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Table of Contents

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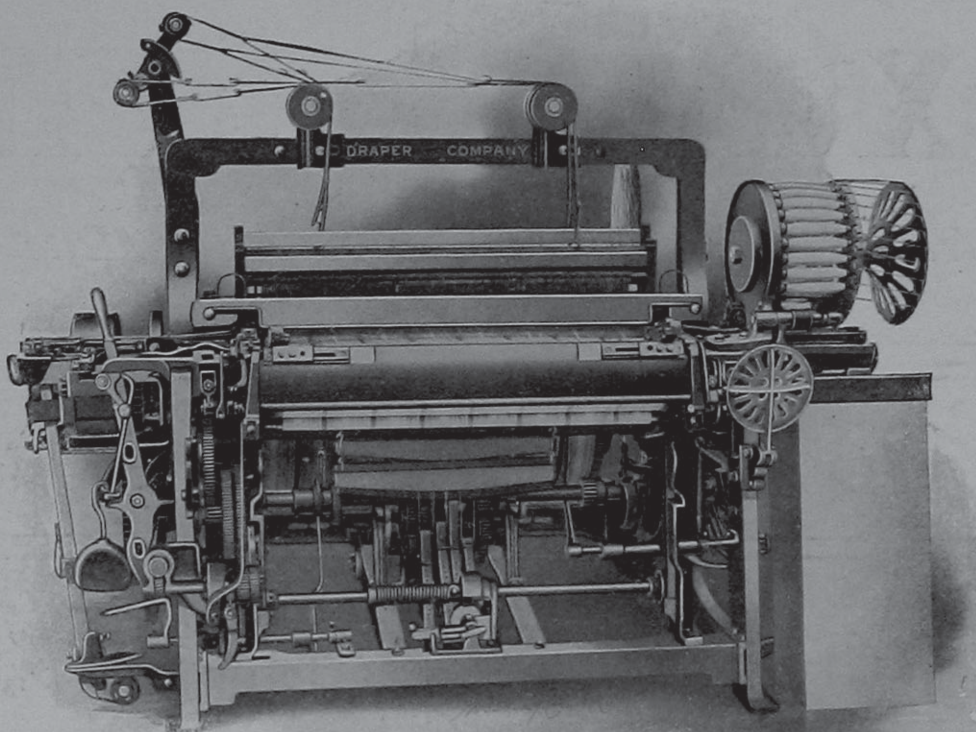

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Posselt's Textile Journal

Vol. III. November, 1908. No. 5.

THE MANUFACTURE OF OVERCOATINGS AND CLOAKINGS.

Beavers.

Beaver Cloth, Beaver Overcoating, Beaver Cloaking, Moscow Beavers, or in short, Beavers, are subnames of a variety of heavyweight woolen goods, used for heavy coats or overcoats for men's wear, jackets or cloakings for women's wear. As the purpose for which they are used, indicates they must protect the wearer during the cold season, hence in their construction stress must be laid upon the fact that a fabric structure be produced which will as much as possible retain the heat to the body. Their average finished weight is about 27 oz. per yard, with variations within 2 oz., according to demand (wear) the fabric is intended for.

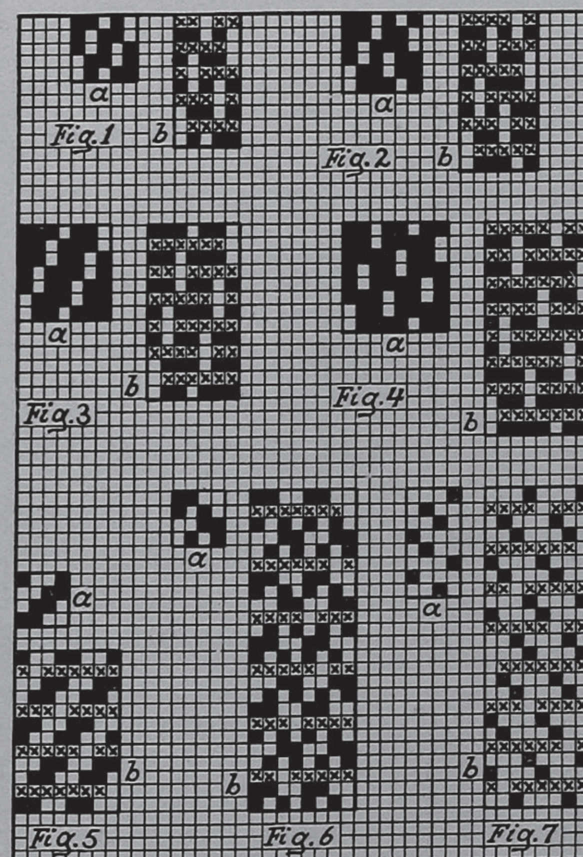
The general construction of these fabrics varies with their purpose of wear. For instance if destined for outdoor purposes under all kinds of weather, like police and drivers' overcoats, etc., in connection with lower grades, a more or less stiff, board like structure is aimed at, *i. e.*, a fabric which besides giving warmth to its wearer will possess a closed face, preventing snow and rain, as much as possible, from entering the structure.

However, with the medium and better grades of beaver cloth, *i. e.*, the bulk of these fabrics, a soft structure is aimed at, a structure which will contain in its interior a great number of fine pores, which, filled with air, become a poor conductor of heat and in turn assist to protect the wearer against the influence of cold weather. Such fabrics have a smooth, soft face, with a hairy covering on the back, imparting to the fabric its characteristic soft feel. The latter is, or has to be produced by means of gigging, for which reason the back filling used must be of such a nature and construction to permit of the easy raising of such a cover, with as little waste in material (gig flocks) as is possible, and without influencing the strength of the fabric. To obtain the result, the proper kind and quality of raw material must be used in the manufacture of the yarn; again, the amount of twist introduced in said backing yarn must not be more than is absolutely required for necessary strength of the fabric, since a hard-twisted yarn will retart gigging, which, when overdone, *i. e.*, forced, will result in a thread then partly broken on the gig in trying to obtain a full-cover nap on the back, which, if obtained in this way would result in a fabric inferior in strength.

