A COTTON FABRICS GLOSSARY

Textile Newspaper Circulations

[From the American Wool and Cotton Reporter.]

THE Twentieth Anniversary Number of this journal appeared in April, and during this period of a score of years we have met with more or less of that imitation which is the sincerest form of flattery.

As the quality of newspaper circulation depends largely upon paid subscriptions, we will give the sum of three hundred dollars ($300) if it can be proven that the cash collections from subscriptions of any other textile newspaper, either weekly or monthly, during the year 1906, were equal to those of the American Wool and Cotton Reporter. The conditions of this offer are that the journals submitting to this test on both sides shall submit their books to a public chartered accountant, that the inferior party upon either side shall forfeit the sum of three hundred dollars ($300), and that the money shall be divided as follows: $100 to the National Association of Woolen and Worsted Overseers; $100 to the National Wool Growers' Association; and $100 for some form of prize in such cotton manufacturers' association as may be selected. This offer is open until further notice.

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A Cotton Fabrics Glossary

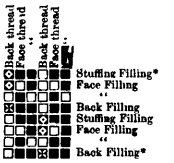
CONTAINING INSTRUCTIONS FOR THE MANUFACTURE OF EVERY KNOWN GRADE AND VARIETY OF COTTON FABRICS

"PIQUE" OR "MARSEILLES."

The quilted weave, as applied to cotton fabrics, is known among weavers as the "Marseilles" weave. It is a double cloth, the face being a moderately close, plain weave. The back is a very open, plain weave. Between the back and face a soft twisted heavy filling, called "stuffing," is woven. The two cloths are stitched together at frequent intervals in weaving, the stitches being arranged so as to sufficiently bind the two cloths together, and at the same time form an ornamental design or pattern. The "stuffing" between the cloths gives the fabric the embossed effect.

THE FACE

being plain woven is drawn into heddles as for sheeting. The back is also a plain weave, but the back warp is also the quilting warp, and has to be mounted in a "jacquard" harness, unless the pattern is small enough to be produced on a "dobby." Two face threads and one back (or quilting) thread are drawn into each dent of reed. The construction is shown in diagram, Fig. 1.



Two threads of face and one of back warp are drawn into each dent of reed. Back warp is on a separate beam, and contains one-half the number of threads that are in the face

Fig. 1.

☑Indicates that the thread is raised by the Jacquard only when used for building. ☒Shows same thread when raised by the comber board regularly to form the back. * Back filling same as face.

THIS CONSTRUCTION

calls for a loom with two shuttle boxes at each end of lathe. Large patterns require a "jacquard" attachment, while the small designs may be made on a dobby head; also two warp beams are necessary. In operation the loom throws in one back, two face and one stuffing pick in regular order. To make the embossed effect show up well the back warp is woven with considerably more tension than the face.

AS AN ARITHMETICAL BASIS

for the construction of this fabric, about 11 times the square root of the average hank number on face and back may be used. The "stuffing" should be four times as heavy as the average number used for face and back. On this basis a Marseilles quilt or counterpane, if woven with average No. 35 on face and back, and No. 8¾ stuffing would have:

64 threads per inch of No. 30 warp on face.
32 " " " " 30 " back.
64 picks " " " 42 filling on face.
32 " " " " 42 " back.
32 " " " 8¾ " as stuffing.

and if woven 12 quarters square, would weigh about 3 9-10 pounds per quilt; or take a 30-inch vesting fabric, made of average No. 80 yarn on face and back and 40 stuffing. The stuffing yarn in this case is only twice the weight of the face, but there are twice as many picks relatively thrown in. There is no back filling used in vestings. The back, when not used in quilting, is floated. The organization would be:

98 threads per inch on face,
98 picks " " " Average No. 80.
98 " " stuffing No. 40.

The picks are thrown in two face and two stuffing regularly. At 30 inches wide the goods would weigh 4 65-100 yards per pound.

IN THIS EXAMPLE

the average number of the face yarn is given. The fabric looks better and

wears better, if warp and filling on face are alike, but it helps the weaving out wonderfully to have a considerable difference between the two, the warp being from 10 to 20 per cent heavier than the filling.

It is beyond the scope of an elementary article like this to attempt any description of the means used to produce the ornate designs of the fabric. The artist who originates textile designs must draw each design to fit the fabric he is dealing with. Each fabric has its special characteristics as to design, and each also has its limitations. The characteristics and limits of the fabric under consideration may be here stated.

COLOR EFFECTS.

1. Color effects are hardly admissible. The fabric is essentially a white one. The quilting warp is sometimes colored, so as to show a pattern composed of colored lines and dots on a white ground. The design is not thereby altered, for the pattern woven with colored stitching may also be woven entirely white.

2. The fabric admits only of a design of "dots" arranged to produce large designs.

3. In the vestings and fabrics with small patterns, the quilting warp threads, when not raised to make a stitch, are floated. The dots then should be arranged so as to avoid very long floats.

4. On counterpanes the design has to be very large, and has to be produced on a "jacquard" machine of comparatively small capacity. This calls for a design that can be enlarged in the tie-up of the harness and to this end certain parts of the design are arranged so as to admit of several repetitions.

