Courtesy of Belding Bros. & Co.

Preparing Leaves and Feeding Silkworms

MERCHANDISE MANUAL SERIES

SILK

BY

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This Series is Dedicated

to Mrs. Henry Ollesheimer, Miss Virginia Potter, and Miss Anne Morgan, who desiring to give greater opportunity for advancement to commercial employees and believing that all business efficiency must rest upon a solid foundation of training and education gave years of enthusiastic service to the testing of this belief.

MERCHANDISE MANUAL SERIES

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EDITOR'S PREFACE

As "Department Store Merchandise Manuals" these books were originally written for salespeople and were designed to give them reliable information concerning the sources and manufacturing processes of the merchandise which they handle. When it was necessary to deal with scientific or historical material it was treated as simply and concretely as possible and the point of view taken was that of business rather than that of the school or laboratory. In this form they have proved their practical value not only to the department store salesperson but in the specialty shop. It has been pointed out, however, that the material has a wider scope than that of sales manuals alone.

As reference books, librarians will find the short, clear statements and full indexes invaluable.

As an encyclopædia of merchandise the series contains scientific information in a simple, compact form which makes it available for children and others to whom the subjects treated are unfamiliar.

As textbooks they are adapted for use in commercial schools, high schools, night schools, settlement classes, and by teachers of household arts and domestic science.

As source books for practical story-telling, kindergartners, primary and vacation school teachers will find in them an abundance of interesting material for short "true" stories on the various industries and crafts, the manufacture of household articles, such as pins and needles, as well as the making of pottery, glass, and steel. These manuals contain just the material often hunted for in vain by teachers and librarians.

As household helps and shopping guides the young housekeeper will find the manuals her best friends because they not only describe the manufacturing processes but tell her how to distinguish well-made articles of good materials from the inferior and badly made. They also tell her how to care for the clothing or household goods which she has bought.

For salespeople and storekeepers they supply the general and specific information about their merchandise which is indispensable to efficiency, yet very hard to gather from the scattered sources upon which they now depend.

These changes should enlarge the usefulness of the manuals without losing any of their specific value in the field of salesmanship.

The subjects of color and design are of great importance in the treatment of many kinds of merchandise. To avoid any confusion arising from varied

statements of principles the editor has put the material into a standardized form approved by the authors of the manuals in which these chapters appear.

We wish to express our grateful appreciation to the manufacturers and experts who have given us such valuable counsel and cordial co-operation.

BEULAH ELFRETH KENNARD.

AUTHOR'S PREFACE

The salespeople in the Silk Department should know the main facts about the production and manufacture of silk, the making of pile fabrics, and the various finishing processes. But while this knowledge is of primary importance to those who sell merchandise it is also valuable to the consumer. The manual is therefore planned so that it may be of use to students of household arts and home economics both in the schools and in the home.

The author is indebted to the editor of the series for the chapters on the principles of color and ornament and design; to Cheney Brothers for the valuable glossaries in the Appendix and also for reading the manuscript; to Mr. E. M. Barlow, Stehli Silk Corporation, for reviewing certain chapters; and to Mr. Albert Blum, United Piece Dye Works for valuable information on dyeing.

For illustrations thanks are due to Belding Bros. & Co., Mrs. Ellen McGowan (author of "Textiles"), to the Macmillan Co., and to Robert M. McBride & Co.

ELIZA B. THOMPSON.

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THE SILK DEPARTMENT

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In all modern stores the Silk Department is one of the largest and most important. It is a very extensive department including portions of the stock in many other sections of the store.

Silk is a staple fabric and is used in making many articles in the ready-to-wear and other departments, which are listed at the end of the chapter.

Location

The location and arrangement of the silk yard goods department are of primary importance. In nearly all stores the silks are wisely placed on counters under the windows where the light is good. The evening silks are in a special section lighted by electricity. These precautions are really necessary, as it is almost impossible to match fabrics for daytime wear by artificial light, or for evening wear by daylight. Some-

times the Silk Department is moved to the second floor to secure better light and more space.

Arrangement

Next to a favorable location, a pleasing arrangement of the silks is the chief consideration. The salespeople in the department are usually experienced and capable, and the display rarely fails to be tempting in its beauty, color, and variety.

The Silk Yard Goods Department

In most large stores the Silk Department proper is divided into sections. The plan differs in various places, but the typical arrangement is somewhat as follows:

Plain Silks (either in colors and white or with white silks in separate section)
White Silks
Black Silks
Novelty Silks
Foulard and Wash Silks
Evening Silks
Pongee Silks
Velvets
Chiffons

In these different sections both foreign and domestic silks are usually sold. They are classified as to color and prices.

Other Departments in which Silk Fabrics are Sold

Besides the department where only silk yard goods are sold, materials made of silk are found in many of the other departments, as for instance:

Linings
Ribbons
Laces, Veilings, and Nets
Neckwear — ties, scarfs, collars, etc.
Trimmings — principally artificial silks
Art Needlework — embroidery silks, silk materials, and articles
Notions — sewing-silk
Buttons — silk-, velvet-, or plush-covered
Handkerchiefs
Hosiery
Underwear
Corsets
Ready-to-Wear — suits, coats, dresses, blouses
Millinery — hats and flowers
Gloves — silk gloves
Shoes — slippers
Bags — silk and velvet, silk linings
Umbrellas and Parasols
Drapery and Upholstery, all-silk and part-silk materials

Chapter II

SOURCES AND CULTIVATION OF SILK

Branches of the Silk Industry

The silk industry may be divided into four general branches:

1. The raising of the silkworms and production of the cocoons.
2. The reeling of the long silk fiber from the whole cocoons (from which a continuous thread may be drawn).
3. The manufacture of spun silk from the pierced cocoons and other forms of waste silk.
4. The manufacture of cloth from both raw and spun silk.

The first two branches of the industry are carried on in Asiatic or European countries where labor is cheap. The last two branches are carried on extensively in the United States, which has the most modern machinery.

Source of Silk

Silk, the strongest and most beautiful of the four

leading textile fibers, is the filament spun by a silkworm, a sort of caterpillar, in making its cocoon.

There are between three and four hundred moths that produce silk cocoons; the one best-known and most widely cultivated is the Bombyx mori.

Silkworms may be divided into two classes:

1. The *cultivated silkworm* is carefully raised and fed on mulberry leaves. The color of the cocoon varies from white to different shades of yellow and sometimes has a decidedly greenish cast. It is raised in Japan, China, Italy, France, Spain, Austria, India, Russia, and the Levant.

2. The *wild silkworm* is found in India, Japan, and China. These worms are not cared for and usually feed upon oak leaves. The tannin and the iron salts in the oak leaves affect the quality of the threads and must be removed before the silk can be properly dyed. The cocoon is a light brown or tan in color, and the threads, which are tan-colored also, are coarser, harsher, and more uneven than the silk from the cultivated silkworm. Three varieties of silk are made from the wild silkworms — pongee, shantung, and tussah.

The Silkworm

The silkworm has a small head and relatively large jaws. Inside the body and on either side are the silk glands which terminate in small orifices or spinerets

under the jaws. The silk filament emerges from the spinerets as a gummy liquid and hardens immediately when it is exposed to the air.

The silkworm has sixteen legs or pads. The six front legs differ from the ten back ones and are used for catching the leaves for feeding. The back legs are thicker and shorter. The worm has twelve rings around its body and there are nine black spots on each side of its body, which are holes for breathing.

Figure 1 shows a life-size silkworm.

The silkworms live but two months during which time they pass through four stages of development:

1. The egg. The eggs are laid once or twice a year, 300 to 500 at a time. They take about ten days to hatch.

2. The worm. The worms hatched from these eggs live one month during which they grow from ¾ of an inch to 3 inches in length.

3. The chrysalis. The worm spends three days in spinning the cocoon and then changes to the chrysalis form, in which it remains for 20 days.

4. The moth. The moth emerges from the cocoon, lives three days, lays its eggs, and dies.

The silkworm eggs are so small that 30,000 or 40,000 weigh only one ounce. From this ounce of eggs, cocoons weighing from 100 to 140 pounds may be expected, and these will produce from 9 to 12 pounds of silk.

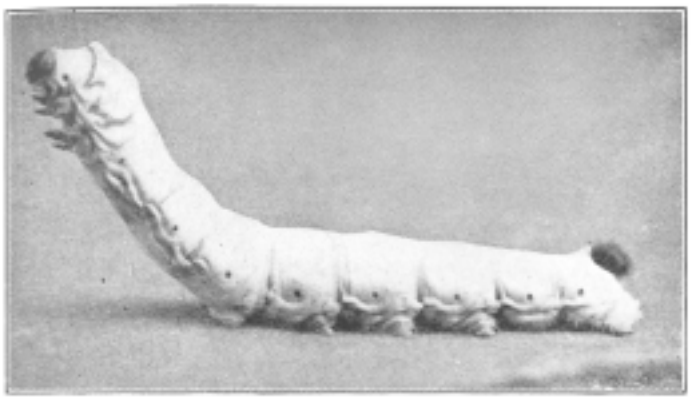


Figure 1. Life-size Silkworm Ready for Molting

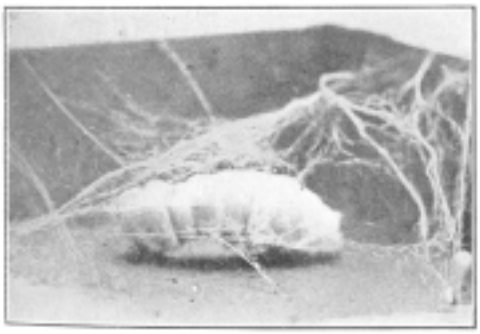


Figure 2. Silkworm Beginning Cocoon

Figure 3. Moth Escaping from Cocoon

Courtesy of Belding Bros. & Co.

The excellence of the silk depends largely upon the mulberry leaves upon which the worm feeds; the white mulberry is considered the best. For the first few days the small worm sucks only the juice from the leaf; then it begins to eat the tender part.

The frontispiece shows Japanese workers preparing the leaves and feeding the silkworms during the first week.

Life of the Silkworm

The worm has four molting seasons. At the end of the first week it stops eating for a few days while it sheds its skin or molts for the first time. When it begins eating again it is very hungry and eats rapidly. When many worms are eating the noise sounds like falling rain.

After about four days the silkworm sheds its skin a second time, about four or five days later á third time, and five or seven days afterwards a fourth time. Whenever it molts it stops eating for a couple of days, raises itself on its hind legs, and remains quiet. The skin begins to crack above the nose. The head comes out first, and then the whole body. As soon as the worm has cast off the old skin it is ready to eat and grow again. It consumes an enormous quantity of leaves between the third and fourth molting. Each time it sheds its skin the worm becomes lighter in color.

Silkworm Diseases

There are many silkworm diseases. At times the rooms where the silkworms are kept are infested with the germs of contagious diseases and the worms die before they are ready to spin. These diseases are the result of domestication; the wild silkworms are less subject to them.

The silk growers must constantly watch for these diseases and any carelessness may cause the loss of all the worms.

Spinning and Making the Cocoon

When it is ready to spin the cocoon from the silk which is secreted in its body, the silkworm loses its appetite, shrinks a little, is restless, and moves its head constantly from side to side. Finally it raises itself on its hind legs, reaches up and attaches itself to a branch which is placed conveniently near. It first throws out guy lines of silk, attaching itself to the branch in this way. These guy lines, which are of inferior quality, are used later as waste for spun silk.[1]

Figure 2 shows a silkworm beginning its cocoon.

During the time it is spinning the cocoon, the silkworm eats nothing. In spinning the cocoon the head of the worm is thrown back and forth and the silk is

1 In rearing large numbers of silkworms it frequently happens that two worms spin one cocoon which envelops them jointly. These cocoons are known by the trade name of "duppions." The silk is inferior as it cannot be reeled in an even thread.

formed like a figure 8 in regular rows up and down. The length of the usable cocoon thread varies from 400 to 700 yards, seldom reaching 1,000 yards.

While it is spinning, the silkworm gradually diminishes in size and the inside thread, which is the last spun, is thin and weak, so that it is treated as waste for spun silk.

The parts of the silk filament are:

1. Fibroin, which is the silk thread and insoluble in boiling water.
2. Seracin, which is the gum or glue holding the two silk threads together as they come from the spinnerets below the mouth of the silkworm. This seracin is soluble in boiling water.

The silkworm changes to a chrysalis while in the cocoon and if it is not killed it will, after a certain time, emerge as a moth from one end of the cocoon. After leaving the cocoon the moths, which are small, whitish, and have no mouths, live only a few days, during which time the female lays from 300 to 400 eggs.

Only a comparatively few moths which are needed for reproduction are allowed to escape in this way. The majority of them are stifled before it is time for them to leave the cocoon. Two kinds of cocoons are the result.

Whole Cocoons

In the whole cocoon the chrysalis, or moth, has been stifled so that it cannot force its way out. The stifling is effected by placing the cocoons in a hot oven. From the unpierced cocoon a continuous length of silken thread may be reeled, and the threads of several cocoons reeled together produce what is called raw or reeled silk.

Pierced Cocoons

The cocoons from which the moths have escaped are called pierced cocoons. In coming out of the cocoon the moth breaks all the threads at one end; consequently a long thread cannot be reeled from the cocoon.

Figure 3 shows a moth escaping from its cocoon.

Reeling the Silk from the Cocoon

The reeling of the silk from cocoons is generally done by women and girls, and most often in the country in which the worms are raised. It is done either in the homes of the people or in the small factories called filatures. There are three methods of reeling silk:

1. Primitive. Silks reeled by this method are called Tsatlees. It is a hand-process and the thread is irregular in size, that is, it has knots and bunches. The skeins are frequently of different sizes.

2. Rereels. By this method the silks reeled in the primitive way are reeled over again and the result is a smoother and more reliable silk. The rereeled silk comes from China and Japan mostly.

3. Steam filatures. This is a system of machine-reeling. The silk is smooth and sent out in a much better condition than in the hand-process. It runs better when used for making silk fabrics in the high-speed machines. It also brings a higher price and is worth it, for it causes less trouble in weaving.

The Process of Reeling

1. The cocoons are sorted for quality and color, each color and quality being kept by itself.

2. The outside loose silk, by which the worm attaches itself to the branches, is first taken off the cocoon and saved and used for spun silk.

3. The cocoons are soaked in warm water to soften the gum which holds the silk together.

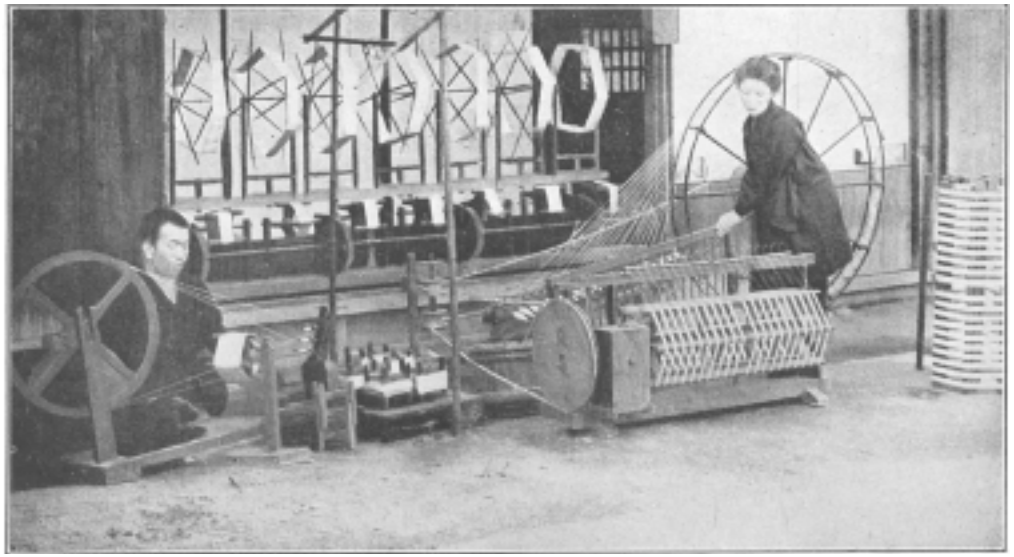
4. The cocoons are then brushed while floating in the water, until a continuous fiber is obtained, that is the loose fibers are caught in the straws of the brush and unwound until all of the outside threads of silk have been taken off the cocoon and what is termed a long end is found. Then the threads from four or more cocoons are united and twisted to form a single thread, because the thread from a single cocoon is too fine to use.

The threads are wound on a reel, a wooden frame with arms. To form a compact and rounded thread and to keep the threads from tangling as they come from the cocoons, each cocoon thread is passed through a ring before the several threads are finally brought together to form the one thread. This completed thread when made up into skeins becomes the raw silk of commerce.

Figure 4 shows the threads being reeled into skeins.

Great care is necessary in reeling, as the threads from cocoons are not all of the same thickness; the silk as spun by the worm is heavier at the beginning of the cocoon and much finer and poorer at the end, varying more or less throughout its entire length. The person who has care of the reeling must try to keep the silk thread uniform, by adding a cocoon thread from time to time, whenever the thread being reeled grows thin. The thread must also be watched carefully to avoid any breaks.

The form in which the reeled silk is shipped varies in different countries. In China and Japan the skeins are taken off the reels, twisted together, and made up into packages, called "books," which weigh from 4 to 10 lbs. each. These are packed in bales varying in weight from 100 to 140 lbs. In European and other countries the skeins are made up into bales without being put into "books." These bales weigh about 200



Courtesy of Belding Bros. & Co.

Figure 4. Reeling Silk into Skeins

lbs. each. Figure 13 shows the raw silk bundled and baled for shipment.

Wild Silk

Tussah silk cocoons are softened with an alkalin substance and are reeled in this damp gummy condition without being floated in water; consequently the filaments do not cohere so well. The coloring matter is in the fiber and it is hard therefore to bleach this variety of silk.

Silks made from the cocoons of the wild silkworms, as already stated, are usually of a poorer quality than those from the domesticated worm; they are uneven in texture, harder to bleach, and do not take dyes so well. But on the other hand they are often more durable than the ordinary silk fabrics, probably because they are not heavily weighted.

These silks are cheaper because no care is taken of the wild silkworms, while the domesticated worms require constant attention. Much time, however, is consumed in collecting the cocoons. The finishing processes are less expensive because the silk is more often used in its natural color.

Chapter III

RAW SILK AND SPUN SILK

Raw Silk

When cotton, flax, or wool arrives at a factory the fibers are matted together and must be separated, combed out, and twisted into a continuous thread by a complicated process of spinning.

The silkworms, however, have spun their own threads and when the delicate filaments have been reeled from the perfect cocoons, the raw silk appears in long fine skeins which are not only easier to manufacture into yarn, but are stronger, than any spun thread of the same weight.

Waste silk must be spun like the other fibers, but raw or reeled silk is "thrown" in order to prepare it for weaving. The manufacturers of yarn from raw silk are called throwsters. The term throwing is used only in raw silk manufacture.

Conditioning

Since silk is sold principally by weight and because it is necessary to determine the amount of water it has absorbed, its weight must be accurately ascertained. A certain amount of moisture, about 11 per cent, is allowed in commercial practice, but silk will hold as

much as 3 per cent without appearing damp, and can be made to absorb an even greater amount. Too much moisture affects the strength and elasticity of the silk. The process by which the moisture is reduced to the required standard is called "conditioning." Official conditioning houses are established in all the large centers of the silk trade.

When the bales containing the books of raw silk reach the manufacturer, they are opened and the skeins are weighed accurately. They are then dried thoroughly in ovens, weighed again, the difference in weight noted, and the dry weight of the full bale worked out by proportion. The conditioned weight of the bale is based on this dry weight plus the allowed regain of moisture — 11 per cent.

Silk Throwing

The series of processes included under the term "silk throwing," consist of:

Sorting
Soaking
Drying
Winding
Doubling and twisting

Sorting

When necessary the skeins are sorted according to color, size, and quality, and laid in piles.

Soaking

In the process of throwing some of the skeins are soaked to soften the gum before winding. In this case lukewarm water is used, which has in it some olive or neat's foot oil, and olive oil soap. Other silks are thrown "bright," that is, they are not soaked, but are wound without softening the gum.

Drying

The skeins of silk which have been soaked are either dried in a hydroextractor, which revolves rapidly and throws the moisture from the skeins, or they are hung on poles in a small steam-heated room or closet.

Winding

The process of winding prepares the silk for the doubling and twisting.

The skeins are placed on a series of reels on the front of the winding machine, the end of each skein passing through an eyelet to the bobbin. The silk is wound up and down the length of this bobbin. The thread passes through two fixed plates which remove irregularities and knots. The machine is fitted so that it stops immediately if a thread breaks or anything is wrong. One worker can manage several machines.

Doubling and Twisting

The silk from the skeins is so fine that several

strands must be put together and twisted in order to make a thread heavy enough for weaving. This process is called doubling and twisting.

In the doubling several threads from as many bobbins are put together to form one thread, which is wound upon a new bobbin. The doubled thread is then twisted on another machine and again wound. In some modern machinery these two processes are combined.

The number of threads and the twist are determined by the future use of the silk.

There are three varieties of yarn.

Singles are single strands of reeled silk; they may be twisted or not. When they are hard-twisted they are used for making gauze and chiffons.

Tram is used for filling or cross threads. Two or more strands of raw silk are put together and twisted slightly to form one strand and then wound on bobbins. A poorer quality of silk is generally used for tram, as strength is not required. Hard-twisted tram is used for the filling of crêpes.

Organzine is used for warp or lengthwise threads, and must be strong. It is made from the better grades of silk. A single thread is twisted with a right-hand twist, then two or three of these are put together and twisted with a left-hand twist, and so made into one strong thread and wound on a bobbin.

The luster is greater when the threads are slightly

twisted. Tram therefore has considerable luster, while the luster of organzine varies according to the amount of twist used.

After twisting, the silk is reeled into skeins containing from 500 to 2,500 yards according to the size of the thread. It is now ready for the dyeing and weaving processes.

Sewing-thread, or sewing-silk, is made by combining two strands of twisted thread into one hard-twisted thread. (See manual for " Notions Department.")

Machine-twist is composed of three strands of twisted threads united into a hard-twisted thread.

Stretching

This is a process usually employed only for sewing-silks. The twisted thread from the bobbins is passed through water and over rollers which stretch the thread. Any uneven parts are drawn out, making the thread a uniform size. Silk that is stretched in the gum has great brilliance or luster.

Spun Silk

Raw or reeled silk was the only silk used to any considerable extent until about sixty years ago, when the process of spinning by machinery, which had been applied to the other textile fibers for nearly a century, was found to be equally practical for silk which could not be reeled.

By this process short and broken silk fibers are made into one continuous thread. They are not long and strong, like the reeled silk, and the yarn is not so lustrous, for it must be twisted more; consequently it makes an inferior and usually a cheaper silk. The best spun silk yarns are largely used for filling, or weft, for silk dress goods or for half-silk goods. The lower grades are used for poorer dress materials and for knitting.

Waste silk has been utilized only since the perfecting of spinning machinery during the last century. Before that time the short fibers were useless.

The first patent for the carding and spinning of waste silk was obtained in England in 1671 by Edmund Blood, although the spinning of waste silk into thread did not become a large industry until recent years. Silk was probably never spun by the old method of spindle and distaff.

Sources of Spun Silk

The sources from which spun silk is obtained are:

1. Pierced cocoons, from which the moth has been allowed to escape.
2. Floss, which is silk of an inferior quality, including that spun first by the worm in fastening the cocoon to the branches, and the silk from the inside of the cocoon, the last to be spun.

3. Silk waste, which comes from the different processes of manufacture.
4. Wild silk cocoons, which cannot be reeled.
5. Double cocoons, where the cocoons of two moths are fastened together.

The waste silk is imported in bales and is received by the factories in this form. Some bales may contain all pierced cocoons. Other bales may be made up entirely of long tangled waste from the reeling of the raw silk from the cocoons. These long tangled cords are known as frisons.

The bales are opened and the contents examined carefully, in order to remove as much dirt and foreign substance as possible.

Processes in the Preparation of Spun Silk

The processes are:

1. Removal of the gum
2. Beating and opening
3. Combing
4. Inspecting
5. Spinning:
   Drawing and doubling
   Twisting and winding
6. Gassing or Singeing

Removal of the Gum from Waste Silk

As waste silk must be spun it is necessary to remove

the gum before it can be handled. This is done by boiling, maceration (or schapping), or chemical degumming.

1. Boiling off. The silk is put in open-mesh bags and pulled up and down in boiling soapy water for three or four hours. The softened gum passes out through the meshes. The silk is then transferred to a washing machine containing cold water.

2. Schappe or fermentation method. Schappe is French for spun silk. In this process the waste silk is put into a tank of warm, soapy water and left for two or three weeks until fermentation sets in and the gum is loosened. If the silk is not taken out at the right time the fiber is weakened and the silk loses some of its luster.

3. Chemical degumming. In this process waste silk is degummed by soaking in an alkali or in an acid solution.

The silk loses about a quarter of its weight when the gum is taken out. It is next washed in hot water for about five minutes, then in cold water for a longer period, and dried.

Beating and Opening

The silk is put into a machine which removes the dirt and foreign matter, such as chrysalis shells, sticks, etc., and opens up the fibers and makes them more flexible.

Combing

In the next machine the silk fiber comes in contact with revolving rollers upon the surface of which are fine needles. These needles comb and straighten out the longer fibers and pull off the shorter fibers. The silk comes out in the form of sheets or "laps" which may be combed several times.

The short fibers which are combed out are known as noils, and may be used over again for an inferior quality of silk. Uusually these are made into goods which have no luster; they are used mostly for upholstery.

Inspecting

The laps or rolls of silk fibers are carefully inspected and any impurities are removed by hand. The work of inspection is done in a dark room upon a table of glass lighted from below, so that impurities are easily seen and removed.

The Spinning Process — Drawing and Doubling

The drawing machine further combs and straightens and also draws out the fibers and forms them into continuous strands called slivers, which are like soft, loose ribbons. These pass through other drawing machines, into which several of the strands are fed at one time, and come out as one continuous strand, the same size as one of the original number. In the

last process the slivers are wound on bobbins ready for the roving frame.

Twisting and Winding

In the roving frame the yarn is drawn from the bobbins at the top of the frame, then twisted as it passes from the bobbins to the spindle, and then wound on spindles at the bottom of the frame.

Gassing or Singeing

The finished yarn is often roughened by lumps which are smoothed off by a process called gassing or singeing. The yarn is run through a gas flame at so high a speed that the flame will not burn the thread, but will burn off all the loose ends.

In the last process the thread is wound from the bobbins into skeins ready for dyeing.

Uses of Raw and Spun Silk

Raw or reeled silk is used in the manufacture of fine silk materials (called broad silks) and fine sewing-thread.

Spun silk is used in making coarse broad silks, knit goods, hosiery, braids and bindings, embroidery, and crochet silks. It is not so strong as reeled silk and it does not have as much luster, because it is twisted harder than reeled silk and also because there are many short ends projecting from the surface of the yarn.

The two kinds of silk are often combined in the same material, the raw silk being used for the warp and the spun silk for the filling.

Chapter IV

WEAVING

Woven Silk

If a piece of plain silk is unraveled, many lengthwise threads are found placed side by side and interlaced by one continuous crosswise thread. This crosswise thread, which has been introduced in some manner from edge to edge, holds the lengthwise threads together and in position, forming a material which will be more or less durable according to the strength and fineness of the threads and the way in which they are interlaced.

The simplest weaving consists of two sets of threads: (1) the lengthwise threads, which are arranged first in order and are called the warp threads, and (2) the crosswise threads, which are called the woof, weft, or filling threads.

The filling threads as they are interlaced across the warp threads are carried over one and under one; in the next row the threads alternate — under one and over one — just as in darning. Each row is pushed up close to the preceding one so that the cloth may be firm.

Warp and Weft

The lengthwise, or warp, threads must be placed in position first. Since the strain on these threads is greater and they need to be strong, each thread is made up of two or more strands firmly twisted together, making a heavier thread than the weft. The weft is only slightly twisted into soft, thinner threads which can be closely pushed together. (See Chapter III on organzine and tram.)

For the durability of the silk and for the good appearance of the material, it is of great importance in weaving that the difference between the warp threads and the filling threads should not be too great. For instance, if the warp thread were very strong and heavy and the filling thread fine and weak, the silk would not wear well.

Antiquity of Weaving

Weaving is one of the oldest of the handicrafts and seems to have been practiced by all primitive people. In the more backward countries today there is hardly a savage tribe which has not in some way discovered the art of making thread and weaving it into cloth. They follow the same methods and use the same appliances as those of very early times, so that it can be seen how directly all the modern improvements in weaving are based on early discoveries.

Weaving was carried to a high degree of perfection

by the great peoples of ancient times in Egypt, China, India, Greece, and Rome. This perfection was reached, however, not by the use of complicated machinery, as at present, but by patient hand-labor. The multitudes of warp threads were stretched on simple looms and each thread was picked up in its turn and the weft inserted.