As will be readily understood, the looser the interlacing of the back filling is arranged, the softer the resulting fabric structure will be, however too large a float should be omitted.

With reference to the face of the fabric, the same, with the exception of cotton warp beavers, is produced by the warp if dealing with one system of warp, or by the face warp if dealing with double cloth structures, *i. e.*, warp face selection of weaves must be used.

In order to be able to raise the characteristic nap on the face of these fabrics, the greatest of care must be exercised in the selection of the proper stock. A short, fine quality clothing wool must be used, a fibre which will result in a velvety thread, the numerous ends of fibres as composing the thread standing out from its core, again excessive, *i. e.*, unnecessary twist in the yarn must be omitted; both items, if carefully



observed, assisting felting and the gigging during the raising of a short, heavy nap, as is required to be raised out of said felt.

This will indicate to us that for the construction of these fabrics, weaves have to be used calling always for 2 systems of filling, (Face and Back filling) since the position of the back filling in the fabric will, as compared to that of a back warp, always produce a better nap, the teeth of the teasel striking the filling thread in a perpendicular direction, whereas they strike the warp in a parallel position.

We will now give a collection of a few standard weaves for this class of fabrics.

A. One system of warp and two systems of filling.

(1) ARRANGEMENT OF FILLING.—1 FACE: 1 BACK.

Double Satins (as explained on page 101 of the October issue of the Journal) present a smooth face, beside resulting in a stronger fabric structure than common satin weaves. The warp produces the smooth effect in the double satin, and the warp has to form the face of the fabric in the resulting beaver structure, hence our double satins, form a most excellent collection of weaves for the face, for the present subdivision of beaver weaves.

Figures 1, 2, 3 and 4 show specimens of such weaves, *a* showing in every example the single cloth weave, *i. e.,* the respective double satin as used in connection with *b* the respective beaver weave. The corresponding single satin, warp up, is used in the latter for the interlacing of the back filling.

Black type shows the face weave, and

Cross type the back weave

Figure 1 shows the 5-harness (Repeat 5 by 5 and 5 by 10, respectively)

Figure 2 the 6-harness (Repeat 6 by 6 and 6 by 12, respectively)

Figure 3 the 7-harness (Repeat 7 by 7 and 7 by 14, respectively) and

Figure 4 the 8-harness (Repeat 8 by 8 and 8 by 16, respectively) satins used.

Weaves, thus given refer to rather lighter weights of fabrics, more particularly adapted for cloakings and medium weight overcoatings, since on account of the arrangement of the filling of one pick face to alternate with one pick back, we cannot use a much heavier count of yarn for the back filling than compared to that of the face filling. If we want to use a heavier count of yarn for the back filling, *i. e.,* produce a cheaper and heavier fabric, we then must arrange the

(2) COMBINATION OF FILLING.—2 FACE: 1 BACK.

Figure 5 shows such a weave and where *a* shows again the single cloth weave, *i. e.,* the 4-harness even sided twill and *b* said weave backed, 2 picks face to alternate with 1 pick back. Repeat of the latter is 8 by 12. The face picks are shown by *black* type and the back picks by *cross* type.

Weaves 1, 3 and 5 are apt to show a twill effect in connection with low warp textures, a feature which in connection with lower and medium grades of cloakings may not be objectionable, but which, in connection with beaver overcoatings is not desired and where then an absolutely smooth face, minus any twill effect is desired.

In exceptional cases it may be desired to use a still heavier count of back filling and when we then must use

(3) COMBINATION OF FILLING.—3 FACE: 1 BACK.

Figure 6 shows such a weave. *a* is the face weave, *i. e.,* the 4-harness even sided, broken twill, and *b* the backed weave, repeating on 8 warp threads and 32 picks. Face picks are shown by *black* type and back picks by *cross* type.

(4) COTTON WARP BEAVERS.

The same hold a most important place in connection with medium and lower grades of beavers for overcoatings and heavy weight cloakings, and if constructed well, can not be distinguished by the average person from all wool structures. The object aimed at in their construction is to bury the cotton warp into the interior of the fabric, *i. e.,* hide it on the face of the fabric by the face filling and on the back of the fabric by the backing. This will show us that in this instance the face filling alone has to produce the face of the fabric, hence attention must be paid to the proper selection of the stock for it, the same as was explained in connection with the selection of stock for the warp when dealing with weaves Figures 1 to 4; only that in the present instance lower grades of wool, beside better grades of shoddy, will be used, since the fabric has lost its *all wool* character in connection with the clothing merchant as well as the consumer, on account of the cotton warp entering in its construction.

Figure 7 shows us a specimen of such a cotton warp beaver, the same having for its face the 4 by 8 irregular satin weave, shown by itself in diagram *a;* diagram *b* showing the application of the latter for 2:1, for backed cloth.

Repeat: 8 warp threads and 32 picks.

Black type indicates face picks.

Cross type indicates back picks.

In our next article we will deal with beaver cloth constructed upon the double cloth principle, *i. e.,* the bulk of beaver fabrics, taking up in turn the finishing process and later on fancy overcoating and cloaking structures.

To Impart the Lustre and Scroop of Silk to Wool.

The best method for imparting this characteristic property to wool has proved to be the use of chloride of lime and hydrochloric acid, along with an intermediate soap bath. The best method of proceeding is, after thoroughly scouring the wool, to pass it through a weak bath of acid and afterwards work for half an hour in a bath of chloride of lime. The yarn is then allowed to drain, but it is not rinsed. It is then worked again for half an hour in a bath containing hydrochloric acid, and afterwards well rinsed. Treatment in a hot soap bath follows, and, again without rinsing, work in a cold bath of acid, after which the material is ready for dyeing. Lustrous, harsh wools give the best results. The chloride of lime turns the color of the wool yellow, and which then can only be used for blacks and dark colors. For light shades the original color of the wool can be restored by treating it with stannous chloride and hydrochloric acid, without affecting the silky handle.