THE NAME "PIQUE"

is now generally applied to this fabric when woven in small patterns within the capacity of the "dobby." This name particularly applies when the goods are to be used for ladies' and children's dresses, men's shirt fronts, etc. However, the fabric that is called "pique" when used for dresses or shirt fronts, would be a "Marseilles" if made up into a man's vest. The name "pique" is probably from the French "piquer," to quilt or prick with a needle. Possibly the name "Marseilles" is also a corruption of the French "matelas," a quilt or mattress.

A CORDED "MARSEILLES."

or "pique" is essentially the same fabric as the figured article, but is woven rather differently. The warp is drawn into a three-shed harness like a common three-shed twill. To produce the corded effect the harnesses are operated by a dobby. Two warps are used as in the preceding cases, one warp having twice as many threads as the other; the quilting warp is drawn into the back harness, the face warp in the middle and front. The pegging plan of dobby chain is shown at Fig. 2.

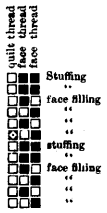


Fig. 2.

As this weave calls for four picks of face filling and two picks of stuffing in succession, the lathe need only have drop boxes on one end.

QUILT WEAVE GOODS

should be finished so as to preserve, as far as possible, the convexity or puff of the quilting. To this end, after bleaching and sizing, they should be dried on tenter-hooks. The piece goods can be dried on the tentering machine, through which they should run face down. The quilts or counterpanes are handled singly, and are stretched on square tentering frames and dried in a hot room. There is a fabric on the market called "P K," which is often confounded with "pique," the names having the same sound. "P K" is a float weave and the fabric bears no relation to "pique" or "Marseilles."

TUCKS.

Cotton Wash Fabric.

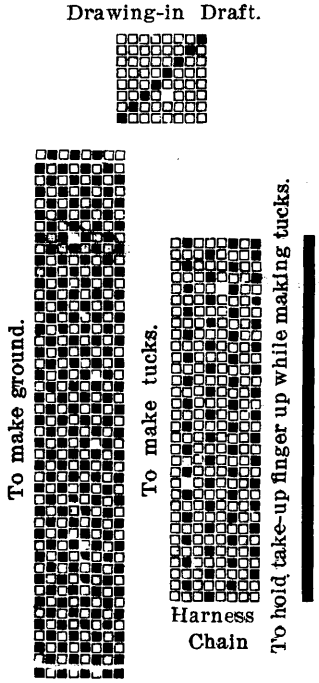
A tuck fabric is a single cloth and is made by using two or more warps, is generally composed of all cotton, cotton and silk, and all silk, and can be made on any loom having either a dobby or a jacquard attachment, and single or double box, double box looms, of course, giving great scope for filling patterns.

A tuck effect in a cloth is a perfect pleat running across the cloth from one selvage to the other and was used extensively a few years ago in making

fancy bosoms for men's outing or neglige shirts and ladies' waisting, very elaborate effects being produced by weaving ground cloth in colors either harmonizing with or contrasting to that of the tuck.

Two different numbers of filling are used in this fabric, namely, a fine one for the plain ground or flat part of the cloth, and a coarse number for the tuck as the tuck is a filling effect, and the coarse filling causing it to stand out more prominently from the ground fabric than would be the case if fine numbers of filling were used to form the whole fabric.

In making a common tuck effect two



beams are necessary, also 10 harness or heddle shafts. The top beam containing the tuck warp is drawn in on the 2, 4, 6, 8th harnesses, and the bottom beam, containing ground warp, is drawn on 1, 3, 5, 7th harnesses, the other two harnesses to work independently for selvage, plain weave being used all the time.

The harness or head chain is pegged to work all the harnesses plain weave at the same time for whatever length of plain ground is desired in the cloth being woven. "For example, if you want 40 picks plain ground cloth before weaving" the tuck, simply peg the chain plain weave on all harnesses for 40 picks. Then to form the tuck peg the chain so as to work only tuck harnesses for plain weave, for number picks necessary to give length of tuck desired, the ground harnesses being at rest.

While the tuck harnesses are working, the take-up motion is temporarily dispensed with by coupling the take-up finger to a jack in the head motion by running a strap over the top of the loom and down the side. After having woven the desired number of picks to form the tuck, as the loom turns over, all the harnesses are set working plain weave, and as the first pick of the chain operates the head motion, tne take-up finger drops, the take-up motion is again in gear, and the reed beats in, the pick binding the turn and throwing it out from the ground fabric.

This fabric is generally made to finish from 2½ to 3½ ounces and 27 inches wide.

CONSTRUCTION COMMON TUCK.

1,300 reed, 2 ends per split, 1 end per heddle, 29 inches width in reed, including selvage; 1036 plus 16 splits, 2072 plus 64 ends. Ground warp and tuck warp, 1-40s cotton; 70 picks per inch 1-40s cotton filling. 7 per cent shrinkage in width in weaving and finishing; 10 per cent shrinkage length finishing and weaving.