All ancient people seem to have known two sorts of weaving, which differ only in the way the weft is carried across the warp. In one kind the warp is tight and the weft is carried across with a sufficient tension to pull it straight and warp and weft show in equal proportion. In the second way the weft is left slack as it is carried across and the result is that all the warp is covered by the weft.

Raw Material Used in Ancient Times

The raw material used by the ancient weavers depended on the natural products with which they were familiar and the inventive skill which they used.

The simplest of these raw materials for weaving were the long grasses and the leaves of any plants which could be split into strips, but the principal textile fibers were also used by ancient peoples.

The Egyptians used flax and produced the first linen; the people of India used cotton, as the cotton plant grew plentifully in that country, and their fine cottons were a marvel to the other nations; the pastoral tribes

used the wool and hair which was shorn from their flocks; while the Chinese had the monopoly of silk, and their silk fabrics were the admiration of all who could buy them.

An account of the development of the art of weaving cannot fail to be of interest to those who handle woven fabrics, and the principles of weaving and the power-loom of today will be better understood if the more simple parts of the hand-loom are described.

Origin of the Loom

Where only the grasses and rushes were used, as in the weaving of mats and baskets, they could be held in place easily, but as soon as any length was required, it was necessary to plan some kind of frame to hold the warp threads tight while the weft was interlaced across them. This frame was universally called a loom and was improved from time to time according to the needs and ingenuity of the weaver.

Figure 6 in the manual for the " Cotton and Linen Departments " shows a primitive loom.

Looms have been represented in the paintings and sculptures of ancient artists. The early poets allude to the loom and the operations of weaving and needlework. Illustrations of looms have been found in some of the ancient tombs in Egypt, and looms also appear in some very old paintings. These looms are in different positions; in one picture the warp is stretched

on the ground, and a figure appears to be weaving a mat, while others show upright frames.

Although weaving was without doubt a domestic occupation in Greece and Rome, there are fewer illustrations of the art than are found in Egypt. On two ancient Greek vases the looms of Penelope and Circe are pictured; these are both represented as upright looms, differing somewhat from those of Egypt.

Nothing very definite can be learned from these pictures as to the methods by which the ancient peoples procured their fine and beautiful results. However, these references prove that the occupations of weaving and embroidering were carried on extensively in the ancient world and were held in high esteem.

An interesting drawing in a London museum proves that the Chinese had looms for plain weaving and that, by adding various contrivances, they made pattern-weaving looms on which they wove beautiful silk fabrics.

Hand-Looms

In the most primitive looms the lifting of the threads of the warp for the intersection of the weft was done by the fingers; this was slow work, and very early in the history of weaving a device was used by which the weaver could lift the threads with his feet by means of treadles attached to the heddles through which the warp threads were inserted.

It is not known when this improved loom was first used, but it is probable that the Chinese were its originators, because silk is so fine that it would be most difficult to pick up the warp with the fingers.

From the first attempts at weaving until the development of power-looms, all sorts of devices were constantly being added to the loom, not only that the weaving might be made easier, but also that more complicated weaving might be done and more beautiful fabrics woven.

Parts of the Hand-Loom

The hand-loom consists of the following parts:

Frame
Warp beam
Cloth beam
Heddles
Harness
Reed or batten
Treadles
Shuttle

The *frame* holds the parts of the loom.

The *warp beam,* upon which the warp threads are wound before weaving, is at the back of the loom.

The *cloth beam* is at the front of the loom. The warp threads, after they have been carried through the heddles and reed, are fastened to the cloth beam and the finished cloth is wound upon it.

The *heddles* are either wires or cords having a hole or eye in the center through which the warp threads pass.

The *harness* consists of two or more sets of heddles. These sets of heddles are suspended from a beam which is attached to the loom at about the center of the frame.

The *reed* or *batten* is composed of a large number of wires set in a frame-work. These wires, which resemble a comb, may be set near together or farther apart. The warp threads pass between the wires and the fineness of the cloth depends upon the width of the spaces between the wires. The reed is also used for pushing up the weft, so that the threads may be close together and the cloth firm.

The *treadles* which are connected by cords to the heddles or harness, are worked by the feet of the weaver and move the heddles up and down. A "shed," an opening through which the shuttle passes, is formed when a series of alternate threads is lifted at one time by the heddles.

The *shuttle* holds a bobbin, upon which the weft thread is wound. The shuttle is passed by the weaver back and forth between the two series of the warp threads made by the shed.

Power-Looms

The power-loom was invented in 1785 by the Rev.

Edmund Cartwright, an Englishman. It was first used in the United States in 1815.

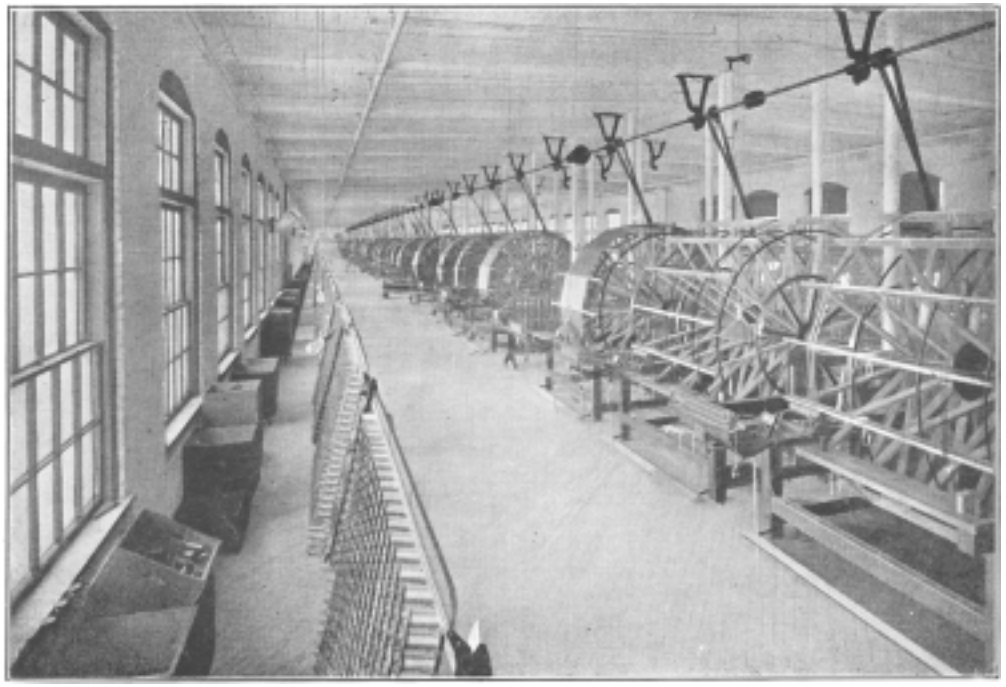
In the development of the power-loom the hand-loom was used as a basis so that the parts of the loom and the principles of weaving are practically the same. So many contrivances have been added to the power-loom, however, that operations which were once performed by hand are now accomplished automatically. Among these are devices for holding a number of shuttles at the side of the loom and for sending each in its turn across the warp with its own particular color; empty bobbins are automatically replaced by full ones, and the loom is made to stop instantly if any thread breaks. Special devices are provided also for the weaving of complicated patterns.

Warping or Placing Silk Upon the Loom

The great looms of our modern silk factories must be prepared for weaving, just as the hand-looms were, by first stretching the warp threads on the loom. This process is called "warping" and each warp thread is called an "end," while the crosswise threads are known as "picks."

Bolts of cloth as they come from the loom vary greatly in length. Each individual warp thread must be as long as the finished cloth.

If the silk is to be very wide and of rather fine quality, from 3,000 to 6,000 ends will be required —



Courtesy of Belding Bros. & Co.

Figure 5. The Warping Room

that is, from 3,000 to 6,000 single threads lying side by side.

Silks which are eighteen inches or more in width are called by the manufacturers "broad silks," to distinguish them from ribbons, which are made on narrow fabric looms. (See Chapter XVI for information on ribbons.)

In the preparation of the warp the silk is wound on spools, one for each warp thread. These spools are put on a rack or creel. The thread is passed from the creel through a coarse comb and from there to a finer comb or reed. Then after passing through a still finer reed the warp threads are passed on and wound around the warping frame which is a large wheel, or reel, eight yards in circumference. As the reel revolves it draws the threads from the spools in such a way as to cause them to lie parallel upon its surface. These reels may be seen in the view of the warping room, Figure 5.

Beaming Off

From the frame the warp is wound on the warp beam of the loom, which is afterward placed in the back of the loom. Care must be taken in this operation that all the threads are kept at an even tension as they are wound on the warp beam. After this is in place in the loom the threads must be drawn through the heddles and through the reed; this is usually a

hand operation. Figure 6 shows workers passing a single warp thread through the heddle eye of the harness.

Movements of the Loom

Three principles underlie the art of hand-weaving and they are also most important in modern power-weaving:

1. Shedding, the raising of part of the warp threads at one time to form an opening through which the shuttle passes.
2. Picking, the throwing of the shuttle back and forth through the shed.
3. Battening, pushing the weft threads close together after the picking, in order to make a firm texture.

In addition to the preceding movements two others should be mentioned:

4. Letting off, unrolling the warp from the warp beam to furnish thread for the forming of new cloth.
5. Taking up, winding the cloth which has just been woven onto the cloth beam to make room for the weaving of more cloth.

Chapter V

SILK WEAVES

Varieties of Weaves

The fineness of the silk fiber and its beautiful luster have made it suitable for many varieties of weaves. Those most used are:

Plain
Rib
Twill
Satin
Gauze or leno
Double-cloth
Pile
Pattern

Plain Weave

The plain or tabby weave, as it is sometimes called, is the simplest and is used for the largest number of materials. Among the silks made with this weave are China silks, India silks, and taffetas.

Two harnesses are ordinarily used in the loom in making plain weaves, but in the plain-weaving of silk four or more are often used. In this case the silk

yarn is threaded through the different harnesses so that they will act as two. Half the threads or all the odd-numbered threads are raised at one time by machinery, the shuttle carrying the weft or filling is sent quickly through the shed thus formed, and the weft thread is beaten back against the cloth; then the alternate threads — the even-numbered threads — are raised and the shuttle is sent back again, and so on.

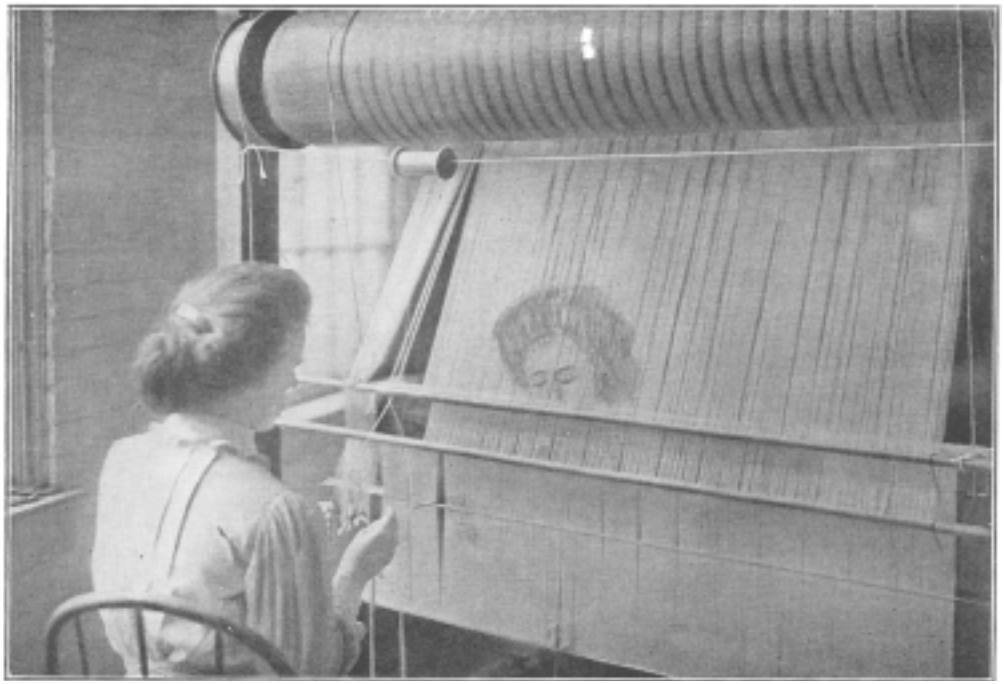
Rib Weaves

The rib weave is the plain weave with a rib or corded effect made by varying the size of the threads of either warp or weft, or by the use of a heavy filling over which the silk threads pass. As these heavy filling threads are often cotton or worsted, the weave of the materials made in this way is not always satisfactory, for the silk threads covering the filling may wear off and show the cotton underneath.

Some of the materials woven with the rib weave are bengalines, poplins, grosgrains, ottomans, failles, reps, moirés, and others.

Rib weaves are of two kinds:

1. Warp rib, in which only the warp yarns which make the ribs are seen. In this case the ribs run across the fabric and are formed by the weft passing twice through the same shed.
2. Filling rib, where only the filling yarns which make the ribs are seen, and the ribs run



Courtesy of Belding Bros. & Co.

Figure 6. Workers Passing a Single Warp Thread Through the Heddle Eye of the Harness

lengthwise of the fabric. The ribs are formed by passing the filling over two and under two warp threads, passing once through each shed.

Twill Weave

The twill weave is known by the diagonal lines which run across the cloth. Some of the silk materials made with the twill weave are plain foulards, surahs, or silk serges.

The diagonal lines are formed by the way in which the filling thread intersects the warp. Each filling yarn passes over one and under two or more warp threads, but not the same set of threads each time. Each row begins one thread in advance of the preceding row; the result is that diagonal ridges are formed.

Satin Weave

In the satin weave the weft passes in succession over one thread and under a group of warp threads, a common number being seven. Each time the weft crosses the warp it passes over and under different warp threads until it has been back and forth seven times; then the first row is repeated and each row of this next group of seven repeats the first group and so on.

In this way nearly all the warp is brought to the surface and nearly all the weft is left underneath, and the ties, as they are called, (that is, the single threads

crossed by the weft), come at a different place each time and are hardly perceptible so that the surface has the smooth and shiny appearance characteristic of satin. After the finishing process of calendering, or passing between heated rollers, this surface reflects the rays of light completely.

Satins are not always woven on seven or eight threads; there may be almost any number from five to twenty-four, but seven threads, the repetition coming in the eighth row, seem to be used most commonly. The number of threads indicates the number of heddles required in the loom, and satins are designated as five-heddle or eight-heddle satin, etc.

In weaving satins the wrong side of the satin is on top and the face down. This makes the process of weaving easier, as only one heddle need be raised for the filling thread to pass through; whereas if the fabric were woven with the face up eight, ten, twelve, or more heddles or shafts would have to be raised, according to the number of warp threads to be skipped.

Although there is no record to show when satin weaving was invented, the Chinese were doubtless the first to devise this method. It is particularly adapted to the silk fiber, because the luster of the silk shows much more than in plain weaves.

The satin weave is the foundation of all modern pattern-weaving, as the satin ground shows to ad-

vantage the silk and gold embroideries which the Chinese have always been so skilful in working.

Gauze or Leno Weave

Gauze or leno weaving produces an openwork effect, such as is found in grenadine and marquisette, which are firm and yet at the same time thin and open fabrics.

A special loom carrying two warp threads is required. The regular warp thread is placed as usual. The extra warp thread twists to the right and left around the regular thread. The filling threads pass over and under the two warp threads, binding them tightly together and forming a wavy appearance.

Double-Cloth Weaves

Double-cloth weaving is the process of weaving two cloths at the same time to form one fabric. It is found in broad silks or ribbons where:

1. Both sides are of different color.
2. One side is velvet and the reverse side satin.
3. The figures are different on each side.

The weave is also used in silks which are made heavier by being backed, that is, the back may be of wool and the face of silk or satin; and in cravats or neckties which are made in tubular form.

1. The two cloths may be woven separately and

joined only at the two edges; in this case a tubular fabric is formed, such as is used for men's neckties or cravats.

2. The two cloths may be woven in two separate pieces, each having its own warp and filling, but the threads are interlaced at certain regular intervals, fastening the two pieces together to form one material. This is the method used for double-faced ribbons and silk materials which are backed to make them heavier and stronger.

Pile Weave

Velvets and plushes are known as pile fabrics. There are two methods by which the pile may be produced.

1. Velvets are usually woven by the double-cloth method — two pieces of cloth face to face. There are two sets of warp threads; each warp has its own weft, and in addition extra pile threads pass up and down from one set of warp threads to the other. The distance between the two sets of warp threads determines the length of the pile.

Two shuttles go back and forth across the cloth, carrying the filling for each set of warp threads and at the same time binding in the pile threads. As the weaving proceeds, a knife travels in the same direction as the shuttles and a short distance from them, cutting the pile threads between the two pieces of cloth.

Courtesy of Belding Bros. & Co.

Figure 7. A Weaver at Work

These threads after being cut stand up straight and form the pile or nap of the velvet. Two pieces of velvet are thus woven at the same time. As they come from the loom the two pieces are wound on separate beams.

2. Another method of weaving velvet, which is not much used now, is done with two sets of warp threads, one set being for the pile. The pile is raised by inserting wires into the shed under the pile thread and across the warp threads. When the wires are pulled out, a small knife on the top of the wire cuts the pile loop, leaving the ends standing straight, or in the case of uncut velvet, the wires have no knife on top but are pulled out, leaving the loops uncut. The inserting of the wires and the pulling out of the same is all done by machinery.

In this method one piece of cloth is woven at a time and the loops forming the velvet are on top and in sight. The warp and filling threads may be either of silk or cotton. These form the back of the velvet. The pile thread which forms the face of the velvet is always of silk.

3. Another method is used in making corduroy and velveteen or cotton velvets. Two sets of filling threads are used to one of warp. The extra filling thread forms the pile on the face of the cloth, and as the weaving proceeds it is cut by hand with a special kind of knife along the length of the material.

The Process of Pattern-Weaving

When designs or figures are wrought into a fabric while it is being woven, the process is called pattern-weaving.

Whether the warp is placed in a simple frame and the weft put in by patient hand-labor, or whether the work is done on a complicated loom so constructed that the warp threads are lifted automatically for the weft or filling to intersect, the principle is the same. Even in the most intricate patterns the effect is obtained by only the warp and filling threads intersecting each other at intervals which differ according to the design.

A simple pattern may be made by striping the warp, that is, putting in threads of different colors when warping the loom, so that when the filling is carried across, the contrasting colors will appear at regular intervals. Still other effects may be obtained by weaving the filling also in stripes. Some of the old Egyptian patterns were made by striping the weft or filling. In other cases gold, silver, and brightly colored threads were added to the weft at certain intervals.

Antiquity of Pattern-Weaving

Pattern-weaving by mechanical means seems to have been unknown to all the ancients except the Chinese. The Egyptians had some methods of weaving in rich, colored patterns which are unknown to us, though

examples of their workmanship are to be found in museums today. They also applied designs with the needle or by stenciling the fabric after it was woven. Their materials were elaborately decorated, as were those of Babylonia and eastern countries, but we have no evidence of a mechanical contrivance to produce patterns.

The Draw-Loom

The origin of the draw-loom is not known, but the earliest record of it comes from China. As silk was first woven in China it is almost certain that the loom for pattern-weaving was invented there and passed, with silk manufacture, to Western Asia and then into Europe.

The principle of the draw-loom is the same as that of the most elaborate Jacquard loom of the present day. It simply provides a mechanical contrivance for the irregular lifting of the warp threads.

In the draw-loom vertical cords were attached to certain threads of warp so that they might be drawn up separately according to the pattern which was to be woven into the fabric.

The loom had two mountings: one, the usual shaft-mounting needed to form the cloth, and the other a harness, called the "draw boy mounting," by which the separate threads were lifted to form the patterns. The old-fashioned draw-loom also required two op-

erators: one to attend to the throwing of the shuttle across the warp, and the other, called the draw boy, to draw up the threads as previously arranged. The draw boy had a position near the top of the loom, from which he could manipulate the harness assigned to him.

Improvements upon the Draw-Loom

The first improvement upon the loom was made in 1604 by M. Simblot, a Frenchman, who connected a separate series of cords, called the "simple," with the neck of the harness. This arrangement enabled the draw boy to handle the cords while standing at the side of the loom.

During the seventeenth and eighteenth centuries, in both England and France a number of patents were taken out for devices by which the threads could be manipulated by the weaver without the aid of the draw boy. As early as 1687 Joseph Mason invented a "draw boy engine" which could be worked by the weaver.

In 1728 M. Falcon made a chain of perforated cards through which the hooks lifting the warp threads would need to pass, thus controlling the design automatically, and in 1756 M. Vaucanson made a cylinder over which a perforated paper band was passed, securing the same result. This system of controlling the threads not only made the draw boy unnecessary, but reduced the number of harnesses and greatly increased

the range of patterns which might be produced. If patterns are woven on the draw-loom more harnesses are required, and as one loom cannot carry more than about thirty harnesses, only small patterns can be woven.

The various inventions of the eighteenth century remained ineffective, however, because weavers could not use them. It was M. Jacquard who combined the inventions and secured their practical use. The modern pattern-weaving loom is therefore called by his name.

Jacquard

Joseph Marie Jacquard was born at Lyons in 1782. It is impossible to say how much of his work was original and how greatly he was indebted to his predecessors, but he succeeded in perfecting a practicable machine which was adopted by the weavers.

His first attempt to use the machine was in 1804 when he introduced it into his own factory. The silk weavers were opposed to him, and his machine was taken to the public square of Lyons and burned. On that same square today a statue is erected to his memory.

In spite of persecutions, the machine was later set up again in France and in 1820 some were secretly set up in England. At first they were used chiefly as substitutes for the draw boys on the harness-looms.

During the nineteenth century Jacquard's invention was considerably altered by British mechanics and was adapted to the power-looms. At present its use is general over nearly the whole of the textile industry.

The Jacquard Loom

The patterns which can be woven on the ordinary harness-looms are limited in number, but the Jacquard loom admits of four hundred or more changes in pattern. The cost of working on the Jacquard loom is greater than on the plain looms, but the results are so varied and satisfactory, that its use is general throughout the textile industry, especially in the weaving of silks, velvets, and fine laces.

The principal difference between the Jacquard loom and the plain harness-loom is that the shedding in the former is controlled from above the harness, whereas the shedding in the harness-loom is effected by treadles worked from below. By means of the Jacquard attachment to the loom, each one of the hundreds or even thousands of warp threads may be operated separately, without disturbing any other thread on the loom, and they may be lifted in the right order for the formation of any design.

This wonderful invention governs all the operations of the loom. It makes the pattern and ground of the fabric, it changes in proper succession the shuttles carrying the different colors of the design, and it ad-

justs many other details — all by means of holes which have been punched in certain order in a set of cards.

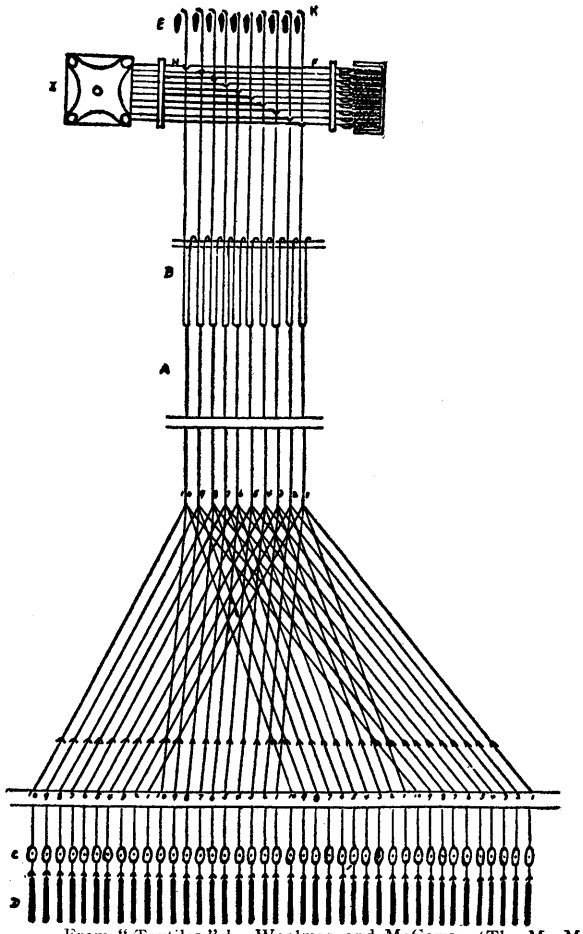
Mechanism of the Loom

The attention of the visitor in the weaving room will be attracted by the almost countless cords which rise perpendicularly from the warp threads in the loom to the attachment overhead. Near the top of the loom is a series of perforated cards, tied together at the ends. These cards are in constant motion and by means of them the design is woven into the cloth.

The mechanism which brings the cards in contact with the threads is most ingenious and rather complicated. It may be easily understood by a careful study of the diagram, Figure 8, in connection with the following explanation of the essential parts of the machine and their relation to one another.

Each cord (A) is fastened at its upper end to a hook (B). This set of hooks controls each individual warp thread by raising the harness cords. These cords have "mail eyes" (C) near the lower ends, through which the warp threads pass, so that when the cords are drawn up the warp threads rise also. The cords are pulled back into place by weights called lingoes (D).

The griffe, or hook lifter (E), consists of a series of bars or blades which lift the sheds. The hooks



From " Textiles," by Woolman and McGowan (The MacMillan Company), by courtesy of the authors and publishers

Figure 8. Detail of Jacquard Loom

A—Neck Cords. B—Hooks. C—Mail Eye. D—Weights or Lingoes. E—Griffe or Hook Lifter. F—Needles. G—Spring Box. H—Needle Eye. I—Cylinder. K—Catch of Needles.

work vertically and have a catch (K) at one end which passes over the griffe.

The needles (F) work horizontally. They are bent back at one end so that each needle may come in contact with the spring in the spring box (G). There is an eye in the center of each needle so that the hooks may pass through. The needles control the hooks.

The hollow, four-sided, revolving cylinder (I) makes one quarter of a revolution with each pick of the pattern, thus placing one of its four sides in contact with the needle.

The cards pass over the cylinder, coming in place alternately and showing the pattern by pressing back those needles not needed to raise the shed.

The Cards

The use of the cards may be better understood by comparing them to the perforated paper roll of the mechanical piano-player. Just as the tune played on the piano is cut in the strip of paper, so the design to be woven in the loom must be cut in the series of cards of the Jacquard machine.

The design for the woven silk is first drawn in color on paper which is ruled for the purpose. The ruling is in straight, vertical, and horizontal lines across the paper, forming small squares; the pattern is carefully planned to fit into certain numbers of squares, like designs for cross-stitch embroidery.

The paper on which the design has been drawn is placed in an upright position on the machine used for the perforation of the cards. Only about an inch of the pattern shows at a time, and the line to be cut is indicated by a scale bar placed across the face of the design; the spaces on this scale bar are numbered from left to right and the numbers on these spaces apply to the warp threads in the loom, the cards in the harness, and their connecting hooks, rods, etc., as well as the corresponding spaces in the pattern card. Each card controls the motion of the loom for one pick, that is, the raising of certain warp threads while the shuttle passes once through the threads which form the shed.

The card cutter places a card in the machine and by pressing certain knobs, holes are perforated in the cards; these holes correspond to the spaces occupied by the design on the line which he is copying. The scale bar is then adjusted for the next line of warps and the next card is cut, and so on until cards have been cut for each line of the design. The cards are then laced together in their right order to form an endless chain. In weaving an elaborate pattern the expense is increased by the use of many thousands of these cards.

Varieties of the Jacquard Loom

There are many varieties of Jacquard looms and these may vary in different particulars. Some aim at

economy in cards, others at reducing the number of needles and hooks. Modern ingenuity is constantly at work to find better and less expensive methods. But after all, the essential principles of the machine remain practically the same. If the warp threads are to be lifted, then some form of hook or cord, or some similar device must be used, which in turn must be directed by either a card cylinder or some other appliance equally effective.

Figured Velvets

Figured velvets are also made on the Jacquard loom. Only such threads of the pile are lifted for the insertion of the wires (see "Pile Weave" above) as are needed to form the figure, and other threads are left to be woven into the ground.

As the pile threads are used in different proportions, they cannot all be placed on one warp beam, but are wound each on its own bobbin. These warp bobbins are spread on frames, each bobbin being separately weighted and each acting independently, so that the number of threads used varies with the figure.

When pile figures appear on otherwise plain fabrics, the figures are generally woven in a sort of a face filling effect and then cut with a knife as already described.

Chapter VI

DYEING SILK

Classes of Dyed Silk

The processes of throwing (see Chapter III) and dyeing are usually carried on in different mills by entirely different concerns, but some of the larger mills complete all the processes.