The chlorination however should not be carried too far, for which reason, the use of hypochlorite of soda, in place of chloride of lime, is advised, better colors, it is claimed, being then obtained.

SILK FROM FIBRE TO FABRIC.

(*Continued from page 52.*)

Wild Silks.

By this name there comes from India, China and Japan, in the market the product of an uncultivated and unattended, *i. e.*, wild silk worm. Compared to the domesticated bombyx mori, their glands are twisted and the ducts considerably larger and more compact, a feature which is the cause of the difference in the structure of the resulting fibre to that obtained from the bombyx mori. Researches in ancient oriental literature show that this wild silk has been used since times immemorial. In the work, *Tschu-king,* Konfuzius states that as far back as in the XXIInd century B. C., the cocoons of the oak tree were collected. In the year 39 B. C., the harvest of wild silk cocoons according to *Fauvel* was quoted at 600,000 *Kg.* = 1,322,400 *lbs.* When the first fabrics from India made from wild silk came to Europe, little interest was then displayed in it, any more than that their brownish shade of color was noticed, the name then given to said silk being *raw silk,* although fully aware that it referred to the product of a species of silk worms not feeding on the leaves of the mulberry tree and had nothing to do with the raw silk of the bombyx mori. However, when towards the end of the 50's, diseases of considerable importance broke out in Southern Europe and the Levant in connection with the bombyx mori, then Europe began to take notice of the wild silk worm and make a study of it, in the hopes to be able to obtain a substitute for the true silk worm; a feature which however can never be accomplished.

The product of the wild silk worm, however, will never equal that of the bombyx mori, since their cocoons, as a rule, do not show the regularity of construction of the latter. Most of the wild silk worms spin interrupted, with the result that ends will become crossed and frequently mixed up, so that in connection with some varieties no unentangling of this mess is possible, and when then such cocoons have to be treated by the spun or the waste silk process. In former days, *i. e.*, previous to the introduction of machinery for spinning such yarns, the product of these cocoons was considered of no value, whereas at present it forms a most important raw product for said yarns.

However, wild silk possesses also advantages, amongst which we find: Durability, on account of its peculiar construction; low price; quantity of silk per cocoon, and finally no care or trouble in raising. Besides these points quoted, it must be remembered that for certain classes of fabrics, like trimmings, ornaments, fringes, furniture coverings, etc., the product of the wild silk worm has obtained a hold, which in many instances may be considered as without a possible substitute.

Another disadvantage of wild silks is the fact that in their natural state they are of a dark color, which cannot be removed completely by means of boiling, but requires the use of a rather expensive bleaching process for this purpose. Some kinds of wild silk also contain stringy substances of doubtful nature, acting variously against degumming and bleaching, producing in lighter shades of colors stripe effects, termed *marinage.* It must be also remembered the difficulty with which wild silks can be matched in dyeing dark shades. Its chemical constitution differs from that of the true silk; wild silk fibres, more or less, resisting the entrance of mordants and dyestuffs. Again, the characteristic flat shape of the fibre, with its slight twist around its axis, reflects light from it under different degrees, with the result that dark shades, even black, will not appear of the full rich tone, characteristic to true silk. However, in connection with medium shades, this change in color to the eye, more particularly with fancy effect yarns, may be an item specially desired.

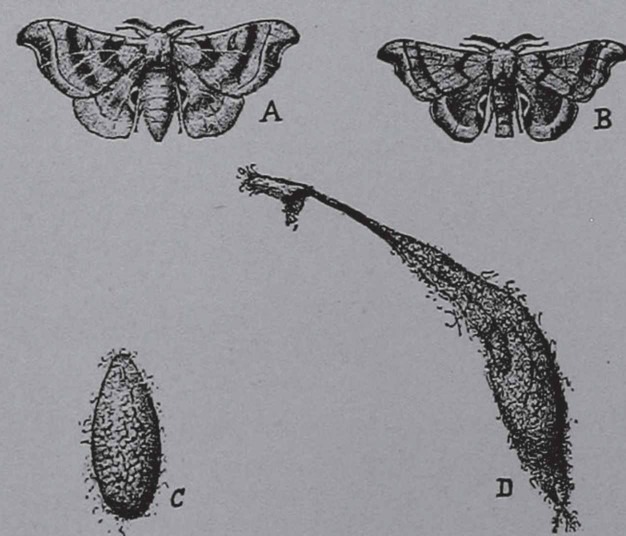


Fig. 12 Theophila mandarina. A Female, B Male, C and D Cocoon.

Wild silks can be divided into two divisions, viz.: such as permit reeling of the cocoon, and such where reeling is out of question.

Amongst the first division we find (1) the wild mulberry worms, (2) Antheræa Yamamay, (3) the Tussah specie, (4) the Monga specie, and finally (5) the Actias specie. Subdivisions 3, 4 and 5 belong also to the Antheræa family.

The second division comprises (1) the Attacus specie, and (2) species of a mixed character.

(1) The Wild Mulberry Worm.

The silk of the wild mulberry worms, whether met with in a half cultivated, or in a complete wild state, may be considered as the medium between cultivated or true silk and wild silk. They are found in India, China and Japan, and (according to *Bretschneider* in his work on Chinese silk worm trees, published in Peking) are known collectively as *Yen-ssé.*

Amongst varieties of this silk, of importance are: *Th. Huttoni,* a native of the N. W. Himalaya, producing in some parts of that country two generations a year, in others, only one. This worm produces a fine white or yellowish, more particularly a gray silk of a very good quality.

Another variety of importance is the silk known in China as *Tien-ssé,* the product of the *Th. mandarina,* a light brown worm closely resembling the true silk worm. The cocoon obtained is of a nearly white color, easily reeled off if soaked in a soap bath. The size of the cocoon is 27 by 10 *mm* and of an average weight of from 25 to 30 *cg*, in dry and empty condition about 5.5 *cg*. One *Kilo* contains about 5,800 cocoons of which about 235 *g* are silk and the rest pupa or chrysalis. One cocoon furnishes about 45 *mg* silk, hence there are needed 22,222 cocoons for 1 *kg* grège. One cocoon furnishes a silk fibre of from 150 to 210 *m* in length. Its elasticity varies from 8 to 12%, strength is 8 *g* and loss in degumming about 23%. The product is a yellowish, beautiful fine silk and is used in the manufacture of extremely light textured fabrics.