Tuck pattern: 46 picks 1-40s cotton for plain ground; 32 picks 2-20s cotton for tuck. Selvedge, 4 in a heddle and split. Finish, about 3½ ounces.

SCRIM.

Scrim. A loose woven, flimsy-looking cloth, composed entirely of two-ply cotton yarn, both warp and filling, and resembles a fine meshed fish net.

Scrim is usually made in bright colored stripe and plaid effects. It is peculiarly adapted to the draper's art, as it is a light-weight creation, therefore soft and pliable; it is also used as a fly net for horses in the summer time.

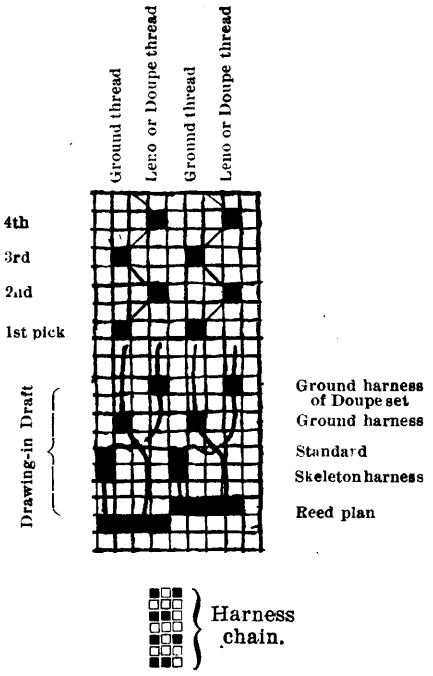
Scrim is made of 2-20s cotton, dry color, in both warp and filling, and as a fabric requires nothing in the nature of a finish except being run through a hot press, simply to smooth the wrinkles which may occur during the process of weaving.

By using 3-10s and 4-10s cotton warp and filling, and of course in proper pro-

portions, we produce hammocks and material for laundry bags with this same scrim weave, or, to be correct, gauze weave. Scrim can be woven in any power loom, but best results are obtained by using a light running loom such as Bridesburg or Mutual. The

SCRIM WEAVE OR LACY EFFECT

can be produced by using a regular doupe set of harness, but the best, quickest and cheapest method is by using an attachment known as the Ashoff



This weave applies to a fabric (scrim) in which the Doupe set is working every pick, and each Warp thread working with a mate thread, and producing perfect Leno effect.

NOTE. In drawing in the Ground thread crosses over the Doupe thread.

motion, which is an improved set of harness or heddle and heddle shafts built especially for this kind of effects in cloth. This motion consists of two heavy wooden frames built similar to heddle frames and suspended in the loom from the top roller, in the manner in which old roller looms were equipped for weaving gingham.

In place of heddles these frames are filled with a coarse reed, in accordance with number of splits per inch required for fabric; these reed dents are plugged with lead, alternately top and bottom, and two ends are drawn straight through both harnesses.

THE ASHOFF MOTION

makes a shed in the regular roller loom style or by treddle or cam, and has likewise a sideway movement, which is obtained by placing a small eccentric on the bottom loom shaft.

Near the side of loom this eccentric is connected by a one-half inch iron rod with a pair of bevel gears which are fastened on the loom frame at a point equal to the centre of the shed. These gears are in turn coupled by smaller rods to the heddle frames, and create the side motion, which allows the threads to operate in a sort of rolling motion or, in other words, each thread rolls half-way round its mate thread and the filling pick, binding it in, and on the next pick the roll is reversed, and this creates the lacy effect. Use regular 2-20s cotton yarns and set the warp about 44 inches in the reed, 20 ends and 20 picks per inch; will weigh about 1½ ounces and measure about 36 inches wide from loom.

FOR LAUNDRY BAGS

use 4-10s cotton in the gray; set 30 inches in reed, three ends and three picks per inch; will run 25 inches from loom; no finish.

In hammocks very elaborate effects are made with the scrim weave as applied to the Knowles or Crompton harness loom. Diamond twill and fancy colors are a favorite combination and make good selling line.

4-10s cotton yarn (warp filling); 42 inches in reed; 14 ends per inch; one end per dent; 14 picks; stripe patterns. No finish as cloth is made into hammocks straight from loom.

HAMMOCK CRASH.

This cloth, as the name implies, is used in the making of hammocks. It is made strong and durable to stand the strain and wear that it is subjected to and can be woven on almost any ordinary loom. It is generally made in three grades, viz., best, medium and low.

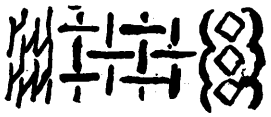
The best grades are generally made on the jacquard loom, so that very elaborate patterns may be introduced.

A 400 tie-up is generally used, but any tie may be used according to the requirements of the design and quality of the cloth.

The warp is generally composed of three or four or more colors of yarn, the colors being very bright and contrasting, such colors as green, red,

gold and black taking a prominent part.

The design is generally an extensive and elaborate one and in stripe form, but designs of the following character are sometimes employed, with particulars as follows:



Warp: ⅜ cotton, as sample, 20 ends per 1 in., 10 x 2 reed, 46 in. wide in reed.