Dyed silks are divided into two classes:

1. Yarn-dyed goods, which have been dyed in the skein before weaving.
2. Piece-dyed goods, which are dyed after the silk has been woven into cloth.

Yarn-Dyeing Processes

The processes in yarn-dyeing are:

Boiling-off
Weighting
Dyeing

Boiling-Off, Scouring, or Stripping

The raw silk is thrown "in the gum" and the gum is now removed by the boiling-off process. The skeins

Courtesy of Belding Bros. & Co.

Figure 9. Dyeing Silk

of silk are immersed in boiling soap suds made from olive oil soap. This process softens and removes the gum and leaves the silk soft. As much of the color is in the gum, the silk, which may have been yellow, green, or white, comes out white and glossy. The hardness of the gum varies in different kinds of silk; that from Japan has the softest gum of all.

By one process of making gauze or crêpe materials the silk is not boiled off or scoured. The gum is left in, as it is then easier to give the required hard twist to the silk, and the removal of the gum later gives the desired crinkled effect. For dyeing with certain colors the silk is half-scoured. Crêpe is also made by variations in the weaving process.

Process of Boiling Off

The skeins of silk as they come from the throwing mill are opened, a stick is passed through a number of them, and the ends of the stick are rested upon the sides of a vat of boiling soapy water. The skeins hang from the stick. In this way there is no danger that skeins may become tangled. They are constantly moved over the stick so that all parts of the silk may lie in the boiling water for the same length of time. This process not only removes the gum but puts the silk in a better condition to receive weighting, which is usually the next process, though some silks are unweighted. After the skeins have stayed in the bath

from a half-hour to three hours, they are taken out and dried or whizzed in a hydroextractor which removes all the moisture in a very short time. If the silk is to be "pure dye," that is, if nothing but the color is to be added, it is dyed next and the silk is then washed, dried, stretched, and finished.

Weighting of Silk

The removal of the gum from either raw or spun silk in the boiling-off process reduces its weight about 25 per cent and leaves it very soft and light. One pound (16 oz.) of silk will weigh 12 oz. after boiling-off. As silk is sold by weight this loss is a serious one to the manufacturer, and it is perfectly legitimate to make up the 25 per cent. Sugar of lead, which is harmless, was once used; today salts of tin and iron in solution and other injurious substances are used, and often much more than the original loss of 25 per cent is added. A pound of silk can be made to weigh 40 or 50 oz. or even more, and the manufacturer gains by this process and puts on the market an inferior quality of silk. The result is that while a cheap silk can be made, it will not wear well and soon splits and cracks under its weight of tin and iron.

This weighting is usually done before the silk is dyed, but it may be put into the dye bath. A manufacturer who wishes to deceive can add as much as 300 per cent extra weight by the use of chemicals.

Weighting Materials

By using different chemicals, silks of all colors can be weighted. Some of the weighting materials are salts of tin, iron, sodium, magnesium, chromium, and barium. Sugar, gelatin, glycerin, glucose, and paraffin are also employed. Those most commonly used are tannin, tin, iron, and sugar.

Process of Weighting with Tin

The silk is put into a bath of salts of tin; this treatment does not affect its color. After remaining in this bath for several hours it is taken out, washed, and dried. It is then passed through a solution of phosphate of soda, again washed, and dried. From this process the silk has gained about 2½ oz. to the pound of raw silk. The silk may be passed several times in succession through these two baths; each time it gains in weight.

Next a bath of silicate of soda is given; this adds a little to the weight and is claimed to add luster and strength to the goods. A final washing is given the silk and it is ready for the dye bath. Dark-colored silks can stand more weighting than light-colored ones, and salts of iron are used for dark silks, while salts of tin are used for light-colored silks.

Results of Weighting

Weighting which is not properly done weakens the

strength of the fiber so that the silk will not wear well. Many people cannot understand why a silk petticoat is in shreds when it has been worn very little. Heavily weighted silk cracks and splits after a short time whether it is used or not. Perspiration often unites with the chemicals in the silk and causes it to fall apart.

Silks made many years ago before there was such excessive weighting would wear for years and many an heirloom gown is in better condition than a last year's dress.

Wild Silk

The wild silks (tussah) are difficult to dye. For this reason the genuine wild silks are usually sold in the natural unbleached color.

Classification of Dyes

Textile fibers are divided into two large classes:

1. Fibers of vegetable origin, as cotton, linen, jute, etc.
2. Fibers of animal origin, as wool, silk, fur, etc.

Colors that will dye the animal fibers will not dye the vegetable fibers, and vice versa. Colors that will dye one animal fiber will dye all other animal fibers, yet today there are dyes for each fiber, whether animal or vegetable, as silk dyes, wool dyes, cotton dyes, linen dyes. This is sometimes an advantage in dyeing

mixed silk and cotton goods; the silk takes the dye, the cotton does not, and the result is that if a white stripe of cotton thread is put in a silk fabric the cotton will remain white after the silk has been dyed.

Silk was originally dyed by means of vegetable coloring matter, such as logwood, Brazilwood, and madder; and animal products, such as cochineal.

Modern Dye Stuffs

There are two classes of dye stuffs for silk:

1. Basic or substantive colors
2. Acid colors

Basic or substantive colors will combine directly with the silk fabrics without the aid of a mordant. Acid colors will not combine with the fiber unless a mordant is used. The acid colors are now widely used because most of the silk is weighted with tin, which acts as a partial mordant for the acid colors.

Mordants

A mordant is a chemical substance which unites with the fiber and with the coloring matter, fixing the coloring matter on the fiber. Silk is usually dyed in a bath containing the "boiled-off liquor" from the scouring in which the gum was boiled out. A little acetic acid is put into the bath to neutralize it.

Yarn-Dyeing

In the dye room are long vats filled with the steaming hot dye mixture which has been prepared according to the desired color. The skeins of silk yarn are immersed by being suspended over sticks which rest on the edge of the dye vat. These sticks and skeins are moved constantly so that the dye may penetrate every part. The depth of color depends upon the length of time the silk is in the dye. After it is taken from the vat it is immersed in water to remove the loose color and then dried.

Figure 9 shows the process of yarn-dyeing.

If a light-colored silk is required, bleaching must precede the dyeing. The skeins of silk are either bleached with peroxide or put in a sulphur chamber.

Stretching

After the silk is dyed it may be placed over a peg in the wall and twisted, pulled, and stretched until it is soft and glossy. A still greater luster may be obtained by stretching the silk by machine. In this process the skeins of silk are laid between damp cloths. When the silk has become thoroughly moistened the skeins are placed over two steel arms, which are then screwed apart, thus stretching the silk and holding it tight. Dry heat is then applied. Although this process diminishes the elasticity of the silk it adds much to its brilliancy and luster.

Scroop or rustle is given to silk by soaking it in dilute acetic acid.

Black Silk

Black silks are treated separately and differently from colored silks. Either salts of iron or salts of tin are used in the weighting, but more often the iron salts are used. The silks may pass through a weighting solution several times, each time coming out heavier than before. The silks must be washed thoroughly after each process. Logwood is used in dyeing black silks.

Piece-Dyeing

Piece-dyed goods are woven with the gum in the silk; this gum must first be boiled out of the goods and then they are either dyed in the piece or prepared for printing.

Piece-dyed goods are practically all pure dye and very little attempt is made to weight them.

Printing

As a rule silk printing is confined to fabrics woven of pure silk and dyed in the piece, though it is possible to produce designs on weighted skein-dyed silks.

The most primitive method of printing and one still employed by the Chinese and Japanese is done by the use of stencils.

Block printing was the next method employed and it is still much used in Europe. In block printing, the pattern is worked out in relief on wooden blocks, and the color is taken up by pressing the block against the pad on which the color has been previously prepared — one color on each pad and one block for each color. Good results are obtained in this way but the process is slow, for the pattern is put on the silk by placing one block at a time in its place on the fabric. A blow from a mallet prints the color on the fabric.

Machine Printing

Most silk goods are now printed by machine. The design is engraved or etched on copper rollers; there is one roller on the machine for each color. If there are eight colors in the pattern there must be eight rollers on the machine. The color, which is thickened with gum, is in a trough at the bottom of the machine and is supplied to the cylinders by rolls which turn in the color trough and against the cylinder. Any surplus is scraped off by a knife blade which is called a "doctor." This leaves the color only in the engraving and this is taken up by the cloth, as it passes next to the cylinder. In order to set the colors, the cloth is steamed after printing and it is then washed in order to remove the gum used to thicken the colors for printing.

Warp printing is done by printing the pattern directly on the threads of the warp with rollers or blocks. This gives the effect of an indistinct design on the silk fabric, because the filling threads, as they cross the warp-printed threads, cover small portions of the design. Dresden and chiné silks are warp-printed.

Ways of Printing

There are three methods of printing patterns:

1. Application or direct printing. This is the printing of the pattern on the cloth, all of the colors being printed at once by means of engraved rollers as just described.

2. Extract or discharge printing. In this case the silk is first dyed and the pattern is printed upon the dyed fabric by chemicals. The cloth is then subjected to heat and moisture. This causes a chemical reaction to take place which either removes the color of the material where the design was printed, leaving it white, or produces a new color by chemical combination. If a light color is required, a bleaching agent is put into the chemical. The material is then washed and dried to prepare it for the finishing processes.

3. Resist printing. By this method the pattern is first printed on the goods with wax or some chemical which will resist the action of the dyestuff. The fab-

ric is then dyed and washed in benzine or some agent which dissolves the wax or chemicals and brings out the design.

Antiquity of Vegetable and Animal Dyes

Methods of extracting colors from plants, fruits, and bark of trees, and their use in the dyeing of textiles were known in prehistoric times. Dyeing was practiced in China in a most primitive way at a very early date. Later the manufacture of colors and methods of dyeing became known in India, where they were much improved. The printing of textiles was also practiced. From India the art passed to Babylonia and Assyria; thence to Egypt, where mummy cloths have been found which were dyed with indigo and madder. The Phoenician merchants imported Oriental dyestuffs and others of their own manufacture into Greece. Tyrian purple was the dye most used by the Phoenicians. It was obtained from several varieties of mollusks which are found in tropical seas. The purple murex was the most common of these. Green and blue dyes were also obtained from shell fish of the murex family. Little is known of the methods employed by the Greeks and Romans.

Art of Using Dyes Regained in Europe

With the fall of the Roman Empire the art of dyeing was lost to Europe, but it began to flourish in

Arabia and Turkey and was brought back to Europe by the importation of Oriental products. Then Venice became famous for dyes and dyed goods.

In the thirteenth and fourteenth centuries Florence reached the zenith of her power and among her other arts and handicrafts famous dyed silks were produced. The art passed on to Germany, France, and Flanders, and from Flanders to England.

Growth of Industry in France

In France the fostering of the industry was due to Colbert, a famous statesman who lived during the reign of Louis XIV. Two centuries before, in 1456, Gilles and Jean Gobelin had established dye-works in Paris. During the next century their descendants added a tapestry manufactory to the original works. There the Gobelin tapestries, famous for their beautiful, rich, and peculiar colors, were made. The most beautiful of the dyes was a greenish-blue, which is now known as Gobelin blue. In 1662, at the instigation of Colbert, the factory became the property of the state and Gobelin tapestries were produced in much larger quantities.

Early in the nineteenth century Chevreul, a great French chemist who had a profound knowledge of the science of color and the dyeing industry, perfected the vegetable dyes and discovered how to produce many more color combinations.

Decrease in Cost of Dyes

Dyed goods were great luxuries and prohibited to most people because of their exorbitant price, but the invention of the steam engine and steam weaving machines in England led to mechanically driven apparatus for extracting dyestuffs and preparing them for use, and this lessened the expense. The most important dyes were indigo for blue and madder for red. Cutch was used for brown. Persian berries were used for making extracts of different yellows. These colors were used direct, in a few instances in connection with mordants, such as salts of iron, copper, and aluminum in the form of sulphates.

American Dyes

After the discovery of America new colors were obtained — reds from Brazilian redwoods; blues and blacks from logwood; cochineal, a scarlet extracted from female cochineal insects, exported from Mexico. Safflower, or false saffron; fustic, or yellow-wood; and many other extracts from West Indian and South American plants also came into general use.

Mineral Dyes

Dyes made from various mineral compounds have been largely used. The most important is Prussian blue, discovered in the eighteenth century. It is made

from iron salts in combination with potassium ferrocyanid.

Coal Tar Dyes (Aniline Dyes)

The most important of recently developed dyes are those made from coal tar. They are derived from a substance which results from the burning of coal in making illuminating gas. With the development of the gas industry, which began about 1814, there came a by-product known as gas coal tar, which is obtained from soft coal when it is baked in closed retorts. The tar is condensed as the gas passes off. It is a black, heavy mixture, resembling pitch and was formerly difficult to get rid of, since it was considered of no value.

Chemists began experimenting with the product and as early as 1834 aniline dyestuff was discovered, although it was not at first known by that name. In 1841 the same product was discovered by another chemist and at this time called aniline. The year 1856 can properly be called the time of the discovery of the coal tar dyestuff when Professor W. H. Perkin, an English chemist, produced the first aniline dye which was manufactured for commercial purposes. The manufacture of coal tar dyes is now one of the largest and most scientific industries in the world.

Growth of the Industry

Although the industry originated in England, in a

short time France was leading in the production of aniline dyes; then Germany and Switzerland became interested and developed aniline dyes to the highest degree of efficiency. Germany practically held the monopoly of the manufacture to 1914, when the war began. The other countries, including America, were dependent on Germany for the finished raw materials called intermediates from which their dyes were made. Immediately following the outbreak of the war the industries in this country were handicapped and the only solution seemed to be to wait until the end of the war, for it was thought that only Germany could send the dyes. But as time passed American capitalists and chemists and others have worked over the situation until America is turning out dyestuffs which are said to be equal to those of Europe.

Many people think that the colors and the perfumes obtained are extracted directly from the coal tar. This is not the case, for coal tar is a mixture of a great many products which are separated from each other by distillation. These products are carefully treated, and combined chemically with other chemicals that are not present in the coal tar. The combination of substances produces new chemical compounds known as intermediates. These intermediates, treated with other intermediates, or heavy chemicals, produce such substances as dyes, explosives, etc.

Chapter VII

FINISHING PROCESSES

Variety of Processes Required

Silks, after being dyed and woven, or woven and dyed, are measured, weighed, and examined. The woven pieces are usually about seventy yards in length. A process, called picking, follows. The pickers, usually women, open the bolts of silk, pass the material over an upright board in front of them, and watch closely for small lumps, loose threads, or anything that may harm the smooth appearance of the silk. It is then examined again and sent to be "finished."

Silk finishing is not usually done in the factory where the material is woven, but by a special "finisher" who puts the manufacturer's mark upon it and starts it on its way through the different machines.

Good silks require very little finishing, but those which are rough and uneven, heavily weighted, or thin and sleazy, must have these defects concealed by gumming, steaming, rolling, pressing, and other processes to make them salable.

If a moiré, or watered, effect is desired in the silk this also is produced in the finishing.

The principal finishing processes are:

Calendering
Dressing or stiffening
Breaking
Tentering
Gassing
Moiré finish

Calendering

Calendering is practically ironing the silk. Even the best silk goes through this process. The material is run between heavy rollers, usually heated by gas or steam. As heat always takes some of the stiffness from the silk, there is also a cold process in which very heavy rollers are used. Calendering not only smooths the silk, but adds gloss or luster.

Stiffening

Silk which is too soft or sleazy is passed through a machine having coils of steam pipes which send a jet of steam and glue across the goods. The glue falls upon the material in a fine spray and adds the necessary stiffness. Manufacturers have different stiffening agents. Some use a mixture of glue, cocoanut oil, and glucose.

Breaking

Silk which has been stiffened artificially is put later

through a breaking machine which has rollers with buttons or small knobs of brass fitted in spirally. As the silk passes between the rollers the spiral knobs draw it on the bias first to one side and then to the other, breaking up the glue and making the material soft.

Tentering

The tentering machine is usually a very long one. As the silk may have shrunk a half inch or more in width during the previous processes, it is put on this machine to stretch it to its original width. The silk is caught by its edges and held tightly while moving slowly first over steam and then over dry heat from many gas flames.

Gassing

The process is somewhat like that used in treating the yarn referred to in Chapter III. The silk is run swiftly through a machine which may have gas jets burning on both the top and bottom, or only on top. As the material passes over or under the flame the fuzz, or short ends of the silk, is singed off and the surface is left smooth. The speed of the machine is so great that the flame burns off the loose fibers without injuring the silk.

Moiré Finish

The moiré or watered effect can be obtained only

upon silks woven with a cord, and materials with a pronounced cord show the effect the best. There are two ways of doing this:

1. The two selvages of the silk are folded together and the silk is then submitted to heavy pressure between heated rollers. Wherever the cords come in contact with each other they become flattened so that when the light falls upon the surface of the fabric it is reflected differently at these points. The result is the wavy, watered effect.

2. By the other method the silk is run under pressure through two heated rollers which have a grain engraved upon them exactly corresponding to the grain of the silk. By drawing the silk to one side the grain of the roller crosses the silk grain and crushes it whenever it strikes.

Shower-Proofing

Shower-proof silks are put through a secret process which prevents them from being spotted by water. This process does not injure the fabric nor affect its feeling or appearance.

Permanency of Finishes

An artificial finish upon any fabric tends to disappear when the material is in use. The gloss wears off, stiffness is lost, and goods made smooth by pressure become roughened by wear.

When silk has been finished it is inspected for imperfections, measured and folded by machine, wrapped in paper, and finally is carefully packed for shipment.

Chapter VIII

ARTIFICIAL OR FIBER SILK

Reason for Making Artificial Silk

Silk is the most costly, as well as the most beautiful, of the textile fibers. So much hand-labor is required for the raising of silkworms and the gathering of the raw silk from their cocoons, that the product must always be expensive. For this reason many experiments have been made whereby an imitation or substitute for the silk fiber might be produced by chemical processes.

These experiments have succeeded to such an extent that several varieties of artificial or fiber silk resembling silk very closely are now made and are used instead of true silk for many purposes.

Difference Between Real and Artificial Silk

The fiber of silk differs from that of cotton, linen, or wool in both its length and its structure. The length of all these may be measured by inches, while silk is many yards long. The other fibers when viewed under the microscope are composed of tiny cells whose

walls make the firmness of the fiber, while silk has no such cellular structure.

The spinning of silk by the worm from the gummy substance in its own glands, and the hardening of this substance on exposure to the air has suggested to chemists that they might first produce a substance similar in composition to the silk in the body of the silkworm, and then force this substance through tiny tubes, corresponding to the mouths of the silkworms.

Since fibroin, or the silk fiber, is animal fiber, experiments have been made with various animal substances, but even if they had been wholly successful, they are too costly to be practical. The substance which is the basis of all the artificial silk used in commerce is called cellulose, and is of vegetable origin. Cellulose can be best obtained from either cotton or wood pulp, though it occurs in the other vegetable fibers.

Kinds of Artificial Silk

The three kinds of artificial silk which have been commercially successful are:

1. Nitrocellulose or pyroxylin silks
2. Cuprammonium silks
3. Viscose silks

The first two of these are made from cotton waste, while the third is made from the pulp of the spruce

tree. Pyroxylin silks are the oldest, but viscose silks are the cheapest and practically the only ones made and used in the United States.

Manufacture

There are a number of agents used in dissolving the cellulose, such as ammonia, alcohol, ether, and caustic alkalies.

To produce pyroxylin silks nitrocellulose is dissolved in a mixture of alcohol and ether. Cuprammonium silk is produced by dissolving cotton cellulose in a solution of ammonia and cupric oxide.

For viscose silk the wood of the spruce tree is chopped and finely ground.[1] It is then treated with caustic soda and water, which causes the fiber to swell.

The solution is next exposed to the action of carbon disulphid and the fibers continue to swell until they are like a jelly, which easily dissolves in water. The solution is viscous, or of the consistency of molasses. For this reason the name viscose is given to the artificial silk product.

The sticky mass is forced through exceedingly fine tubes of glass or platinum, which terminate in water containing ammonium sulphid or ammonium chlorid.

[1] It is said that the wood of the mulberry tree has been experimented with, and when reduced to cellulose gives the best basis for the making of artificial silk, but since the mulberry is needed for the silkworms, it cannot be spared for other use. It has also been found by further experimenting that any soft wood will answer, but the wood of the spruce tree seems especially adapted to the purpose.

Upon touching the water it hardens into delicate filaments which are drawn out, slightly twisted into a thread, and wound upon bobbins or spools. While the filaments of artificial silk are very fine, the average number being about eighteen to a thread, they are not nearly so fine as true silk.

History

The first attempt to produce an artificial fiber resembling the filament of the silkworm was made as long ago as 1734 by a Frenchman named Reamur. He used a sort of varnish which he forced through very small holes; this hardened like silk, but it was never practical.

It was not until 1855 that another attempt was recorded. This was made by a Swedish chemist, Andemars. Cellulose pulp was used, made by dissolving the inner bark of the mulberry tree in alcohol and ether. This formed a sticky substance, which when drawn out into threads, hardened in the air like real silk. Although he took out a patent on the process, he was not successful in putting it on the market.

In 1883 J. W. Swan, an Englishman, experimented with threads made from a solution of nitrocellulose. This composition is like gun cotton and very inflammable, but he overcame the difficulty by denitrating the threads with ammonium sulphid.

Chardonnet, a Frenchman, was the most successful

of all the inventors. He took out his patent in 1885. He used cotton dissolved in alcohol and ether. In order to carry on his work a factory was opened at Besançon. Others who took out patents were Du Vivier in 1899, Lehner in 1890, Pauly in 1897, and Stern in 1898. Many other processes have been tried.

Characteristics

Artificial or fiber silk has a very high luster and is far more brilliant than real silk. It takes dyes readily and many beautiful colors are easily obtained. It is not soft like silk, but harsh and stiff to the touch. As a material it does not drape nor fall in graceful folds. When wet or submerged in water it feels like a gelatinous substance.

It is neither as strong nor as elastic as true silk. When wet it loses much of its natural strength, but it regains this when dry. A single yarn of artificial silk is usually made up of from fifteen to twenty filaments, twisted very little. Artificial silk can easily be detected by unraveling a thread and noticing the many filaments of which it is composed. These readily separate and do not have the twisted appearance of real silk.

Uses

From artificial silk are made dress trimmings, passementerie dress braids, hat trimmings (many of which look like straw), neckties, hosiery, sweaters,

scarfs, many beautiful embroidery silks, draperies, and many of the silk stripes, figures, or patterns in fancy mixed goods, or so-called "part-silk" goods.

It is found in cotton-and-silk mixed goods, where its high luster makes a very good effect. Artificial silk has not as yet been woven by itself into a strong, firm dress material, but is woven with a cotton warp. It has, however, been knitted into satisfactory materials.

At the ribbon counter may be found ribbons made with a satin weave; the warp is of cotton and the long threads of the satin weave are of fiber silk. This does not at present seem very satisfactory as the artificial silk threads become roughened and lose their smooth appearance.

Artificial silk has recently been woven into a very beautiful gauzelike material, which has a metallic look like gold or silver. In light colors this is most attractive.

Experiments are constantly being made and artificial silk is coming more and more into favor. The cost of production is about one-half that of silk, but much of the material sold by the yard is as expensive as silk.

Fiber silk sweaters are very much less costly than silk sweaters; fiber silk stockings are less expensive than silk stockings and wear better than a cheap silk stocking.

Many hat trimmings are made of artificial or fiber silk; some of these are run through gelatin which sticks

the fibers together and makes weaving unnecessary, giving a finish which resembles patent leather. This treatment with gelatin is a quick process.

Sometimes millinery silk tulle or maline is made by pouring the paste or pulp over a flat surface, rolling it out thin, and marking it with rollers which are engraved in such a way that the maline has the appearance of having been woven. This material is satisfactory because it is good-looking, its cost is low, and it will last if it is not wet.

Names of Materials

Some of the names given to very attractive materials of artificial fiber silk are:

Baronet Satin
Fan-ta-si
Khaki-Kool
Kumsi-Kumsa
Satin Supreme
Sport Crêpe
Tricolette

Laundering

Artificial silk will not stand a high temperature and it must be handled carefully when washed or ironed. Hot water or hot irons injure real silk and are even more injurious to artificial silk.

Vegetable Silk

Some plants and trees have seed hairs or fibers attached to the seeds. Among these is one which bears a pod, somewhat resembling the milkweed pod but larger in size. When the pod is ripe it bursts open and is found to be filled with thin, transparent silklike fibers, less than one-half inch long. Efforts have been made to spin and weave these fibers into cloth. It has been found more satisfactory to combine them with wool or cotton.

These fibers are known as "kapok." The trees are found in India, South America, and the East Indies, and they are called "cotton trees," or "silk cotton trees." The best use for kapok has been as filling in the manufacture of mattresses and pillows and in upholstery.

Chapter IX

MIXTURES, IMITATIONS, ADULTERATIONS, AND TESTS FOR SILK

Mixtures—Silk and Wool

Silk is mixed with wool and with cotton in making many materials.

Among the silk-and-wool mixtures there are those which have a silk warp and worsted filling, as:

Gloria
Henrietta cloth
Lansdowne
Bombazine

Mohair is sometimes made of a combination of silk with hair from the angora goat. All these materials, however, are usually sold in the Wool Department.

There are also corded "silks," in which the heavy filling for the cords is wool, but where the silk warp threads completely cover them, as bengaline and poplin.

Mixtures—Silk and Cotton

Silk is also combined with cotton in such materials, as:

Voiles
Shantungs
Foulards
Cotton-back satin
Velveteens
Silk muslins
Silk ginghams
Upholstery materials

In most cases the mixture is apparent, as the materials do not have the same luster as all-silk fabrics. In others the fabric may be easily taken for all silk, particularly when mercerized cotton is used with the silk.

Cotton is also used for the cords in such corded material, as:

Poplin
Eolienne

Sometimes silk-faced fabrics are backed with a material of another fiber, for example wool, to make them heavier. (See Chapter V for "Double-Cloth Weaving.")

Imitations

Because of its value, silk has more imitations than any other fiber. The principal imitations are:

1. Mercerized cotton, where a permanent silky finish has been given to cotton. This is sometimes used as a substitute for silk. (See

pages 36–38 of manual for "Cotton and Linen Departments.")

2. Artificial silk, manufactured from cellulose. (See Chapter VIII.)

Silk-surfacing is a method of treating cotton yarn to make it look like silk. This is done by soaking smooth cotton yarns in a solution of pure silk made by dissolving silk remnants and other silk waste in some acid.

Before being placed in the silk bath the cotton yarn is soaked in a metallic acid solution, which causes the silk solution to be more readily taken up. The yarn is then dried, run between heavy rollers, gassed, and polished. A fine silklike appearance is the result. The cotton yarn is covered with a thin layer of true silk, but it has little durability and can be used only for goods which will have little wear and no hard washing.

Many mercerized cotton fabrics are given names which lead inexperienced persons to think that there is some silk in the article. Some of the names of these cotton materials which suggest the presence of silk are:

Near silk
Silkaline
Farmer's satin
Sateen

Adulterations

Silk is adulterated in many ways to lessen its expense, as:

Weighting with metallic salts (see Chapter VI)
Adding spun silk
Adding wild silk
Adding artificial silk
Adding mercerized cotton
Adding cotton

Characteristics of Silk

Intelligent use of the tests here given for distinguishing real silk depends largely upon a definite knowledge of the characteristics of true silk.

Its most individual qualities are as follows:

Strength. Before the gum is removed silk is the strongest for its size of all the textile fibers. Weighting decreases its strength.

Luster. Silk has more luster than any of the other fibers. Its luster is increased by special treatment, but weighting and careless laundering decrease it.

Elasticity. Before the boiling-off process silk is very elastic. Weighting decreases the elasticity.

Cleanliness. Silk fabrics may be said to "shed the dust," that is, dust does not accumulate quickly nor do germs increase rapidly on silk.

Softness. Silk is unusually soft after the gum is removed.

Endurance. Silk if not heavily weighted will last for years.

Weight. Silk is the lightest in weight of all textile fibers.

Absorption. Silk absorbs water and will take a great deal of moisture; this quality makes it good for umbrellas, underwear, etc. It may be soaked in water without impairing its strength. It is the only fiber which is proof against mildew.

Burning Tests

Pure silk burns slowly, with an odor of burning hair, and the flame goes out quickly, leaving a gummy substance. It is sometimes more satisfactory to pull out threads from both warp and filling and apply a match to them, as both threads may not be of silk. The silk thread will swell and boil, and a little ball will form on the end; if there are any cotton threads they will burn quickly.

Weighted silk is easily detected by the burning test. When a match is applied to the sample the silk will burn away and leave an ash which retains the shape of the sample. This ash is the mineral weighting, which will not burn. Another form of this experiment is to place a sample of the silk on a small dish and leave it in a very hot oven for about an hour; then the silk will be consumed and the weighting left.