Th. mandarina furnishes two generations a year, viz.: in June to July, and August to September. This variety of silk is also met with in Japan and where it is called *Naraoko* or *Kuwago*. In India, according to *Liotard*, this silk worm is met with in an absolutely wild condition. There are several other varieties of wild mulberry silk worms met with, but which are not considered of sufficient commercial importance.

(To be continued)

RIBBONS, TRIMMINGS, EDGINGS, ETC.

A Treatise on Narrow Ware Fabrics.

(Continued from page 103).

Hollow Weaves with Stuffer and Figuring Threads.

In these fabrics, the stuffer warp threads rest, *i. e.*, float between Face and Back structure, not visible on either side of the fabric; being for this reason raised on every back pick and lowered on every face pick.

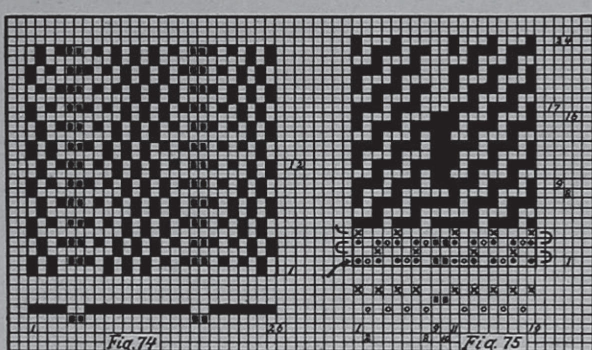


Fig. 74 Fig. 75

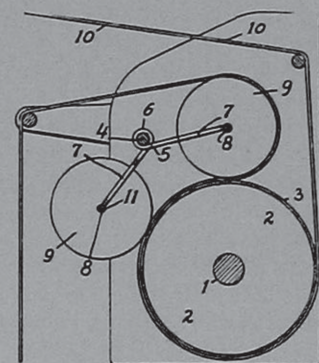
If said stuffer warp threads, at the same time are also used for the purpose of figuring on the face, or the face and back of the fabric, they then must be raised on the respective face picks when required to be seen on the face of the fabric, and lowered on the respective back picks when required to be seen on the back of the fabric structure.

Fig. 74 shows us a hollow weave in which the stuffer warp threads float between the face and back throughout the entire repeat of the weave of the fabric. These stuffer warp threads are shown in weave as well as *gamut* given below the weave, in *rectangular* crochet type.

Weave Fig. 75 shows us *regular double plain*, with stuffer and figuring effect, *i. e.*, the two stuffer warp threads (9 and 10) shown in the *rectangular* crochet type in gamut (as given below weave), float between face and back structure on picks 1 to 8, are then shown to float on face of fabric structure on picks 9 to 16, and on the back of the fabric structure on picks 17 to 24.

Take-Up for Ribbon Looms.

This new Take-up mechanism refers to looms which include drums for drawing the fabric from the looms. The new take-up leaves the front of the loom entirely free and unobstructed, and does away with the cumbersome wooden frame usually employed.



The accompanying illustration is a diagram showing the principle of the construction and operation of this take-up. Examining said diagram we find rigidly mounted upon shaft 1 a series of take-up drums 2, (one for each ribbon) having a surface of sand paper 3 applied thereto.

Parallel to this shaft 1 is provided a second shaft 4. Adjacent to the drum 2, the shaft 4 has mounted thereupon a pair of spring wire yokes 5, provided at the centre with one or more coils 6 which constitute helical springs. The yokes are mounted upon the shaft by means of the coils 6, and have arms 7 extending in opposite directions. At the ends, the arms are formed into laterally disposed toes 8. Rollers 9 are used to hold the fabric 10 in engagement with the drum. The rollers, at the ends, have recesses 11 formed, to receive the toes 8 of the yokes and whereby the rollers are pivotally mounted in position and held in engagement with the drum 2.

The arrangement is such that the spring coils 6 force the rollers 9 against the drum 2 by means of the arms 7. Consequently, if for one or the other reason one of the rollers is forced away from the drum 2, the connecting yokes effect a firmer engagement of the other roller with the drum. The fabric 10, passes from the loom around the drum 2 and between the same and the rollers 9, and subsequently around one of the rollers.

DESIGNING AND FABRIC STRUCTURE FOR HARNESS WORK.

GRANITE WEAVES.

These weaves are used for fabrics where broken up effects on the face are desired, the object aimed at by the designer being to produce correspondingly, small, broken up effects in the weave. The most important point to be kept in mind by the designer, when planning new weaves of this system, is to keep away from producing fancy twills, remembering that such weaves will result in many instances without any intention on his part, whereas in many cases it will be more or less impossible to drive away from these twill lines, and when then they must be well broken up affairs, omitting twill effects as much as possible. For this reason, the best plan to obtain good granite weaves is by using our satin weaves for their foundation, for the fact that the object aimed at in designing satins (see page 99, Vol. I) has been to arrange a stitching, as much as possible distributed. In some instances, twill weaves (distributed) may be used for their foundation, but as will be readily understood, considerable more care must then be exercised in the formation of the new granite weave; again granite weaves may be obtained by means of arranging certain effects after a given motive. Using satin weaves for their foundation, remains however the most important plan of constructing granite weaves, hence forms more particular the subject of the present lesson.

As will be readily understood, the repeat of the weave used at the same time indicates the repeat of the resulting granite, by what is meant, that if we use, for example, an 8 leaf satin for our foundation, the resulting granite is then an 8 by 8 harness granite; again, if we would distribute said 8 leaf satin over 16 warp threads and 16 picks, *i. e.*, use every other warp thread and every other pick only, when laying out the foundation of the granite, the resulting granite will then repeat on 16 warp threads and 16 picks.