Filling: ⅜ cotton, as sample, 18 picks per 1 in.

The warp is woven with an even tension and where a gauze or leno weave is used, two or more beams are necessary and the necessary slackners etc.

When the warp is composed of several colors of yarn, the filling is generally used undyed or in one solid color.

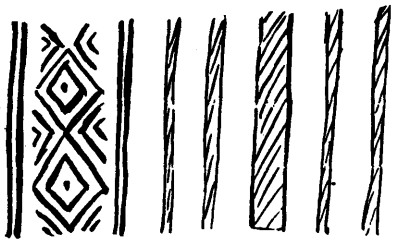
Semi-fancies (generally of medium quality) and plain or lower grade cloths may be woven on harness looms (16 to 24 harness being employed). Plain or lower grade cloths are sometimes woven in looms having a cross-weaving or gauze-reed attachment when the weave is a gauze or leno, which is generally the case.

These cloths (medium grade) are not made as strong and compact as the first quality; the particulars being as follows:

Warp: 14 ends per 1 in., ⅜ cotton, 7 x 2 dent reed.

Filling: 12 picks per 1 in., ⅜ cotton.

The weave is generally a semi-fancy one, i. e., plain weave for 2 in. or 3 in. and then a gauze stripe or gauze stripes at irregular intervals across the warps. The colorings in warp are similar to the first grade colorings, and the design is less elaborate, sometimes on the following order:



Repeat several times.

The cheapest qualities are much lighter in weight and more open in texture, the particulars being as follows:

Warp: 8 ends per 1 in., ⅜ cotton, 8 dent reed x 2; mess every other dent.

Filling: 7 picks per 1 in., ⅜ cotton.

The weave is generally a gauze one, one that is largely used, being 3 picks plain and 1 pick gauze.

This quality is often made with undyed cotton warp and filling and is dyed in the piece a solid color. It may also be made with colored warp threads, but on account of the scarcity of warp threads less effective results are obtained than are obtained in the first two grades.

A typical sample is herewith enclosed, but is a little better quality than the particulars given refer to.

These cloths are generally made by manufacturers who make up their own cloths into hammocks and sell in this form.

They require no finishing, as they are made up into hammocks in the condition as taken from the looms, except in cases where the goods are to be dyed.

DRAPERY FOR HAMMOCKS.

In making hammocks, hangings or draperies are employed and these cloths are closely related to the hammock cloth. They are made on the same looms as hammock cloths and are of the same texture.

The yarn used is the same generally, but the cloth need not be as strong as the body cloth. The ends and picks per 1 in. may be a little lower. The drapery cloths are made two in a width, there being 12 in. or 14 in. of the reed empty between the two cloths. The filling is thrown across in the regular manner, and when the cloth is woven, the filling is cut in the centre of space between the cloths and the ends thus formed constitute the fringe of the hangings, which fringe is knotted in various ways to make the hanging more effective.

In order to secure the warp threads at the inside edge of drapery while weaving, the two ends nearest the fringe side are made to cross each other in weaving and make a firm selvage for the actual cloth.

The warp yarn may be either in colored stripe form or solid color, and the filling solid color, or both warp and filling may be in undyed state and dyed in the piece when woven.

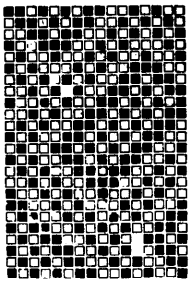
The draperies are made to match the body, similar colorings and designs being employed.

WEAVES TO EMPLOY.

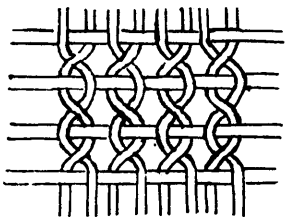
The best qualities have generally

jacquard effects, and as the texture is not so compact, the plain weave must be used extensively in ground, the figure being either 5 harness satin or 3—1 twill.

The medium qualities as made on harness looms have weaves of the following character, the plain weave being conspicuous in order to make a firm cloth:



Low grade cloths are made almost exclusively with the gauze weave, the following being a typical one:



MADRAS.

Madras is a light-weight cotton cloth, composed of all cotton or cotton and silk, and is a single cloth fabric, having excellent wearing qualities.

It has been on the market for many years and is considered a staple in the cotton goods line. It is a narrow fabric sold at 27 inches width, and is made of varying grades, weighing from two ounces to three ounces per yard, and is used at all seasons of the year. It is used by the ladies for summer skirts, shirtwait suits, etc.; by men for shirts, shirt bosoms, and four-in-hand and bow neckties. It is also used as a drapery in workmen's homes for windows, etc.

It is known by the plain white ground and fancy colored narrow stripe warp effects and is made of cotton yarns ranging from 1-26s to 1-80s warp and filling, and from 50 to 100 or more ends per inch. The knowledge of the utility of madras being common among most all classes of people, permits of the greatest scope in creating both harmonious and contrasting color and weave combinations, simplicity in color arrangement being generally the keynote to success in producing an elegant, good-selling line.