Another simple experiment for weighted silk is to

place a sample in a glass bottle or test tube and with a pair of pincers or a twisted wire hold the tube over a gas flame. The silk will gradually be consumed and the metallic weighting left in the bottom of the bottle.

Microscopic Tests

Silk fiber under the microscope will be seen to consist of two threads held together by gum.

Silk with the gum boiled off will appear smooth, cylindrical, lustrous, and transparent.

Wild silk has a broad filament which is irregular in diameter with many lengthwise lines.

Spun silk is difficult to distinguish, but the fibers are irregular in form.

Artificial silk has a glassy, metallic look. The fiber is wider than true silk and looks something like a glass tube with flutings. Real silk fiber is always twisted; artificial silk is seldom twisted, but consists of a number of parallel strands.

Chemical Tests

Cultivated silk is destroyed in two minutes in a 40 per cent solution of hydrochloric acid, but tussah or wild silk is not much affected.

When a sample of wool-and-silk mixture goods is put into a cold 10 per cent solution of caustic soda the wool is destroyed at once and the silk is affected more slowly.

The presence of cotton or wool may be discovered by placing a sample in a 40 per cent solution of hydrochloric acid. The silk will be destroyed in two minutes and the other fiber will remain untouched.

Artificial silks in cold 10 per cent caustic soda are destroyed in about two minutes and true silks not so quickly.

Other Miscellaneous Tests

Silk mixed with cotton or wool can often be detected by the use of the magnifying glass.

Whether the silk is reeled silk or spun silk can be determined by untwisting the fibers and seeing whether they are long or short. The threads of spun silk also draw apart and break more easily than reeled silk.

A good silk has "body" to it and will snap when shaken.

Weaving Tests

Press the two thumbs together on the fabric and pull tight, both warp-way and filling-way. If the material is not strong it will pull apart — fray out, or tear.

To find out if the material will pull away at the seams, see if the threads can be moved by pushing with the finger nails. If the threads push apart easily the material is not strong. Soft silks, otherwise good, will sometimes draw in the seams. Consequently they

should be made up so that there is as little strain as possible.

Tests for "Feel"

A person may be trained to recognize by look and feel the qualities of pure silk, its adulterations and imitations, and hence the values. The good or best qualities should be studied, so that the cheaper qualities may be judged by comparison.

Artificial silk is easily recognized by its high luster and coarse threads, and by the fact that it is woven with another material, usually cotton.

Weighted silk can often be detected by its stiffness.

Good silk is soft to touch.

The best of silks will wear shiny.

A test for elasticity is made by wrinkling the material in the hand and shaking it out. If the wrinkles stay in, the material will quickly become crushed and wrinkled when worn. A good silk when crushed in the hand will, upon being released, spring out again.

Crêpe de chine and other silks with closely twisted threads wear better than the soft silks, but are not so lustrous.

Taffetas crease easily, for they are stiff and often heavily weighted.

A very stiff silk will soon crack.

The old test to see if a silk had body enough to wear well was to lift it slowly up and down in the hand. If

it felt heavy it was considered a superior quality, especially in a black silk.

This test cannot be depended on now, for the silk may be weighted with 50 per cent or even 100 per cent of tin or iron and glue weighting, which will give it body so that it will feel heavy, look lustrous, and seem good to most people.

Experience in handling silks is one of the best tests. One can learn to know a good silk by the feel of it.

Chapter X

PRINCIPLES OF COLOR *

Importance of a Knowledge of Color to the Salesperson

Color is a matter of very great importance in connection with many varieties of merchandise. In order to judge textiles, china and glass, art embroidery, draperies, rugs, ready-to-wear garments, millinery, and many other varieties of merchandise intelligently, some fundamental knowledge of color is essential. The accepted theories of color and color combinations are therefore given here briefly.

Combinations of Colors

There are two ways of combining colors which produce quite different results. They are:

The combination of colored lights.
The combination of colored pigments or dyes.

When different colored lights are combined, the result is a combination of the two colors. When colored

* This chapter, containing the essential principles of color, was prepared by the editor and appears in several of the manuals of this series.

pigments are combined, one color seems to absorb or counteract the other. One explanation of the difference is that the pigments are never perfectly pure, that is, they contain elements of other colors and therefore cannot give the same result as a combination of the similar colored lights.

All colors are produced by the effect of light upon the nerves of the eye, and as the eye sees them, colors are contained within the light itself, forming when united a white or colorless light, as in sunlight. It is only when part of the light rays are in some way absorbed or intercepted that we see the remaining rays as distinct colors.

The Spectrum

Nearly everyone has seen the band of beautiful colors which is formed by a beam of sunlight passing through a prism. The same effect is produced when the sun's rays pass through the raindrops and we see the beautiful band or rainbow of colors in the sky.

The theory is that as the beam of sunlight passes through the prism, it is separated or split into the elements of which it is made up and forms a band of colors instead of a white light. This band of colored light is called the spectrum, and the colors, whether seen through the prism or in the rainbow, are known as the spectrum colors. They are red, orange, yellow, green, blue, and violet. But when we see these colors,

either in the rainbow or through the prism, there is every gradation from one color to the next so that the change from one color to the other is almost imperceptible. For instance, the red changes through the different degrees of red-orange to orange, and this changes through the orange-yellows to yellow; the yellow changes through the yellow-greens to green; the green changes through the green-blues to blue; the blue changes through the violet-blues to red.

Standard Colors

The colors of the spectrum are accepted as the normal or standard colors: red, orange, yellow, green, blue, and violet.

These normal or standard colors are represented in each case by the greatest intensity of the color. For instance, the standard red is the most intense red, the standard blue is the strongest blue, and so on.

While the spectrum has six colors which seem to be of equal importance in the ray of light, we find that in mixing pigments or dyes they fall into two classes called primary and secondary colors.

Primary Colors

The primary colors are so individual that they cannot be produced by any mixture of other colors. They are red, blue, and yellow.

Secondary Colors

Secondary colors may be made by mixing two of the primary ones. They are:

Orange, made by mixing red and yellow.
Green, made by mixing yellow and blue.
Violet, made by mixing blue and red.*

Characteristics of Primary Colors

Of the three primary colors, yellow is the most "advancing," that is, seems to stand out from its background. It is nearest to white and possesses the greatest power of reflecting light. It imparts brilliancy in a greater or less degree to every compound into which it enters.

Red is the most positive. It represents warmth as it is brilliant and cheerful, and it appears to advance somewhat. Red expresses vibration, action, and warmth.

Blue is the most "retiring" of the primaries and represents coldness, appearing to recede from the eyes. It imparts coldness in various degrees to every color or hue into the composition of which it enters.

* There are several theories concerning the number of primary colors in light, but they do not alter the fact that blue, red, and yellow cannot be made in pigments or dyes by combining other colors; while the tints, shades, and hues of all other colors except blue, red, and yellow may be made by means of such combinations.

Characteristics of Secondary Colors

Of the secondary colors, green, composed of the primaries blue and yellow, is cool or warm as it inclines to blue or yellow. Yet in general it is cool, cheerful, and refreshing.

Orange, composed of yellow and red, is the most "advancing" of the secondaries. It is composed of two luminous colors and is considered the warmest and most powerful of all the colors. It should therefore be used sparingly.

Violet or purple, composed of red and blue, is the darkest of the secondary colors and is related most nearly to black. It reflects very little light and looks still darker in a declining light. It is a retiring color and, although red enters into its composition, it cannot be classed as a warm color except in its redder hues. In yellow artificial light, such as gaslight, it appears brown. Next to green, purple may be considered the most pleasing of the secondary colors and has almost universally been considered the royal or imperial color. It is probable, however, that the Tyrian purple, of which we have heard so much, approached a crimson or red, rather than the deep and subdued color known as purple today.

Luminous and Somber Colors

Colors are also described as:

Luminous or warm:
- Yellow
- Orange
- Red
- Light green

Somber or cold:
- Blue
- Violet
- Dark green
- Broken tones of luminous colors

Broken Colors

Tertiary or broken colors are not found in the spectrum, but may be made by mixing two secondary colors. They contain all three primary colors in unequal proportions and are named according to the predominating color:

Russet, orange plus purple — red predominating.
Olive, purple plus green — blue predominating.
Citrine, orange plus green — yellow predominating.

Besides the compound colors called tertiaries, there are many other hues into which the three primary colors enter. Among these the most characteristic are brown, maroon, and gray.

Brown requires black for its basis, with a mixture

of citrine and olive. It is a retiring and sedate color, but not dismal nor depressing.

Maroon is formed by a mixture of russet and olive, with an excess of red.

Gray is always restful to the eyes. A perfectly neutral gray which forms the perfect background for other colors, is a combination of black and white. Besides the neutral gray, there are many others, as blue-grays, olive-grays, and green-grays, formed by adding other colors.

Black and white make gray in whatever combination they are used.

Absorption and Reflection of Color

The color of any object is due to its power to absorb certain colored rays in white light and to reflect others. An object which looks red reflects only the red and has absorbed the other colored rays. A blue body reflects the blue and absorbs all other rays.

White substances reflect all the rays of light; black substances absorb them all. For this reason black is said to be the absence of all colors, as white is the presence of all. (However, no mixture of colored pigments will produce white. The theory is true only of light rays. Mixtures of colored paints will produce gray.)

By its absorption of light rays, black lowers the tone

of any color placed next to it. Some colors, such as yellow, it " impoverishes."

By its reflection of all light rays, white heightens or brightens the tone of any color which is placed close beside it.

Complementary Colors

The color rays absorbed by any substance "complement," or complete, the ones reflected in making white light. Therefore, they are called the complementary colors.

The complementary color of:

Blue is orange, or red plus yellow.
Red is green, or blue plus yellow.
Yellow is violet, or red plus blue.

In the diagram (Figure 10) the complementary colors are found by following the various lines across the circle to the opposite outer edge.

These colors are sometimes supplied by the nerves of the eye itself which are wearied by looking too long at one hue. This may be proved by a simple experiment.

If a circular piece of red paper is placed on a white background and looked at steadily for a time, and then the eyes are turned toward a white surface, a green circle exactly corresponding in size to the red one first

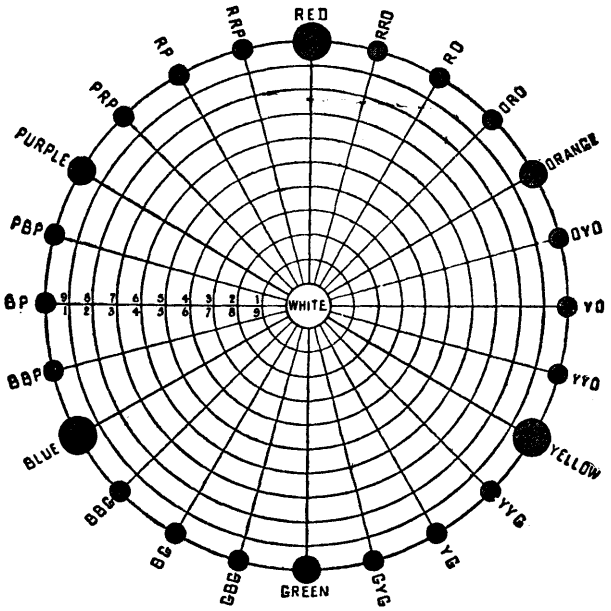
seen will appear. A blue or a yellow circle will produce their complementary colors in a similar manner.

This exhaustion of the nerves of the eye also causes a color to appear duller after one has looked at it a long time. If the nerves are rested by another color — especially the complementary one — they will become normal again.

When the complementary colors are reflected from another color rather than a white background, they change the hue of that color.

To eyes which are fatigued by looking at blue, red will appear like an orange-red, yellow will be more intense, and green will appear as a yellow-green. If red has been looked at, blue will appear as a green-blue, yellow as a green-yellow, and green will appear blue. After green, red will have a violet appearance, yellow will be more like orange, blue will be a violet-blue, and orange a red-orange. These are matters of great importance in the display of merchandise. The following rules should be remembered:

Red near blue seems yellower.
Red near yellow seems bluer.
Red near green seems purer and brighter.
Red near black seems duller.
Red near white seems brighter.
Red near gray is not changed.



From "Color Harmony in Dress" by Audsley, by courtesy of Robert M. McBride & Co.

Figure 10. Diagram Indicating the Primary and Secondary Colors with Their Hues, Tints, and Contrasts

Other colors are affected in similar ways.

These effects are produced by the natural tendency to see the complementary of any color, which in the case of green intensifies the red and in all the other cases changes its color by mixing their complementary color with it.

Properties of Color

Colors may be distinguished according to their hue, their value, and their intensity.

Hues

The word hue may be used in three ways.

In writings on the science of color hue signifies the property which distinguishes one color from another.

In common speech it is employed to mean a particular shade or degree of color.

The word is correctly used when applied to the modification of one color by the addition of another color. Thus, red-violet and blue-violet are hues of violet made by the excess of red or of blue. In the diagram the hues are found between the primary and secondary colors. Still further divisions are possible.

Values

The value or tone of a color is the gradation from light to dark by the addition of white in the lighter tones and of black in the darker ones. A tone lighter than the standard is properly called a tint, and one darker is called a shade, but many people call both tints and shades " shades." Rose color is a tint of red, while crimson is a shade.

In the diagram the concentric circles represent the tints produced by adding varying amounts of white;

the numerals above the line represent the parts of color; those below, the parts of white.

Color Scales

The scale of any color, whether it be a pure color or a hue, consists of all the tones from the lightest tint to the darkest shade. There are, for instance, scales of green-blue, purple-blue, and gray-blue.

Intensity

Intensity is the strength of a color. The normal or standard colors are in full intensity. The intensity of a color is reduced by "graying" it with its complementary color. By the addition of orange to blue, or of green to red, the color may be subdued to half-intensity or quarter-intensity, and so on. If a large amount of the complementary is added, the original color will be reduced to a dull gray.

Color Harmonies

Harmony in the combination of colors may be of two kinds:

1. Harmony of contrast.
2. Harmony of analogy or likeness.

Harmony of contrast is between colors which are most unlike each other. It is perfect when the colors are complementary. Blue and orange, or red and

green, are perfectly harmonious, one of the reasons for the pleasant sensation being that each one deepens the color of the other and makes it purer. The true contrasting color of any color may be found by following the cross lines in the diagram. The harmony of complementary colors is very bright if the colors are in full intensity. Grayed or broken tones make a quieter harmony.

Harmony by contrast may also be secured with the hues on each side of the complementary color, as blue with red-orange, or yellow or red with blue-green or blue-violet.

The harmony of analogy or likeness is between colors of the same or related color scales. They may be:

1. Different shades or tints of the same scale, as light red and dark red.
2. Different hues of the same color, as blue-green and yellow-green.

The first is sometimes called a mono-chromatic or self-color harmony. The tints or shades combined should have enough variety to be distinct, but should not be so different as to lose their likeness and form a harmony of contrast. On the diagram these harmonies are shown along each line from the full color to white.

A dominant harmony may be formed by the use of

a number of hues of the same color, as yellow-green, gray-green, and blue-green, which blend because green is dominant.

Color Under Artificial Light

All colors undergo more or less change under artificial light.

Under gas or lamplight, which is much yellower than daylight, purples and violets often appear brown. Some of the darker hues are almost destroyed.

Blue is darkened.
Brown is made warmer in hue.
Green is yellower.
Red, orange, and yellow are all brightened.

The inverted gas mantle gives a somewhat less yellow light, and therefore these effects are somewhat less pronounced.

The incandescent electric light gives a violet hue to blue, and a reddish hue to brown. It seems to add some red as well as yellow to colors.

The arc light and Welsbach gas mantle have an excess of blue, which is imparted to colors.

Chapter XI

COLOR IN THE SILK DEPARTMENT

Necessity for Knowledge of the Laws of Color Harmony

It is desirable that all who sell fabrics should possess sufficient knowledge of the laws of color harmony to enable them to understand not only how to display goods to the best advantage by artistic grouping, but also to give helpful advice to customers.

The suitability of colors and color harmonies to the purpose of the customer depends in great measure on whether the material is to be worn or used in house decoration. This applies particularly in the Silk Departments, because dress materials and drapery silks are often found at the same counter.

Colors in full intensity and striking contrasts are more suitable for the subdued light of the house than for the bright sunlight, and in the selection of dress materials the question of suitability or becomingness to the wearer is very important.

Colors Best Suited to Different Types of Women

A gown may be satisfying as far as lines are con-

cerned, but colors may add or detract from its becomingness.

For women with red hair black is the best color, although they can wear very dark blue, blue gray, or brown.

For middle-aged women — especially those whose hair is gray — black, gray, mauve, and some of the silvery greens, are the most becoming.

Stout women look larger in white, and smaller in black, dark blue, dark green, and dark brown.

A tall, thin woman should not wear black nor very dark colors.

There are so many variations in the color of people's complexions, hair, and eyes, that it is hard to give general rules. Each one should be studied to see what colors bring out the best points and neutralize the less favorable ones. For instance, green is usually becoming to blondes because it harmonizes with the yellow in their hair (by analogy) and brings out the rose color in the complexion.

The brunette's skin, on the other hand, has more orange in it. Some shades of green may be worn by brunettes, but the greatest care should be exercised in the selection of the proper shade of green, because the brunette's complexion contains a great deal of orange, and the green, acting upon the red of the orange, may readily produce a brick-dust appearance. Green therefore is a risky color for the brunette; and so is violet,

which would neutralize the yellow of the orange and heighten the red.

The Fashionable Color

Fashion usually dictates the color, as well as the kinds of fabrics, for each season and how they should be used. Every season has its new and so-called " fashionable color," which is designed only to increase trade. Most women in order to be fashionable adopt these new colors, for the simple reason that they are new and are what other people are wearing.

Everyone must know that color has its effect upon the appearance of the complexion. Not all complexions look equally well in the same color. Some may be improved, while others may look very badly. Yet although the majority of women know this, they continue to select the " fashionable color."

If women were only willing to take the advice of someone, perhaps the salesperson, capable of giving a reliable opinion, then the manufacturer or the dyer would not be able to decide on any one color, but would produce materials giving a choice of colors.

Conditions Affecting Color

Since it is by light that colors are produced, the color of a body is affected in various ways.

1. By a change from daylight to artificial light, or the reverse.

2. By the properties of the material, as the brightness of the color varies according to the nature of the fabric, i.e., silk, wool, etc.
3. Different individuals do not see color in the same way; some people are "color blind," that is, their eyes are not sensitive to a particular color and they cannot distinguish red from green or rose from mauve.

Effect of Various Lights on Colors

Some colors which are becoming by daylight are not so under artificial light; and others — like green, yellow, and some shades of red — are more becoming at night, as well as much more suitable. The effect is especially noticeable with dyed fabrics.

Colors selected for clothing should be first of all becoming and also suited to:

The season of the year.
The time of day.
The function at which the dress is to be worn.
General use.

Colors for evening wear should always be shown under artificial light; for day wear, under daylight.

Effect of the Material on Color

The weave and the finish of silk change the appearance of the colors, and luster is often added in the

finishing process to enhance the brightness of the color.

The manner in which the warp and filling threads intersect each other, and also the frequency with which they intersect make a difference in the brightness of the color, as well as in the smoothness of the surface of the cloth. In a plain weave where every thread of the warp and filling intersect, the luster is not nearly so bright as in the satin weave, where the warp threads lie on the surface in almost unbroken lines. A twill weave or a cord produces a still rougher surface than the plain weave and is consequently less lustrous.

A good, smooth finish adds luster to cloth, because it increases the reflecting power of the material, and the brightness of the color is thus enhanced.

In the case of the raised fibers of velvet the light penetrates the material and becomes saturated with the color before being reflected, and the color appears soft and subdued; but when these raised fibers are pressed flat in one direction, as in mirror velvet, the light reflects from the surface and the color appears brighter.

The luster of the fabric has much to do with its becoming appearance. Hard, bright surfaces like satin are more trying than the deep, rich colors of velvet; with many colors — such as bright blue, pink, and blue white — which bring out any defect in the texture of the skin, it is advisable to separate them from the skin by lace or tulle which grays and softens the effect.

Colors for Household Decoration

In selecting colors for a room it should be borne in mind that everyone is more or less sensitive to the influence of color. Each color has a distinct effect upon persons and produces different sensations in different moods. All intense colors, moreover, need to be modified.

In deciding on color combinations for a room the following facts must be considered:

The size of the room.
The number of windows.
The size of the windows.
The location of room — whether north, south, east, or west.
The kind of room — whether living room, bedroom, etc.
Effect of adjoining room.

One should remember also that:

Yellow and its varying tones will give light and warmth. It is not needed where a room has plenty of sunlight.
Red will appear to give warmth. Pure red is exciting.
Blue will appear to diminish the size of the room.

Color harmonies in draperies or furniture-coverings may be very vivid, especially if the room is not brilliantly lighted, but it is usually more satisfactory to

have one dominant color with harmonies of likeness prevailing, and only touches of the brilliant harmonies of contrast.

If broken tones or colors of half-intensity are used, the harmony of contrast may be more evenly distributed between the two colors.

Suggestions for Color Schemes

If a good color scheme is desired, there are three reliable sources from which suggestions may be gained:

Nature — among the flowers, the autumn leaves, the mosses and lichens, the birds, the shells and minerals, the sunset.

Museums — where there are wonderful collections of old tapestries, embroideries, etc.

Pictures — especially among the Japanese prints, where color is simply but daringly used with unusual beauty and quality.

Chapter XII

THE PRINCIPLES OF ORNAMENT AND DESIGN [1]

Definition of Design

Men are not satisfied with making things that are merely useful. They are also trying always to make useful things beautiful, and are often willing to sacrifice usefulness entirely, if the thing is beautiful. A vase was originally a vessel to hold water, but many ornamental vases would be quite unfit for their original purpose.

There is some attempt at ornament in nearly all manufactured things. Even the dust-pan has a pattern on it, and the kitchen stove and sink have ornamental brackets. The desire to ornament, or make things beautiful, leads to design.

A design may be merely the plan for anything, but when we speak of "design" we usually mean an ornamental or beautiful plan.

Kinds of Designs

Designs may be of two kinds:

1 This chapter, containing the essential principles of ornament and design, was prepared by the editor and appears in several of the manuals of this series.

1. The form or shape of an article, such as a vase, a chair, a dress, or a hat.
2. Surface-decoration or pattern design, such as engraving on metals, or the woven or printed designs in textiles.

Patterns, or flat designs, may also be divided into:

1. Structural, those which are produced by the method of manufacture, such as mosaics in jewelry, or woven designs in textiles.
2. Applied, those which are put on after construction, as painting or embroidery.

Pattern Design

In structural design the form of an article must be regulated first by its use; and beauty must nearly always be secondary to usefulness. But in pattern design the artist has much more freedom. Yet there are limitations and laws which must be observed if the purpose of decoration or ornament is to be secured.

Lewis F. Day, one of the well-known writers on pattern design, says, "The art of pattern design consists not in spreading yourself over a wide field, but in expressing yourself within given bounds," that is, the beauty of a design does not consist in its elaborateness or bright colors, but in its obedience to the laws of design.

Some of the most satisfactory kinds of patterns are

produced by the methods of manufacture. To plait grasses together, to weave cloth, is to make patterns which may be of almost endless variety.

Sources of Pattern Design

Nature has been called the source of design, but we do not know whether men first made patterns just for the pleasure of seeing repeated lines and color contrasts, or whether they were trying to imitate what they saw around them. If we look at the decorations on early pottery or basket-weaving, which were probably the first forms of pattern design, we shall be led to believe that the first instinct was ornament and the imitation of nature was second. The Greeks, who have never been surpassed as artists, imitated nature very little in their patterns, which usually consisted only of beautiful proportions and perfectly balanced repetitions of graceful lines.

Motives of Design

The motives, or elements of design, may be either natural, conventional, or abstract.

Natural designs imitate nature as much as the material will permit.

Conventional designs suggest nature, but are simplified and adapted to the purpose of the ornament or the pattern.

Abstract designs are made up of repeated lines and

patterns which have no intentional resemblance to natural forms, though sometimes it is hard to draw a clear line between very much conventionalized nature and abstract patterns.

Material of Pattern Design

Pattern designs are made up of lines, forms, and spaces, which must be arranged in an orderly manner. There must be points of emphasis, rhythm, symmetry or balance, and harmony of all the parts.

Points of emphasis are those features of the design which attract the attention. If all the elements were equally prominent, the design would be weak and ineffective. The points of emphasis are given prominence by striking outlines, bright color, or contrasted features.

Rhythm is the result of an arrangement or repetition of lines or units to form a continuous and related movement. Borders are an example of rhythm.

Balance is the result of the arrangement of the parts of the design so that one part will not be much more prominent than another.

Harmony is the fitness to purpose, the unity of all the parts, such as fine proportions, values, and color.

Planning a Pattern

It may be supposed that a pattern-designer chooses a beautiful figure, such as a rose, and simply scatters it

over the space it is to cover, making such changes as he wishes and repeating it at his pleasure. This is far from the case. If he used that kind of freedom, the design would be sure to have irregular lines, awkward spaces, and confusion. It would lack all the features which make it design and not accident.

On the contrary, the designer bases the structural lines of his patterns on geometrical spaces, such as the square, the triangle, or the diamond; circles or other curved figures are merely modified squares, etc. The square or diamond is the customary basis of Western design, while the far East has always preferred the triangle.

The size and repetition of the design depend upon the space it is to fill, and the problem of the designer is to make a plan which will fill the space perfectly. He decides where the masses and lines shall go, where the points of emphasis shall be, and indicates the balance and harmony of the composition, but does not work out the detail. The size of his space determines the number of repetitions, as for instance the width of a textile material. When he has blocked out the pattern the designer sketches in the lines, and gradually the perfect pattern appears.

In repeated patterns it is necessary to observe certain rules which are less important in a single composition. Repeated patterns should be:

1. Conventionalized — the established forms are

more pleasing in repetition than the more temporary ones.

2. Well-balanced — the balance good enough for a single composition is not always good enough for repetition.
3. Modest — repeated patterns should not be too obtrusive. There is greater freedom when the pattern is self-colored.

Value of Line in Patterns

We have spoken of lines, forms, and spaces as the material for pattern. Most of the great artists have been masters of line, yet it is often little understood. "Line" does not mean the outlines of the figures, but rather an effect of lines along which the eye is unconsciously carried, whether the line is boldly given or only suggested by shadows and masses of color. We may observe the effect of line in a pattern at a distance, although it may not be so clear when we study the details. Walter Crane tells us that line is a language. For example, "Vertical lines express exalted feeling while bowed or bent lines show dejection and despair."

Lines may be firm, rough, ragged, or smooth and flowing, rectangular or curvilinear. These differences affect the impression which the design makes upon us. The lines may also radiate or spring outward from a central point; they may be spirals or scrolls turning

back in a mounting, circular fashion; they may interlace, as in strap work, or fret or key patterns, such as the swastika.

The direction of the line should harmonize with its character. Straight lines steady a pattern and curving lines give it grace and freedom.

One of the problems of the designer is the "composition of line." This may be described as the arrangement of the prominent lines to give a pleasing, restful, and harmonious impression.

Forms and Spaces

The forms of the pattern are the units of the design, as a natural or conventionalized flower or a geometrical figure. Line and form have a close connection, though they do not mean the same thing. If lines are flowing, the forms should be graceful; if the lines are angular and bold, the forms should incline more to the geometrical — that is, the lines of the figures and the lines of the composition or design must harmonize.

Two variations of pattern forms have come to us from the far East.

1. Diaper patterns, in which squares, circles, or other spaces are filled tightly with patterns like stars, daisies, spots, or fernlike traceries which usually make a background for another more prominent pattern.

2. " Inhabited " forms, large figures, often flowers or leaves, which are covered all over with smaller patterns. Persian figures of the palmetto, for instance, may be made up of tiny roses and leaves. The difficulty of detail in large forms is thus solved.

Spaces in a design are as important as the forms. The beauty of a pattern may be ruined by awkward and irregular spaces. If the figures are crowded or ill-balanced, they cannot be seen to advantage. If they are too far apart they lose in effectiveness and the design is not well bound together. The spaces form the setting of the units of design and are as much a part of it as the forms.

Borders form a very important part of most designs. The border is the framework and binds it together. " A good designer is known by his borders." If the body of a design is elaborate, the border should be simple; if the filling is simple, the border may be elaborate.

Borders are only repeated lengthwise and are confined within fixed marginal lines. The pattern of the border may run along the margin or "stand steady," that is, the units of design may be distinct and separate. These are called " stop," " block," or " turn-over " patterns. Sometimes the two types of borders are combined.

Block or panel designs may be placed at certain distances apart with a flowing pattern between them. Blocks or panels are often used to help the designer turn a corner without deforming his flowing pattern.

Chapter XIII

DESIGNS FOR SILK

Varieties of Design

Designs for textiles are either woven in with the threads or applied by printing or other means after the cloth has been woven. In silk materials every known method for applying design may be found. The gloss of satin threads, the deep pile of velvet, and the compound weaves, are all used to produce patterns, as well as yarn of different colors and surface-decoration with printing and embroidery.