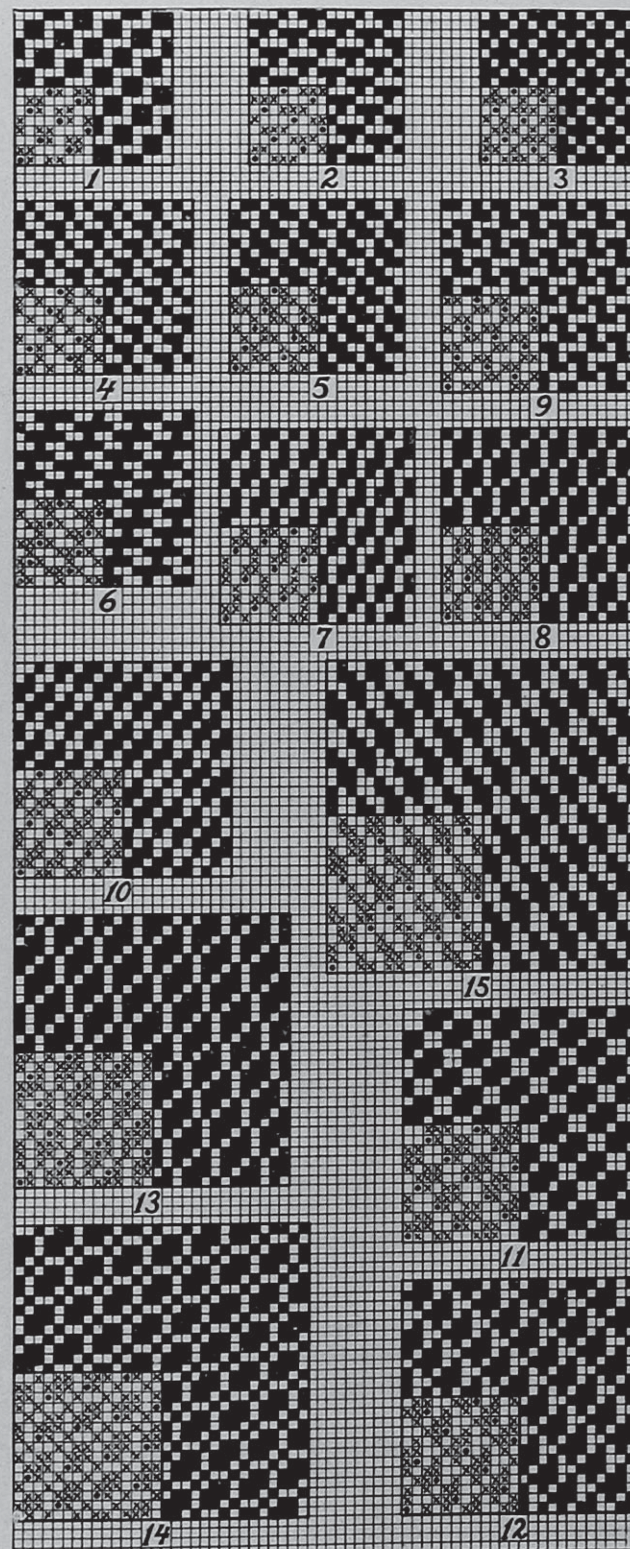
Constructing Granite Weaves from Our Regular Satins.

RULE: Place your satin, filling effect, on the point paper and then add risers on top, obliquely, at the side, or at the bottom to this foundation spot, uniformly for each spot, until a perfect granite weave is the result. Remember, that in many cases this procedure will result in an imperfect weave, by what is meant, that *not every effort* made to construct new granite weaves *will result in a perfect weave.*

Painting out with color the effect obtained, for four or more repeats, will in most instances show whether you obtained a perfect weave or not. This will show to the student that granite weaves are not as easily constructed as other systems of weaves; they require thinking and lots of patience.

This will indicate to the student that it will be well for him to lay out the foundation satin for more than one repeat (say two repeats each way, is a good plan) and then carry out the rule given before throughout these four repeats.

Always add one spot at a time to each foundation spot of the satin, do not be too hasty, and it will prevent risers from running into risers belonging to another foundation spot, which might be the case provided you would add several spots at a time to the foundation spot of the satin.



Go to work slowly and carefully, and after a little patience you will be astonished at the nice variety of new weaves you will obtain.

This unavoidable trouble in connection with the construction of granite weaves thus referred to, will at the same time indicate to you that it will be well for you to keep a record of any good granite weave which you will design or come across, and for which reason in connection with the present lesson, we illustrated some of the most frequently met with granites, all being practical weaves which will produce the result aimed at—well broken up effects on the face of the fabric. At the same time, when consulting our "*Dictionary of Weaves,*" appearing regularly every month, the student will notice that we have kept a record of all good granites which came to our notice during the last 35 years of practical work, and which will readily demonstrate to the practical man the importance of this Dictionary, and where he will find thousands and thousands of good weaves at his command, by preserving the files of this Journal.

We will now explain the plate of weaves accompanying this article, *i. e.,* granite weaves Figs. 1 to 15 inclusive, and when, by studying these examples, the student will be able to construct any number of new granite weaves, as the case may require in practical work.

In connection with these fifteen examples of granite weaves shown, we indicated in the left hand lower corner the foundation and the construction of the weave by means of different kinds of crochet type used, the other three repeats of each weave given, being all shown in one type, viz.:

Dot type shows the foundation satin (filling effect) for one repeat.

Cross type shows all the spots added to the spot of the foundation satin.

Black square type shows three repeats of the resulting granite weave executed in one type.

Dot, cross and *black* square type are for risers, *empty* squares indicate sinkers.

Weave Fig. 1 has for its foundation the 8-harness satin (see *dot* type), to each of which spots we added additional spots on top, to the right, and oblique up to the right. The repeat of the granite is 8 warp threads and 8 picks.

