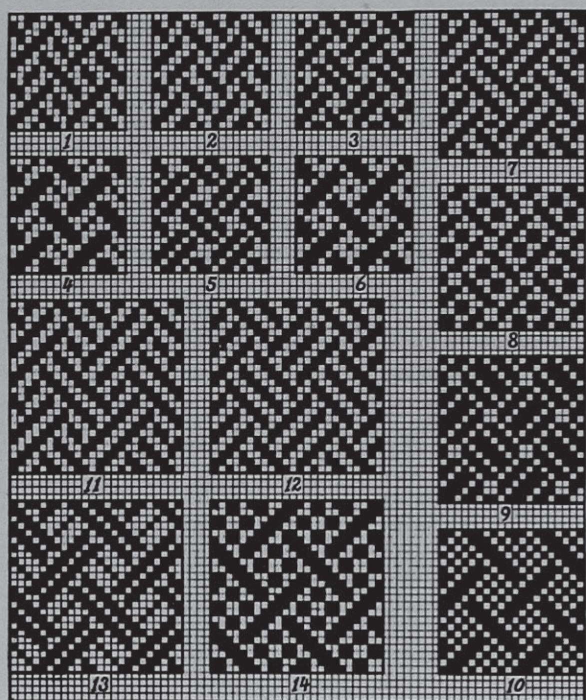
DESIGNING AND FABRIC STRUCTURE FOR HARNESS WORK.

Entwining Twills.

This sub-division of our twill weaves refers not only to one of the most useful sub-division of twills, but at the same time comprises one of the most interesting systems of weaves to be constructed. They are used extensively in the manufacture of dress goods, as well as men's wear, in connection with cotton, woolen, worsted and silk fabrics, being also frequently used in connection with Jacquard Designing.



Entwining twills are obtained from our regular twills by running one, two or more pieces of such twills parallel to each other at a 45 deg. grading, placing against this twill line, or these twill lines, at right angles, a second series of a corresponding piece or pieces of twills. The two twill effects thus placed to run against each other, must be uniform, *i. e.*, balanced, in order to produce the characteristic entwining effect of these two sets of twill lines, and from which this system of twills receives its name.

Entwining twills can be designed for any even number of harnesses beginning with eight; 8, 10, 12, 16 and 24-harnesses being the capacity most often called upon, although they can, if so desired, be made for any number of harnesses above 8.

As will be readily understood, by consulting the accompanying two plates of weaves, entwining twills call for straight drawing in drafts, *i. e.*, no reduction of harnesses is possible.

Entwining twills repeating above 24-harness refer to Jacquard Work, and where they are extensively used in connection with dress goods, as off and on brought to the notice of our readers, in connection with our Articles on "Novelties from Abroad."

The rule for constructing entwining twills is:

After ascertaining the harness capacity for which the new weave is to be designed, run the number of twill lines desired, for a certain number of threads from left to right on the point paper; paint three more repeats of these twill lines. Run the twill lines in opposite directions, properly connecting them to the last risers of the first painted twill lines. It will take some practise on the part of the novice to master the subject.

To ascertain the lowest repeat of a weave, provided the number of twill lines to be used are given, multiply them with the repeat of the foundation twill, the result being the answer.

If less than the possible number of twill lines to use, are used for a given repeat of a weave, the result will be two open spaces left in one repeat of the new weave. These open spaces, referring to an excessive floating of warp and filling, are then in turn tied down by interlacing warp and filling with small, special effects.

To illustrate the subject, consider the 4-harness even sided twill for foundation, calling for 2 pieces of twill lines to be used.

Answer: 4 times 2 equals 8, *i. e.*, 8 harnesses and 8 picks are the lowest repeat for this entwining twill. (Fig. 2 of weaves given in connection with this lesson, illustrates this subject.)

Another example: Take the 6-harness even sided twill to be used for foundation in connection with 4 pieces of twill lines.

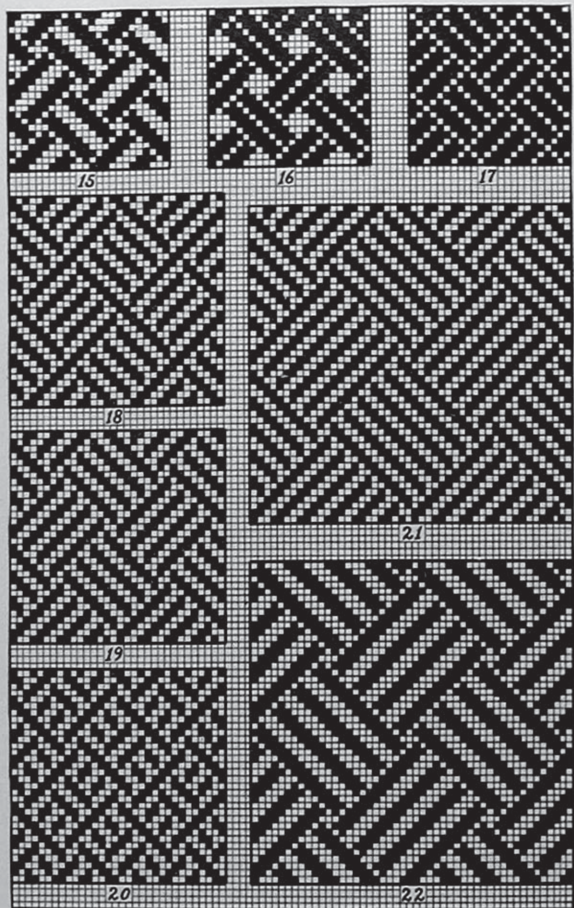
6 times 4 equals 24, *i. e.*, 24 is the repeat for warp and filling for this entwining twill. (Fig. 22 of weaves given in connection with this lesson illustrates this subject.)

From explanations given it will be seen that provided we use less twill lines than those quoted in the examples, we get open spaces, which as mentioned before have to be filled out, a feature readily explained if considering weaves Figs. 11 and 12. In connection with both weaves, the 4-harness even sided twill forms the foundation weave, Fig. 11 calling for two pieces of twill to be used, and Fig. 12 for three pieces of twill to be used. The latter weave uses up every available space, since 4 times 3 equals the repeat of the entwining twill, and which is 12 harnesses and 12 picks; whereas in connection with weave Fig. 11, we only used two twill lines, 4 times 2 equal 8, leaving four ends over if considering the repeat of the weave (12 harnesses and 12 picks), thus obtaining in the entwining twill an open space, which in turn has been filled out in the example with two ends of twill although other effects like baskets, plain weaves, etc., can be used for this purpose.

Weave Fig. 1 has for its foundation, the 4-harness even sided twill, one single piece of twill entwining against another piece being used, with the result of two empty spaces in the repeat of the weave, and which have been filled up by means of two ends of twill.

Fig. 2 repeats on 8 by 8, and has for its foundation the 4-harness even sided twill using two pieces of twill against each other, and which complete the weave, leaving no open spaces.

Fig. 3 shows another entwining twill repeating on 8 by 8, running one piece of the $\frac{2}{1}\frac{2}{3}$ 8-harness



twill against each other. One piece of the twill line used times 8 (repeat of foundation twill), equals 8, and results in an entwining twill having no empty spaces.

Figs. 4, 5 and 6, show three more entwining twills, repeating on 8 by 8. Weave Fig. 4 calls for a 3 up twill line, entwining against a similar 3 up twill line (8 minus 3 equals 5), leaving an open space and which has been tied down.

Fig. 5 has again the $\frac{2}{1}\frac{2}{3}$ 8-harness twill for its foundation, *i. e.,* the same foundation as was used in connection with weave Fig. 3, only using a different ending of the twill line, the resulting entwining twill requiring no tying down.

Fig. 6 corresponds to what was explained in connection with weave Fig. 4, it being a similar twill line, the only difference being in the ending, *i. e.,* joining of the twills where they entwine into each other.

Figs. 7, 8, 9 and 10 show four entwining twills repeating on 10 by 10.

Figs. 11, 12, 13, 14, 15, 16 and 17 show seven entwining twills repeating on 12 harnesses.

Figs. 18, 19 and 20 show three entwining twills repeating on 16 harnesses, and Figs. 21 and 22 two entwining twills repeating on 24 harnesses.

Questions:

(1) Foundation twill: $\frac{3}{1}\frac{3}{5}$ 12-harness regular twill; run one piece of this twill against another similar piece of twill, running at right angles. Interlace the resulting space.

(2) Foundation twill: $\frac{3}{1}\frac{1}{1}\frac{3}{3}$ 12-harness regular twill; run one piece of this twill against another similar piece of twill, running at right angles. No open spaces are formed in this instance.

(3) Foundation: 4-harness regular twill. Run two pieces of twill against each other. 4 times 2 equals 8, and 16 minus 8 leaves 8, hence open spaces result, and which interlace with smaller pieces of twills.

(4) Foundation: 4-harness regular twill. Run four pieces of twill against each other. 4 times 4 equals 16 and 24 minus 16 leaves 8, hence open spaces result, and which interlace with smaller pieces of twills.

Jacquard Cheviot Dressgood.

Warp: 2304 ends, 2/40's worsted, cheviot.

Weave: Jacquard Design; repeat 128 by 128; 400 Jacquard machine using 384 needles of it, *i. e.,* cutting the design 3 times over (128 x 3 = 384.)

Straight-through Tie-up, 6 Divisions @ 384 ends.

Reed: 14½ @ 3 ends per dent; 43½ ends per inch; 53 inches wide in reed.