Elements of Design

The elements of the designs consist of natural, conventionalized, or abstract figures which must be arranged in an orderly and effective manner according to the space to be filled. For yard goods the pattern is determined by the width of the material, as the length may be indefinitely extended.

Classes of Patterns

Patterns consist of figures in repetition and may be divided into five classes:

1. Rectangular
2. Step-repeat
3. Drop-repeat
4. Turn-over
5. Turn-around

Rectangular

Rectangular patterns are the simplest. In these the figures run across the material in a straight line.

Step-repeat

Step-repeat patterns have every other figure a "step" lower, the first, third, and fifth figures would be on one line and drawn across the material, and the second, fourth, and sixth on another.

Drop-repeat

Drop-repeat patterns do not move up and down, but each succeeding figure is a little lower than the one to the left or right. Lines touching corresponding parts of the figure would run diagonally across the cloth. This is a common variation; it gives more freedom than the rectangular or step-repeat.

Turn-over

Turn-over patterns are made by doubling the pattern over on a vertical line so that the sides meet exactly opposite one another. With a turn-over pattern there

is usually a center space in which the design is not reversed. This keeps it from being too stiff and formal. Turn-overs reduce the cost of weaving, as the same cards, reversed, may be used for both sides of the pattern.

Turn-around

Turn-around patterns are made by placing the design in different positions. It may be turned half or three-quarters around, or upside down.

The advantage of these methods may be seen by studying the accompanying diagram (Figure 11), in

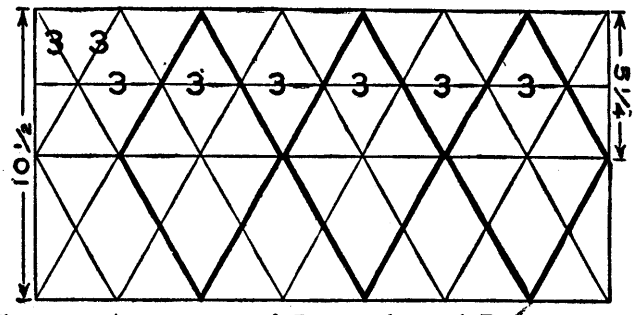


Figure 11. Arrangement of Rectangular and Drop-repeat Patterns

which the design which will repeat exactly on a material 21 inches wide is seen to be limited to a three-inch triangle, while a design 10½ x 6 inches may be used in a drop repeat. The large diamonds represent the space filled by each unit of a pattern with a drop-

repeat, the small diamonds the space filled by a rectangular pattern.

Process of Designing

The design is first drawn as it will look in the finished goods. It must be suited to the weaves and textures for which it is to be used and the colors in which it will be developed. It is then transferred to "point" paper, which is very finely ruled in each direction. The pattern is enlarged on this paper so that every space represents a thread of warp or filling. This is highly skilled work, as the working design must represent the actual threads and does not suggest the finished pattern to an untrained eye.

Designs for silk should bring out the beautiful surface of the material, the depth of color in velvet, and the clear color due to the luster of the fiber. These characteristics will make effective patterns in silk, although in cotton goods the same patterns would be dull and ugly.

Dress Goods Patterns

Designs for dress goods are usually much conventionalized or abstract. If natural flowers are used they are very small. Otherwise, unless the pattern is self-color it is too pronounced. In ribbons much more freedom may be allowed, as they are used in small quantities for decoration. Warp-printed patterns may

be less conventional and abstract, as their outlines are hazy and not aggressive.

Suitable Patterns for Dress Goods

Diaper or all-over patterns after the oriental fashion are very good, especially in self-colored designs.

Dots, stripes, checks, and plaids conform to the requirements that patterns should be "modest," especially for clothing, but rich and varied patterns are suitable to rich materials, such as brocades.

Brilliant patterns, which would be very inappropriate and tiresome if worn where they would be constantly seen, may be used for linings.

Elaborate borders are also in good taste for handsome materials, as they contrast well with a plain satin or velvet ground.

Sport silks usually have conventional designs, often developments from Egyptian or Greek motifs, sometimes from Chinese or Japanese, all of which are effective in the bright colors and strong contrasts of these goods.

Drapery Silks

Drapery silks have a much wider range of pattern than those for dress goods. They often have festoons or baskets of flowers, fruits, and figures, especially of birds. They are often made with turn-over designs. Many draperies have Persian patterns with large figures "inhabited" by smaller ones.

Values of Designs That "Take"

Designers for fine textiles are trained artists who receive large salaries. Some of the finest artistic talent in France and England is employed in this way. A pattern that "takes" may mean a fortune to the mill that produces it.

The mills, therefore, have their own pattern-makers and guard their designs very jealously. These designs cannot be protected by patents, and mills copy the designs of their competitors until foreign manufacturers have complained that American mills appropriate their patterns as soon as the goods are placed on the market. As the copies are made in inferior cloth the pattern is cheapened and is no longer popular in the more expensive goods. This accounts for many heavy losses in novelty materials.

Some agencies in Paris and other fashion centers of Europe make a business of supplying the new patterns to American manufacturers who subscribe for them by the year or by the hundred. It then is a matter of business shrewdness to place the pattern on the market early enough to supply the season's trade, but not soon enough to give competitors a chance to copy it.

History of Designs for Silk

The fact that silk lends itself so readily to artistic treatment was taken advantage of long ago. Each historic period since the twelfth century, when the

Arabian weavers first worked their looms in Sicily, has produced its distinctive style of design, which may be studied and more or less imitated by modern designers.

Italian Art

In the fifteenth century Italian art reached the highest degree of perfection, both in design and technique, and the influence extended all over Europe. The beautiful Flemish tapestries and figured and brocaded velvets show the influence of the Italian silk textiles.

French Skill

The early French silk damasks can barely be distinguished from those of Italy. Soon, however, the French showed an individuality of their own. Their designs were of a delicate, lacelike character, with sprays of foliage and bouquets gracefully intertwined with trellis-like forms. During the seventeenth century a wavy ribbon was a feature of French design and with it stems and flowers were mingled, sprays and garlands of flowers were gracefully arranged, and the French convention of the rose was first developed.

About this time came the exodus of the most skilful French silk weavers to England, and they carried with them this type of design. On that account the English and French woven silks of that period are much alike.

During the eighteenth century, French artists produced in their designs not only flowers, birds, butter-

flies, but also figures and even landscapes. Toward the end of this period, however, the heavy brocades and damasks were superseded by soft, gauzelike fabrics and simple classic designs were used.

Jacquard Weaves

In the early nineteenth century came a change in the technique of silk weaving, the power-loom was introduced and the Jacquard machine for silk pattern-weaving took the place of the hand-loom. Art in silk weaving seems to have declined and began to revive only when a general system of education in design was established.

By the end of the century Great Britain was foremost in the design and manufacture of fabrics for house decoration, but France is now, and has been for three centuries, the leader in designing and manufacturing the most beautiful and costly dress fabrics.

Chapter XIV

SILK YARD GOODS [1]

Classification

Some of the silks mentioned in this chapter are little used at the present time, but many of them may still be found among old possessions and as most of them have given good service in times past it is well to have their names appear here. Oftentimes silks which have not been used for a number of years return to style again.

Armure

This is the French word for armor, a name suggested by the style of weaving, which produces a fine pebbled surface, or small diamond-shaped figures. The weave is an imitation of the armor of feudal times, which was made of metal plates overlapping each other like fish scales, allowing the armor to conform to every movement of the body.

Batiste

This is a fine, sheer fabric, sometimes made of silk,

1 See glossary in Appendix for pronunciation of French words not given in this chapter.

but more often of cotton or linen. (See manual for the "Cotton and Linen Departments.") It is sometimes woven with small dotted effects.

Bengaline

The name of this fabric comes from Bengal, India. It is a plain, heavy, corded fabric with silk warp threads. The cord is formed by weft threads, sometimes of silk, but usually of worsted, running across the cloth. These are entirely covered by the silk warp threads so that none of the wool is exposed and the fabric shows only silk threads on its surface.

Bolting Cloth

This is a fine, open-mesh silk cloth of which bolters, or sieves, for sifting flour are made. It is also used for fine fancy work.

Brocade

This is a rich silk fabric, having raised figures of flowers, foliage, or other designs. These designs are often woven in gold and silver. Brocades may also be woven of any material or combination of colors.

Brocades are classed as:

Gold-thread brocades
Silk-damask brocades

Gold and silver threads are prepared in different ways. In olden times a flat, gilded ribbon was used

over a silk thread which was of a color as near that of the metal as possible. Skill was required to wind the metal around the silk so that the edges would lie as close as possible without overlapping. In Milan, Italy, a secret process was used whereby the thread was golden on one side only. Flat threads of copper were also made. The Chinese used bands of gilded paper upon the silk thread.

At first the name brocade was given only when the flowers or ornaments were of gold or silver, but later it was used even when no metallic threads were employed.

In the thirteenth century brocades were manufactured in Lucca, Italy. The manufacturers were driven out of Lucca by the governor and went to another place, where they built a new factory and invented a modification of the brocade, which they called damask.

Japan has for centuries taken the first place in the production of figured silks of all kinds, including brocades.

Broché

This is a French term for brocade.

Cachemire de Soie

(French; pronounced "cashmeer de swah.") This silk fabric has a fine twill and is finished to look like cashmere.

Changeable Silk

See " Glacé," below.

Charmeuse

See " Satin charmeuse " under " Satin," below.

Chiffon

(French.) This is a thin, sheer, transparent, open-mesh, plain-weave material. Both warp and filling are hard-twisted single threads. It is piece-dyed, sometimes printed in dainty patterns, and given a soft finish.

The word chiffon when used with other materials signifies light weight and soft finish, as " chiffon taffeta," and " chiffon velvet."

Chiffon Taffeta

See " Taffeta, chiffon " below.

China Silk

This is a plain-weave silk with a beautiful, natural luster. It is supposed to be made on the hand-looms in China and is easily recognized by imperfections which are always found in hand-spinning and hand-loom weaving.

The name China silk has been used in the United States for a class of machine-made silks, usually in plain colors, although sometimes printed, made in imitation of the genuine China silks.

Chiné Silks

In these silks the design is somewhat faint and indistinct, due to the fact that the pattern is printed on the warp threads only.

Cloth of Gold

Cloth of gold has a golden effect from being heavily interwoven with tinsel. This splendid fabric is first mentioned in Exodus 39; 3, "and they did beat the gold into thin plates and cut it into wires to work it in the blue, and in the purple, and in the scarlet, and in the fine linen with cunning work."

In the early weaving of cloth of gold both round wires and flat strips of gold were used. The flat strips were wound around silk threads. The cloth was generally woven by using a thread of silk and a thread of gold, although there were instances where it was made entirely of gold thread.

Although cloth of gold was formerly used almost exclusively by the nobility and by the church, it has in recent years been made of cheaper material and is more generally worn.

Crêpe

Crêpe is a French word derived from the Latin, *crispus*, meaning curled. It is a thin, light-weight, crinkled fabric.

Crêpe Charmeuse

This soft, rich, piece-dyed fabric has a dull luster and a glovelike feel. It is made with a satin weave.

Crêpe de Chine

This is a soft, light-weight silk with a finely crinkled effect. It is plain woven with raw or thrown silk warp and with the filling of alternating twists of hard-twist tram. It is piece-dyed and often printed. This silk is popular for underwear and also for waists and dresses.

Crêpe Meteor

This is a smooth, lustrous silk fabric with a fine twill face.

Damask

This is a figured silk in which the figures and the ground are of contrasting weaves. It is usually made with a satin ground, the figures being woven in by means of the Jacquard loom.

Dresden

See " Chiné," above.

Eolienne

This is a sheer, finely corded fabric of silk, silk and wool, or silk and cotton.

Epinglé

This is a French word meaning a slender pin or

wire. It is a firm fabric woven with fine cords forming cross ribs. Sometimes it is woven with single cords at regular intervals and sometimes there are two or three cords together in groups at uneven distances apart. This silk is used for ribbons and cravats.

Faille

(French; pronounced "fy-e.") This is a plain, soft, ribbed silk with small, flat ribs.

Faille Française

(French; pronounced "fy-e frong-saize.") This is a faille silk made in France. It has two or more picks in a shed; these are held in position by a special binder warp.

Foulard

Foulard is a French word meaning silk handkerchief; the silk was originally used for handkerchiefs only. It is a soft, thin dress fabric. It is usually a two-and-two twill weave, although it is sometimes plain. It is piece-dyed and usually printed. The designs are large or small according to the prevailing style.

Gauze

This fabric is said to have had its origin in Gaza in Palestine, an important cloth-weaving center in ancient days. It is a thin, transparent silk fabric woven

by the gauze or leno weave. Gauze is dressed or sized while it is stretched and then dried.

Georgette Crêpe

This is a thin, sheer silk having a fine crêpe effect in the weave.

Glacé

This French word, meaning glazed, is often applied to silks made of two tones, that is, with the warp of one color and the weft of another. These are sometimes called " shot " silks and sometimes " changeable " silks.

Grenadine

This is a plain or figured, open-mesh dress fabric with gauze or leno weave. Grenadine may also be made of worsted and cotton as well as silk. It sometimes has stripes of satin.

Gros de Londres

(French; pronounced " gro de londr," meaning grain of London.) This is a silk dress fabric with cross ribs, either with alternating coarse and fine ribs or ribs of two different colors.

Grosgrain

(French; pronounced " gro-gran.") The name of this fabric comes from the French *gros,* meaning a

thick grain. It is firm, close-woven, fine-corded or grained, and finished with only a slight luster.

Habutai

This is a pure silk fabric made in Japan. (See also "Japanese Silk" below.)

India Silk

This name is given to the plain-woven silk manufactured in India on hand-looms. It has a beautiful natural luster and resembles China Silk and Japanese silk.

Jacquard Silks

Silks which have figures woven by means of a Jacquard loom are sometimes called Jacquard silks, although they are better known as brocades.

Japanese Silk

This is a plain-woven, smooth, soft, lustrous silk manufactured in Japan. It may be dyed in plain colors or printed, but a great deal of it comes as white, glossy, and shimmering. The name covers a variety of Japanese silks, but is most customarily applied to habutai. (See also "Kikai" below.)

Jersey Cloth

Silk jersey cloth is a very soft, knitted fabric. It is

used for dresses, undergarments, and especially for gloves.

Kikai

This is a Japanese silk, not so fine nor of so good a quality as habutai.

Liberty Satin

This silk takes its name from Liberty and Company of Paris and London. It is a soft, satin fabric, made on 8 or 12 shafts, having raw silk warp and spun silk filling. It is piece-dyed.

Louisine

This silk fabric has a coarse, uneven surface made by weaving two or more warp threads together in a plain weave.

Marquisette

This sheer, plain-weave fabric has an open mesh made with a gauze or leno-weave.

Matelassé

These silks have a raised pattern. They are usually of one color and have a rich flowered pattern showing only by its slight relief or embossed appearance.

Merveilleux

See " Satin merveilleux " under " Satin " below.

Messaline

Messaline is a fine, light-weight, 5-shaft satin, very soft and brilliant. The back also has a luster.

Moiré

This is the French word for clouded or watered silks. As explained in Chapter VII, corded silks are the only ones which can have the moiré or watered finish.

Moiré Antique

In making moiré antique the pattern is engraved on a brass roller and the material passed under great pressure between it and another roller which has a plain surface. This is sometimes called "long moiré."

The same method is also applied to moiré ribbons.

Mousseline de Soie

(French; pronounced "moo-sel-een de swah.") The name comes from the city of Mosul near the site of Nineveh. It is a sheer, soft fabric of silk, similar to chiffon, but of more open weave.

Organdie

This is a light-weight, transparent, somewhat stiff silk material.

Ottoman

The name of this fabric comes from the Ottoman or

the Turkish Empire. It is a heavy, plain dress fabric with large cords extending from selvage to selvage. The filling or cords may be of silk, wool, or cotton.

Peau de Cygne

(French; pronounced "po de seen"; meaning swan's skin.) This is closely woven, satin-weave fabric of soft, lustrous finish.

Peau de Soie

(French; pronounced "po de swah"; meaning silk-skin.) This soft-finished, satiny dress fabric has a dull luster and somewhat grainy appearance. It comes in plain colors. The best grades are double-faced, that is, they are finished on both sides alike, while the cheaper grades are single-faced, finished on one side only.

Pekin Stripe

This fabric has strong contrasting stripes which are usually of satin and grosgrain alternating.

Plush

Plush is a pile fabric with a much longer pile than velvet. The pile may be silk, worsted, or mohair. Silk is used in the seal-skin plush, an imitation of seal-skin.

Pongee

This is a thin, soft, washable silk fabric woven from the natural-colored silk of the cocoons of the wild silkworm which feeds upon oak leaves. Formerly the entire supply of this silk was imported from China and Japan, where it was woven on the hand-looms, but it is now produced in the United States.

The finest kinds, which are bleached, dyed, or printed after importation, are known in the trade as China silks.

Pongee may be a mixture of wild and cultivated silk.

Poplin

This is a soft, light-weight fabric with a fine cord effect. It is made with a plain weave and has a silk warp and a cotton or a wool filling.

Rep

Rep is a corded fabric and its name is a corruption of the word ribs. The cords sometimes run crosswise of the fabric, when only the warp is seen, and sometimes lengthwise, when only the filling which makes the ribs is seen.

Satin

This is a silk fabric having a high luster. The manner of weaving (see Chapter V) is the principal reason for the luster, which is enhanced:

1. By the quality of silk used — better silk produces a better luster.
2. In the finishing process — the pressing of the fabric between hot rollers or the calendering process adds a finishing luster to the material.

Satin is the typical representative of the satin weave.

It is said that satin was made first in China, but it is known to have been made in England in the thirteenth and fourteenth centuries and was probably made in France and Spain before that time. At this early time, probably because of its high price, it was little used, but by the eighteenth century it was in more general use.

There are many varieties of satin. Among these are:

Satin charmeuse is a light-weight, piece-dyed, lustrous satin having a hard-twisted warp and usually a spun silk filling.

Satin, cotton-back is a lining satin with a raw silk warp and cotton filling, piece-dyed.

Satin damask has elaborate designs, sometimes in velvet.

Satin de chine is a soft satin with a crêpelike finish.

Satin de lyons (French; pronounced "de lee-on", meaning satin of Lyons), is a fine quality of satin made at Lyons, France. It is all-silk, skein-dyed, and very lustrous. Another variety of the same name has a

twilled back, is much cheaper, thinner, has less luster, and is used to some extent for fine linings.

Satin, double-faced is a heavy, reversible satin, that is, both sides alike, made by having a back warp as well as a face warp.

Satin duchesse (French; pronounced "doo-shess") is a rich quality and heavy grade of all-silk satin dress fabric, originally made in black only and without a pattern.

Satin façonné has a Jacquard pattern on a satin ground.

Satin merveilleux (French; pronounced "mair-vay-yeh"; meaning marvelous satin) is a fine, close-twilled, satin-faced silk dress fabric having a glossy finish. The twill is very imperceptible.

Satin regence (French; pronounced "ray-zhans") is one of the most costly of silk dress fabrics. It has a rich satin surface with fine sunken lines extending across from selvage to selvage.

Satin rhadame (French; pronounced "rad-am"), is a satin the surface of which is broken by fine twilled lines which extend diagonally across the surface; it is made with silk or cotton-back.

Satin royal is a very fine and expensive dress fabric made of pure silk and having a satin finish on both sides. Each face has fine twilled or sunken lines extending diagonally across the surface of the material, as in satin rhadame.

Satin surah is a medium heavy dress material with a twilled surface and a satin finish.

Satin taffeta is a fabric with a satin weave on one side and a taffeta weave on the other.

Shantung

This silk is named from the province of Shantung, China, where it is made. It is a rough plain-weave fabric made from tussah, or wild silk. It is a heavier grade than pongee.

Shot Silks

See " Glacé " above.

Silk Serge

This has a twill weave and is similar to surah.

Surah

This fabric is named from Surat, India, where it was first made. It is a light, soft, twilled silk.

Taffeta

The word taffeta is derived from the Persian *taftah,* to spin. This is a thin, glossy silk fabric, either plain-woven or cross-ribbed, with cords so fine as to appear plain-woven. It is made of skein-dyed silk. The name was formerly applied to all plain silks and is supposed to be an example of the first kind of silk-weaving known.

Besides the plain taffetas there are checked and flowered taffetas, the style of which changes with the season; other kinds of taffetas are:

Chiffon taffeta, a taffeta of good quality which is subjected to much heat and pressure in the finishing process so that it is very soft and lustrous.

Glacé taffeta, a taffeta in which the warp and filling are of contrasting colors, giving a "shot" effect.

Tulle

This fabric is named for the town of Tulle, France. It is a plain, fine, silk net, with a small mesh.

Tussah, Tussur, or Tussore

Tussah silk is a tan or light brown (natural) colored silk made from the cocoons of the wild silkworms.

Velour

This is a velvety material made of coarse wool yarn and silk, woven like plush with a coarse, stiff pile.

The name velour is the French for velvet and is applied to a great variety of fabrics which have a velvety finish.

Velvet

The name comes from the Italian *velluto,* meaning

shaggy. This fabric has a short, soft, thick pile face and a plain back. It may be all-silk or silk-and-cotton. A great deal of spun silk is used for velvets. (See also Chapter XV.)

Voile

This is a sheer, semitransparent, plain-weave fabric of silk, wool, or cotton, sometimes ornamented with stripes or figures.

Novelty Silks

New silks with new names or old silks with new names are constantly appearing. Often different manufacturers have different names for the same silk. Among some of the new names are:

Will o' the Wisp
Crêpe Kokette
Samara Prints
Crêpe Velour
Mayflower Prints
Bolling Prints
Satin Finish
Satin Arcadia
Taffeta Soiree
Satin Majestic

Model silks may be seen in the shops each season, bearing the label of some famous French dressmaker, who has used and in many cases designed that silk.

Some of the names frequently seen are:

Callot
Cheruit
Jenny
Paquin
Worth
Bulloz

Chapter XV

THE VELVET DEPARTMENT

Varieties of Velvets

The Velvet Department is usually a part of or near the silk yard goods department. Although velvet fabrics are used to some extent all the year round, they are in most demand in the colder months and their popularity also depends upon fashion.

In this department are found all pile-woven fabrics, namely:

Velvets
Plushes
Velveteens
Corduroys

These materials range in width from 18 to 45 inches.

Uncut velvet is velvet made with a looped pile which is left uncut.

Mirror velvet is velvet which has had the pile pressed down flat.

Panne velvet is a light-weight velvet with the pile flattened down.

Chiffon velvet is also pressed between rollers, but not

so flat as mirror velvet. The pressing gives it a beautiful shaded luster.

Cotton velvets or *velveteens,* which are made entirely of cotton, are very little affected by pressure, and after a time the pile springs back and resumes its plain appearance.

Behring seal is the name of a pile fabric suitable for cloaks and suits.

Velvets are also made in a variety of fancy patterns, as stripes, shot effects, and various embossed and figured designs.

Plush

The difference between plush and velvet is in the length of the pile. If the pile is longer than one-eighth of an inch, the fabric is called plush.

Tussah silk is very largely used in plushes and the longer pile fabrics because of its strong elastic fibers, lustrous quality, and softness. It is especially suited to the imitation of seal and other furs. Even the dyed and tipped effect of the genuine seal may be produced.

Some American manufacturers who have been unable to obtain a sufficient quantity of tussah yarns from England have erected their own spinning plants.

Wool and cotton are also used in the manufacture of imitation furs. Artificial silk has been successfully woven into pile fabrics.

Qualities of Velvets

All inexpensive velvets have a cotton back, but if the pile is thick the back does not show. A cheap velvet with a thin pile will show the back.

Velvet with a silk back is expensive. It has a glossy finish, is stiffer than the cotton-back velvet although lighter in weight, and the foundation does not show on the right side if the velvet is folded so that the pile separates.

It is often better to use a good velveteen of fine luster and close pile than a poor velvet which has a thin pile.

History

Nothing is definitely known of the country from which velvet first came nor of the people who were ingenious enough to plan the method of weaving velvet. It may have come from Central Asia or perhaps from China. It was not until the fourteenth century that any historical mention is made of the fabric.

Its earliest uses were for royal and state robes, ecclesiastical vestments, and splendid hangings. The material was especially fitted for these purposes because of its rich depth of color and its soft and graceful folds.

In medieval times the Italian velvets were among the most magnificent. Different effects were produced in these velvets by changing the length of the pile on the same fabric, that is, by having piles of different lengths; by brocading with plain silk, with uncut pile,

or with gold tissue; and also by varying the color of the pile. At this early period the most expensive velvets were made in Genoa, Florence, and Venice.

The first velvet mill in America was built in 1865, but since the enterprise was unsuccessful it was given up after a short time, and until comparatively recent years velvets used in the United States have been of foreign manufacture.

Centers of Industry

Genoa from medieval times to the present day has produced vast quantities of rich velvets.

Crefelt and Lyons are the modern centers of manufacture.

In the United States velvets are now made in Connecticut and in New Jersey.

Chapter XVI

THE RIBBON DEPARTMENT

Varieties of Ribbons

In the Ribbon Department may be found all the combinations of color and weave seen in the Silk Department and some additional varieties. The weaves and styles of ribbons comprise:

Taffetas
Moirés
Glacés
Satins
Satin-and-failles
Gauze
Ottomans
Velvets
Grosgrains
Velours
Double-faced satins
Velvet-and-satins
Shot or changeable silks
Yarn-dyed
Piece-dyed
Dresden or chiné (warp-printed)
Jacquard designs
Surface-printed

Materials

Ribbons may contain cotton, they may be weighted, and they often have tinsel threads woven into them, but the principal material is silk, and the quality used

is generally raw silk. Artificial silk, mixed with cotton, may be found in novelty ribbons.

Weaving

Ribbon looms are made to carry several ribbons, often from twenty to thirty, with a separate shuttle for each one. These shuttles are carried back and forth, from one side of each narrow warp to the other, by means of a special mechanical device.

Taffeta, moiré, satin, and many other ribbon weaves are exactly like the broad silks from which they are named, but there are many double-faced ribbons which do not correspond to any broad silks. Double-faced satin, and velvet-and-satin are the most popular of these. Most of the broad velvets used are cotton-back, but the best velvet ribbon is satin-back. Cheap grades are always cotton-back. These are all woven with a double-cloth weave.

Velvet-and-satin ribbons are sometimes made with contrasting colors on the opposite sides; for example, black or navy blue ribbons may have scarlet or yellow backs.

Finishing, Dyeing, and Printing

Ribbons are sometimes piece-dyed, but more generally yarn-dyed. Changeable silk ribbons are made with warp and weft of different colors. Sometimes there are two colors in the warp and one in the weft.

Each weft or filling thread is called a pick; the average number of picks to the inch range from 80 to 100. Satin ribbon has about 90 picks, while taffeta has about 120.

Ribbons usually have some weighting material in the dye to give them body, and some receive a large amount of glue or other sizing in the finishing processes.

Soft taffeta ribbons require very little finishing.

Satin ribbons are calendered to increase their luster.

Gauze ribbons are made from " schappe " silk or silk in the gum.

The less expensive fancy ribbons are surface-printed, but finer varieties are either warp-printed or woven on the Jacquard machine.

For warp-printed ribbons the warp is first beamed and then printed on rotary presses. They were formerly block-printed, when the warp was caught together by an occasional weft thread, then spread out on a table, and the block designs imprinted on it. After this it was put back in the loom and woven. Warp-printing gives a soft, uncertain outline to the pattern because the plain weft threads cross it at so many points. Dresden or chiné effects are given in this way.

Jacquard designs in one or two colors are easily produced, the design being simply reversed on the wrong side; but if floral or other designs in several colors are to be woven, there are apt to be long, loose

threads on the under side. These may be cut off after the weaving is finished, but this involves extra expense.

Designs

Designs in ribbons change with every season, but the tendency of fashion has turned from the definite floral patterns to more conventionalized ones, and especially the oriental designs. Chinese, Japanese, Persian, Indian, and Russian motifs have been popular, especially in sport ribbons. In the latter we have seen Egyptian and Hawaiian patterns. While there will be fluctuations, the probability is that conventionalized and oriental patterns will continue in favor as the East has always been the source of the patterns which are best suited to textile manufacture.

The fancy varieties which vary in popularity from year to year are the plaid, striped, and dotted ribbons. Silver and gold threads are woven or used in silk ribbons in embroidery or stripes.

Qualities and Lines

Ribbons are usually bought with their ornamental value in mind and therefore customers are not so apt to ask about quality if the ribbons are attractive in design and color. But a soft, unweighted silk will show its beauty when gathered up or looped in bows, and even if intended for only one season, the better quality is almost always a wiser choice.