COLORS.

Those colors most in demand, which have been adapted to this fabric, are rich and delicate shades of blue, rose, green, linen, tan, lavender, ecru and bright red.

For prominent hair line effects use black, navy blue, dark green, royal blue and cherry red. Good fast color is necessary in making madras as it is a wash fabric, the feature of which is the fine colored stripe effect running warp ways.

If inferior colors are used, they will surely spread during the finishing process, and will cause a clouded stripe where a distinct one was intended, thereby causing a pile of seconds. Madras used in making men's stiff bosom shirts, which retail at $1.50 and upward, in most cases is made entirely with a plain weave.

Sometimes the colored stripe is developed by doubling up in the heddle and reed (by drawing in two or more ends in one heddle, and the threads of several heddles in one split in the reed).

ANOTHER METHOD.

Another method is to weave the colored warp threads on other harnesses than those of the body of the cloth, using a twill weave on these harnesses, and by doing so create a perfect cord in the cloth.

High-grade patterns are usually formed by making a plain white stripe from ½ inch to 1½ inches in width, and the colored stripe of 2, 4, 6, 8 ends. In using any of these numbers of ends, the width of the colored stripe is governed by the fineness of reed, and method of drawing through the reed, consistent with the weave effect desired.

Madras is usually made on either the old roller loom, or the more modern dobby loom.

Fancy madras is made more successfully on the dobby loom, 20-harness capacity covering most all combinations used in this line.

A good grade of madras is made by using 1-30s cotton warp and filling.

1.200 reed, two ends per dent: 31½

inches in reed; 56 picks, 1-30s filling; finish, 27 inches; weight, 2¾ ounces.

WARP PATTERN.

14 White 1-30s }
1 White 2-40s } Plain weave.
14 White 1-30s }
4 Rose 1-30s....Basket weave.
10 White 1-30s..Plain weave.
4 Green 1-30s...Basket weave.

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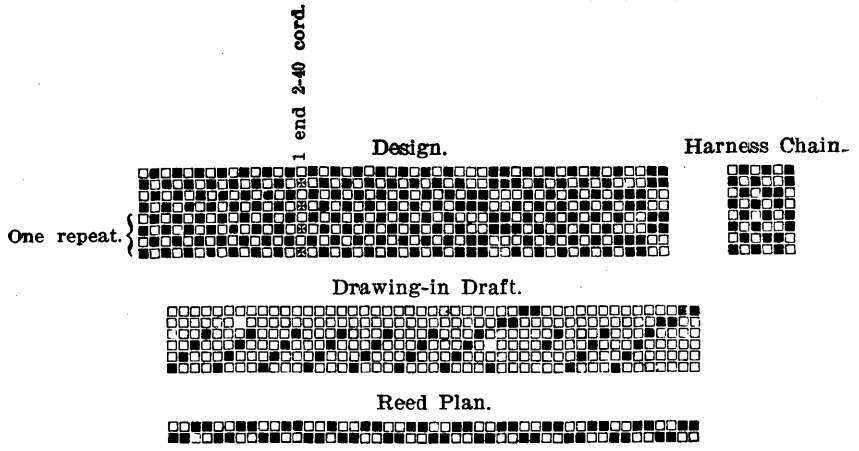
Finish for madras: Run through washer, cylinder (to dry cloth), tentering machine, calender or press.

Finishing Particulars.

Starch, 6 ounces cornstarch, 2 ounces white cocoanut oil softening, 1 gallon water. Calender with light calender machine.



Note.—Design is two repeats in filling, and is intended to show connection between first and second repeat.

Dyeing Particulars for Madras.

Following are dyeing particulars for good madras shades:

LIGHT GREEN.

Mordant yarn with 2 per cent tannic acid. Give 5 turns and fix with 2 per cent tartar emetic. Wash well. Dye 1 per cent new methylene blue G G, ½ per cent thioflavine T. Wash well.

PINK.

Mordant yarn with 2 per cent tannic acid. Give 5 turns and fix with 2 per cent tartar emetic. Wash well. Dye 9 ounces acridine red 6 B, 3 ounces rhodamine 3 G. C. Bischoff & Co. Wash well.

GINGHAM (Common.)

Gingham (common) is a single cloth composed entirely of cotton and always woven with a plain weave; it is the most universally known fabric on the market and is made in various grades, having from 50 to 76 ends per inch in the reed and of 1-26s to 1-40s cotton yarns in both warp and filling. It is a wash fabric, made in both check and plaid patterns, into which an almost unlimited variety of color combinations are introduced. It is most commonly used in the manufacture of ladies' and children's aprons and summer outing dresses.

It can be woven in any power loom having a box motion attached but is most successfully made in Fairmount, Bridesburg, Mutual Mason 4x1, Crompton 6x1 gingham loom, or 4x1 box, roller loom, using four harness or heddle shafts, and having as a selvage eight double ends on each side.

Gingham warps are made in two lengths, 720 yards and 1,080 yards, and these lengths being subdivided into shorter lengths or cuts, usually 14 and 21, respectively.