Dress:

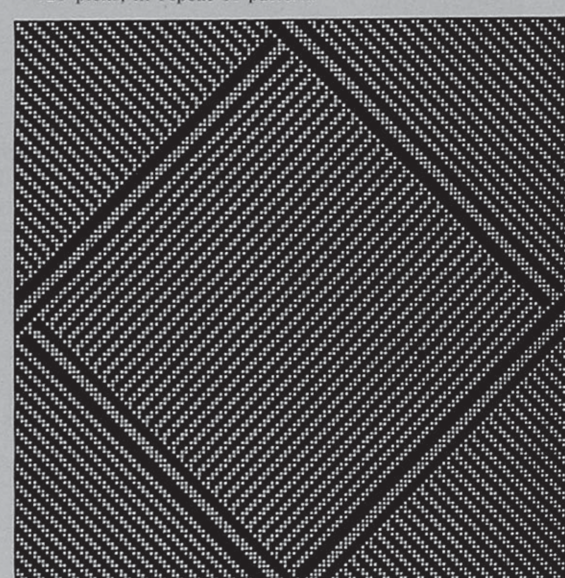
32 ends 2/40's, w. c., dark olive green mix.
32 " " , " , white (bleached).
32 " " , " , light olive and white (bleached) twist.
32 " " , " , white (bleached).

128 ends, in repeat of pattern.

Filling: 46 picks per inch, arranged thus:

32 picks 1/20's, worsted cheviot, dark olive green mix.
32 " " , " " , white (bleached).
32 " 2/40's, " " , light olive and white (bleached) twist.
32 " 1/20's, " " , white (bleached).

128 picks, in repeat of pattern.



Finish: Scour well, dry, shear, press; 48 inches wide.

Posselt's Textile Journal

A Monthly Journal of the Textile Industries

2028 BERKS STREET, PHILADELPHIA, PA.

E. A. POSSELT, - - - - Editor and Publisher
C. F. POSSELT, - - - - - - Secretary

SUBSCRIPTION RATES

United States and Mexico, $2.00 per year.

Canada, $2.50 per year.

Other countries in the Postal Union, $3.00 per year.

Single Copies, 25 cents.

This Journal is published on the tenth of each month.

Postage prepaid by the Publisher.

Subscriptions begin with the number following the date on which the subscription is received at this office.

In writing about subscriptions, always give your full name and address.

When writing for changes in address, always give the old address as well as the new address to which copies are to be sent.

Money should not be paid to agents or solicitors unless they can show authority from this office. This Journal cannot be responsible for money paid to unauthorized persons.

Subscriptions are payable in advance. Money can be sent by check, draft, money order or in registered letter. Make all drafts, checks, money orders, etc., payable to E. A. POSSELT, Publisher, 2028 Berks Street, Philadelphia, Pa.

ADVERTISING RATES ON APPLICATION.

COPY FOR ADVERTISEMENTS must reach this office not later than the 25th of month preceding date of issue, to insure proper attention.

EUROPEAN AGENTS: Sampson Low Marston & Co., Ltd., 100 Southwark Street, London, S. E., England.

At a meeting of all the cotton mills of Almance County, North Carolina, held at Burlington October 30, it was unanimously resolved to curtail production to the extent of two days a week, or one-third time, until February next. The agreement went into effect immediately and every mill in the county to the number of twenty-six, signed up. In the aggregate nearly 200,000 spindles and 6,000 looms are affected and nearly 20,000 ooperatives.

The Australian wool clip will be the largest on record; about 1,900,000 bales, worth $135,000,000, will be exported.

The erection of a large wool storehouse for Boston has been begun at Mystic wharf by the Terminal Wharf & Railroad Warehouse Company. The new building, adjoins the Boston & Maine property, and will be eight stories high, 363 by 83 feet; it will be of brick, with concrete floors and columns. The net storage capacity will be about 230,000 square feet and the cost will be about $500,000. When completed, it will accommodate about 70,000,000 pounds of compressed wool. The American Woolen Company will be the chief tenant, having engaged two-thirds of the holding capacity of the storehouse for its raw wool supply. The Manufacturers' Storage & Warehouse Company is the lessee of the building.

THE KNIT GOODS SITUATION.

Agents handling domestic *full fashioned hosiery* have lately offered goods at the lowest prices ever known, with the result that their mills are getting a volume of business in excess of their capacity, compelling some of the mills to be operated double time. Although the orders booked by these mills show a loss, they will be filled. Some of the mills have closed their books against further orders. The next season's business will have to be done on higher prices, on account of the pronounced advance in the price of combed yarns.

Some mills have their fall lines ready for the 1910 season, and large buyers have been investigating lines of fleeced underwear; some large buyers already looking far ahead on high class goods.

The leading mills are receiving requests for prompt deliveries of all domestic staples on order; odd lots being also in demand for immediate delivery.

On general lines of hosiery, the advance in prices has made agents cautious, they being in no hurry to push for business, believing that by waiting for a time the buyers will meet the views of manufacturers.

Fancy hosiery is in demand, considerable attention being also given to staple blacks for men's and ladies' wear.

In connection with cotton ribbed goods, union suits to retail above $3, and some of the better qualities of worsteds, are hard to secure for immediate delivery. With lower grades, although there is a good supply on hand, very attractive prices are offered as compared with the values ruling a few months ago.

The better lines of sweaters, in fine woolens and worsteds, hold a steady price, while the lower lines of cotton, have not found favor.

Owing to the high price of cotton, German textile experts have been turning their attention to other fibres that might be used as a substitute for it. Recently it is reported, a spinning company at Chemnitz, Ger., has succeeded in spinning the fibre contained in the seeds of the kapok, or silk-cotton tree of the tropics. In its natural state this fibre cannot be spun, owing to its extreme brittleness, but Prof. Goldberg, of Chemnitz, claims to have found a method of treating it to make it spinnable; the yarn is described as having a peculiarly soft, silky feel to the hand.

The fibre has hitherto been in use as a padding material for furniture and in making pillows and similar articles, and it has answered this purpose so well that the cultivation of the tree has already been introduced into the German colonies of New Guinea and East Africa. The fibre has the advantage of being considerably cheaper than cotton, but no information is at hand showing the wearing qualities of fabrics made from kapok yarn.

In connection with dyeing aniline black, be careful to avoid high temperatures and a dry atmosphere in the drying and ageing operations, in order to prevent the hydrochloric acid from attacking the fibre. For this reason observe carefully the development of the green.

TRUE SILK.

Nature has endowed certain caterpillars, the Bombyx mori, *i. e.*, the true silk worm as well as the various species of wild silk worms, with the power to store within their bodies the material from which to build for themselves, a shelter (the cocoon) for protection while changing from their larva state to a moth.

BOMBYX MORI.

Showing cocoon, eggs laid by the moth in fair quantities but not adhering together, the annulated caterpillar feeding upon the oval leaves of the mulberry plant, also the chrysalis at bottom of illustration.

This shelter or covering, *i. e.*, the cocoon, forms the silk of commerce, the larva after changing into the chrysalis or pupa state previously to its changing into the moth, having, for this reason been killed by stiffeling, *i. e.*, subjecting such of the chrysalis, the cocoons of which are desired for reeling into silk yarn, to oven heat or steam, so as to kill the caterpillar in its chrysalis state, in the cocoon.

In connection with such of the cocoons as are destined for breeding, the moth is not killed, the same boring its way through and out of the cocoon, to start generating over. This spoils such cocoons for reeling purposes, they being in turn afterwards used up as waste silks in the manufacture of spun silk yarns.

Cocoons are sorted by experienced hands, the same as you will sort the various portions of fleeces of wool, into the different kinds suitable for the different purposes for which the silk is to be used.

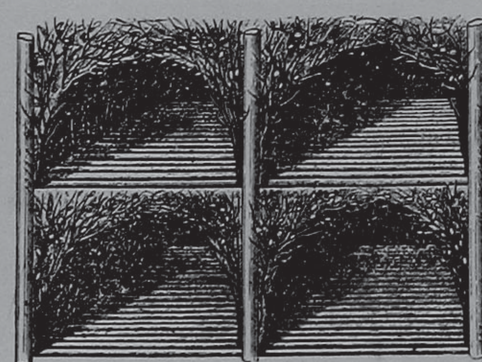
The manufacture of net silk, or true silk as it is called, is considerably simpler than the manufacture of any other textile thread, the silk worm while spinning its cocoon producing a filament from 700 to 1200 feet long.

The silk worm is a species of caterpillar which, like all other insects of the same class, undergoes a variety of changes during the short period of its life; assuming, in each of three successive transformations, a form wholly dissimilar to that with which it was previously invested. All the caterpillar kind do, indeed, pass through changes like those of the silk worm, and the beauty of many in their butterfly state greatly exceeds it; but the covering, which they put on before this mutation, is poor and mean, when compared to that golden tissue in which the silk worm wraps itself.

All the curious changes and labors which accompany and characterize the life of the silk worm are performed within the space of a very few weeks. This period varies, indeed, according to the climate or temperature in which its life is passed; all its vital functions being quickened, and their duration proportionally abridged, by warmth. With this sole variance, its progressions are alike in all climates, and the same mutations accompany its course.

The three successive states of being put on by this insect are, that of the worm, larva or caterpillar; of the chrysalis, pupa or aurelia, and finally the moth. In addition to these more decided transformations, the progress of the silk worm is marked by five distinct stages of being: the Egg, the Larva, the Cocoon, the Chrysalis and the Moth.

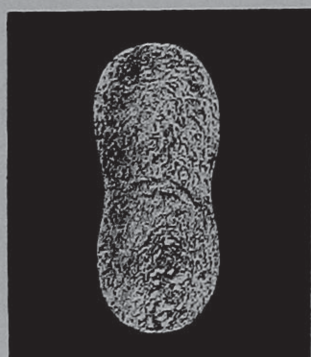
The Egg: The egg of the silk worm moth is called by silk raisers the *seed*. It is nearly round, slightly flattened, and in size resembles a turnip seed. Its color when first deposited is yellow, and this color it retains if unimpregnated. If impregnated, however, it soon acquires a gray, slate, lilac, violet, or even dark green hue, according to variety or breed. It also becomes indented. When diseased, it assumes a still darker and dull tint. Near one end a small spot may be observed, the micropyle, and is the opening through which the fecundating liquid is injected just before the egg is deposited by the female. After fecundation and before deposition, the egg of some varieties is covered with a gummy varnish which closes the micropyle and serves to stick the egg to the object upon which it is laid. Other varieties, however, among which may be mentioned the Adrianople whites and the yellows from Nouka, in the Caucasus, have not this natural gum. The shell becomes quite white after the worm has made its exit by gnawing a hole through it, which it does at the micropyle. Each female produces on an average from three to four hundred eggs. In the standard ounce of 25 grams ($28\frac{1}{3}$ grams = 1 ounce avoirdupois) there are about 50,000 eggs of the small



Construction of Arches upon which the Cocoons are spun.