The diversity of staple lines which must be carried in a Ribbon Department is greater than in almost any other. One writer in the magazine, *Silk,* has made the following estimate of the stock of ribbons which is necessary:

"Taking as a basis six staple weaves which, to meet consumer requirements, must be carried from number two through all the intermediate numbers up to one hundred lignes, in say one hundred colorings, if one takes up a pencil and pad and figures it out, it readily can be seen the bulk of these staple stocks alone assumes formidable proportions. Then if you pile on to this bulk from twenty-five to fifty numbers of fancies, the various lines of wash ribbons, and a dozen or so novelty effects, the demand for which comes with the season, some idea can be obtained of what a poor ribbon year means to the house doing business in that end in the matter of piled-up stocks."

Broken lines are always hard to clear off.

Uses

Ribbon is a material, however, which adapts itself readily to a great number of uses and an ingenious saleswoman can suggest new fancies. Hairbows and girdles, camisoles, boudoir caps, bags and cases, collars, novelties for the traveler or the home decorator, can be made of ribbon; if these fancies are displayed on the ribbon counter, they add much to interest.

Ribbon is used for all kinds of trimming, but in millinery it is quite indispensable. Ribbon bands, scarfs, quillings, bows, cabochons, rosettes, and sport caps are some of the many ways in which ribbon may effectively be used.

Avoiding Remnants

Customers like remnants in these days of ribbon fancy-work. Losing even half a yard on a bolt of ten yards makes a loss to the department. Such losses should be avoided. The usual way, when less than a yard is left, is to offer that short length to the customer at half price. Such a sale is a loss. A yard or more should be put on a fresh bolt; any amount under that length should be put in the remnant box, and at least once a month the remnants put on a table. Customers will buy them eagerly. One large retail house in New York keeps two remnant boxes on the counter the year round; one contains plain, the other fancy ribbon remnants, each with a ticket giving the price and quantity. People are attracted, and usually either buy remnants or take the regular goods.

Importance of Color

The decorative character of ribbons makes color and color combinations of the first importance. The proper grouping of ribbons on the shelves of a department will make a truly artistic effect, while the wrong group-

ing will confuse and offend the eye, making a good selection difficult for the purchaser.

A fine color sense is equally important in the use of ribbons. The modern demand for vivid contrasts is often expressed by means of ribbons of very brilliant hues. If the color combinations are correct they may be the perfect finishing touch to a costume, if they are not the effect is crude and unpleasant. Narrow ribbon of the color complementary to that of the dress may be used in full intensity (see page 100) with excellent effect when a larger amount of the same tone would be bizarre.

Bright color either in dress or in household decoration must be employed with a nice balance of daring and discretion. Fancy ribbons from good manufacturers will help to train the eye as the combinations are usually made by artists and at the present time they seem to exhaust the possibilities of the color scales. From the delicate, soft shading of the warp-printed chiné patterns to the gay Batik effects they illustrate almost every principle of color combination in a charming and convincing way.

History

Ribbons were not used as such in Europe until the sixteenth century. Before that time they were woven on the bands or borders of garments and were narrow like a rib, hence the name "ribband."

When first manufactured they were frequently made of gilt, interwoven with threads of gold and silver, and were expensive. Consequently the English parliament passed an act forbidding their use by tradespeople and reserving the right to wear them to the nobility.

In the seventeenth century quantities of silk ribbons were worn, especially by the men. The pictures of that time show men wearing loops of ribbons in great profusion all over their costumes.

Ribbon was sometimes used on men's and women's costumes in strips from neck to waist and also on the sleeves. The material to which it was attached was usually gathered and puffed out. In other cases the strips were attached to the garment only at the ends. In recent revivals of this classic fashion sleeves and the upper parts of bodices have been made wholly of strips of ribbon.

The terms "blue ribbon" and "red ribbon," which are given as marks of excellence, originated in England. The blue ribbon designated the Order of the Garter, which is the oldest order in England, and the red ribbon designated the Order of the Bath, which is the next highest order.

Ribbons vary in width from ¼ inch to 12 inches. The custom of numbering ribbons originated in England and was governed by the thickness of the English penny, which was nearly the size of our silver dollar. A number one ribbon was the width of one of these

pennies set up on edge; a number two ribbon was the width of two of the pennies set up edgewise; a number seven ribbon was the width of seven pennies; and so on.

Chapter XVII

THE UMBRELLA AND PARASOL DEPARTMENT

Materials Used in Umbrellas and Parasols

Umbrellas and parasols are reckoned among the silk departments, but they are made of many materials: cotton, wool, silk, or mixtures, for the covers; and wood, steel, brass, and leather for the frames; besides the ornamental mountings which may be of gold, silver, ivory, mother-of-pearl, tortoise shell, or celluloid.

Divisions of Stock

The department may be divided into three sections:

Ladies' umbrellas and parasols
Men's umbrellas
Children's umbrellas and parasols

The women's umbrellas may be divided into three grades: first, second, and third quality.

Frames of Women's Umbrellas

The frames of the best umbrellas for women have fluted or hollow steel ribs with ball tips; they are japanned black and the joints are covered with fine

leather or silk. The mountings are all very fine. The runner (the circular piece that slides on an umbrella stick and carries the connections) is of brass, either japanned or bronzed over.

The second quality is of the same materials with somewhat lighter brass and mountings less highly finished.

The third quality has solid steel ribs, small self-tips, the joints covered with cotton, an iron runner, and a zinc notch, japanned black.

Covers

The covers of the best umbrellas are of strong twilled silk; in the next quality they are a mixture of materials: silk-and-wool, gloria finished, or silk-and-cotton, or some fine mercerized or schreinerized cotton. The cheapest are of soft-finished cotton materials.

Sticks and Handles

The sticks should be light and strong. They are made of many kinds of wood. Sometimes the handle is a part of the stick, as when twisted roots are left or the wood is soaked in water and bent. When the handle is to be of metal or some fancy mounting, steel tubes are often used. The mountings may be of any degree of luxury. Engraved gold and silver, carved ivory, and inlaid mother-of-pearl are often found.

Manufacturing

The sticks, now usually made of steel tubing, are first cut to the required length, then the springs are fastened in. The slots for the springs are drilled by a small circular saw and the springs riveted in place. The framework is then adjusted. The frame of a silk umbrella consists usually of 8 or 10 ribs and the same number of stretchers. Cotton umbrellas sometimes have 14 or 16 ribs.

The runner and ferrule (the small metal cap at the end of the stick) are slipped on the stick and the ribs and stretchers are drawn into place by wires which pass through the eyes at the ends. The ferrule is then riveted to the stick, small pieces of leather or cloth are fastened over the joints, and the frame is ready for the cover. Some umbrellas have no ferrule.

The silk for the cover is first hemmed, then the pieces are cut in batches and sent back to the machine-room to be stitched together. The completed cover is slipped over the frame, sewed to the ribs, and the cap or metal top-piece attached.

The various small umbrella fittings are shown in Figure 12.

Folding Umbrellas

Umbrellas which are designed to fold so that they may be packed in a suitcase, or trunk, have a collapsible end which, when the spring is pressed, sinks down

into the steel rod. The hinged handle then folds over, making a compact bundle the length of the ribs. Another variety has hinged ribs also.

The mechanism of these folding umbrellas is apt to get out of order, though some people find them entirely satisfactory, and they are a great convenience to the traveler.

Parasols

Parasols may be divided into two classes: those which can be used for both sun and rain, and those which are so small or so fanciful that they can be used only for the sun.

The best parasols have fluted steel ribs which are sometimes brass- or nickel-plated or gilded and have tips of the same color. The runner is of brass. The joints are covered with silk.

Those of a medium grade have solid steel ribs which may be plated with brass, and the runner is of light iron. Since parasols are smaller than umbrellas and are not intended to resist wind, the frames need not be made so strong. The more expensive ones differ from those of medium grades chiefly in their finish and ornamentation.

The parasols intended for both sun and rain may have ribs 21 to 23 inches long. The more ornamental ones are 20 to 21 inches. Covers are made of many varieties of material. Plain silk in green, blue, brown,

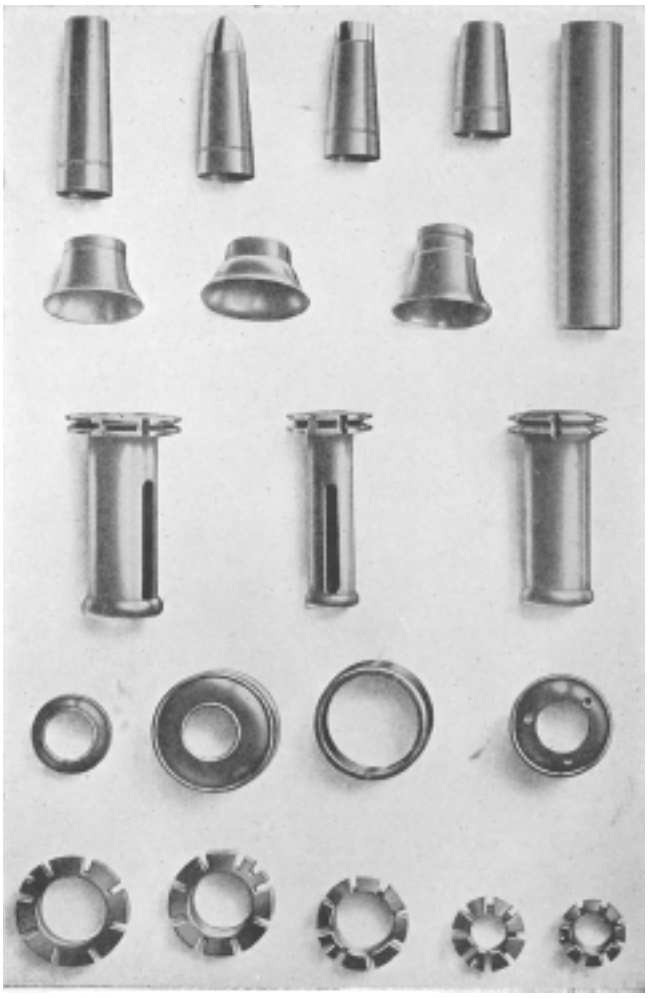


Figure 12. Umbrella Fittings

ecru, or black and white may be found in the larger ones. They are also dotted and striped, sometimes with a satin stripe following the outer edge.

Fancy parasols are made in every hue, with large and small patterns and sometimes trimmed elaborately with quilled ribbon, fringe, or lace. Satin-faced covers are usually made with a silk weft on a cotton warp.

Pongee, linen, and cotton parasols are also much used, especially at the seashore or summer resorts. The pongee or linen is either natural color or bleached, but the cotton covers are of every shade to imitate silk.

Some parasol frames are made so that different covers can be used to match summer dresses. Each cover has little clips to fasten it to the frame.

Parasol sticks are more elaborate than umbrella sticks and are often very fragile. At one time they were like shepherdess crooks with bows of ribbon; at another they represented golf sticks. They may be very costly with ornamentation of gold, silver, ivory, or inlaid jewels.

Men's Umbrellas

Men's umbrellas differ in quality rather than in style. They are built for strength and service rather than beauty, and are seldom much ornamented.

Frames of Men's Umbrellas

As the man's umbrella is larger it must have a

stronger frame than that for a woman. The first-quality frame is similar, except that joints are stronger and the runner is of hardened brass. The joints are covered with cotton.

The medium-grade umbrella is also strong and flexible, but has a steel runner and somewhat heavier ribs. The joints are covered with silk or leather.

Inexpensive grades are made with solid steel ribs, which are necessarily heavy if strong and have a japanned iron runner.

Covers of Men's Umbrellas

The best silk covers for men's umbrellas are made in England. If made of pure, unweighted silk the cover is expensive, as it must be heavy to be completely water-proof.

Mixtures or union goods, consisting of wool and silk or cotton and silk, are much stronger and more satisfactory than the cheaper grades of silk. An Egyptian cotton warp and good silk weft makes a handsome and strong cover. The yarn-dyed mixtures are imported.

Mercerized and schreinerized cotton is used for the less expensive covers. A dull-finish cotton, however, will look better than the schreinerized material after it has been worn some time, because the finish soon wears off. (See manuals for "Cotton and Linen Departments" for cotton finishes.)

Sticks and Handles of Men's Umbrellas

So many kinds of wood and cane are used for sticks that a list is given.

Name of Wood	*Where Grown*
Acacia	Africa and Australia
Ash	British Isles, Europe, and America
Bakow	Singapore
Bamboo	China and Japan
Bay Tree	Algeria
Beefwood	Cuba
Birch	Great Britain and Northern Europe
Blackthorn	British Isles
Black tork	West Indies
Boxwood	Persia and West Indies
Briar	West Indies
Carob	Algeria
Carolina reed	China
Cedarwood	North America
Cherry	Austria-Hungary
Chestnut, Spanish	France
Coffee	West Indies
Cork	Spain and Algeria
Crab-apple	British Isles
Date-palm	Algeria
Dogwood	England
Ebony	Ceylon and Macassar
Elm	England and Central Europe
Eucalyptus	Algeria
Fullers' teazle	England, France, and Germany
Furze	Scotland
Gru-gru	West Indies
Guelder rose	Balkan States
Hazel	British Isles and Europe
Holly	England
Hornbeam	England
Lancewood	South America
Loya cane	Australia

Name of Wood	*Where Grown*
Malacca cane	Siam
Maple	Europe and America
Medlar	France
Midgen	Australia
Mountain ash	England and Northern Europe
Myall-wood	Australia
Myrtle	Northern Africa
Nana cane	Algeria
Oak	England
Olive	Algeria
Orange	Spain and Algeria
Palmyra	India
Partridge cane	China
Partridge wood	West Indies
Penang lawyer	Penang
Pimento	West Indies
Pomegranate	Algeria
Rajah cane	Borneo
Rattan	Eastern Tropics
Snakewood	Persia and Brazil
Thistle	British Isles
Tonquin cane	China
Whangee	Japan
Whitehorn	British Isles

Some of these woods are used in their "natural" finish, while others are colored and finished in many different ways.

The simplest handle is bent or curved by steeping the wood in water until it can be given the desired shape. Metal tops with flat disks or handles of horn, bone, or ivory are also used, sometimes with a hollow steel tube instead of a stick to connect the handle with the runner.

The handles of both men's and women's umbrellas are sometimes made of carved ivory, gold, and other costly materials, even set with the semiprecious stones. Such umbrellas or the handles alone may be found at jewelers' shops and in the jewelry department. The most expensive ones are made so that they may be unscrewed from the stick and removed for safe-keeping when the umbrella is not in use.

Umbrellas for men range from 26 to 30 inches.

Children's Umbrellas

Children's umbrellas and parasols are made in a number of grades. The best ones are similar to those made for women, but are smaller. The cheaper ones are often very fragile and, though bright and pretty when bought, soon lose their freshness.

Suggestions as to Care of Umbrellas

Umbrellas and parasols should never be left tightly rolled as the silk will cut on the edge of the folds. A wet umbrella should be spread out, so that it will dry evenly and quickly, as dampness rots the silk.

A good umbrella frame will outwear several covers and will often justify a new cover. Parasols can be made with adjustable covers to match different costumes.

History

Umbrellas are now regarded as a protection from the

rain, but that is a comparatively recent use. Umbrellas were first designed as a protection from the sun and the word umbrella comes from the Italian *ombrella,* meaning "a little shade."

In Asiatic countries the umbrella has been for many centuries an emblem of royalty; kings and princes have walked or ridden under its protection from prehistoric times.

The time assigned by the Chinese to the advent of the first umbrella antedates by 5,000 years the Mosaic date of the creation of the world.

In India there is a legend that Vishnu was shaded by an umbrella when he visited the inferno.

The Greeks introduced umbrellas into Europe and the Romans carried very elaborate ones made of skin or leather. They were introduced in England about the seventeenth century, but they had been fashionable in Venice and Florence and in France before that.

Jonas Hanway in 1780 was the first man in England to use an umbrella as a protection from the rain. Hanway had traveled in the far east and brought his umbrella from Persia. For a long time it was considered effeminate for a man to carry an umbrella, though women had been using them for sunshades.

At one time huge umbrellas were kept in the halls of country houses and were carried over the heads of the ladies as they went from the house to the sedan chair or carriage. These umbrellas had frames of

whalebone and were covered with thick cloth. Parasols were often very elaborate and costly with fine whalebone frames, silk tassels, and fringes. They were often jointed so that the top could be turned to a vertical position and used as a fan or to shade the eyes. The handles were sometimes made of carved coral or ivory and were jointed with a metal slide covering the hinge. When not in use the handle could be folded over and the parasol carried under the arm.

Chapter XVIII

THE HISTORY OF SILK

Discovery in China

The most beautiful textile fiber, silk, was first discovered by the Chinese. The silkworms were a natural product of China and the cocoons were plentiful.

According to Chinese records, the silkworms appeared in the garden of Hoang-Ti, who was the Emperor of China, 2700 B.C., and the emperor's wife, Si-Ling-Chi, who became interested in the cocoons, herself discovered a way of reeling the silk from the cocoons and of weaving the fine thread into cloth. She is even now worshipped throughout the Chinese Empire as the " Goddess of Silkworms."

The secret source of the silk fiber was guarded for many years, and although the silk was imported from China, no one, under penalty of death, was allowed to carry eggs of the silkworm to another country.

Silk Culture in Japan

Silk-weaving was known in Japan long before the Christian era. About the third century A.D. a large number of Chinese emigrated to Japan where they

were given a section of the country in which they might practice the Chinese method of silk-weaving. Later they were ordered to settle in different parts of the empire and to rear silkworms, as well as to weave the raw product into cloth.

For centuries the Chinese weavers led in silk culture and promoted the industry in Japan. The silk-producing sections of the empire were required to pay annual tribute of silk fabrics to the Emperor.

Japan and China have shared the honor of being the greatest silk-producing countries in the world.

In 1874 the Japanese Empress Shoken established sericulture (silkworm culture) in the imperial palace and ever since that time it has received the fostering care of the royal family. A rearing house has been constructed, mulberry trees planted, and one chief expert and ten assistants are employed. Great care is used in the selection of these experts, most of whom are graduates of local agricultural or sericultural schools.

Chinese Silks

Not only were the Chinese the first to domesticate the silkworm, but they invented looms and appliances by means of which they carried the art of weaving to a high degree of perfection. They planned twills and satin weaves, whereby the lustrous quality of the silk was particularly displayed, and their arrangements for

ornamental pattern-weaving have never been surpassed. The most approved modern looms are in all essential points exactly the same as the compound draw-loom for pattern-weaving which is shown in ancient Chinese pictures.

China has always continued to be the greatest producer and consumer of silk fabrics.

Japanese Silk

The Japanese, who were apt pupils of the Chinese, are the only ones who have ever approached them in excellence. The Chinese do not make any great point of exporting woven silk, but the Japanese have for years contributed largely to the world's markets. Japan's export of manufactured silk recently amounted to $7,500,000 in one year. Great improvements have been made in machinery and weaves. Japanese crêpe de chine and georgette are made for the American, European, and Australian markets, and in the first three years of the war seven thousand pieces of silk were sent to the Allies for air-ships which require a well-woven fabric of unusual strength.

Strict responsibility about filling orders has not always been shown, however, and the great demand and high prices have caused an inferior raw silk to be sent abroad.

A Chinese organization called the General Guild of the Silk Trade of Shanghai has taken up the question

of improvements in the methods of silk production.

For ceremonial garments the Chinese and the Japanese have always used heavy silk inwrought with gold and silver as rich and costly as could be furnished. Recently the Japanese have used for their brocade a gold paper cut into narrow strips and spun around a silk thread, twisted into a thread of itself and woven with the fabric. The fabric made in this way looks as if it were inwrought with genuine gold, but it is much cheaper and more flexible than gold.

Silk in India

Silk has been manufactured in India in very large quantities and has been excellent in technique and design. Silk was carried to India from China about the third century and manufactured there.

Silk Production in Europe

Aristotle, the first ancient writer to mention silk, writes of Pamphilia, a lady of Cos, as wearing a transparent silk gauze, so fine that it was called "woven wind." It is evident that this tissue was fashionable at that early period. The cloth was probably woven of thread unraveled from a Chinese fabric.

In ancient times Chinese silks and embroideries were exported, but not the silk thread. Plain woven fabrics were bought and unwoven in other countries, to obtain the thread which the Chinese made very strong and

dyed in beautiful colors. It is said that the Saracenic and Spanish weavers, whose beautiful work may still be found in the museums, obtained their silk thread in this way. Raw silk was not exported from China until centuries later.

At the beginning of the Christian era raw silk was one of the most valuable imports into the Roman Empire. Although it had been used for centuries the people had no idea of its source. They imagined that, like flax and cotton, it might come from the trees or flowers.

The silk which the Romans used was sent from China overland through Persia. The long journeys were made by caravans and many months were consumed in the transportation, but the price obtained more than covered the expense of the journey, and brought a good profit to the merchants dealing in the silk.

In the sixth century A.D., when the Roman Emperor Justinian engaged in war with Persia, the entire supply of raw silk was cut off, so Justinian determined to find the source of the raw material. By paying a large sum of money, he induced two Nestorian monks to go to China and to learn the mystery of the whole silk process.

These monks traveled on foot through Persia and India to China, where they succeeded in learning the secret. Although anyone who carried silkworms' eggs

out of China could be punished by death, the monks hid several thousand eggs in their hollow bamboo staffs and escaped with their booty.

In 555 A.D. they returned to Constantinople, the capital of the Eastern Empire. They presented the eggs to Justinian and he afterward placed the monks in charge of an industry which he established. By raising the price of silk he added much to his imperial treasury. After his death the monopoly ceased and the industry spread to other countries.

In the tenth century the Moors started silkworm culture in Spain, where it later developed into a most important industry.

By the twelfth century it had spread to Greece and Italy, and in the thirteenth century France was raising silkworms and manufacturing silk.

In the sixteenth century, Flemish weavers went to England and started the industry, but the climate did not seem suited to the raising of the worms. From time to time attempts have been made to introduce sericulture in England, but they have always failed.

Cloth of gold was used in England from the reign of Edward I to the time of Henry VIII, that is, from the thirteenth to the sixteenth century. The wearing of this cloth was prohibited except to people of the nobility.

Silk was first introduced on this continent through the Spanish conquest of Mexico in the sixteenth cen-

tury, and plans were made to establish sericulture in Mexico. Although silk was exported to some extent, the industry did not last long.

Early Attempts in the United States

A few years after the settlement of the Virginia colony in 1620 skilled men were sent for by the English to start the raising of silkworms, but with little result.

The most successful attempt at silk culture in the American colonies was in Georgia, but even there the industry was never a commercial success. Pennsylvania and Connecticut each tried silk-raising until, with the outbreak of the revolution, the silk industry was suspended. After the war it was revived principally as a household industry.

Silk culture has been tried in this country from Maine to Florida and to California, but for various reasons all efforts have failed. The principal obstacle has been the cost of labor which is so much higher here than in Europe and Asia.

Between 1837 and 1840 there was a speculation in mulberry trees throughout the country. So great was the excitement that fruit trees were cut down to make room for the mulberries and enormous prices were paid for the trees, but a severe winter set in and killed most of them and put an end to the short-lived speculation.

Centers of Raw Silk Production

It has been proved that raw silk can be produced commercially only in those countries where labor is cheap and abundant. China, Japan, and Italy furnish four-fifths of the world's supply. China is first in the amount produced, but in quality it ranks third. There are two ports in China from which the raw silk is shipped: Shanghai and Canton. The best Chinese silks come from Shanghai and are known as "steam filatures." The wild silk comes from the northern part of China.

Japan is second in the amount of raw silk produced, and second also in quality. The greatest market in Japan is Yokohama. The color of the silk from Japan is pure white.

Italy is third in the amount of raw silks produced, but the quality is the best. The color of the Italian raw silk is bright yellow.

Figure 13 shows raw silk bundled and baled for shipment to this country.

European Centers of Silk Manufacture

France produces the largest number of manufactured silks and also the highest grade of materials. Lyons is the center of the trade and is noted for the many beautiful Jacquard weaves — velvets, embroidered tulles, gauzes, mousselines de soie, and chiffons woven in the factories. Other cities renowned for

silk-weaving are Calais, Paris, Tours, and Avignon. Most of the beautiful French ribbons are made at St. Chamond and St. Etienne.

Italian silk is the finest next to that woven in France. The city of Milan ranks after Lyons in silk manufacture, while Naples and Como are also thriving centers of the industry.

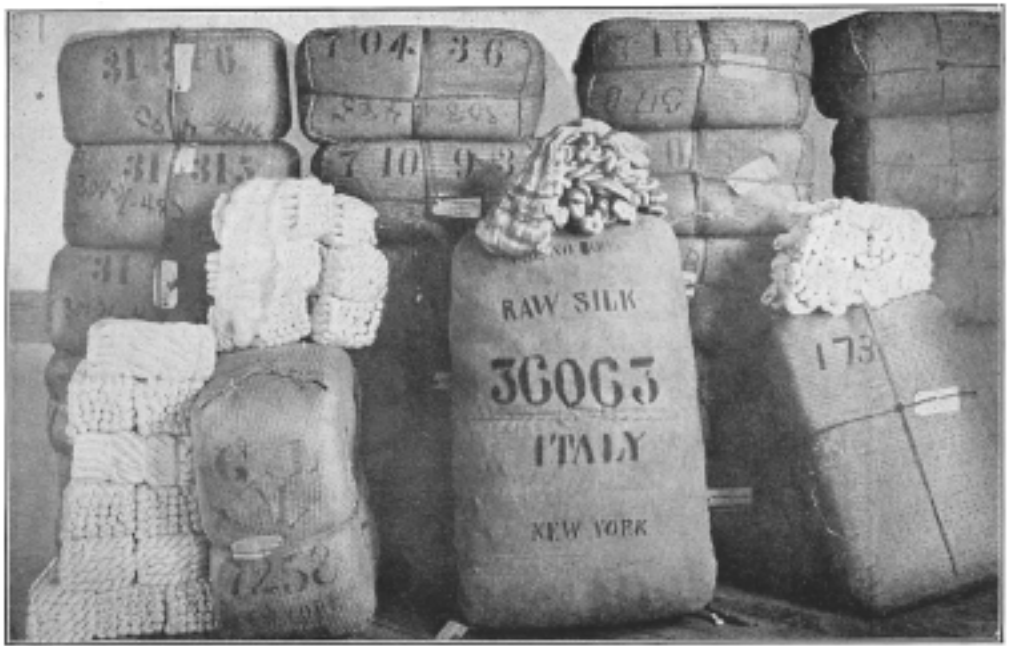
Russia, Austria, Spain, and Switzerland also engage in the manufacture of silk. Switzerland is chiefly famous for the fine ribbons and knitted goods produced at Basle and Berne.

Manufacture of Silk in Great Britain

It is probable that the early silk fabrics in England were made and used as the background for the embroidery for which England had been famous since the middle ages. In the middle ages the raw silk was no doubt obtained at great cost from the East and made into silk threads for the embroidery.

In the seventeenth century a large number of Protestant refugees from France — many of whom were skilled weavers — went to England and founded an industry, the center of which was at London. Since that time silk-weaving has continued to be an important branch of the textile industry in Great Britain and of late years some of the most artistic decorative furniture silks have been produced there.

At the present time the United Kingdom manufac-



Courtesy of Belding Bros. & Co.

Figure 13. Raw Silk Bundled and Baled

tures dress goods, ribbons, laces, and embroideries. Leeds is noted for the production of fine sewing-silks, and Coventry is famous for the ribbons woven there.

Liberty Silks

A very specialized silk industry grew up at London during the last century. The house of Liberty, from which are obtained the Liberty silks famous for their quality and delicate artistic coloring, was founded in 1875 in a little shop on Regent Street, London, by Arthur Lasenby Liberty. Arthur Liberty (who is now Sir Arthur) began almost at once to imitate the weaves of the Orient; the silks and brocades of China and Japan, the soft woolen fabrics of Cashmere, the filmy gauzes of India, and many other exotic materials were one by one paralleled and in many instances surpassed. The Liberty silks have always been very soft and beautiful for draperies. Liberty colors are known all over the world for their delicacy and permanence. They are dyed only with vegetable dyes.

The Manufacture of Silk in the United States

The raw silk used in the United States is imported from foreign countries where labor is cheap. The work of raising the worms and reeling the silk from cocoons must be done almost entirely by hand. Since silkworms may be raised in the United States only

with the greatest care and cost, the industry is not a profitable one and has practically died out.

The raw silk exported from China and Japan comes to New York, the distributing point for the country, by way of San Francisco and Seattle. The raw silk from Italy and France comes direct to New York.

Before 1880 silk manufacturing in the United States was a small industry. Since that time it has grown and developed rapidly. At present the United States leads all other countries in the volume of silk manufacturing.

Silk manufacture is carried on in many states, but most extensively in New Jersey, Pennsylvania, New York, and Connecticut. The center for the manufacture of goods from raw silk is Paterson, N. J. The largest amount of waste silk is sent to Hartford, Conn., and Boston, Mass., whence it is shipped to the New England mills, which lead in the manufacture of sewing-silks.

A list of the leading silk manufacturers of the United States will be found in the Appendix.