Weaves Figs. 2 and 3 show two other granite weaves having the 8 harness satin for their foundation, and which from explanations given in connection with weave Fig. 1 as well as the different kinds of type used, will explain themselves.

Weaves Figs. 4, 5 and 6 illustrate three 9-harness granites, obtained in a similar way as previously explained, having the 9-harness satin filling effect for their foundation.

Weaves Figs. 7, 8 and 9 have for their foundation the 10-harness satin.

Weave Fig. 10 has for its foundation the 11-harness satin.

Weaves Figs. 11 and 12 have for their foundation the 12-harness satin.

Weave Fig. 13 has for its foundation the 14-harness satin.

Weave Fig. 14 has for its foundation the 15-harness satin.

Weave Fig. 15 has for its foundation the 16-harness satin.

Examining our plate of weaves, or if constructing new weaves, it will be noticed that weaves of an even repeat, as for example, 8, 10 and 12, will result in better effects, *i. e.,* well broken up effects being easier obtained in weaves repeating on an even number of harnesses than those of an uneven number, a feature readily explained by the fact that if considering the foundation satin used in connection with the repeats of granites quoted, it will be noticed that they present a better broken up arrangement of their spots of interlacing than satin weaves of an uneven repeat of harnesses, and when naturally what holds good for the foundation, will hold good at the same time for the resulting new weave.

Question:

Construct one additional new satin for 8, 10, 11 and 12 harnesses.

(*To be continued.*)

STRENGTH, ELASTICITY, TWIST, CONTRACTION BY TWIST.

It is well known that *face* and *feel* of a fabric may be varied indefinitely by varying the amount of the twist in the yarn used in its construction. For instance, let us consider two extreme cases: Most any kind of yarn, whether single, two or more-ply, can be made to handle harsh or wiry by an excess of twist imparted to it, a feature which in some few instances may be the object aimed at, whereas in most cases, it would result in an unsalable article; again, most any weaver will know the result of a warp without sufficient twist to permit perfect weaving, besides the finished fabric then presenting not the desired *feel* to the hand, again, the fabric may be lacking in strength.

THE OLD FASHIONED PROCEDURE.

The general plan observed for testing yarns for its strength, *i. e.* its breaking strain or the elasticity of the thread, is by stretching or pulling the thread as held between the thumb and forefinger of each hand, and noticing the amount of strain required to break it. In some instances, a certain length of thread is guessed at and the procedure carried on by holding the thread against the edge of a bench or table, the length of stretch given to the thread before it broke being guessed at, neither considering that possibly the hand had moved an inch or more or less than what he thought it had.

In the same way the twist is counted. The person examining the thread submitted for duplicating or testing, thinks he has for example 6 inches of thread between the fingers of the hand that holds one end and the fingers of the other hand, that in this instance does the untwisting of the thread; he may also think that he turned that thread just 48 times; he knows that 48 divided by 6 gives him 8 turns per inch, but he does not know, nor never will, whether he has 6 or 10 turns per inch in sample of yarn thus tested.

THE PROPER PROCEDURE.

However, we are glad to notice that his old fashioned style of testing yarns as to strength and twist, *i. e.*, guess work, is rapidly done away with by the more progressive mills, mechanical apparatuses being substituted for the work, which in turn record results with mechanical precision. Such tests, systematically carried on in a mill, will repay the cost of the apparatus a hundred fold in a short time, since by their aid, differences in yarn are at once detected. The yarn spinner, knowing that a certain manufacturer tests his yarns, in this way keeping a record of it, will be more careful in his deliveries. Poor lots of yarn will seldom, if ever, enter such a weave-plant. At the same time, such testing will be of benefit to the mills spinning their own yarns, since it will act as a record between the spinning and weaving departments. It will protect the weaver from being overrun with poor yarn and compel each overseer, from the buyer to the spinner, to keep his eyes on the condition of the material submitted to him, since his work in the next department may be rejected, the overseer of said department having to do this, to protect himself. It will faithfully record how changes made in the quality of the raw material affect the spun yarn; it will show the correct turns of twist per inch necessary to result in a maximum of strength to the yarn, considering at the time the purpose of wear the final fabric is destined for.

In order to ascertain exactly the strength of the various fibres or yarns, the amount of their elasticity, the use of a little apparatus, as shown in the accompanying illustration, Fig. 1, will be found of great advantage. Letters of reference in the illustration indicate as follows: A, is a base board of hard wood (generally leaded) upon which is fixed a pillar B. The top end is forked into a jaw, carrying on each side a screwed center-piece, into which is fixed the fulcrum of the lever C, D. These two center-pieces can be screwed closer together, or further apart, as required, and the pivot which forms the fulcrum E, of the lever is pointed at each end, and fits into a hollow in the two ends of the center-pieces and enables it to work perfectly free, and yet can have no lateral motion as would be the case if knife edges were used.

The lever from E to D is divided into five equal parts, each of which is equal to the distance of the center of the jaws C, from the center of the fulcrum at E. G, is a balance weight to counterpoise the longer arm E, D, of the lever. Each of the five divisions of the lever E, D, are divided into ten parts. The range of the instrument depends upon the weight of the sliding weight F, and which can be varied when desirable. Three different weights, *viz.*, 50 grains, 100 grains, and 1,000 grains are most frequently used, and the range of the instrument with these different weights is as follows:

WEIGHT	1ST DIV.	2ND DIV.	3RD DIV.	4TH DIV.	5TH DIV.
Grains.	*Grains.*	*Grains.*	*Grains.*	*Grains.*	*Grains.*
50	50	100	150	200	250
100	100	200	300	400	500
1,000	1,000	2,000	3,000	4,000	5,000

By using the intermediate decimal divisions of spaces on the levers, we obtain in the case of the 50 grains weight, an increase of 5 grains for each division; with the 100 grains weight, 10 grains for each division, and with the 1,000 grains weight, 100 grains for each division; so that the range is from 50 grains up to 5,000 grains, with difference of not less than 2.5 grains when the 50 grain weight is used, 5 grains when the 100 grain weight is used, and 50 grains when the 1,000 grain weight is used. At the end of the lever D, a graduated scale H, is placed, divided into spaces which enable the elasticity of the fibre to be measured in terms of the distance of the two jaws C, and I, from each other. The generally used arrangement is that if the jaws C, and I, are separated one tenth of an inch it will indicate half an inch on the scale H, thus enabling very small ranges of elasticity to be readily seen.