Japanese races, 37,500 of the ordinary yellow annual varieties, and from 30,000 to 35,000 in the races with large cocoons. It has been noticed that the color of the albuminous fluid of the egg corresponds to that of the cocoon, so that when the fluid is white, the cocoon produced is also white, and when yellow, the cocoon again corresponds.

THE LARVA: When first hatched, it appears as a small black worm about a quarter of an inch in length.



Constricted Cocoon with fine texture.

Its first indication of animation is the desire which it evinces for obtaining food. In about eight days from its being hatched, its head becomes perceptibly larger, and the worm is attacked by its first sickness. This lasts for three days, during which time it refuses food, and remains motionless as in a kind of lethargy. At the end of the third day from its refusal of food, the animal appears, on that account, much wasted in its bodily frame; a circumstance which materially assists in the painful operation of casting its skin, which it

Non-constricted Cocoon, with coarse texture.

now proceeds to accomplish. To facilitate this moulting, a sort of humor is thrown off by the worm, which, spreading between its body and the skin about to be abandoned, lubricates their surfaces, and causes them to separate more readily. The insect also emits from its body silken traces, which, adhering to the spot where it rests, serves to confine the skin to its then existing position. It then proceeds, by rubbing its head among the leafy fibres surrounding it, to disencumber itself of the scaly covering. Its next effort is to break through the skin nearest to the head, which, as it is there the smallest, calls for the greatest exertion; and no sooner is this accomplished and the two front legs are disengaged, than the remainder of the body is quickly drawn forth, the skin being still fastened to the spot in the manner already described. This moulting is so complete, that not only is the whole covering of the body cast off, but that of the feet, the entire skull, and even the jaws, including the teeth. In two or three minutes from the beginning of its efforts, the worm is wholly freed, and again puts on the appearance of health and vigor, feeding with recruited appetite. It sometimes happens that the outer skin refuses to detach itself wholly, but breaks and leaves an annular portion adhering to the extremity of its body, from which all the struggles of the insect cannot wholly disengage it. The pressure thus occassioned induces swelling and inflammation in other parts of the body, and after efforts of greater or less duration, death generally terminates its sufferings. Worms newly freed from their exuviæ are easily distinguished from others by the pale color and wrinkled appearance of their new skin. This latter quality, however, soon disappears, through the repletion and growth of the insect, which continues to feed during five days. At this time, its length will be increased to half an inch; when it is attacked by a second sickness, followed by a second moulting, the manner of performing which, is exactly similar to the former. Its appetite then again returns, and is indulged during other five days, in the course of which time its length increases to three quarters of an inch; it then undergoes its third sickness and moulting. These being past in all respects like the former, and five more days of feeding having followed, it is seized by its fourth sickness, and casts its skin for the last time in the caterpillar state. The worm is now about one and a half or two inches long. This last change being finished, the worm devours its food most voraciously, and increases rapidly in size during ten days. The silk worm has now attained to its full growth, and is a slender caterpillar, from two and a half to three inches in length. The desire of the worm for food begins now to abate: the first symptoms of this is the appearance of the leaves nibbled into small portions and wasted. It soon after entirely ceases even to touch the leaves; appears restless and uneasy; erects its head; and moves about from side to side, with a circular motion, in quest of a place wherein it can commence its labor of spinning. Its color is now light green, with some mixture of a darker hue. In twenty-four hours from the time of its abstaining from food, the material for forming its silk will be digested in its reservoirs; its green color will disappear; its body will have acquired a degree of glossiness, and have become partially transparent towards the neck. When the worm has fixed upon some angle, or hollow place, whose dimensions agree with the size of its intended silken ball or cocoon, it begins its labor by throwing forth thin and irregular threads, which are intended to support its future dwelling. During the first day, the insect forms upon these a loose structure of an oval shape, which is called floss silk, and within which covering, in the three following days, it forms the firm and consistent yellow ball; the laborer, of course, always remaining on the inside of the sphere which it is forming. If at this time any of the threads intended for the support of the cocoon should be broken, the worm will find, in the progress of its work, that the ball, not being properly poised, becomes unsteady so that he is unable properly to go forward with his labors. Under these circumstances, the worm pierces and altogether quits the unfinished cocoon, and throws out its remaining threads at random wherever it passes; by which means the silk is wholly lost, and the worm, finding no place wherein to prepare for its change, dies without having effected it. It may sometimes happen, but such a thing is of

Manner of depositing fibre in building cocoon.

Silk Fibre Magnified. Showing the two minor strands of which it is composed.

unfrequent occurrence, that the preparatory threads before mentioned are broken by another worm working in the neighborhood, when the same unsatisfactory results will be experienced.

The silken filament, which when drawn out appears to be one thread, is composed of two fibres, unwound through the two orifices before described; and these fibres are brought together by means of two hooks, placed within the silk worm's mouth for the purpose. The worm rests on its lower extremity throughout the unwinding process, and employs its mouth and front legs in the task of directing and uniting the two filaments. The filament is not wound in regular concentric circles round the interior surface of the ball, but in spots, going backwards and forwards with a sort of wavy, figure 8 resembling motion. This apparently irregular manner of proceeding is plainly perceptible when the silk is being reeled off the ball; which does not make more than one or two entire revolutions while ten or twelve yards of silk are being transferred to the reel.

Mr. Robinet, of Paris, made the following curious calculation on the movements a silk worm must make in forming a cocoon supposed to contain a thread of 1500 metres. It is known, says Mr. Robinet, that the silk worm, in forming his cocoon, does not spin the silken filament in concentric circles round the interior surface of the ball, but in a zigzag manner. This it effects by the motions of its head. Now if each one of these motions gives a half a centimetre of the silken filament, it follows that the worm must make 300,000 motions of its head to form it; and if the labor requires 72 hours in the performance, the creature makes 100,000 motions every 24 hours, 4,166 per hour, 69 per minute, and a little more than one in a second.

At the end of the third or fourth day, the worm will have completed its task, and we have then a silk cocoon with the worm imprisoned in its centre; the cocoon being from an inch to an inch and a half long.

When the insect has finished its labor of unwinding, it smears the entire internal surface of the cocoon with a peculiar kind of gum, very similar in its nature to the matter which forms the silk itself; and this is no doubt designed as a shield against rain or the humidity of the atmosphere for the chrysalis in its natural state, when of course it would be subject to all varieties of weather. The silken filament of which the ball is made up, is likewise accomplished, throughout its entire length, by a portion of gum, which serves to give firmness and consistency to its texture, and assists in rendering the dwelling of the chrysalis impervious to moisture. This office it performs so well, that when for the purpose of reeling the silk with greater facility the balls are thrown into basins of hot water, they swim on the top with all the buoyancy of bladders; nor unless the balls be imperfectly formed, does the water penetrate within until the silk is nearly all unwound.

When the ball is finished, the insect rests awhile from its toil, and then throws off its caterpillar garb. If the cocoon be now opened, its inhabitant will appear in the form of a chrysalis or aurelia, in shape somewhat resembling a kidney-bean, but pointed at one end, having a smooth brown skin.

THE COCOON: The cocoon consists of an outer lining of loose silk known as *floss,* which is used for carding, and is spun by the worm in first getting its bearings. The amount of this loose silk varies in different breeds. The inner cocoon is tough, strong and compact, composed of a firm, continuous thread, which is, however, not wound in concentric circles as might be supposed, but irregularly, in short figure-of-8 loops, first in one place and then in another, so

Interior of Silk Rearing Room (Magnanerie).

that in reeling, several yards of silk may be taken off without the cocoon turning around. In form the cocoon is usually oval, and in color yellowish, but in both these features it varies greatly, being either pure silvery-white, cream or carneous, green or even roseate.

THE CHRYSALIS: The chrysalis is a brown, oval body, considerably less in size than the full grown worm. In the external integument may be traced folds corresponding with the abdominal rings, the wings folded over the breast, the antennæ, and the eyes of the inclosed insect—the future moth. At the posterior end of the chrysalis, pushed closely up to the wall of the cocoon, is the last larval skin, compressed into a dry wad of wrinkled integument.

The silk worm remains in the form of a chrysalis for periods which, according to the climate or the temperature wherein it may be placed, vary from fifteen to thirty days. In India, the time is much shorter; in Spain and Italy, eighteen to twenty days; in France, three weeks. It then throws off the shroud which had confined it in seeming lifelessness, and appears as a large moth of a grayish-white color, furnished with four wings, two eyes, and two black horns or antlers which present a feathery appearance.

THE MOTH: If left until this period within the cocoon, the moth takes immediate measures for its extrication, ejecting from its mouth a liquor with which it moistens and lessens the adhesiveness of the gum wherewith it had lined the interior surface of its dwelling, and the insect is enabled, by frequent motions of its head, to loosen, without breaking, the texture of the ball; then using its hooked feet, it pushes aside the filaments and makes a passage for itself into light and freedom. The silken threads are simply pushed aside, but enough of them get broken in the process to render the cocoons, from which the moths escape comparatively, useless for reeling.

The moth is of a cream color, with more or less distinct brownish markings across the wings. The males have broader antennæ or feelers than the females, and may be by this feature at once distinguished. Neither sex flies, but the male is more active than the female, and may be easily recognized by a constant fluttering motion of the wings, as well as the feature mentioned before. They couple soon after issuing, remaining coupled during several hours, and in a short time after separation the female begins to deposit her eggs, whether they have been impregnated or not. Very rarely the unimpregnated eggs have been observed to develop.

Compound Spindle for Silk Throwing.