Chapter XIX

SUGGESTIONS TO SALESPEOPLE AND PURCHASERS

Arrangement and Display

An appreciation of the beauty of the Silk Department not only makes the salesforce enjoy their work, but also makes them more effective with customers; the bright, interested person will sell twice as much silk and be twice as valuable to the store.

Much can be done in the arrangement of the Silk Department to make it attractive.

Color and color combinations should form an interesting study for the salesperson in this department. Many striking and pleasing effects may be obtained by a careful student of the laws of color harmony.

The lustrous quality of silk aids immeasurably in the arrangement. When silks or velvets are displayed over fixtures on or above the counter, their beauty is much affected by the way in which the light strikes the glossy surface of the silk or the rich pile of the velvet.

The colors of silks are also very much changed in their appearance by the proximity of other silks. Salespeople should understand the laws of color harmonies, and return to the shelves, or fold up, silks, the colors of which detract from those under consideration.

Backgrounds

The background against which the silks are displayed is another most important factor in the arrangement of the Silk Department. A list of colors suitable for backgrounds is given herewith. It was compiled recently for the use of window-dressers, but it is equally valuable for the department display. Caution must be observed, however, if the department is lighted by artificial light instead of daylight, because some colors are brightened, some dulled, and some changed in hue.

Color of Goods to be Displayed	*Complementary Color*	*Other Suitable Background Colors*
White	Black	Purple, red, blue, green, brown, gray
Gray	Black	Brown, blue, purple, orange, red
Black	White	Yellow, buff, cream, orange, light gray
Red	Green	Olive, blue, white, light pink, yellow
Yellow	Purple	Black, blue, white, dark brown, rich green
Blue	Orange	Yellow, white, pale blue, red
Orange	Blue	Purple, olive green, black, white
Green	Red	White, yellow, orange, brown, pink
Purple	Yellow	Lavender, orange, cream, pink
Brown	Sage	Green, yellow, cream, white, gray
Olive	Maroon	Red, brown, cream, white
Lavender	Cream	Brown, purple, dark blue, dark gray
Pink	Straw	Yellow, green, blue, maroon
Sage	Brown	Maroon, orange, red, purple, white

Variety in Arrangement

Variety and new ideas of arrangement attract customers in any department, but they are especially desirable in selling silks and velvets, and it is easy to obtain new effects because of the beauty and richness of color which suggest almost endless combinations. The arrangement of the department should be changed frequently and practical suggestions from salespeople should be encouraged.

The Information Needed by the Salesperson

Salespeople should know the names of the different silk materials which they are selling, and the names of the colors, especially the most fashionable or new colors. Lists of terms commonly used in the silk industry are given in the Appendix.

Knowledge of the prevailing styles and the uses for silks will help the customer, provided the salesperson knows what he is talking about. One young salesman was heard to tell a young woman that all gathered skirts were made from "silk cut on the bias!" She expressed her astonishment, but he insisted that it was so.

The salesperson should know the difference between domestic and imported silks. Knowing the names of the best manufacturers is often an aid in selling.

The difference between pure silks and artificial silks should be easily detected, because of the high luster of

the artificial silk, and also because close-weave fabrics of artificial silk contain another fiber, usually cotton.

How Much Material to Sell to a Customer

The salesperson should also know approximately how much material is needed for a dress, suit, coat, waist, sleeves, or vest. Often the fact that silks are 27 inches or 40 inches wide means little to a customer, and she is apt to purchase too little or too much and be greatly inconvenienced.

Since the styles of costumes and the patterns of silks change every season, it is impossible to give any permanent and definite rules for the amount of material that should be sold. The experienced salesperson can often judge from the way the pattern runs on the silk whether more or less material will be needed. The size of the customer is another factor which must be considered. The ability to judge the amount needed is a sure test of knowledge of style and design and also of the salesperson's power of observation.

Quality and Values

In buying and selling silk its use and the service which will be demanded of it must be considered, because the value of a textile lies in the service it will give, whether for appearance, wear, or style.

If the silk is needed to serve only a short time, a cheap quality will answer. If, however, long, hard

wear is required a good quality must be purchased for a fair price.

On the silk counter are fabrics varying in price according to the quality of the silk. If the customer asks why one piece of silk is better than another, the unsatisfactory answer in many cases is, "Because it costs more," instead of the answer that "The quality is better because of —" followed by an adequate explanation of the reasons.

It is well for the salesperson to know the true reasons for the high price of some silks, because such reasons are all clear and convincing and really answer the inquiries of the customer.

Reasons Why Silk Is More Expensive Than Other Textile Materials

The cost of silk, as compared with other textiles, depends upon:

1. The cost of raw material. This includes the care and feeding of the worms, gathering the cocoons, and reeling the silk from the cocoons. The quality of the silk depends largely upon the care taken in these processes.

2. Cost of transportation. There is practically no raw silk in this country.

3. Cost of dyeing. The cost varies according to the dye used and the treatment of the silk.

4. Cost of manufacture. The differences in the

price of silks produced in this country depend largely upon the nature of the twist; a heavy quality of silk requires more threads twisted together and more processes in twisting. The wearing qualities of silk depend not only on a good fiber, but on the equal weight of warp and filling. A silk in which the threads are well-twisted wears better than one with little or no twist.

Knowledge of Manufacture

It is important for the salesperson to know all the characteristics of the silk fiber — its difference in feel, appearance, strength, luster, etc., before manufacture and after.

The general processes of manufacture for standard fabrics should also be known.

If the salesperson also understands substitutes and adulterations used, it will be an aid in detecting them.

The following brief outline gives the essential points upon which the information should be founded.

Values of Different Kinds of Silk

1. Quality and value depend upon:
   (a) A suitable proportion of warp and weft.
   (b) The care taken in the various processes of preparation for weaving.

(c) The excellence of the weaving itself.

2. If ornamental, the value depends upon:
   (a) The beauty of the design.
   (b) Its suitability to the material.
   (c) The color scheme.
   (d) The adaptation for the purpose for which it is used.

3. The quality of silk thread depends on:
   (a) The evenness with which the several filaments are reeled from the cocoon.
   (b) The care taken in all the various processes in the throwing mill.
   (c) Careful boiling-off and skilful dyeing.
   (d) The presence or absence of artificial weighting.

Matching Samples

In selling silk to harmonize with or match woolen, velvet, cotton, or other silk materials, the salesperson should realize that color is greatly affected by several conditions.

The most important ways in which it may be changed or influenced are by:

Light
Surface of fabric
Adjacent colors
Tone of color

Effect of Natural and Artificial Light on Matching Colors

Daylight is usually accepted as the standard light under which to match colors. There is some difference of opinion in regard to this standard, however, since daylight is subject to many outside influences. The morning light often casts a pinkish tinge, while afternoon light is purplish; smoke and dust in the air give a reddish cast to the light; and it is somewhat altered by the shadows of clouds, buildings, and foliage. Under clear, noon sunlight colors appear warmer; under a north skylight they are colder. Because of these conditions many tones of color are more satisfactory under artificial light, because the properties of gas and electricity may be chemically analyzed and depended upon.

In general, it is easier to match somber colors — blue, violet, dark green, and all shades of brown and gray — in the daytime. The pale tints and luminous colors — red, yellow, orange, and light green — usually appear to better advantage by artificial light. A great deal depends, of course, on whether the gown in question is for morning or evening wear. Many grays which look normal at night have a brown or green tinge in the daytime. A violet-blue, which is bright in the daytime, looks very somber and dull under artificial light. It is hard to distinguish some of the tints of

blue and green at night, because of the yellow tinge given by the artificial light.

Effect of Surface of Fabric on Matching Colors

If the surface is porous the light penetrates more deeply, suffers more internal reflections, and reaches the eye quite pure in color. Wool and silk fibers which are animal fibers, are translucent; therefore, the colors seem more brilliant than in linen and cotton, which are relatively impervious to light.

The nap of some fabrics causes them to show changeable colors. If it ends toward the light, the latter penetrates to a considerable depth and is deeply colored by multiple reflections. If the nap ends away from the light, there is more reflection and less penetration; therefore, there is also less change in color.

Effect of Dyes in Matching Colors

Materials dyed with aniline dyes may be matched better in the daytime because many aniline dyes have a fluorescent appearance; that is, they possess the property of giving off under some kinds of light a color different from their own and from the light in question.

Effect of Adjacent Colors

In accordance with the law of complementary colors, many shades and tints are affected by the proxim-

ity of other colors. This is especially true when neutral or grayed colors are placed near colors of full intensity. For instance, a black pattern on a red ground looks blue-green, and white surrounding green looks pink. For this reason the salesperson should be careful to put away all silks except the materials that the customer is considering.

Tone of Color

Colors at their full intensity are less affected than either the lighter or deeper tones under artificial light; but daylight is sometimes needed to bring out the full beauty and richness of shades of color; most pale colors and tints are warmed and heightened by artificial light.

Accurate Measurement

In selling yard goods accurate measurement is necessary. An example may be noted where four short pieces of silk were bought, each one supposedly a quarter of a yard in length. The silk pieces, besides being cut unevenly, each measured from three to four inches over the nine inches, in which case the loss to the store was fully three-eighths of a yard of silk.

Salespeople should avoid making new folds and creases in displaying goods on counters and in putting them away on shelves. When wrapped for delivery, goods should be so folded as to avoid creases which

cannot be smoothed out. Rolling the silk is the best way to prevent creasing.

Laundering and Care of Silk

Wash silks or silks which are so light in color that they soil easily are often ruined by improper handling in laundering.

Heat, whether hot water, a hot iron, or hot sunshine, yellows silk. Therefore the water and the irons used in the laundering should be medium hot and the silk should be rolled, while wet, in a heavy cloth and allowed to remain until it is dry enough for ironing.

White soap should be used, which should be dissolved in the water, and not rubbed directly on the silk. Strong soaps have a tendency to turn silk yellow and to destroy the gloss. Silk should be handled carefully while in the water; it should be squeezed, and not rubbed and twisted.

All rinse waters should be of the same temperature as the first water. A little bluing may be used if desired, the bluing water being also of the same temperature. For the last wringing, silk may be wrapped in a heavy towel or cloth and wrung, instead of being twisted, by itself.

Laundering often takes away the little dressing which was originally in the silk. A new appearance or a redressing may be given the silk by using gum arabic in the last rinse water. Gum arabic comes

either in powdered or lump form. If the powder is used, one or two teaspoonfuls should be dissolved in a quart of warm water and then strained for use. If in lump form the gum should be put in boiling water and the water kept hot until the gum is dissolved. A quarter of a cup of this solution should be used to a quart of water. Too much gum arabic stiffens the silk.

When ironing silk on the right side the safest method is to place a thin cloth over the silk. This cloth may be dampened if parts of the silk dry before ironing. Sprinkling might spot the silk. Silk may also be ironed directly on the wrong side. Silk well laundered will be soft like new.

Mixtures of silk and cotton, or silk and linen, and any material with silk embroidery should be treated as silk.

Laundering Ribbons

The best way to launder ribbons is to wet and stretch them on a clean table, then rub them with a soft brush and neutral soap suds until clean. Rinse in a clear water, never wrinkling the ribbon, but keeping it smooth and straight. If the hand is run down the ribbon, some of the water can be pressed out. Stretch the ribbon on the table again, rubbing the hand over it to make it very smooth, and allow it to dry in this position. It is better to pin the ends or

weight them, to keep the silk smooth while drying. When laundered in this way the ribbon will look like new.

If a salesperson has been careless in putting the ribbon in an envelope and it has become wrinkled and creased, it may be wet thoroughly and stretched on the table. When dry it will be smooth like new, whereas if ironed it usually becomes flimsy and looks old—the crisp new look has been taken from it.

Cleaning and Steaming Velvet

Velvet may be cleaned by sprinkling thoroughly with magnesia or cornmeal. Let it stand for twenty-four hours and then brush off with a soft brush. The process may be repeated a second time with still better results.

All velvets may be freshened and folds taken out by steaming, as follows. Place a hot iron on end; over the bottom of it place a wet cloth. As the steam arises from the cloth hold the wrong side of the velvet next to the cloth. The steam passing through the velvet will loosen the pressed down nap and a light brushing afterwards with a soft brush will raise the nap. The steam from a teakettle may also be used, but this does not furnish so broad a surface.

Chapter XX

CLASSIFICATION OF THE STOCK OF A TYPICAL SILK DEPARTMENT

DIVISIONS

A. Staple Silks
   1. White
   2. Black
   3. Plain Colors
   4. Evening Shades
B. Novelty Silks
   1. Fancy
   2. Foulards and Wash Silks
   3. Pongees
C. Chiffons, etc.
D. Velvets

A — STAPLE SILKS

1. Materials
   Armure
   Batiste
   Bengaline
   Bolting Cloth
   Brocade
   Brocaded Taffeta
   Cachemire de Soie
   Charmeuse
   China Silk
   Chiné Silk
   Corded Silk
   Crêpe

Canton Crêpe
Crêpe Charmeuse
Crêpe de Chine
Crêpe Meteor
Damask
Eolienne
Epinglé
Faille
Faille Française
Glacé Silk
Gros de Londres
Grosgrain
Habutai
India Silk
Japanese Silk
Jersey Cloth
Kikai
Liberty Satin
Louisine
Matelassé
Messaline
Moiré
Organdie
Ottoman
Peau de Cygne
Peau de Soie
Pekin Stripe
Rep
Satin
Satin Brocade
Satin Charmeuse
Satin (Cotton-Back)
Satin Damask
Satin de Lyons
Satin (Double-Faced)
Satin Duchesse

Satin Façonné
Satin Merveilleux
Satin Regence
Satin Rhadame
Satin Royal
Satin Surah
Satin Taffeta
Silk Serge
Surah
Taffeta
Voile

2. Weaves
Plain
Twill
Rib
Satin
Brocade
Double Cloth
Jacquard

3. Colors
Black
White
Street Shades (Normal and Grayed Tones)
Changeable
Evening Colors
Luminous Colors
Tints

B — Novelty Silks

I. *Fancy*

1. Materials
Printed Silks
Crêpe
Taffeta
Japanese Silk

Brocades
Satin
Metal
Crêpe
Charmeuse
Striped Silks
Plaid Silks
Silk Ginghams
Cloth of Gold and Silver
Radium Silks

2. Weaves
Plain
Twill
Rib
Satin
Brocade or Jacquard
Double Cloth

3. Colors
Normal
Grayed
All Tints and Shades
Combinations of Color with Black and White

II. *Foulards and Wash Silks*

1. Materials
Foulards
Crêpe de Chine
Japanese and China Silks
Habutai
Fancy Stripes, Plaids, Checks

2. Weaves
Plain
Twill
Jacquard

3. Colors
   - Normal
   - Grayed
   - All Tints and Shades
   - White

III. *Pongees*

1. Materials
   - Pongees
   - Rajah
   - Tussah
   - Shantung
   - Monk's Cloth

2. Weaves
   - Plain

3. Colors
   - Natural
   - Plain Tints and Shades
   - White
   - Black
   - Printed Figures

C — CHIFFONS, ETC.

1. Materials
   - Plain Chiffon
   - Chiffon Cloth
   - Crêpe Chiffon
   - Georgette Crêpe
   - Marquisette
   - Mousseline de Soie
   - Grenadine
   - Tulle
   - Gauze

2. Weaves
   - Plain
   - Gauze or Leno

3. Colors
   - All Tints and Shades
   - Black
   - White
   - Printed Figures

D — VELVETS

1. Materials
   - Chiffon Velvēt
   - Corduroy
   - Mirror Velvet
   - Panne Velvet
   - Uncut Velvet
   - Velveteen
   - Plush
   - Velour

2. Weaves
   - Pile
   - Jacquard

3. Colors
   - All Tints and Shades
   - Black
   - White
   - Stripes
   - Embossed and Figured
   - Shot Effects

Chapter XXI

CLASSIFICATION OF THE STOCK OF A TYPICAL RIBBON DEPARTMENT

DIVISIONS

A. Ribbons by the Yard
B. Made Goods

A — RIBBONS BY THE YARD

1. Kinds
   - Taffeta
   - Moiré
   - Satin
   - Glacé
   - Messaline
   - Grosgrain
   - Dresden or Chiné
   - Brocade
   - Washable
   - Tinsel
   - Gauze
   - Novelty
   - Velvet

2. Materials
   - Real Silk
   - Artificial Silk

Cotton
Cotton-and-Silk Mixtures

3. Widths

Taffetas	¼ to 12 in.
Moiré	" " " "
Messaline	" " " "
Satins	" " " "
Grosgrain	" " " "
Velvet	⅛ to 12 in.
Lingerie	⅛ to 12 in.
Fancies	¼ to 12 in.
Brocades	1 to 12 in.
Tinsel	½ to 12 in.

4. Styles
   - Hair Ribbons
   - Sash
   - Hat Bandings
   - Beltings
   - Lingerie
   - Fob and Watch Guard
   - Millinery
   - Tinsel
   - Decorative

5. Designs
   - Conventional
   - Floral
   - Stripes
   - Checks
   - Dots,
   - Persian
   - Dresden
   - Printed
   - Painted
   - Picot Edge

6. Colors
   - Taffeta, Satin, Grosgrain, Moiré — Black, White, Gray, Red, Blue, Green, Yellow, Lavender in Tints and Shades
   - Velvet — Same
   - Washable — White, Tints of Pink, Blue, and Lavender
   - Tinsel — Silver and Gold
   - Gold and Silver on White and Black Satin, Moiré and Taffeta backgrounds
   - Novelties — Dresdens and Stripes in Colors
   - Two Toned
   - Self Colors

B — Made Goods

1. Articles
   - Sashes
   - Girdles
   - Lingerie and Tailored Bows
   - Table Decorations
   - Sport Hat-Bands
   - Ribbon Sachets
   - Flowers
   - Bags

Appendix

Books for Reference

Textiles

Silk Manufacturing and Its Problems, James Chittick. James Chittick, New York City.

Silk, Its Production and Manufacture, Luther Hooper. Sir Isaac Pitman and Sons, London.

Silk — Its Origin, Culture and Manufacture. Corticelli Co.

Silk, the Real vs. the Imitation. Brainerd & Armstrong, New London, Conn.

Skinner's Silks and Satins — Their Romantic Story. Wm. Skinner & Sons, Boston, Mass.

The Story of a Silk Mill. Belding Bros. Co., Boston, Mass.

A Short Description of Silk and Silk Manufacture. Cheney Bros., Boston, Mass.

A Glossary of Silk Terms. Cheney Bros., Boston, Mass.

Textiles, Woolman and McGowan. Macmillan.

Textiles, Paul H. Nystrom. Appleton.

Textiles, Wm. H. Dooley. D. C. Heath & Co.

The Story of Textiles, Perry Walton, J. S. Lawrence.

Household Textiles, Charlotte McGibbs. Whitcomb and Barrows.

Wool, Cotton, Silk, Posselt. Posselt, Philadelphia.

Textile Fibers, Their Physical, Microscopic, and Chemical Properties, J. M. Mathews. Wiley.

The Chemical Aspect of Silk Manufacture, R. L. Fernbach. Van Nostrand.

Weaving

Hand Loom Weaving, Luther Hooper. Macmillan.

Origin of Inventions, O. T. Mason. Scribner.

Woman's Share in Primitive Culture, O. T. Mason. Appleton.

Home Life in Colonial Days, Alice Morse Earle. Macmillan.

Color and Design

The Principles of Harmony and Contrast of Color, M. E. Chevreul. G. Bell & Sons, London.
Color Harmony in Dress, G. A. Audsley. McBride, Nast & Co.
Color Instruction, L. Prang. Boston.
Everyday Art, Lewis F. Day. B. T. Batsford, London.
Bases of Design, Walter Crane. G. Bell & Co., London.
Textile Design and Color, W. Watson. Longmans, Green & Co., London.
Nature in Ornament, Lewis F. Day. B. T. Batsford (London).
Pattern Design, Lewis F. Day. B. T. Batsford (London).
Design. The Prang Co.
Design in Theory and Practice, E. A. Balchelder. Macmillan.

Dyeing

Dyes and Dyeing, C. E. Pellew. McBride Nast & Co.
Manual of Dyeing and Textile Chemistry, J. M. Mathews. Wiley.
Dyeing of Textile Fabrics, J. J. Hummell. Cassell.

Leading Silk Manufacturers in the United States

Astoria Silk Works, Long Island City, N. Y.	Silk plushes, broad and lining silks, velours, velvets
American Silk Spinning Co., Providence, R. I.	Spun silk yarns (Schappe), silk noils
Augusta Silk Works, Paterson, N. J.	Wide and narrow ribbons
Belding Bros. & Co., Northampton, Mass.	Plain and fancy, broad, dress and lining silks, sewing and embroidery silks
Brainerd & Armstrong, New London, Conn.	Embroidery, sewing, knitting, and crochet silks, dress silks, linings

Champlain Silk Mills, Brooklyn & Whitehall, N. Y.	Spun silk yarns (Schappe), silk tops, silk noils
Cheney Bros., South Manchester, Conn.	Spun silk yarns, thrown silks, organzine, trams, broad, dress, lining and tie silks, cotton-and-silk mixed goods, cravats, plushes, velvets, decorative silks, ribbons, upholstery goods, handkerchiefs, mufflers, hat bands, dress and coat trimmings, silk for insulating
Corticelli Silk Mills, Nonotuck Silk Co., Florence, Mass.	Machine twist, sewing, embroidery, and knitting silks
Doherty & Wadsworth Co., Paterson, N. J.	Plain and Jacquard dress silks
Duplan Silk Co., Hazelton, Pa.	Plain and fancy piece-dyed silks
Doherty Silk Co., Henry, Paterson, N. J.	Broad silks
Dundee Textile Co., Passaic, N. J.	Plain and Fancy silks, silk-mixed goods
Empire Silk Co., Paterson, N. J.; Carbondale, Pa.	Plain and fancy dress and tie silks
Eagle, J. H. & C. K., Shamokin, Pa.	Broad silks and commission throwing
Gallia Silk Mills, Bethlehem, Pa.	Plain and fancy broad silks
Hand & Sons, John, Paterson, N. J.	Ribbons, dress and tie silks
Hamlet Textile Co., Woonsocket, R. I.	Plain and fancy dress linings, silks
Klots Throwing Co., Carbondale, Pa.	Commission throwsters
Lehigh Valley Silk Mills, Bethlehem, Pa.	Commission throwsters
Mallinson & Co., H. R., Long Island City, N. Y.	Plain and fancy dress silks

Meyer Silk Mills Co., John H., Northampton, Pa.	Plain and fancy broad silks
New London Wash Silk Co., New London, Conn.	Knitting, crochet, and embroidery silks
Paragon Silk Co., Paterson, N. J.	Broad silks
Phoenix Silk Mfg. Co., Paterson, N. J., and Allentown, Pa.	Dress, lining, and tie silks, ribbons
Portland Silk Co., Middletown, Conn.	Plain and fancy dress and lining silks
Rossie Velvet Co., Mystic, Conn.	Silk velvets
Skinner & Sons, Wm., Holyoke, Mass.	Silks, satins
Susquehanna Silk Mills, Marion, Ohio	Broad, tie, lining and printed silks, upholstery goods
Schwarzenbach, Huber & Co., W. Hoboken, N. J.	Plain and fancy broad and dress, tie, lining, umbrella, and thrown silks
Stewart Silk Co., Easton, Pa.	Plain and fancy dress silks and throwing
The Viscose Co., Marcus Hook, Pa.	Artificial silk

Glossary of Terms Used in the Silk Industry[1]

Accordion Pleating. Narrow pleating, similar to that of an accordion.

Advance Samples. Short lengths of patterns on which business has been done, furnished in advance to buyer to be cut up into sample cards.

A La Mode. (French.) In fashion.

Alizarine Dyes. A series of very fast colors. Alizarine is the coloring principle in the madder root.

Anglais. (French; pronounced "Ong-glay.") English.

Aniline Dyes. Colorings prepared from benzole, one of the

[1] This list is used by courtesy of Cheney Brothers.

constituents of coal tar. The name is from anil, the indigo plant, as aniline is a substitute for indigo.

APPRÊTEUR. (Fr.; pr. "ah-preh-teur.") A finisher.

ARTIFICIAL SILK. Cellulose (wood-pulp, cotton, etc.) chemically transformed into a gummy solution, threads of which, after being hardened, present a glistening, white, silky appearance.

ATELIER. (Fr.; pr. "ah-tel-yah.") A workshop.

AUNE. (Fr.; pr. "oan.") Same as Ell — which see. The 1¼-yard folds of silk goods are called aunes.

AUREOLE. (Fr.; pr. "o-ray-ole"; a halo.) A ring or line which appears round the place where a spot has been cleaned on a fabric.

AUTOMNE. (Fr.; pr. "o-tom.") Autumn.

BACK-REED. A reed, made of a frame with threads or movable wires, set in behind the true reed, and which serves to open up the warp threads and to hold back lint, etc.

BALE. European-silk bales weigh, net, 100 kg. = 220½ lbs.; Japanese and Shanghai bales are 133⅓ lbs.; and Canton bales are 106⅔ lbs.

BATTEN. The lay or lathe of a loom for striking the weft threads home. Ribbon battens are divided into spaces.

BAVE. (Fr.; pr. "bahv.") The double silk filament emitted by the silkworm.

BIAS. Goods cut diagonally (usually at 45 degree angle) are said to be cut on the bias.

BLEACHING. The process of bleaching, generally done with sulphur or peroxide of hydrogen or sodium for silk. Chlorine is the principal agent in bleaching cotton; sulphur in bleaching wool.

BLOCK PRINTING. The printing of fabrics or warps by means of blocks with patterns worked on their faces. This is all hand-work.

BLOTCH GROUNDS. Printed patterns, in which the ground is printed in black or color, instead of being left white.

BOBBIN. A spool upon which yarn is wound.

BOILED-OFF SILK. Silk with the gum discharged, but undyed.

BOILING-OFF. The process of degumming silk threads or goods by boiling in soap and water.

BOLT. A roll or piece of goods, of definite length, as it comes from the maker for sale.

BONNAZ MACHINE. A small machine for embroidering figures on woven goods.

BOOK. A bundle of Asiatic silk. Japan books weigh, generally, about 4 to 4½ lbs., each containing about 50 to 60 skeins. China and Canton books are heavier.

BOX. The receptacle on the loom in and out of which the shuttle passes.

BOX WORK. Goods in which two or more colors or materials are used in the filling.

CALENDERING. The smoothing and pressing of goods between ponderous rollers.

CARTON. A pasteboard box. Ribbon boxes are called cartons.

CATTY. A Chinese weight fixed by treaty at 1⅓ lbs. Also known as "Chin."

CHAFE-MARKS. Whitish marks in piece-dyed goods, due to roughening or displacement of fibers.

CHAINE. (Fr.; pr. "shane.") Warp.

CHINA CURLIES. A variety of waste made in reeling China raw silk.

CHOP. The brand used to identify any make of Asiatic raw silk.

CHRYSALIS. The pupa of the silkworm, enclosed in the cocoon.

CLEANING. A treatment given to raw silk to remove nibs, slugs, etc. The removing of spots, stains, etc., from woven goods.

COAL-TAR COLORS. Brilliant coloring matters, extracted from coal tar.

COCKLING. A damage in silk goods from irregular shrinkage of the filling.

COCOON. The silken covering that the silkworm spins about itself.

CONDITIONING. The exact determination of the weight of silk on the basis of its normal condition, i. e., absolute dry weight plus 11 per cent. The term is also loosely used to cover tests for size, boil-off, etc.

CORDONNET. (Fr.; pr. "cor-don-nay.") A silk used for braiding, knitting, etc., with a cable-like twist. Several raw-silk threads are doubled and loosely twisted in one direction and three of them are joined and smartly twisted in the reverse direction.

COUNT. The number of a yarn, indicating its yardage per pound.

COUTURIER. (Fr.; pr. "coo-toor-yay.") A dressmaker.

CRAQUANT. (Fr.; pr. "crah-kong.") The "scroop" or crunching sound produced by twisted silk.

CRÊPE DE CHINE TWIST. Tram, hard-twisted for crêpe de chine work. Usually 30 to 75 turns per inch.

CRÊPE OR CHIFFON TWIST. Thrown raw silk 20 to 100 turns per inch more or less, for use in making crêpes, chiffons, etc.

CROWS' FEET. Wrinkled places in goods, when they have been allowed to dry in a crumpled and creased condition.

CUT. Any standard length of goods. Broad-silk cuts are usually 60 yds.; ribbons, 10 yds.

CUT SELVAGE. The edge where pieces have been separated when two or more widths are woven together.

DEGUMMING. The boiling-off or discharging of the gum, or sericin, from silk.

DENIER. A French coin, used as a weight for determining the size of raw silk. It weighed 24 Paris grains, equaling 19.6728 English grains. The weight now used, called "denier," weighs .05 grams, and the number of these weights required to balance a skein of 450 meters, is the denierage or size of the silk. Dividing 4,464,528 by any denierage gives its yardage per lb.