When a gingham warp is woven out the set of harnesses or heddles, it is taken out of the loom, and is placed in a twisting frame and twisted, an operation which means the fastening together, by means of the fingers, of those ends remaining in the set of harness, and those of the new warp. A practised

operator can accomplish this work at the rate of 50 to60 ends per minute, and he is generally a boy of perhaps 16 years of age.

Loom fixers each have a section of looms numbering 60, to care for and keep in good running order.

FINISHING GINGHAMS.

The goods are taken from the loom and conveyed to the wareroom,and the ends of several pieces or cuts are sewn (chain stitch) together on a sewing machine, thus making a continuous length of cloth of several hundred yards, about 300 yards. (This is done to facilitate handling.)

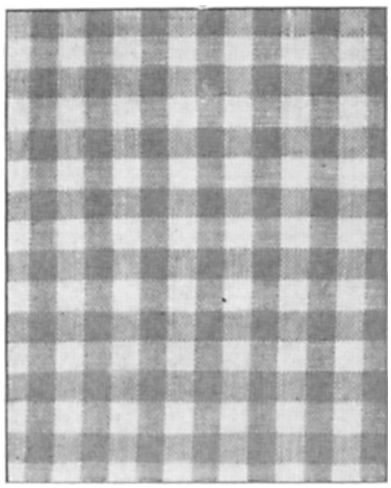
It is now run through the sprinkler, the object of which is to dampen the cloth in such a manner as to improve its receptive qualities in the sizing operation.

The sprinkler is a machine having a box arranged on its top. Through this box is passed a roller having bristles set on end at regular intervals, similar to the brush in a carpet sweeper; the box is fed with water by means of a small pipe, and the cloth on entering the machine passes over the roller brush, which in revolving comes in contact with the water, and spreads it over the cloth, which is drawn through the machine by means of delivery rollers at the opposite end.

From the sprinkler, it goes to the size tubs, where it is given a good amount of starch sizing. It is next run through the cylinders to dry it, and then run through the tentering machine, which operation is a continuing of the drying process, also stretching the cloth in width. It is then passed through the calender, which is a sort of hot press, and in which operation it is smoothed, and receives the desired glaze on the face of the cloth. From the calender the cloth goes to the lapping machine, where it is rolled around a small wooden board,known as a lapboard, the operator making a bolt of each cut of cloth, the length of which is governed by the subdivision of warp.

After the lapping operation, the cloth, which is now in the shape of a bolt (commercial term), is taken by the folder, who unravels a couple of yards and doubles it up, and neatly rolls it back in place, while he tucks in the ends. The bolt is then stitched with a strong cord, twice through each end; the ends are then singed with a gas flame to remove odd scraps of filling threads. The bolts of cloth are then placed in a plate press in the following order: three or four bolts are laid flat side by side in the press, and a zinc or other metal plate placed upon them. This is repeated until the press is filled with desired number of pieces or bolts, the top of the press is then run down by means of a belt connecting with a driving shaft, and the goods allowed to remain in this condition several hours, after which the paper bands are placed around them and they are ready for shipment. The following is a list of standard gingham patterns, known as two shuttle checks and usually made in blue, brown, green, black, red, colors.

Warp and filling: 2-2, 4-4, 6-6, 8-8, 10-10, 12-12, 14-14, 16-16, 18-18, 20-20, 24-24, the pattern reading:



Gingham.

2 Blue, 2 White or 24 Blue, 24 White } Warp and filling.

For side pattern effects use same colors:

4—2, 8—4, 6—4, 10—6, 20—10.

10—6—2—6

8—4—2—4

6—4—2—4

Read in this manner:

10 Blue, 6 White, 2 Blue, 6 White } Warp and filling.

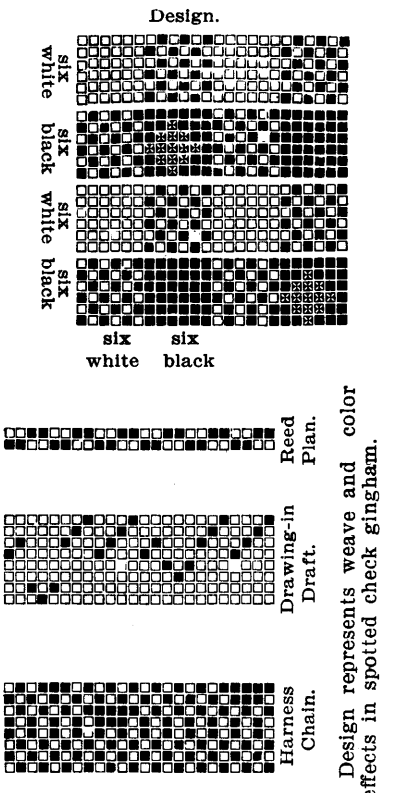
Staple ginghams are known to the mill man as 900, 1,200, 1,400, meaning 900 reed, 1,200 reed, 1,400 reed. Those made with a 1,400 reed are usually intended as an imitation of zephyr ginghams.