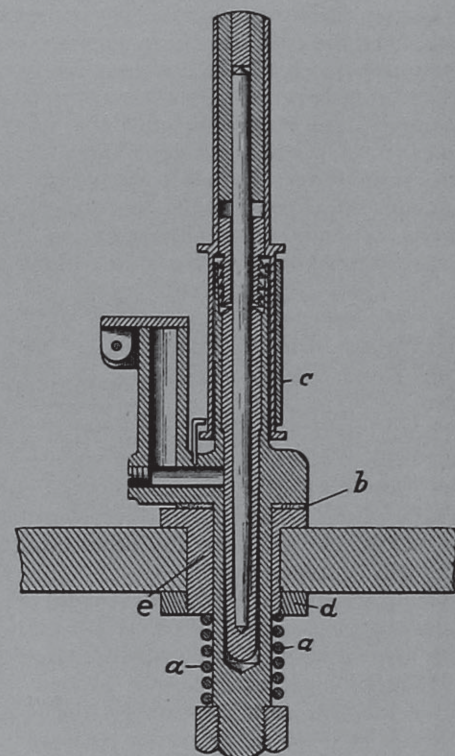
The object is to provide an improved driven compound spindle for silk throwing, in which friction is reduced to a minimum, thus permitting of running it at exceptionally high speed; the spindle is practically devoid of vibration and can be adjusted easily and readily.

The accompanying illustration is a vertical sectional view of this compound spindle, which is the invention of Francis Seymour, one of the most widely known inventors of Silk Machinery in Paterson.

In the construction of this compound spindle, the whirl and spool holder are mounted to turn on the spindle, and the latter is mounted to rotate in the bolster, permitting the spindle to be rotated at an excessively high speed. At such an excessive high speed there will be a tendency of vibration which would be injurious in its effect on the silk.

To overcome this trouble, Mr. Seymour absorbs such vibration by spring *a*, and introducing also a yielding washer *b* between the bushing and the holder.

To obtain the proper frictional contact between the whirl and the belt *c*, the entire spindle can be moved toward or from the belt without detaching any parts from the supporting rail. For this purpose, the nut *d* is loosened and the eccentric bushing *e* is turned axially whereby the entire spindle is moved slightly



toward or from the belt and after the desired adjustments are made, the parts are locked into position by tightening the nut *d*.

ARTIFICIAL SILK.

On pages 72, 73, Vol. IV, No. 3; pages 120, 121, Vol. IV, No. 4, and pages 12, 13, Vol. V, No. 1, a description of the manufacture of this modern textile fibre was given. On account of the steadily growing demand for this fibre and its inadequate supply, data with reference to its cost and production Abroad will be of the greatest of interest to our readers.

The cost of the production of artificial silks is more for the nitrocellulose products, because nitric acid, alcohol, and ether are dearer than ammonia and copper salts, and than caustic soda and carbon bi-sulphide. Of course, economies may be effected in most processes of manufacture, by a rigorous attention to the proper recovery of as much as possible of the reagents employed.

The prices at which the several artificial silks are to-day sold on the markets are considerably less than what was charged for it some years ago, a feature which points not only to elaborate processes of recovery, but also to improved methods of production. But apart from this view of the matter, surprising fluctuations in prices take place at any time.

In the year 1898-99, the price paid for artificial silk was about 60 marks per kilo. ($6.48 per lb.), which had fallen by 1902 to 17 marks per kilo. ($1.84 per lb.), yet rose again in 1903 to 30 marks per kilo. ($3.24 per lb.).

The present price of Chardonnet silk of medium titre for trimmings and embroideries is 12 marks per kilo. ($1.30 per lb.), for the copper silk 9.6 marks per kilo. ($1.04 per lb.), and for viscose silk 6 marks per kilo. ($ .65 per lb.).

Eschalier's Sthenose silk costs 6.4 marks per kilo., or $ .69 per lb.

At this time the price seems to average from 16 to 20 marks per kilo. ($1.72 to $2.15 per lb.).

The total production of artificial silk in 1903 reached about one million kilos or about two and a quarter million pounds; in 1906, 2,400,000 kilos or 5.289,600 lbs., and at present it has reached five million kilos or 11,020,000 lbs.

Italy produced, in the year 1904, 5,900,000 kilos (13,003,600 lbs.) of natural silk, and France 624,000 kilos (1,375,296 lbs.).

Calculating the world's consumption of natural silk at 50,000,000 kilos (110,200,000 lbs.), it is seen that the consumption of artificial silk already reaches one-tenth of that. The 5,000,000 kilos (11,020,000 lbs.) is made up of

2,200,000 kilos (4,848,800 lbs.) of nitrocellulose silks,
2,000,000 kilos (4,408,000 lbs.) of copper silks, and
800,000 kilos (1,763,200 lbs.) of viscose silk.

The following large works are engaged abroad in the manufacture of artificial silks:

GERMANY:

Vereinigten Kunstseidefabriken A. G., Frankfort, A/M. *(nitro)*.
Vereinigten Glanzstoffabriken A. G., Elberfeld *(copper)*.
Furst Henckel Donnersmarckschen Kunstseide und Azetatwerke, Sydowsane Stettin *(viscose)*.
Kunstseidefabrik of Hanau *(copper)*.
Kunstseidefabrik of Julich *(copper)*.
Rheinische Kunstseidefabrik A. G., Cologne, and the Deutsche Kunstseidefabrik at Harburg, are engaged in the manufacture of Todterhaupt *casein* artificial silk.

FRANCE:

The Chardonnet Works, Besancon *(nitro)*.
Les Soies de Givet, Givet and Yzieux *(copper)*.
La Société Francaise de la Viscose, Paris *(viscose)*, with works at Argues la Bataille.
La Société Generale Pour la Fabrikation des Matieres Plastiques, Paris.
La Société Italienne de la Viscose, Lyons.
La Soie de Beaulieu, Jessains.
Société Anonyme des Plaques et Papiers Photographiques, A. Lumiere et fils, Lyons.

BELGIUM:

Les Soies Linkmeyer, Buyssinghen les Hales, Brussels *(copper)*.
Kunstseidefabrik, at Tubize and Alost *(viscose)*.
La Société Anonyme de Droogenbosch, Ruysbrock, near Brussels.

ITALY:

Kunstseidefabrik, at Padua *(nitro)*.
Societa Italiana della Seta Artificiale, Pavia.

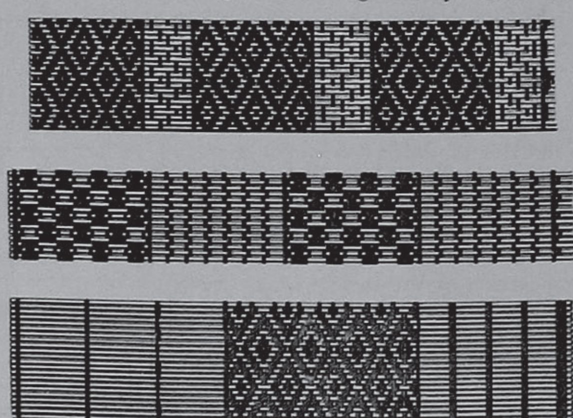
ENGLAND:

Courthauld and Tetley *(viscose)*.

In SPAIN a product is manufactured at Barcelona. In AUSTRIA-HUNGARY artificial silk is made by the Ersten Oesterreichischen Glanzstoffabrik, at Sarvar, in Hungary *(nitro)*. Similar works are also established in RUSSIA. In 1907 the United Cellulo Silk Spinning Co., was formed in ENGLAND, with a capital of £200,000, to work the English Thiele-Linkmeyer patents, and recently in RUSSIA the Société de Moscow Pour la Fabrication de soie Artificielle to work at Moscow the Chardonnet process.

New Designs for Fabrics for Window Shades.

These three designs are fragmentary views of



fabrics for window shades and the like, just patented by A. A. Boeck.

New Designs for Prints.

These six designs are fragmentary views of fabrics, just patented by J. Korzinek.

Waste or Spun Silk.

The product, known as Spun, Waste, Floss, Chappe, or Filosella Silk, is obtained from various sources, amongst which we find:

First, the coarse, loose, outer layers surrounding the true cocoon;

Second, defective cocoons, *i. e.* such as have been used for breeding purposes and from which the moth has emerged, and which are therefore difficult or impossible to reel, also double cocoons and those from diseased worms;

Third, the parchment like skin left behind in reeling the sound cocoons;

Fourth, the waste made in reeling the cocoons, as well as such as made in silk throwing mills.

This waste silk fibre, after being properly prepared, *i. e.* boiled off, in turn is carded, combed, drawn and spun into a yarn partaking of some of the qualities of raw silk, although it is not as bright as the latter, its lustre varying largely according to the amount of gum retained on the fibres. The more the gum has been boiled out, the greater will be the lustre of the fibres. Spun silk is weaker than thrown silk, both in strength and elasticity.

The boiling is usually extended for about two hours, after which the silk is dried and then placed in a damp place to better enable it afterwards to be worked. After being garnetted or carded, *i. e.* torn up into short workable lengths, the silk is dressed—a proceeding somewhat similar to combing. The process results in a lap which is gilled, drawn and then passes to the roving frames, preparatory to spinning and doubling.

A process for waste silk spinning practised, consists in spinning the yarn in the gum, and afterwards subject the yarn or fabric, as the case may be, to the boiling off process, the claim being that in this manner the spinning operation can take place with less waste, besides producing a smoother thread, owing to the influence of the gum which causes the fibres to adhere more closely to each other, the singeing of the yarn in this case being unnecessary.

The best kinds of spun silk yarns (mostly two threads united by doubling) are used as filling for various silk fabrics and velvets, also as warps for many half silk goods, and as embroidery and knitting silk; whilst the lower grades are made up into ribbons and cords, and the poorest are used in cheaper knit goods and other fabrics. Floss or chappe silk, with the exception of yarns for zephyrs, are generally doubled and in turn gassed, for which purpose they are passed quickly through a gas jet about a dozen times, and when they lose about 5 per cent of their weight.