DESIGN. A pattern, or sketch, to be worked out in the goods.

DESSIN. (Fr.; pr. "des-san.") Design.

DIAPER PATTERN. A small-figured effect, usually made in a diamond shape.

DIRECT-PRINTING. Patterns printed direct on a cloth from the rollers or blocks.

DISCHARGE-PRINTING. The printing on a dyed fabric with chemicals that strip or discharge the color when printed. Same as extract printing.

DISCHARGING. The degumming or boiling-off of silk.

DOBBY. A mechanism of limited scope for raising and lowering harnesses in weaving, somewhat after the idea of a Jacquard machine.

DOCTOR-MARKS. Smears made on a printed fabric, from bits of lint being caught under the "doctor blade."

DOUBLE-AND-TWIST. Threads doubled together and then twisted. Usually of different colors.

DOUBLE ENDS. Where the warp ends are drawn in two together.

DOUBLE-OVER. In weaving, when extra picks equal to 50 per cent

of the ground are woven in to form small figures. Much used in the tie-silk trade.

DOUBLE SCALE. An arrangement of Jacquard harness where two ends work together, producing an enlarged pattern.

DOUBLE WARP. A warp in which there is both a face and back warp.

DOUP WEAVING. The twisting of warp threads around the filling picks by employing special heddles or loops called "doups."

DOUPION-DUPION. (Fr. *doupion*; It., *doppioni.*) A rough irregular raw silk, reeled from double cocoons.

DRAM. The 1/16 of an ounce. The dram system is used for the counts of thrown silk. It is based on 1,000 yds. to the dram, or 256,000 yds. per lb., for the size of No. 1. Dividing 256,000 by any dramage gives its yardage per pound.

DRAP. (Fr.; pr. "drah.") Cloth; also wooden cloth, etc.

DRAWING-IN. The passing of the warp threads through the eyes of the heddles in the harness.

DYEING. The coloring of silk and other textile materials, including the boiling-off, weighting, and other processes.

DYNAMITED SILK. Silk weighted with tin salts.

ECHANTILLON. (Fr.; ph. "ay-shon-tee-yong.") A sample. A pattern.

ECRU SILK. (Fr.; pr. "ay-croo"; unbleached.) Thrown silk with but a trifling amount of the gum discharged from it.

ELL. An ancient measure of variable length. The ell (or aune) on which the denier-aune system of silk measure was based, measured 46.79 English inches.

EMBOSSING. The imprinting of raised designs on fabrics by passing them under pressure between suitably engraved heated rollers.

END. A warp thread.

END-AND-END WARP. A warp made of alternate threads of two kinds or colors of yarn.

ESSAY. A small experimental sample of a fabric or design.

ETÉ. (Fr.; pr. "ay-tay.") Summer.

ETOFFE. (Fr.; pr. "ay-toff.") Stuff. Fabric. Cloth.

ETOILE. (Fr.; pr. "ay-twoll.") A star.

EXTRA-LUSTER. A brilliancy given to skein silk by stretching it under steam pressure.

EXTRACT PRINTING. The printing upon goods, previously dyed, with chemicals which extract the color. Same as discharge printing.

FALSE-REED. Same as back-reed.

FIBROIN. The insoluble part of the raw silk. The silk fiber.

FILATURE. (Fr.) An establishment where silk reeling is carried on.

FILLING. Material to be used as weft in a fabric.

FINISHING. The various treatments accorded to goods after weaving to improve their appearance and touch.

FISKE-YARN. A fancy yarn, generally cotton, with showy "flakes" or bits of untwisted list, at intervals.

FLOATS. Weaving imperfections where the filling "floats" over warp threads which it should pass under, or vice versa.

FLOSS SILK. A soft silk yarn, practically without twist. Also the loose waste silk emitted by the worm when beginning to spin its cocoon.

FOND. (Fr.) The foundation or ground of a pattern.

FOUNDATION WEAVES. The three primary weaves, plain, twill and satin.

FOUR-SCALE. Arrangement of Jacquard harness which works four threads together, enlarging the pattern, but with a coarser outline.

FRANÇAISE. (Fr.; pr. "Frong-says.") French.

FRISON. (Fr.; pr. "frée-song.") Waste made in a filature in reeling silk.

FULLERS' EARTH. A soft unctuous clay, used in scouring and cleaning cloth.

GASSING. The singeing of the hairiness from fabrics or yarns, usually by a gas flame.

GENAPPING. Same as gassing. Named after Genappe in Belgium.

GRAM. The metrical unit of weight. Equal to 15.432356 English or troy grains.

GRANDE FAÇON. (Fr.; pr. "grahnd fas-song.") Literally the complete working-out. A method of determining the waste made in throwing.

GRÈGE. (Fr.; pr. "grehz.") Raw silk.

GRENADINE TWIST. Organzine, hard-twisted to suit it for grenadine weaving. Twists run from $^{20}/_{18}$ to $^{60}/_{60}$ turns per inch, more or less.

GREY GOODS. Goods for piece-dyeing while still undyed.

GUM SILK. Thrown silk from which the gum has not been discharged.

HAIR-LINE STRIPES. Patterns showing very narrow stripings of sharply contrasting colors.

HAND. The touch or handle of goods.

HARD SILK. Thrown silk from which the gum has not been discharged.

HARD TWIST. Raw silk, twisted very hard in throwing, suitable for use in chiffons, crêpes, etc.

HARNESS. A series of frames equipped with heddles, and mounted in a loom, through which the warp ends pass, and which, as they are alternately raised and lowered, open the warp for the shuttle to pass. A Jacquard harness is differently arranged.

HARNESS SKIPS. Weaving imperfections where a row of warp ends "skips" over filling threads that they should be under.

HAUTE. (Fr.; pr. "hoat.") High.

HAUTE NOUVEAUTÉ. (Fr.; pr. "hoat-noo-vo-tay.") High novelty.

HEAD ENDS. Same as headings.

HEADINGS. The beginning and ending of a piece of goods, generally woven with some remnant material for filling.

HEALD. Same as heddle.

HEDDLE. A thread or wire leash, attached to a harness frame, and having an eye in the center through which a warp thread passes.

HERRINGBONE. Striped patterns woven in a chevron effect.

HIGH PILE. A long pile such as occurs in plushes, distinguished from low piles, as in velvets.

HIVER. (Fr.; pr. "ee-vair.") Winter.

HONEYCOMB. A character of weave showing hollows, like a bedspread pattern.

JACQUARD. (Fr.; pr. "zhah-car.") Joseph Marie Jacquard (born 1752, died 1834), French mechanician, inventor of the Jacquard machine exhibited in 1801.

JACQUARD CARD. Long cards, laced together, and punched with holes, which govern the patterns woven on a Jacquard loom.

JACQUARD DESIGN. A pattern produced by means of the Jacquard machine.

JOSEPH'S COAT. A warp made in stripes to weave small samples of various colors. Same as sample blanket.

KIBISSO. (Japanese.) A name for certain wastes made in raw-silk reeling.

KILOGRAM. A metric weight of 1,000 grams equal to 2.2046223 lbs.

KIN. A Japanese weight equals 1.3251 lbs., commercially figured as 1.3277 lbs., so that 756 kin weigh 1,000 lbs. Japanese raw-silk quotations are in yen per kin.

LAPPET LOOM. A loom equipped with an apparatus for weaving embroidered effects upon an otherwise plain cloth.

LEASE. The series of crossings in the threads of a warp, in which each warp thread, in turn, is passed alternately over and under a rod or cord.

LEASH. Same as heddle.

LENO WEAVING. A method of weaving open-mesh fabrics where the warp threads twist around the filling threads, as in grenadine.

LIGNE. (Fr.; pr. "lean.") The 1/12 of a French inch, used in ribbon measures, and which equals .0883 English inches.

LOADING. The weighting or adulteration of silk.

LOOM. A machine in which cloth is woven.

LOOM MOUNTING. Arranging a warp, with its harness, reed, etc., in a loom, ready for weaving.

LOUSY SILK. Silk which, when woven into fabrics, shows many light-colored specks on the surface of the cloth.

LOW-PILE. A pile fabric in the velvet class, not having as long a pile as in plush.

MACHINE-TWIST. Thread specially prepared for use on the sewing machine.

MAGAZINE LOOM. A loom provided with a lot of wound quills or bobbins, which are automatically introduced into the shuttle.

MARABOUT, or MARABOU SILK. White silk, well-twisted, and dyed without discharging the gum; used in making imitation marabout feathers.

METALLIC DYE. An extra luster, given to silk by steam-stretching the skeins.

METER. The standard linear measure of the metric system, equivalent to 39.370432 English inches.

METRIC COUNT. The numbering applied to yarns, when based upon the metric system.

MICUIT. (Fr.; pr. "mee-kwee"; half done.) A silk in which about half the gum is allowed to remain when dyed.

MILL-ENDS. The remnants of goods that accumulate at mills.

MISE-EN-CARTE. (Fr.; pr. "mees-ong-cart.") A pattern as laid out on the squared design paper for the card cutter.

MISPICK. An imperfection in a cloth caused by a filling thread not interlacing with the right warp ends. The omission of a filling thread in weaving.

MOMMIE. (Jap.) A Japanese weight equal to 57.874 grains; one pound equals $120\frac{96}{100}$ mommies.

MORDANT. The substance employed to fix upon the goods the color produced by the dyestuff.

MOTIF. (Fr.; pr. "mo-teef"; motive.) Applied to small, distinctive, pattern effects.

NARROW GOODS. Ribbons, tapes, and similar fabrics.

NOIL YARNS. Yarn made from noils, very lumpy and unelastic.

NOILS. Short, lumpy fiber, left after the combing process in the manufacture of spun silk.

NOSHI ITO. (Jap.) A variety of waste made in reeling raw silk.

NOUVEAU. (Fr.; pr. "noo-vo.") New. Novel.

NUANCE. (Fr.; pr. "noo-ongce.") A shade or tint.

ONE HUNDRED PER CENT THROWING METHOD. A method of dealing with the wastage made in throwing, by which the throwster pays for all waste made, being compensated by a proper addition to his price for throwing.

ORGANZINE. Silk prepared for warp purposes of two (or more) raw silk threads well-twisted both in the singles and in the two-ply.

PANTOGRAPH. An apparatus used for transferring the designs for printing from the pattern sketches to the printing rollers, prior to etching them.

PARI. (Fr.; pr. "pah-ree.") The weight of gum silk before boiling off.

PASTEL COLORS. Shades having a chalky or hazy appearance.

PATTERN WARP. Same as sample blanket.

PECUL, PICUL. A Chinese weight of $133\frac{1}{3}$ lbs. used in the silk trade.

PESANT. (Fr.; pr. "peh-song.") Weight.

PICK. A filling thread in a cloth.

PICKING. Removing odd threads, lumps, or similar blemishes from woven fabrics. The movement of a loom as it drives the shuttle across. In cotton or wool spinning, a preliminary opening up given to the stock to prepare it for carding.

PIECE. A length of goods. Broad silks are usually made in 60-yd. pieces. Ribbons in 10-yd. pieces.

PIECE-DYEING. The dyeing of fabrics in the woven piece.

PIERCED COCOONS. Cocoons from which the moths have emerged, being thus rendered useless for reeling.

PILE FABRICS. Fabrics with pile faces, such as velvets, plushes, etc.

PLATED YARN. A thread, having as a core a thread of cheap material round which is twisted a superior fiber, as a cotton thread twisted round with worsted, silk, or metal.

PLUSH. A fabric with a pile face, the pile being longer than velvet.

POIL. (Fr.; pr. "pwahl"; hair, etc.) The silk core yarn in a thread.

POLISHING. A treatment given to goods in finishing to improve the luster.

PRINTEMPS. (Fr.; pr. "pran-tong.") Spring.

PRINTING. The impressing of patterns on warps or fabrics by means of rollers or blocks.

PURE-DYE. Silk colored, but unweighted.

QUARTER-OVER. In weaving, where extra picks, equal to 25 per cent of the ground, are woven in to form small figures; much used in tie silks.

QUILL. The shuttle bobbin on which the silk weft is wound.

QUILLING. Winding filling onto the quills.

RAW GOODS. Fabrics made for dyeing in the piece.

RAW SILK. Silk as it has been reeled from the cocoons.

RAYON. (Fr.; pr. "ray-ong.") A ray, or stripe.

REED. A metal comb, closed at top and bottom, for keeping ing warp threads separate, and fixed in the loom so that it beats up each pick woven into the cloth.

REEDING. The arrangement of threads in a reed, generally stated as $^{6}/_{8}$, $^{7}/_{4}$, etc., the first number being the number of

dents, or divisions, per inch in the reed, and the second showing the number of threads in a dent.

REED-MARKS. Streaks in goods due to faulty reeds, or to the use of an unduly coarse reed for the goods.

REED OMBRÉ. Shaded striped effects made in weaving by passing the warp threads through the reed in a graduated manner.

REFERENCE SAMPLES. Small cuttings of goods, as those attached to an order sheet.

REGAIN. A standard percentage of moisture to be added to an absolutely dried-out textile material to bring it to its normal or "conditioned" weight. This in silk is 11 per cent; in cotton, 8½ per cent; in linen, 12 per cent; and in worsted yarn, 18¼ per cent.

RESIST-PRINTING. Printing textiles with a waxy or other preparation which resists dyeing. Goods are then piece-dyed and the wax or "resist" is removed with benzine, etc., the figure so made showing white against the dyed ground.

REVERSIBLE. Both sides alike, as a cloth. A reversible pattern is one in which the figures point both ways.

RIBBON, RIBAND, RIBBAND. A narrow fabric made of silk.

ROLLER-PRINTING. The printing of patterns from engraved copper rollers.

RUBAN. (Fr.; pr. "roo-bon.") Ribbon.

SAMPLE-BLANKET. A short length of goods, made for samples, having sections of different colors in the warp, and shot with a variety of different fillings.

SCHAPPE. (Fr.; pr. "shap.") Spun-silk yarn.

SCROOP. The peculiar crunchy sound that silk makes when squeezed. It can be artificially produced by an acid treatment in the dyeing.

SELVAGE, SELVEDGE. The edge of a cloth, usually heavier and differently woven.

SEN. A Japanese coin, value one-half cent, U. S.; 100 sen = 1 yen = 49.842 cents gold, U. S.

SERICIN. The soluble gum of the silk fiber.

SEWING SILK. Silk especially thrown and twisted for use as sewing thread.

SHAFT. A harness frame for a loom.

SHAFT LOOM. A harness loom.

SHEPHERD PLAIDS. Checks or plaids, as worn by the Scotch shepherds.

SHOOT. Weft, filling.

SHOT SILK. Fabrics with warp and fillings of sharply contrasting colors.

SHOWER-PROOF, or RAIN-PROOF. Goods treated to resist spotting by water.

SHUTTLE. The implement by which the filling thread is shot to and fro in weaving.

SHUTTLE-WORK. Fabrics in which two or more kinds of materials or colors are used in the filling.

SILK-GUM SERICIN. The soluble content in raw silk.

SILK NOILS. A short, lumpy waste, remaining after the combing of spun silk.

SILK REELING. The production of raw silk by unwinding the silk from the cocoons.

SILK WASTE. Wastages in the various branches of the silk industry, including pierced cocoons.

SINGEING. Removing the hairiness from fabrics or yarn by singeing, usually done by means of gas flames.

SINGLE-AND-DOUBLE WARP. Warps made with an alternation of ends, giving two ends on the face for one on the back, and vice versa.

SINGLES. Threads of raw silk, thrown or twisted, in the single thread.

SINGLE-SCALE. The tie-up of a Jacquard loom where each end works singly.

SINGLE-WEAVING. The weaving of warps made of single raw-silk ends, unthrown.

SIZING. The treatment of warps, or other threads, or goods, with a size to render them firm and smooth. Also the testing of yarns to determine their sizes.

SKEIN. Threads reeled into a coil or hank. Usually 45 to 54 inches in circumference.

SKEIN-DYEING. The boiling-off, weighting, coloring, etc., of silks, or other skein yarns.

SLUGS. Soft thick lumps in a yarn.

SMASH. Hundreds of broken ends in a warp, where the loom has beaten up before the shuttle has passed through.

SOFT SILK. Thrown silk yarn, degummed, dyed, or undyed.

SOIE. (Fr.; pr. "swah.") Silk.

SOIE ONDÉE. (Fr.; pr. "swah-ong-day"; literally, "silk undulated.") Silk prepared by doubling and twisting together a very coarse and a very fine thread. When used for making gauze it imparts to it a watered appearance.

SOIERIE. (Fr.; pr. "swah-ree.") "Silk" in general, i.e., silk goods, silk mills, silk trade, etc.

SOLEIL. (Fr.; pr. "sol-ay"; the sun.) Often used in connection with fabric names.

SOUPLE SILK. Dyed skein-silk from which but little gum has been discharged. Silk so treated is firmer but less lustrous.

SPACES. The openings in the batten of a ribbon loom.

SPLIT-EDGE. Goods woven two or more widths together, being afterward cut or split apart.

SPUN SILK. Silk yarn made from silk wastes, and spun in a similar manner to worsted.

SPUN-SILK COUNT. Same as the cotton scale of 840 yds. to the number, except that two or more ply yarns are stated differently; 2/100, for instance, in cotton, counting same as 1/50; while 2/100 in spun silk counts the same as 1/100. Continental spun silks are sold on metric counts.

STEAM-STRETCHED. Silk skeins, smartly stretched under steam pressure. This greatly increases the luster.

STRIPPING. Removing the sericin from silk by "boiling off."

SURFACE-PRINT. A pattern printed on a woven fabric.

SWATCH. A sample or strip of goods cut across the width of the fabric.

SWIFT. A light reel on which silk skeins are spread for unwinding.

SWIVEL FIGURES. Figures embroidered on cloth by the use of a swivel batten on the loom.

SWIVEL LOOM. A loom with a swivel batten adapted for weaving detached figures on goods.

SYNTHETIC COLOR. A dyestuff compounded chemically to duplicate a natural coloring matter.

TAEL. A Chinese measure of value approximately 1⅓ oz. av. of silver, but varying in different districts. There is no current coin of the tael. Value in U. S. gold is approximately .642 for the Canton tael, and .588 for the Shanghai tael, but varies with the price of silver.

TARTAN. A Scotch woolen stuff, woven in the patterns of the

plaids of Highland clans; hence used as a synonym of a clan plaid.

TEINTE. (Fr.; pr. "tant.") Tint. Color. Shade.

TENDER GOODS. Fabrics not commercially strong enough for their intended uses, including those made weak by improper dyeing.

THREE-SCALE. A method of arranging a Jacquard harness where three warp ends work together, giving a corresponding larger repeat than a single-scale pattern, but with coarser outline.

THROWING. Twisting, and otherwise manipulating, raw-silk threads.

THROWSTER. One who conducts a silk-throwing business.

THRUM. The end of a warp where the threads are knotted together.

TINSEL. Thread of fine flattened wire, twisted round a silk or cotton core; usually made of copper and finished in gold or silver.

TOUCHE. (Fr.; pr. "toosh"; touch.) Handle or feel of goods.

TRAM. Raw-silk threads doubled and twisted. Used for filling.

TRAVERSE. A to-and-fro motion, as in winding silk on a bobbin.

TREVET, TRIVET (Eng.); TREVETTE (Fr.). The sliding knife or cutter used in cutting velvets woven double.

TUSSAH, TUSSUR, TUSSORE. Wild-silk of a brownish color, largely produced in India and China.

TWISTING-IN. The uniting of the threads of a new warp to those of one woven out, by twisting the threads together.

TWIST SILK. Silk thread prepared for sewing purposes.

TYPE PIECE. A sample piece of goods made to represent a quality.

VIGOUREUX PRINTING. A method of printing textile fibers so as to produce a mixture effect in the yarns and goods. Named after the inventor.

WARP. The threads which run lengthwise in a fabric. A very usual length is 300 yds.

WARPING. The process of making warps from silk or other yarns.

WARP PRINT. A pattern printed on a warp previous to weaving.

WATER-PROOFING. Treatment for rendering fabrics impervious to moisture.

WEAVE. The manner of interlacing the threads in a fabric. The construction or design.

WEAVING. The interlacing of the weft with the warp in fabric construction.

WEFT. The crosswise threads in a fabric. The filling.

WEIGHTING. The loading used to increase the weight and bulk of silk.

WINDING. Transferring silk from skeins onto bobbins.

WOOF. Same as weft.

WRONG-DRAW. An imperfection in cloth, due to a warp end having been drawn through the wrong heddle.

YEN. A monetary unit of Japan, having a value of 49.842 cents, gold.

NAMES DESCRIPTIVE OF CHARACTERISTICS OF FABRICS [1]

French	*Pronunciation*	*Description*	*English*
Abbatré	ab-at-ray	Applied to patterns with depressed effects.	Depressed — sunken
A jour	ah zhoor	Open-work effects.	"To-day," as "exposed to the day"
Appliqué	ap-lee-kay	As designs made by stitching braiding on the garment.	Applied — laid on
Apprêt	ap-pray	The sizing or dressing applied to goods.	Finish — dressing
Barré	bah-ray	Effects of a cross-over stripe character.	Barred
Bayadère	by-ad-air	Broad and lively cross stripes.	Bayadere
Borduré	bord-oo-ray	Describes goods with a woven or printed border pattern.	Bordered
Bosselé	bos-el-ay	Patterns made by embossing.	Embossed
Bouclé	boo-clay	Applied to goods in which are novelty yarns showing curly loops.	Curled
Bouillonné	boo-yon-nay	A shirred or rippled effect.	Shirred — gathered

1 This list is used by courtesy of Cheney Brothers.

French	*Pronunciation*	*Description*	*English*
Bourré	boo-ray	Effects where the pattern has a stuffed or wadded character.	Stuffed
Boyau	boy-o	A stripe, or edging, of a cord-like character.	Pipe — hose
Brillant	bree-yong	Shiny. This name is given to a chiffon-like fabric made of untwisted raw silk.	Bright
Brillanté	bree-yon-tay	Something very iridescent.	Glittering
Broché	bro-shay	Showing a certain kind of figured effect.	Figured — stitched
Brodé	bro-day	Figured in a manner similar to embroidery.	Embroidered
Broderie	bro-de-ree		Embroidery
Camaieu	cam-ah-yeu	Made with different shades of the same color.	Cameo
Caméléon	kam-ay-lay-ohn	A three-tone glace effect.	Chameleon, a lizard that changes color
Canille	can-eel	A jointed effect, with stripes broken at intervals by knots or small squares, like a bamboo effect.	Cane-like
Cannelé	can-el-lay	Narrow fancy broken stripings.	Fluted
Carré	cah-ray	Checkered effects.	Squared
Carreau	cah-ro	A check, or block.	Square
Changeant	shong-zhong	Shot effects, as from contrasting colors.	Changeable
Charmant	shar-mong	Used when something is specially dainty	Charming
Charmeuse	char-meuz	Applied to a certain rich piece-dyed fabric. A crêpe-warp satin.	Charmer
Chenille	chen-eel	Velvety silk-cord.	Chenille (Fr.)— A caterpillar
Chiné	she-nay	Blurred, soft, indistinct, as a warp printed effect.	Colored — tinged
Clarté	clar-tay	Clear in outline, well defined.	Clearness

French	*Pronunciation*	*Description*	*English*
Coloré	co-lo-ray	Colored by dyeing or otherwise.	Colored
Coquillé	co-kee-yay	Made with scalloped patterns or edges.	Shell-like — scalloped
Côtelé	co-tel-lay	Having distinct ribs or wales.	Ribbed
Craquelé	crahq-lay	Effect like crackled glass.	Crackled — lace-like
Crêpé	creh-pay	Made with crapy effect.	Craped
Croisé	crwoz-ay	Applied to a velvet weave, with a twilled back.	Twilled
Damassé	dam-as-say	Figured brocade.	Damasked
Damier	dam-yay	A checker-board.	Patterns of large squares
De luxe	de looks	Something superlatively fine.	Of luxury
Dentelé	don-tel-lay	Applied to certain kinds of edges.	Indented
Dentelle	don-tell	Open work, lacey effects.	Lace-work
Deux tons	deu tong	Warp and filling of contrasting colors.	Two-tone
Ecossaise	ay-cos-says	Scotch tartan patterns.	Plaid (Scottish)
Ecrasé	ay-crah-say	A pattern with a crushed or flattened effect.	Crushed
Epinglé	ay-pang-glay	Largely applied to fabrics having ribs of alternating sizes, or colors.	Corded
Exquis	ex-quee	Of the highest character.	Exquisite
Façonné	fah-son-nay	Applied to Jacquard figured fabrics.	Wrought — figured
Fantaisie	fan-ta-zee	Novelty effect, or specially high quality.	Fancy
Festonné	fes-ton-nay	Applied to certain kinds of edges.	Scalloped
Feutré	feu-tray	Used to describe the furry backs on some satins.	Felted
Floconné	flo-con-nay	Fabrics in which appear flakes or tufts of contrasting colors.	Flaky
Foncé	fon-say	Thus "rouge foncé" is liver colored.	Deep-colored

French	*Pronunciation*	*Description*	*English*
Gaufré	go-fray	Patterns produced by pressure between engraved rollers.	Honeycombed — puckered
Glacé	glah-say	Applied to two-tone colorings.	Frosted — ice-like
Granité	gran-ee-tay	Small granular patterns.	Granite-like
Grisaille	greaze-eye	A black-and-white mixed effect.	Grizzled
Grivelé	greeve-lay	A spotted or mottled effect.	Speckled
Imprimé	ong-pree-may	Any printed effect.	Printed
Lancé	lon-say	Applied to special picks used for shot effects.	Shot
Lumineux	loo-min-eu	Showing glints of color through the ground.	Luminous
Lustré	loos-tray	Finished with special brilliancy.	Lustered
Matelassé	mat-las-say	A figured effect, well stuffed out.	Quilted — stuffed
Matte	maht	Flat, dull finishes or weaves.	Lusterless — dead
Métallique	may-tal-leek	Applied to high luster effects.	Metallic
Moiré	mwar-ay	Watered effect of many kinds.	Watered
Monochrome	mon-o-chrome	Different shades of the same color.	Single-colored
Monotone	mon-o-tone	Single-color effects.	Monotonous
Nacre	nakr		Mother-of-pearl
Nacré	nah-cray	Iridescent, pearly effects.	Nacreous
Natté	nat-tay	Small basket-weaves.	Plaited — matlike
Nouveauté	noo-vo-tay	Applied to anything new.	Novelty
Ombré	ong-bray	Showing graduations of color.	Shaded
Ondé	on-day	Having a wavy, watered effect.	Waved
Ondulé	on-doo-lay	Stripes of an undulating character.	Undulated
Orné	or-nay	Specially ornate or decorated.	Ornamented
Ouvré	oo-vray	Figured, stitched or embroidered.	Worked
Pailleté	pi-yet-ay	Showing small, glittering effects.	Spangled

French	*Pronunciation*	*Description*	*English*
Paillette	pi-yet		Spangle
Panaché	pan-ah-shay	Showing birds, flowers, fruits, leaves, etc.	Variegated
Passé	pas-say	Anything out of style.	Passed — out of fashion
Peluché	pel-oo-shay	A rough, plush-like effect.	Shaggy
Percé	pair-say	A kind of open-work effect.	Perforated
Petits pois	pet-ee pwah	Small dots, as peas.	Small peas
Picot	pee-co	A looped arrangement for edgings.	Purl — loop
Plissé	plee-say	Showing alternate stripes, smooth and puckered.	Pleated
Pointillé	pwong-tee-yay	Having a pattern with small points or dots.	Dotted
Quadrillé	cad-ree-yay	Patterns of a squared kind.	Checkered
Rayé	ray-ay	A general name for stripings.	Striped
Relevé	rel-ev-ay	Figures showing in strong relief.	Raised — in relief
Renversé	rong-ver-say	Patterns which reverse.	Reversed
Repoussé	reh-poo-say	Patterns of a raised character.	Pushed-back — bulked-up
Revers	reh-vair	Turned round.	Reverse-side
Rondé	ron-day	Figures of a rounded shape.	Rounded
Rongeant	rong-zhong	As a pattern made by eating out the design.	Corroding
Scintillé	san-tee-yay	Brilliant and scintillating.	Sparkling
Serpentin	sehr-pon-tan	Undulating striped effects.	Spiral — winding
Serré	sehr-ay	Compactly pressed.	Pressed
Soutaché	soo-tash-ay	Effect of braidings on cloth.	Braided
Tacheté	tash-tay	Having a speckled effect.	Spotted
Teindré	tain-dray	Dyed; stained; tinged with color.	Dyed
Travers	trah-vair	Cross-over effects.	Across
Traversé	trah-vair-say	Crossed by stripes in the filling.	Traversed — crossed
Velouté	vel-oo-tay	Soft, velvety and free from harshness.	Velvety
Velu	vel-oo	Rough faced and hairy.	Hairy

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