A good grade of ginghams can be made thus: reed, 900—two ends per dent; 29 inches in width; 44 picks fill-

ing. Finish, 27 inches. Check pattern. Weight about 2.1 ounces; 1-26s cotton warp and filling. Plain weave.

A better grade thus: reed, 1,200—two ends per dent; 29 inches in width; 52 picks filling. Finish, 27 inches; weight 2¼ ounces; 1-30s cotton warp and filling; generally stripe patterns; plain weave.

A fine grade thus: reed, 1,400—two ends per dent; 29 inches in width; 60 picks filling. Finish,27 inches; weight



two ounces; 1-40s cotton warp and filling. Check or plaid pattern, plain weave.

Ginghams are made with from two colors, warp and filling, to eight colors in warp and six in filling.

The 1,200 grade is occasionally made up in spotted check effect or say six black, six white, having a small diamond-shaped figure at regular intervals, produced in dobby looms.

Another style, having great vogue some 10 years ago is known as apron ginghams, made in 900 grade, and having about three-quarters of the width of the cloth woven in a small check, 4x4, and the remainder having a large pattern, with a woven check in the filling. It is usually made in two colors, and made 36 inches in reed.

Reed 900—two ends per dent; 36 inches in reed; 44 picks filling. Finish 34 inches; 1-26s warp and filling. Plain weave.

Warp pattern.		Filling pattern.
4 Blue, 4 White	168½ times = 1348 ends.	4 White, 4 Blue

8 Blue	Read from top to bottom then reverse.
2 White	
6 Blue	
10 White	
10 Blue	
22 White	
10 Blue	
10 White	
6 Blue	
2 White	
52 Blue	222 ends x 2 = 444 ends in border.
2 White	1348 in ground.
4 Blue	
10 White	1792 + 8 ends blue.
2 Blue	
16 White	
2 Blue	
10 White	
4 Blue	
2 White	
40 Blue	

Blue for Ginghams.

Following are the dyeing particulars of a good blue for a gingham (common).

For 100 pounds yarn, 1st bath: 6 pounds immedial indone 3B cone; 12 pounds sodium sulphide crystals; 4 pounds grape sugar (glucose); 3 pounds soda ash; 4 pounds common salt.

For standing bath; 3 pounds immedial indone 3B cone; 6 pounds sodium sulphide crystals; 1½ pounds glucose, ¾ pound soda ash.

Immedial indone 3B cone is one of the Cassella Color Co.'s colors. Should a bluer shade be required, a little immedial indone B cone can be added. If a greener shade is needed, a little immedial yellow D can be added.

Dye for one hour, turning the goods several times, then squeeze off well by means of the squeezing rollers attached to one end of the vat, and level by wringing off rapidly at the wringing post.

Then age the yarn three-quarters of an hour, rinse well and soap if required. Uniform and careful squeezing and wringing off are essential to ensure good levelness of the dyeings.

Immedial indone 3B cone and B cone are excellently suited for the production of every shade of indigo, both for light shades when dyed by themselves, and for medium and darker shades when dyed in combination with immedial direct blue, or the other brands

of immedial indone. By reason of their simple method of application they deserve the special attention of all branches of cotton dyeing.

FINISHING FOR GINGHAMS.

Starch: 2-8 ounces cornstarch; 4-8 ounces white softening; 1 gallon water; mix cold, boil half an hour.

White softening is from cocoanut oil. Pieces are run through a starch mangle and on to a cylinder drying machine. They are then damped on a sprinkler machine and given a light calendering.

CRASH.

Crash is a single cloth fabric, composed of all-cotton yarns, or of cotton and jute. It is used principally for toweling and as a covering for fine carpets. In some of the southern states it is made with a plain weave, and worn as a summer men's wear fabric, as it is cheaper than linen.

It is usually made of 1-14s, 1-16s, 1-20s cotton warp and filling, and sometimes of 1-10s and 1-12s cotton. As a carpet covering, it is woven in a narrow loom, and has either broad or narrow stripes in the warp, of fancy colored dyed yarns, dark red and dark blue being common colors. The ground of the cloth is made of cotton yarns in the gray, or unbleached state. This fabric has the

APPEARANCE OF LINEN,

due to the heavy sizing, and calendering in finishing. Small warp effect twill weaves are used, such as 2—1, either right or left hand, and running at 45 degrees. 1-16s cotton warp and filling crash toweling is made of yarns both in the gray and bleached state, generally about 1-14s cotton warp and filling, in widths varying from 15 inches to 24 inches finished, either all bleached or with side and cross borders, or in what is known as

HAIR-LINE PLAIDS.

Rarely any colors, excepting red or navy blue, are used in toweling.

THE SAME WEAVES

are used in this line as in ordinary linens, namely, the plain weave or 1 up and 1 down, in the commoner grades. But for bathing purposes, where a rough toweling is sometimes required, there is the bird's-eye or huckaback weave—also the eight-end honeycomb weave. Toweling, having as a design floral or scroll figures, is made on narrow looms, having a jacquard machine attached; this sort is used for bureau scarfs.