The waste made during spinning these spun silk, waste silk, floss or chappe silk yarns is afterwards used either by itself or in connection with better stock in spinning still lower qualities of silk waste yarns. In this instance the yarn is spun after the woolen yarn system. These yarns are then used as filling for dress goods, upholstery fabrics, polishing cloths, coarse grades of knit goods; also for packing material, and as insulating lagging for steam pipes, silk being a bad conductor of heat.

Terry Motion for Looms.

For Weaving Turkish Towels, Bath Robes, Etc.

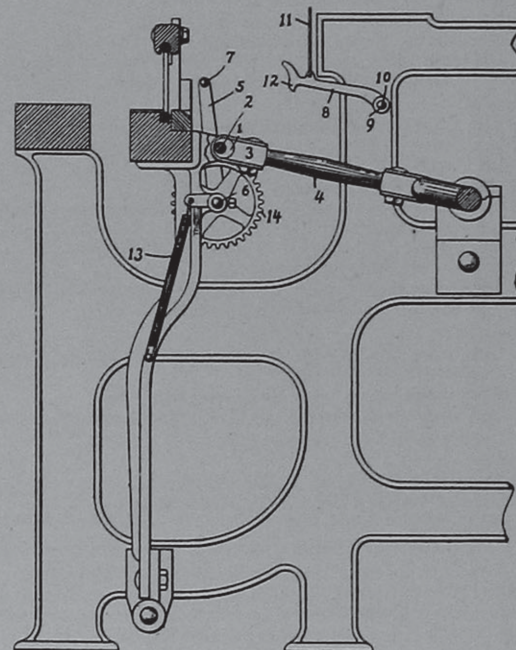
This motion is somewhat similar to other motions used in looms for this class of fabrics, *i. e.*, providing the means for a shorter beatup for the lay for a predetermined number of picks, and then moving it forward to its full beat, to beat up the previously loosely beaten up picks of filling and thus form the characteristic loops produced by means of the lightly weighted terry warp, to these fabrics.

The accompanying illustration shows this Terry Motion (patented by the *Crompton & Knowles Loom Works*), showing also those parts of the loom to which the motion more particular refers to.

In order to prevent the lay from beating up its full stroke, the two eccentrics 1, one being secured to either end of rock shaft 2, receives half a rotation within the bands 3 on the connectors 4, thus decreasing the length of the latter.

To cause this half rotation of the eccentrics 1 as are fast on the rock shaft 2, an upwardly extending lever 5 is provided, the same having its hub fast on the shaft 6, and its upper end provided with a pin 7, which extends in the path of and is adapted to be engaged by a hook lever 8. The latter has a hub 9 loosely mounted on a stud 10, as is secured to the loom frame, and is connected at its free end, through a wire 11, with some pattern indicating mechanism on the loom (not shown) which automatically causes the raising and lowering of said hook lever 8 at predetermined intervals.

In the operation of the loom, when the lay moves to its rear position, and the hook lever 8 is automatically lowered, extension 12 will engage pin 7 and on the



next forward stroke of the lay, the lever 5 will be held by the hook extension 12, in turn causing the partial rotation of the shaft 6, against the action of spring 13, and also the partial rotation of the gear 14, and the pinion fastened to shaft 2 (not shown) and which pinion is in mesh with the gear 14, and the rotation of the shaft 2, and the eccentric 1 fast thereon, so that said eccentric will receive a half rotation, from the position shown in our illustration.

With the eccentric 1 in this position, the amount of the forward movement of the lay will be diminished, and this diminished forward stroke of the lay may be continued for several picks as desired, and until, according to the indication of a pattern surface, the hook lever 8 is automatically raised to release the lever 5.

When this is the case, said lever 5 through the operation of the spring 13, is caused to return to its normal forward position, by the partial rotation of the shaft 6; and through the partial rotation of the gear 14 and the pinion on the rock shaft 2, the latter will be rotated, and the eccentric 1 thereon rotated to the position shown in our illustration, in which position the lay will then move forward its full stroke, as shown in our illustration, to beat up the loops of the terry warp.

NOVELTIES IN DRESSGOODS

FROM ABROAD

Diagonal Dressgood. (Two Color Effect.)

Warp: 5184 ends; 2/64's worsted.
Weave: See **Fig. 1;** repeat 10 by 10; 10-harness straight draw.
Reed: 20 @ 5 ends per dent; 100 ends per inch; 52 inches wide in reed.
Dress: 1 end 2/64's worsted, white.
1 " " " , lilac mix.
—
2 ends in repeat of pattern.
12 Sections @ 432 ends, 216 patterns to one section.
Filling: 84 picks per inch, arranged thus:
1 pick 1/36's worsted, white.
1 " 2/64's " , lilac mix.
—
2 picks in repeat of pattern.
Finish: Scour, dry, shear and press; 48 inches finished width.

Satin Dressgood.

Warp: 5520 ends; all 2/64's worsted; peacock-blue mix.
Weave: See **Fig. 2;** repeat 5 by 5; 10-harness, straight draw.
Reed: 18½ @ 5 ends per dent; 92.5 ends per inch; 60 inches wide in reed.
Dress: 12 Sections @ 460 ends.
Filling: 60 picks per inch, all 1/36's worsted, peacock-blue mix.
Finish: Face finish; 52 inches wide.

Shirtwaist Goods. (Bedford Cord.)

Warp: 2880 ends; 2/64's worsted.
Weave: See **Fig. 3;** repeat 20 by 4; 10-harness fancy draw.
Reed: 15 @ 4 ends per dent; 60 ends per inch; 48 inches wide in reed.
Dress: 40 ends 2/64's worsted, white.
5 " " " , light amber.
5 " " " , dark amber.
20 " " " , white.
5 " " " , light reseda.
5 " " " , dark reseda.
40 " " " , white.
—
120 ends in repeat of pattern.
6 Sections @ 480 ends, 4 patterns to one section.
Filling: 66 picks per inch, all 1/36's worsted, white.
Finish: Scour well, dry, clear face and press; 44 inches wide.

Black-White Figured Dressgood.

Warp: 4320 ends; 2/60's worsted.
Weave: See **Fig. 4;** repeat 80 by 4; 16-harness fancy draw.
Reed: 20½ @ 4 ends per dent; 82 ends per inch; 52¾ inches wide in reed.
Dress: 3 ends 2/60's worsted, black.
2 " " " , white.
2 " " " , black. } times 8.
2 " " " , white.
2 " " " , black. } twice over.
2 " " " , white.
—
80 ends in repeat of pattern.
9 Sections @ 480 ends, 6 patterns to one section
Filling: 70 picks per inch, arranged thus:
2 picks 1/36's worsted, white.
2 " " " , black.
2 " " " , white.
3 " " " , black.
—
9 picks in repeat of pattern.
Finish: Scour, dry, shear and press; 50 inches finished width.

Diagonal Dressgood. (Piece Dye.)

Warp: 2304 ends; 2/40's worsted, in the grey.
Weave: See **Fig. 5;** repeat 12 by 12; 12-harness, fancy draw.
Reed: 16 @ 3 ends per dent; 48 ends per inch; 48 inches wide in reed.
Dress: 6 Sections @ 384 ends.
Filling: 45 picks per inch, all single 20's worsted, in the grey.
Finish: Singe, piece dye navy blue, clear face on shear; 44 inches wide.

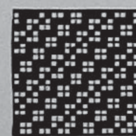


Fig. 1

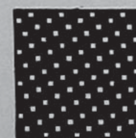


Fig. 2

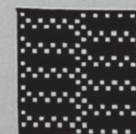


Fig. 3

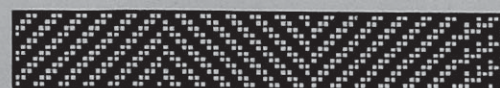


Fig. 4

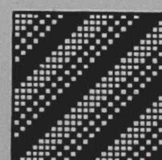


Fig. 5

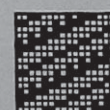


Fig. 6

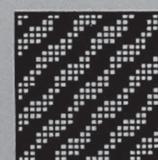


Fig. 7


Fig. 8

Cheviot-Homespun. (Two-color Effect.)

Warp: 1896 ends, all 2/24's cheviot worsted, white.
Weave: See **Fig. 7;** repeat 12 by 12; 12-harness, straight draw.
Reed: 15 @ 2 ends per dent; 30 ends per inch; 63¾ inches wide in reed.
Dress: 6 Sections @ 316 ends.
Filling: 30 picks per inch, all 2/24's cheviot worsted, black and gray mix.
Finish: Cheviot finish; full, wash, dry, clip on shear, press; 52 inches wide.

Costume Fabric.

Warp: 3872 ends.
Weave: See **Fig. 8;** repeat 88 by 4; 12-harness fancy draw.
Reed: 14½ @ 4 ends per dent; 58 ends per inch; 67 inches wide in reed.
Dress: 80 ends 2/52's worsted, gray blue mix.
8 " 2/64's " , " " "
—
88 ends in repeat of pattern.
11 Sections @ 332 ends, 4 patterns to one section.
Filling: 56 picks per inch, all 2/52's worsted, gray blue mix.
Finish: Worsted finish, full, wash, dry, clear face and press; 56 inches wide.

Fall Mantlecloth. (Diagonal Effect.)

Warp: 6600 ends.
Weave: See **Fig. 6;** repeat 16 by 16; 16-harness straight draw.
Reed: 23 @ 4 ends per dent; 92 ends per inch; 72 inches wide in reed.
Dress: 1 end 2/28's worsted, black.
1 " 2/52's " , black.
—
2 ends in repeat of pattern.
15 Sections @ 440 ends.
Filling: 50 picks per inch, all 2/28's worsted, black.
Finish: Worsted finish, full, wash, dry, clear face and press; 56 inches wide.

KNITTING WELSBACH MANTLES.

There are several different stitches used in the manufacture of these webs, known respectively as the floating thread stitch, the lattice stitch, the honeycomb stitch, etc.