A small stop S, adjusted by a thumb screw at the back of the plate, is inserted in a long slot in the

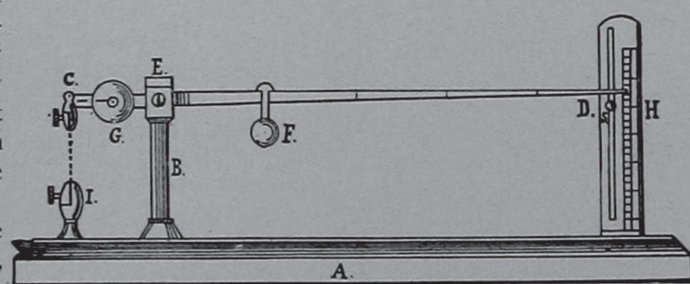


FIG. 1.

divided plate so as to prevent the lever from falling when the point of fracture is reached.

For moving the weight along the lever a fine silk thread (attached to the ring which slides along the lever) is generally used so as to avoid any pressure which otherwise would be exercised if using the fingers. Generally two or more experimental tests are made previously to the final ones as required for reference.

Another type of this class of testing apparatus is manufactured by Mr. Charles H. Knapp, Paterson, N. J., Specialist in building instruments for testing yarns and fabrics. In this type of machine, water is used as the means of producing the necessary weight for straining and breaking the thread. The water, in question, flows (drops) from a receptacle on the top of the machine into a suspended can on the balance, which is capable of holding a certain amount of water equal to a certain weight, the flow being regulated by the action of the beam. The stretch of the thread is indicated by a movable rod which acts in conjunction with the lower jaw, the rod being graduated to fractions of an inch. A number of tests should be made from as many bobbins or hanks selected at random from the bulk, and an average obtained, at the same time taking into consideration the variation. The quality and resisting power of the fibres of which the thread is composed, as well as the evenness of the thread, will thus be indicated by the results obtained for strength, *i. e.*, the load or weight under which the thread stretches and breaks, *i. e.*, the stretch of the thread up to the breaking point.

TWIST.

The turns of twist per inch to put into a yarn, as previously referred to, tends to determine its strength, elasticity, as well as final result in the finished fabric, for which reason, when desiring to duplicate a given yarn, its number of turns of twist per inch must be ascertained. For ascertaining this point, Mr. Knapp also builds a Twist Tester, a perspective view of which is given n Fig. 2. In the same, one end of the thread to be tested is secured between the jaws of a short

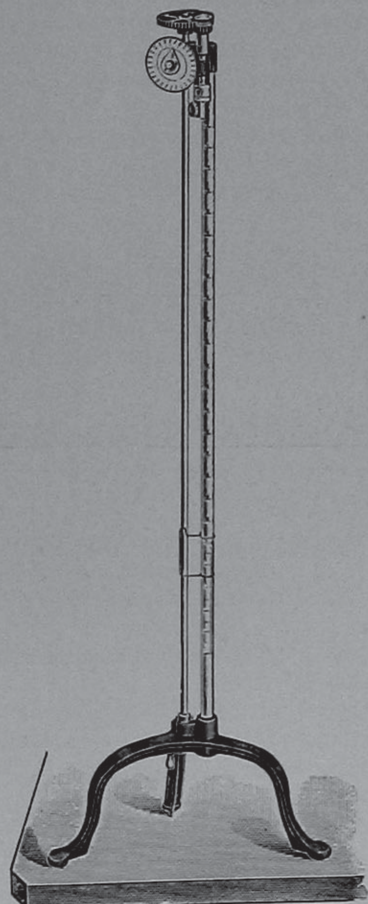


FIG. 2.

stud shaft, which operates in conjunction with the dial indicator. The other end of the thread is secured to a movable indicator, sliding on the supporting rod of the apparatus. In operating the hand wheel, the stud shaft will rotate, causing the worm on the latter to transmit the motion to the dial wheel, thus indicating the amount of twist taken out of the thread, or *vice versa*, if so desired, added to the thread. The tension weight or indicator to which the lower end of the thread is secured, acts as a weight to keep the thread taut during the operation.

When dealing with a two-ply yarn, insert during testing a needle between the singles, close to the fixed jaw on the stud shaft, slide said needle down the thread as the latter is untwisted so that the operator will see at a glance when all the twist is taken out of the compound thread. When dealing with three-ply yarn, two needles must be used.

The matter however is not as easy, if dealing with single yarn, in which case the microscope must be used, in order to ascertain when the yarn is free from twist.

CONTRACTION BY TWIST.

This apparatus of Mr. Knapp, as before described, at the same time, registers besides the twist in the yarn, another most important item to manufacturers, telling them at a glance the amount of *contraction of the roving*, when dealing with single yarn, or the amount of *contraction of the minor threads*, if dealing with two or more-ply yarns, by the distance moved of the tension weight. This amount of contraction, more particularly with folded yarns, is a most important item to the mill, indicating to them in the latter instance the resulting length of the minor threads. The amount of this take up of the minor threads, varies with the number of turns of twist per inch, also the character of the material. The apparatus, as shown in the illustration, refers to the testing of two or more-ply yarn of equal counts of minor threads. When dealing with minor threads of unequal counts, an additional indicator weight with its corresponding parts is required.

RUSTY SILK.

By James Chittick.

There is a defect that is not infrequently met with in the manufacture of broad silks and ribbons to which the name of *Rusty silk* has been applied.

It has given more trouble in ribbons than in broad goods, since owing to the peculiar nature of the defect, it is more concentrated in the narrow fabrics and therefore more conspicuous. In medium to dark shades it is not apparent, but in whites and delicate shades it is very perceptible.