As will be readily understood, the diameter of the cylinder of the machine for knitting these mantles, as compared to other knitting machinery, is quite small owing to the small diameter of mantles made on it.

As mentioned before, special stitches are used in knitting these mantles, requiring a special yarn carrier and special needles placed after a certain system between regular needles; otherwise the machine is similar to other knitting machines, that is, a set of cylinder needles is used and a cam cylinder carrying the cam for actuating said needles. Only continuous circular knitting is required, a feature which greatly simplifies the construction and operation of the machine, which is *full automatic*.

THE FLOATING THREAD STITCH. Two yarns are fed, in connection with this stitch, at the same time from separate holes in one yarn carrier, and it is the method of knitting these two yarns into the fabric which produces the *floating thread* stitch. One thread knits into the fabric after the plain knitting stitch and forms the structure, while the other thread floats behind two of the regular stitches and knits in on every third stitch with the first thread.

The method of making the floating thread stitch, as well as a diagram of the stitch itself are given in the accompanying illustrations, of which Fig. 1 is a cross sectional view of the needle cylinder, also showing the yarn carrier as depositing the two separate yarns in the proper needles for producing the stitch.

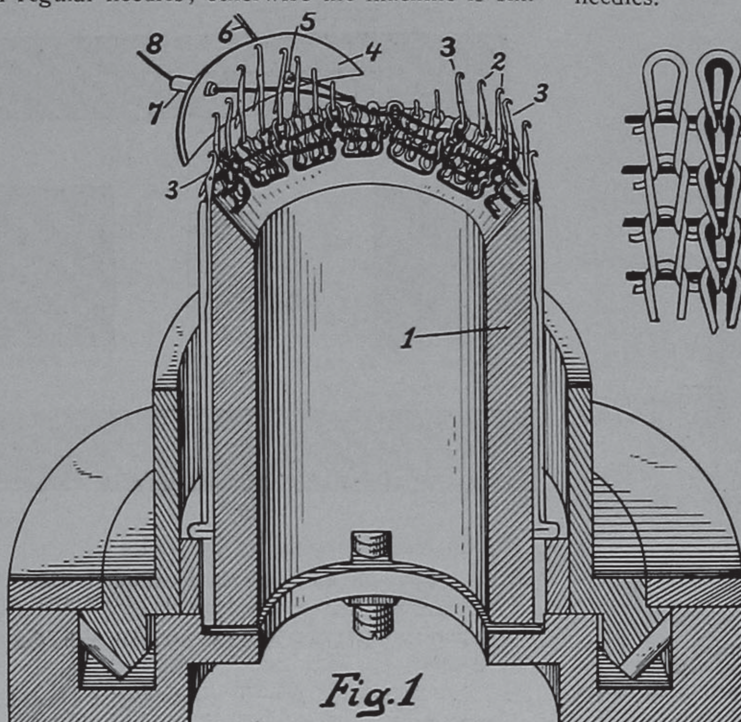


Fig. 1

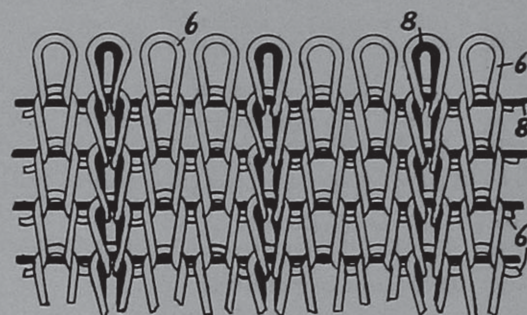


Fig. 2

Fig. 2 is a diagram of a portion of the fabric, showing the interlacing of the two yarns. Besides having the yarn carrier provided with two holes for feeding the two yarns, there are two kinds of needles used in the cylinder, two needles of the regular style alternating with one needle of special construction, which is similar to the regular needle, except that its end carrying the latch and hook is bent back slightly, so that when said needles are raised, their hooks will not be in the circle made by the regular needle hooks and hence they can take a yarn which the regular needles cannot take, by passing said yarn in back of the regular needles but in the front of the hooks of the special needles.

Referring to the illustrations, 1 indicates the needle cylinder, carrying in its grooves the regular needles 2 and the special or bent needles 3, said needles being placed alternately two of regular and one of special in the grooves of the needle cylinder. The specially constructed yarn carrier 4 is provided, toward the back end and near the bottom, with a guide hole 5 which deposits the yarn 6 in the hooks of all of the needles. This is readily done, because the hole 5 is far enough behind the highest point of the raising cam and low enough to the needles to enable the special needles to descend far enough to bring their hooks back into the circle with the regular needles and receive yarn before having their latches closed.

Situated near the top and at the front end of the yarn carrier 4 is a guide hole 7 for depositing the floating thread 8 in the hooks of the special needles 3, said hole 7 being sufficiently high and in front of the highest point of the raising cam to enable it to deposit the yarn 8 before the regular needles are raised high enough to prevent the yarn from passing over them. The third or special needle, by being bent back slightly at the top, prevents the yarn from being deposited behind it and hence catches said yarn in its hook. Before the needle is lowered by the stitch cam of the cam cylinder, the yarn 6 is also deposited in its hook, thus having said needle to cast off two loops for every revolution of the cam cylinder. This system of using a floating thread will produce a web, shown by diagram Fig. 2, in which it will be seen that the regular thread 6 is knitted plain, while the floating thread 8 only knits in with every third plain stitch, leaving it to float behind the other two.

CHEMICAL PREPARATION OF THE KNIT FABRIC FOR MANTLES. The web in coming from the machine in the form of a tube, is afterwards cut into lengths from eight to nine inches long and each of these pieces is then folded and sewn at the top with a loop of asbestos thread. They are now ready for the chemical treatment, which consists in immersing said pieces in a solution of nitrate of thorium and cerium, after which they are dried and the cotton burned out. In this way, the nitrates are converted into oxides and the shell is then stiffened and is ready to be packed into boxes for shipment.

Non-Shrinkable Underwear, Etc.

The same is a late invention by Edouard Leurent, of Lille, France, and is based upon the well known fact that Underwear, Flannels, etc., made of pure wool, have the drawback of shrinking at the washing, forming a felt. This feature destroys the elasticity of the wool fibre, at the same time destroying the pores of the material, or the interstices between the threads are suppressed. From this time onward, the fabric does not fulfill its hygienic object. In order to remedy these different inconveniences, that is to say, in order to make an unshrinkable fabric which preserves all its hygienic properties and which is at the same time of long duration, Mr. Leurent claims that it suffices to form the yarn of the fabric in question as composite threads of wool and linen. Threads of linen twisted with one or more threads of wool, have for their object to prevent these latter threads from shrinking and the fabric from felting; moreover they contribute to increase the strength of the threads which enter into the composition of the fabric or flannel. The operation of twisting is effected by the ordinary means.

In order to ascertain the per cent of grease in a lot of wool, take a sample of the latter, and after weighing it, extract it with ethyl-ether or with benzine, weighing the residue of the wool-fat after evaporating the solvent in the flask.

To ascertain the amount of soluble matter a lot of wool contains, agitate a sample of it in distilled water at a temperature of 86 deg. F. It will remove the dried perspiration, *i. e.,* suint or yolk, of the wool; removing at the same time any solid impurities such as sand, earth, etc., adhering to it. The latter are then filtered off on a weighed filter, dried and weighed.

The sample of wool is then dried and weighed, and when the difference in the various weighings will readily indicate the amount of loss in each procedure.

WOOL SORTING.

Wool after being shorn from the sheep at the ranch is folded and rolled up, each fleece in a package, and tied up with a string, to make handling easier. Any number of these fleeces are placed in a large sack and in this manner reach either the commission

Typical Wool Fibre (from a micro-photograph).

merchants (Boston, Chicago and Philadelphia being the wool centres) or the larger mills direct.

CONDITION OF WOOL.

In the putting up of wool for market there has long been a cause of variance and friction between grower and buyer.

Skin Section of Merino Sheep.

The buyer complains of filthy tags and dirt in the fleeces, and of the use of unnecessary quantities of unreasonably large twine of a fibrous quality that injures the fabric in the manufacture, by means of these vegetable, jute, hemp or waste fibres of every description intermingling with the wool fibres, and in turn being directly the cause of an unnecessary amount of specks in the fabrics, the removal of which requires time and labor and consequently means extra expenses to the woolen or worsted manufacturer. The same also refers to the quality of bagging used by the sheep raiser in packing the fleeces.

On the other hand, growers say that when they exercise the greatest care in all these respects, the buyers will allow no discrimination in price.

There is doubtless some truth in these counter-charges, yet a lot of fleeces carefully handled, of even quality, must claim some consideration from a practical buyer, and command a price that would pay well for the extra care.

Washing Wool on the Sheep.

The advisability of washing sheep before shearing has long been a subject for discussion. Its purpose is the better condition and higher price of the wool. The difficulty presented, which appears to be insuperable, is in obtaining a uniform condition of cleanliness. Necessarily some flocks have more foreign matter in their fleeces than others; there is always great difference in the amount of yolk or grease

Diagram Illustrating Mode of Growth of Wool Fibre.

which the ordinary washing does not affect. Facilities for washing are very poor on many ranches, and different methods of washing are very unequal in their results. If a grower is not inclined to be exactly square in his dealings, or if his perceptions of strict honesty are a little confused by the unfairness of buyers in making no discrimination as to degrees of cleanness in buying, he may slight the process or drive the flock through muddy water. Altogether most flock raisers prefer not to wash, and nearly all dealers unite in a preference for unwashed wools. They find so much unevenness, that in buying washed wool, they usually make some deduction from established washed rates, and in some cases pay little more than for unwashed. It is said that much of the country washing is a positive disadvantage in scouring the wool. Therefore the practice of washing is declining; in many districts it has been altogether abandoned, although the saving of the freight on the grease and dirt certainly should be a large item in favor of sending only wool thus washed.

Grading.

In some instances the fleeces are graded, for one reason or the other, by the commission merchant, but no matter from which source they reach the mill, when arriving there, each and every fleece is graded properly by a competent expert employed by the mill for this purpose, before the fleeces reach the wool sorter. This is done by the mill for the fact that there is no standard or basis or fast rule of grading, and in the nature of wool there never can be. Persons may have what they call a standard grade, but such a standard will be merely an understanding of these people among themselves. For example, what one or more grades might only call a one-half blood, other equally competent graders might term a low three-fourths blood, etc. Certainly with reference to pronounced fleeces, *i. e.,* full grades, no two expert graders would differ, all disputes regarding fleeces chiefly arising when dealing with what are termed *liners,* being fleeces which more or less fall between grades, and which one expert might class with the higher and the other with the lower grade. Every mill has its own idea of grades, and it is therefore particular to have its purchases examined by its own grader, in order to be sure that the wool is graded as desired by them.

Sorting and grading are in smaller mills frequently done by one person, but in large mills, especially those large and prominent woolen and worsted mills where wool sorting is not only required but at the same time its value understood, and where division of labor can be profitably made, one person (or two if the mill is very large) grades the fleeces which several others in turn sort. Grading the wool consists in separating a lot of fleeces into various grades, according to the fineness or coarseness of the fibre, and sometimes according to the length of the staple, and this refers to possibly thousands and thousands of fleeces in a certain lot of wool bought by the mill; whereas sorting consists in taking the fleece and separating the finer and coarser parts. It will be readily understood that fleeces graded by an expert in a mill will certainly simplify the work of the sorters considerably, besides resulting in more wool sorted in a given time by each sorter.

Object of Sorting.

The sorter's work is one requiring constant care, a quick eye, and good judgment, which can only come from long experience. To the uninitiated he appears to work without thought, but there is no work requiring more care, especially in mills whose product is yarn which it is desirable to have of a constant uniform grade.

Before explaining the procedure of sorting, it will be in its place to refer to the object of sorting which finds its necessity in the fact that wool not only varies in quality with different animals, but also on one and the same sheep.

The character of the breed and the pasturage that is afforded to the animals have an important bearing on the wool fibres of commerce and the structural characteristics of wool produced on the different parts of the body. The uniformity of length and of diameter, and the number of scales per inch, vary in different individuals, even among the same breed of sheep. The best is that from the shoulders, the lower part of the neck, the back and the upper part of the sides, while that which covers the head, breech, tail, belly and legs is of an inferior quality.

Dictionary of Technical Terms Relating to the Textile Industry.

(Continued from page 106.)

ICELAND MOSS:—Iceland Moss is the product of lichens, especially Cetraria Islandica which grow in the far north of Europe and also on high mountains in more temperate climates. A stiffening and binding agent used in cotton finishing.

ICELAND SHEEP:—In Iceland a peculiar breed of sheep exists; indeed there are two different breeds, one evidently the result of importation, probably from Norway or Sweden, and larger in size than the native breed, with a finer and whiter wool, and the other a small active sheep, in color

Iceland Sheep (Showing 3 Horns)

varying from dark brown to black. One great peculiarity of this sheep is that it seldom has less than four and often as many as eight horns. They look more like goats than sheep, as the outer covering is long, coarse hair, with a close fine layer of wool underneath.

IHRAM:—The white cotton cloth dress worn by Mohammedan pilgrims.

ILIXANTHIN:—A crystalline compound ($C_{17}H_{22}O_{11}$) obtained from holly leaves (Ilex Aquifolium). When mordanted with iron or alumina, it dyes cloth yellow.

IMBROCADO:—Cloth of silver or gold, used for trimming.

IMBUE:—To deeply dye, tinge, or impregnate a fabric with color.

IMITATION GAUZE:—Open work fabrics in which the perforations are produced without twisting or crossing of the warp threads, but which perforations are not as durable as real gauze, *i. e.*, they will disappear with wear.

IMITATION LACE:—Machine made lace. The same frequently rivals real lace in fineness. The chief difference from the latter consists in the mechanical regularity of the pattern, which makes the design appear lifeless.

IMMATURE COTTON:—Unripe cotton.

IMPRIMÉ:—Printed; derived from the Latin *imprimatur*—let it be printed.

INDIA COTTON:—Cotton grown in India. In commerce known as Surat-Hingunghat and Broach, Tinnivelly, Dharwar,

India Cotton (Surat) Hingunghat

Oomrawuttee, Dhollerah, Western Madras, Comptah, Bengal, Scinde, and Rangoon. An inferior quality of cotton as compared to our cottons.

INDIA LINEN:—A material slightly heavier than batiste, distinguished by its imitation of linen finish, requiring a special calendering. They come into the market from 28 to 36 inches wide, about 40 inches long and average 12 yards to the pound.

INDIAN DIMITY:—A light, corded sheer lawn, with a kind of nainsook finish. The cords run either warp or warp and filling ways in the cloth.

INDIA RUBBER CLOTH:—A fabric covered with India rubber. The latter is cleaned, triturated with sulphur dissolved in benzine or other solvent, and spread upon the fabric by rollers.

INDIA SHAWL:—A cashmere shawl.

INDICAN:—A Sirupy compound of a light brown color ($C_{26}H_{31}NO_{17}$) contained in several species of *Indigofera, Isatis tinctoria* and other plants. Its decomposition results in the blue coloring matter, indigo.

INDIGO:—It is a valuable blue dye, which has been in use for ages. It is prepared from varieties of Indigofera tinctoria, a plant of the bean family, grown chiefly in India. Indigo is also contained in woad, a plant formerly grown in Europe, but now almost entirely replaced by indigo. Indigo finds extensive use as a dyestuff, coloring cotton, wool, and silk, dark blue—indigo blue. In recent years indigo has been prepared artificially—*Artificial Indigo*. In 1885, A. Baeyer discovered a method of preparing indigo-blue or indigotin. Other methods have since been devised. At present large quantities of synthetic indigo are manufactured, and the competition between the natural and the artificial product is sharp. Commercial indigo appears as dark blue cakes, sometimes as a powder. Artificial indigo is sometimes sold in the form of indigo-white. Indigo is insoluble in water, dilute acids, or alkalies. It is soluble in boiling alcohol, with a blue color, but is deposited again on cooling. Dyeings of indigo are very fast to washing, acids, alkalies and light. It is liable to rub, especially when improperly applied.

INDIGO EXTRACT OR INDIGO CARMINE:—Sulphuric acid dissolves indigo and changes it chemically. When its action is continued long enough, an acid is formed which is soluble in water, forms salts with bases and dyes wool directly in an acid bath. It is prepared in several degrees of purity, and is known as acid indigo extract, neutral extract of indigo, refined extract, best refined extract and soluble indigo. Indigo extract is not applicable to cotton; and on wool it is not as fast to washing and light as indigo.

INDULIN OR INDULINE:—Any one of a group of coal-tar dyes which dye cotton, wool, and silk, prepared variously, but possessing similar dyeing properties, and yielding dark dull-blue colors resembling indigo, as violaniline, Coupier's blue, etc.

INGRAIN:—Dyed in the yarn or thread before manufacture. It is a term used to describe textile fabrics dyed before being woven or manufactured.

Ingrain as applied to carpets was originally intended for a fabric where the wool was colored before carding and spinning, but which is not true at present, as the yarn is mostly spun before coloring.

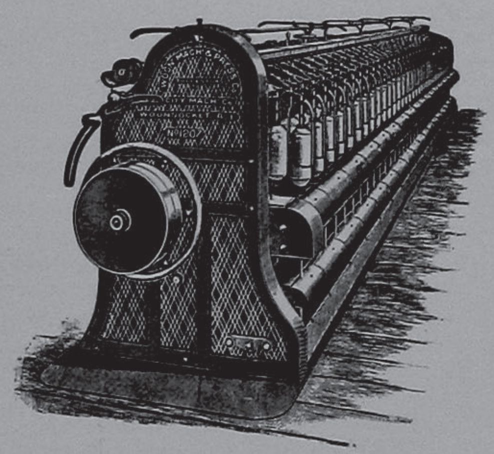
INGRAIN CARPET:—A two or three ply structure made either of worsted or cotton warps and wool, cotton, cowshair, etc., filling. It is also called Scotch or (in England) Kidderminster, from the place where it is made. Ingrain carpets are made 36 inches wide, and with from 800 to 1072 warp threads, according to the quality. Ingrain carpets using 1072 warp threads are termed *Extra Super;* using 960 threads *Super;* using only 800 threads *Fine* Ingrains. The latter represents about the lowest grade of these carpets. These constitute the standard grades of Ingrains made. Sometimes variations in these textures are met with, to suit a certain purpose. A proportional change in the filling texture also takes place with a change in warp texture.

IN GUM:—Raw silk, that has not been boiled off.

INLAID LINOLEUM:—A better grade of linoleum, more thickly coated than ordinary linoleum; hence more durable.

INTAKE:—The point at which a knit or woven article is narrowed.

INTERMEDIATE FRAME:—The second Fly frame in cotton spinning, transforming the slubbing into roving. This machine is a repetition of the slubbing frame, the only difference being that more spindles are used in a given width of machine, since this machine deals with a finer strand of fibres. For common class of yarns, say below 20's, the process is dispensed with, but for better yarns of this count, as well as for all the higher counts, the use of this frame is essential. Its object is to further reduce the slubbing strand in its dimensions.



Intermediate Frame
(Woonsocket Machine & Press Co.)

IRISH DUCK:—A stout linen cloth used for overalls.

IRISH FRIEZE:—A stout, durable, heavily felted woolen cloth, impervious to rain.