The defect referred to is caused by a series of very small and fine brownish lines, or dashes, in the filling, varying in length from say $\frac{1}{32}$ to $\frac{3}{8}$ of an inch. It rarely occurs in the warp, in the filling it is usually found only in the lower grades of silk.

There are a number of ways in which silk may become spotted and so exhibit a defect of somewhat similar character. For instance, for certain purposes the thrown silk, while still on the reel fly, may be put in the steam box to set the twist. If the lining of this box is of rusty iron, there may occur a drip on the silk that subsequently appears in the form of stains.

At the dye-house, also, the silk may be exposed to influences that will spot it after it has been dyed, and similar damage may result if the dyed silk is improperly stored or looked after.

Then, in the mechanical processes of the mill, if the various metal parts of the machine, or the guide wires and friction bars, with which it comes in contact, have been allowed to become foul and rusty, trouble of the same sort may arise.

In all of these cases it will be observed, if the silk is examined under the glass, that most, or all, of the raw silk ends in the thrown silk, have been stained where the spots occur.

This however, is not so in the case of the *rusty* silk. This defect is very hard to detect in the dyed silk thread, or in the thrown silk before dyeing, and it is next to impossible—save by chance—to find it in the raw. In practice it is never seen until it shows up in the goods.

When a thread with this defect in, is picked out of the fabric and put under a good microscope, the interesting discovery will usually be made that but one of the filaments of which the primary raw silk thread is composed shows the stain. In ordinary tram stock there will have been five or six cocoons reeled together, and if the silk has been thrown, say, into four thread tram, the defect will only exist in $\frac{1}{20}$th to $\frac{1}{24}$th of the filaments in the thread. This is so trifling a part of the thread that it is no wonder that it escapes the observation when the raw and thrown silks are inspected.

We will now consider how the trouble originates.

After a silk worm has spun its cocoon it changes into a chrysalis and remains in a dormant condition for two or three weeks, at the expiration of which time it has changed into a moth and bursts its way out of the cocoon, tearing a hole through the end of it, to allow of its passage.

This, of course, destroys the cocoon for reeling purposes, owing to the mutilation of the filament, and it then has to find a use as material for making spun silk, though of very small value compared with its worth if unpierced.

To prevent this damage to the cocoons care is taken to see that the chrysalides are killed by exposure to heat before the time when the moths might be expected to emerge, but sometimes, owing to carelessness or circumstances, this is not attended to in time and many cocoons are destroyed for reeling purposes in consequence.

The cocoon envelope is hard and tough, the gum of the silk giving it almost a parchment like consistency, so, to enable it to tear its way through this covering, the moth ejects from its mouth a quantity of a dark brownish colored fluid which softens the end of the cocoon and allows the insect to work its way out. All pierced cocoons will be found to have a dark brown edging to the holes made by the moths.

Now, if a lot of cocoons had been kept too long for safety before the killing of the chrysalides, and were then put in the heating ovens or chambers, it would not infrequently happen that individual moths would have emitted this softening fluid but would have been killed by the heat before they had a chance to pierce the cocoon. Such cocoons might only be stained part way through, the defect being then not very noticeable, or the stain might, and generally would have gone clean through to the outside.

In addition to cocoons so stained there will be such as have been badly crushed before drying, while the chrysalis was yet soft and juicy, and a similar brown stain, but irregularly distributed, may be created in this manner.

Before being reeled, the cocoons that have been purchased by the establishment are carefully sorted into different groups, usually a first, a second and a third grade. All double, crushed, stained, pierced, and otherwise defective cocoons being thrown aside for spun silk stock.

In a well managed reeling establishment, or filature, making good qualities of silk, all stained cocoons would be rejected, but in mills where the management is less particular, and in which only lower grade silks are produced, such stained cocoons, either through carelessness or intention, might be reeled up into the lowest quality made by the mill, and the difficulty of detecting this abuse would favor its continuance.

The stains referred to, will be nearly circular in shape, about three-eighths of an inch across, and of an intense brown, which retains its color through the dyeing processes. As the length of the reelable silk in a cocoon will be many hundreds of yards, and as the thread is constantly crossing and recrossing the stained spot, it is evident that even one cocoon, so stained, can do a lot of damage. Thus, if a three inch ribbon were being made with one hundred picks to the inch, and if the moderate amount of four hundred yards of silk were reeled from the cocoon, this defective cocoon would do more or less damage to the ribbon for a length of forty-eight inches.

When raw silk is inspected only a few sample skeins out of a lot can be examined, and even if on the lookout for this "rustiness," and it actually existed in a skein under examination, it would not be an easy matter to detect it.

The buyer of the silk, therefore, has small chance of being allowed any claim for damage by the raw silk importer, as the latter has not had, and could not well have had, any intimation or knowledge of the trouble, and it could not be shown to exist within the limits of time within which claims on raw silk must be made.

When *rustiness* crops up, it would be well to re-dye all the whites and pale shades dyed from that particular parcel into darker colors and dye fresh lots for these light tones from some other lot, preferably one of better grade. The seller should, of course, be notified of the trouble and the buyer will no doubt be careful to buy no more silk of the concern that gave him this trouble.

Embossed Effects,

such as crepe finish, obtained by the usual embossing process have the fault of sensitiveness to moisture, they being lost when the goods are ironed or sprinkled with water.

A new process, invented by Dr. During of Berlin, has for its object the overcoming of this disadvantage, and consists in impregnating the fabric with a solution of egg or blood albumen, or of casein, or a mixture of these, and then calendering it, either cold or nearly so, so that there is no coagulation during calendering. When the fabric leaves the calender, it is then heated to bring about the protective coagulation on both sides of the fabric.

As the albuminous body used is not coagulated in the calender, there is no clinging to the rollers, and hence no necessity to clean the rollers, or trouble from smearing of the embossed parts of the fabric. The casein or other albuminous body used, can be dyed for the production of certain effects.