IRISH MOSS:—Known also as *Pearl Moss,* and as *Carrageen Moss,* is a species of sea weed, *Chondrus Crispus,* growing on the northern coasts of the Atlantic Ocean, where it is collected when thrown by the breakers, after storms, upon the coast, dried and marketed. It contains a large portion of a peculiar gelatinous matter, termed *pectin* or *vegetable jelly.* When boiled with water it dissolves almost completely, forming a thin, transparent jelly on cooling, which is slightly mucilaginous and adhesive. On evaporation the liquor leaves a dry mass of a tough firm character with some amount of elasticity. It is this which makes the Irish Moss so valuable for sizing and finishing, for it enables it to give a firm full feel to cloths, and which retain this on account of the saline matters the weed contains. It is sometimes mixed with sulphates of soda, and magnesia, etc., for introducing into dyed goods, as Oxford shirtings, to produce a more mellow feel, and to make the fabric more pliable and less likely to curl at the edges when dry. It is an ideal material to use for the finishing of flannelettes, enabling us to in turn weight them rather heavily. The slightness of its adhesive power gives it a great advantage for use in connection with raised goods, since it makes the decoction incapable of matting the raised nap, while at the same time bleeding of colors is avoided, also loss of fibre and waste of finishing material. It is also employed, to some extent, as an ingredient of size for the warp of grey cotton cloth, being also used in some cases in connection with the sizing of woolen warps. One disadvantage the weed has, and that is that the mixing does not keep; it soon ferments, loses its gelatinous character, and evolves a sour odor. Goods finished with it are liable to mildew, but this can be guarded against by the use of a disinfectant.

IRISH POPLIN:—A light variety of poplin sometimes also called single-poplin, made in Dublin, and celebrated for its uniformly fine quality. The genuine Irish poplin is manufactured from the best organzine silk for its warp, using a wool filling of the very best quality, the result being a rich, handsome, durable fabric.

IRISH SHEEP:—There are two varieties, those found in the mountains and those found in the valleys.

IRIDESCENT:—Rainbow and shot color effect, showing prismatic hues and play of color.

IRON ACETATE:—Ferrous acetate, black liquor, black mordant, pyrolignite of iron, printer's iron liquor, iron mordant. This important mordant consists of protoxide of iron, combined with and kept in solution by crude wood-vinegar, or pyroligneous acid. It serves for producing upon cotton a variety of shades according to its strength, and the coloring matter with which it is used. It gives its oxide of iron to the fibre more readily than copperas.

IRON NITRATE:—Iron nitrate, *true* iron mordant, rust mordant. Iron for blue should be sharper than iron for other purposes; if too *dead, i. e.,* if the amount of iron is too great in proportion to the acid, a part of the Prussian blue formed will be deposited at the bottom of the dye-pan, and that which is fixed upon the goods will be dull, loose, and cloudy. The nitrate of iron must not be acid, otherwise the color is thinned and probably irregular.

ITALIAN CLOTH:—A lining, one yard in width, made either of cotton and wool, cotton and mohair, or all cotton; also termed *Farmers'* Satin.

(To be continued.)

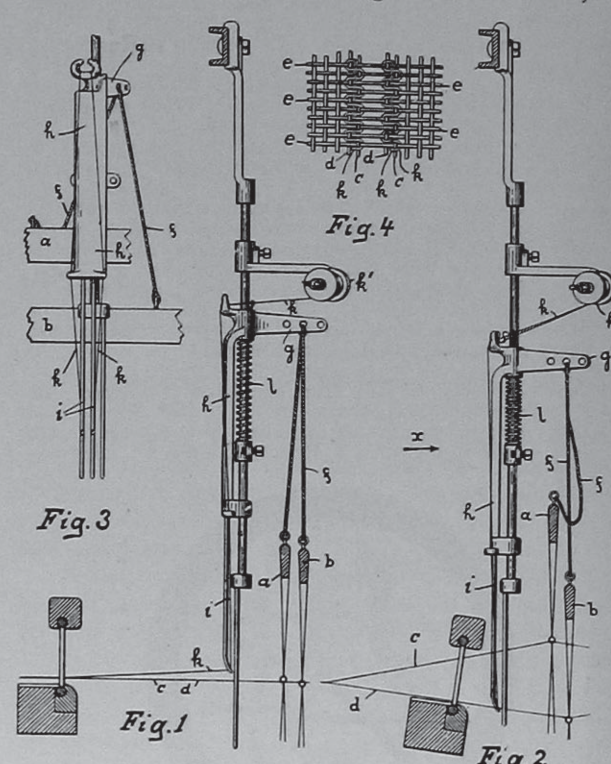
The Crompton Knowles Centre Selvage Motion.

Figure 1 is a side view of this centre selvage mechanism, showing lay and harnesses in section. Figure 2 corresponds to Figure 1, but shows the lay in its rear position and the shed open. Figure 3 shows the parts shown in the lower portion of Figure 2, looking in the direction of arrow *x,* same figure. Fig. 4 shows a detached piece of fabric, having a centre selvage formed.

a and *b* are two vertically extending harnesses, which form the shed in the usual way, and *c* and *d* are two sets of warp threads, which with the filling threads *e,* Fig. 4, form the woven fabric shown in said figure.

The operation of this centre selvage mechanism is thus:

When the lay is in its rear position, as shown in Figure 2, the harnesses *a* and *b* have then formed the open shed as shown, and through the connection *f* to



the arm *g* on the bar *h,* the latter with the needles *i* is moved to its lowest position, to carry the selvage threads *k* as coming from spool *k'* to the lower plane of the warp threads.

The shuttle is now thrown through the shed, and on the forward movement of the lay, and when the harnesses change the shed, as shown in Fig. 1, the needle bar *h* will be raised through the action of the spring *l*, and the selvage needles *i* will come above the upper plane of the warp threads, as shown in Fig. 1.

As the other harness moves downwardly, through the connection *f* to the arm *g* on the bar *h*, the latter will have a partial rotary movement in a horizontal plane communicated thereto, to carry the selvage threads *k* over the warp threads *c* and *d*, to the other side of the warp threads, and on the next backward movement of the lay, when the harnesses open the shed again, the needles will be carried downwardly on the opposite sides of the warp threads, so as to have the filling laid in again, and this operation will be repeated.

As the loom continues to operate, the fabric will be woven with the centre selvage, as shown in Fig. 4.

Old Black Stockings in Demand Abroad.

Hamburg, Germany's important seaport, handles every year about 5,000 tons of Black Stockings received from here and re-shipped from Hamburg by rail to the manufacturing centres of low grade textiles in Germany, Austria and Russia; destined in turn there to be re-manufactured into *Kunstbaumwolle* (German), *Effiloché* (French), or in plain English *Cotton-Shoddy*.

Old black stockings are free of duty in Germany and Austria, but are taxed at 3.5 rubles per pood (equivalent to about 5⅛ cents per pound) in Russia. As Russia is now protecting her cotton growing districts by an import duty of about 6 cents per pound on raw cotton, the apparently high rate on old black stockings by no means prohibits their importation.

American black stockings are much preferred to European stockings, as they are of softer and finer make and are very little darned or mended, thus, when stockings of this character reach the shoddy manufacturer they furnish a better and longer staple than can be obtained from European made stockings. Moreover, European stockings, usually harder, are also very often mercerized and thus made harder still, so they must be pulled several times, a process which reduces the length of the staple.

American goods command from 25 to 30 per cent more than others, are shipped to Europe in pressed bales, and are re-sorted upon arrival in Hamburg for the exclusion of colored stockings and black stockings with white heels. When the latter are found the heels and tips are cut off so that only the black portions remain. The chief reason for the extensive use of black stockings abroad is that the resulting shoddy is black and does not need to be re-dyed.

American black stockings are worth from $1 to $1.20 per 100 pounds, f. o. b. American ports. The freight to Europe runs up to 25 cents per 100 pounds.

The Southern Supply Department of the Draper Company in Atlanta, carries a stock of about 300 to 400 tons of finished loom repairs, and with a still larger stock in Hopedale, the Company is prepared to give better service than ever before.

It is advisable for mills to purchase supplies direct, and thus avoid the trouble incident to misfits, hard castings and consequent bad results in the weaving.

POINTS ON THE MANUFACTURE OF LOW GRADE WOOLENS.

Mixing.—This is one of the most important processes in the manufacture of yarns as used in low grade woolen fabrics, on account of the wear the latter are put to; for which reason one of the most important points for the superintendent is to produce a cheap, but sound yarn, up to the quality required, and this without the aid of a high percentage of wool. As will be readily understood, it is comparatively easy to make satisfactory yarns if using high percentages of wool, but to obtain good results when using for the bulk of the mixing, shoddy, mungo, extract, waste and cotton, changes matters somewhat.

This difficulty may also be greatly increased by the variations in the condition and quality of the by-products referred to; difficulty being frequently experienced to obtain a uniform quality of a supply. When dealing with woolen goods in which a pure wool or noils forms the bulk of the product, such trouble is not likely to occur.

The various operations through which shoddy, mungo or extract pass in their manufacture, more or less destroy their uniformity of character, more so if these processes have been rushed, or carelessly done. No such trouble is experienced with wool, which passes direct from the scouring and drying department to the picker room.

These difficulties in connection with our low grade yarns are still further increased by the difference in the nature of the various fibres used in the mixing of the lot, for the reason that manufacturers of low grade woolens have to rely on vegetable as well as animal fibres in all their varieties of conditions to obtain the best results; and which fibres to combine requires care and experience on the part of the man in charge of the mixing department.

In connection with these low grade woolen yarns, the fibres composing the mix, must be thoroughly intermingled with each other so that each portion shall take care in properly forming its part of the thread. It must be remembered that an imperfectly mixed lot will make considerably more trouble in connection with low woolens than with others, on account of the difference in the character and quality of the various materials used in the mix. Provided we examine a poor quality of such a low grade of woolen yarn, the same will seem to be lumpy and irregular, thicker in some parts and thinner in others; again the least stretch imparted to it will reveal a weak and tender yarn. Using the microscope will show an excessive amount of wool, mungo, or cotton, in some places, with a less amount in others; the various materials of the mix not having been perfectly intermingled with each other, in turn do not add their proper quota of strength to the thread, which, in addition to being tender and having made trouble in carding and spinning, at the same time was not elongated to its full extent, *i. e.*, the proper count of yarn was not spun. To obtain a uniform thread, a perfect intermingling of the various materials used in the mix is a most essential point, and neither the best of machinery nor