Crash can be

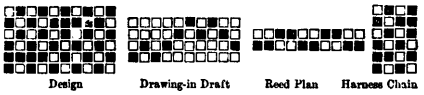
WOVEN ON ANY POWER LOOM.

The kind of loom necessary to produce any certain grade of crash is governed by the construction of weave effect desired, as, for instance, either the plain weave or twill weave effects are best adapted to the roller or cam loom; the more complicated fancy weaves, such as huckaback and honeycomb, necessitate the use of a dobby loom.

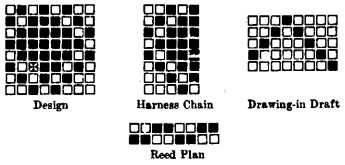
TO FINISH CRASH,

it is first run through a sprinkler, to dampen it; then it is put through the size tub and rather heavily sized, after which it is run through a dryer. From the dryer it goes to the calenders, in which machine the gas-heated top roller acts upon the sizing and produces the rather glazed effect on the face of the cloth.

HUCKABACK DESIGN.



HONEYCOMB DESIGN.



Crash toweling using huckaback weave: reed 850, 2 ends per dent; 18 inches wide; 1-16s cotton warp and filling (bleach); 46 picks of filling; finish 16½ inches; weight, 1.85 ounces.

To make a softer feel, use one-half number of picks and wind 1-16s and 1-20s (1 end of each) on same bobbin, and weave it in; this also increases the mottled effect.

Crash toweling using honeycomb weave; reed 850, 2 ends per dent; 20 inches wide; 2-20s cotton warp and filling (bleach); 44 picks of filling; loom width, 16 ounces; no finish; weight, 3¼ ounces. Use dobby loom for each of these fabrics.

In making honeycomb toweling, if using a cross border, the Crompton double cylinder or two-weave dobby is the most convenient, as the border weave and the body weave each has

its separate harness chain, and is worked from the box chain.

THE FINISHING.

Detailed Description of the Process of Crash Finishing.

To finish a piece of crash ready for the market: If the piece is clean enough and a cheap rough finish is required, the first process is starching. A very light starch liquor is necessary, to one gallon of water, two to six ounces of cornstarch, one-half to one pound cocoanut oil softening. Mix in cold water and boil together for 30 minutes. The pieces are passed through a starch mangle at full width, over a drying machine of steam cylinders. They are then passed through a light calender to straighten the goods out, and smoothed down a little. They are then folded up, packed in cases and shipped away.

The goods can be bleached, each piece being placed separately in a kier, or the ends sewed together and the goods run into a kier, with a 4 degree Tw. solution of caustic soda, and boiled six to eight hours.

The goods are then run through

A WASHING MACHINE

and returned to the kier, and the soda boil repeated for eight hours. The goods are run through a washing machine, and through a solution of oil of vitriol ½ degree Tw., washed again, and run through a solution of chloride of lime at ½ degree Tw., piled in a bin for eight hours, run through an acid solution of oil of vitriol ½ degree Tw., and well washed till all trace of acid is eliminated. If any acid is left in the goods, the goods, being very heavy, will be tender, as they will retain so much acid when dried on the drying machine, they will have the fibre of the cloth injured. The goods are then starched with four to six ounces to a gallon of cornstarch, one-half pound cocoanut oil, white softening. This is to add a little fullness to the cloth without making it too stiff and starchy. The goods are then dried on a tenter frame at full width, to keep them straight and have the weft perfectly straight across the piece.

If required, they are then given a light calendering. If a light buff or ecru is required, a little color is added to the starch liquor, or the goods are dyed on a jigger machine, or on a padding machine.

These goods will stand a great amount of wearing, and look dressy and chic, without being too expensive.

DOMET OR OUTING CLOTH.

Domet, or outing cloth, is a single cloth, composed of single cotton yarns, generally 1-20 to 1-26 warp yarn, and 1-14s or 1-16s cotton or cotton and cotton shoddy mixed filling yarns. It is made in bright colored stripe and plaid patterns, and is used in the manufacture of shirts, pajamas, etc., and is always woven with a plain weave, or 1 up, 1 down.

In effect it is a fabric having

A SOFT, REGULAR NAP

on both sides of the goods and in appearance is very similar to a flannel.

The nap is produced by carding or

Domet.

brushing up the loose outside fibres on a rather slack twisted filling yarn, by running the cloth through a napping machine.

The napper is a machine consisting of a series of wooden rollers, through which the cloth passes, as the machine is working, automatically. The brush roller, that part of the machine which raises the nap, is a wooden cylinder covered with wire card clothing, and is in fact the same as a fancy on a woolen card. This brush roller is set on the top of the machine near the centre, and is so arranged that the cloth passes between it and a wooden or other solid roller or cylinder, and as the brush roller revolves, the wire teeth in the card clothing come in contact with the surface of the cloth and as they are running in opposite directions, the filling being the softest, the natural result is a nap being raised.

A domet fabric may have either a high or long nap, or a short or close nap.

THE DEGREE OF NAP

to be produced is governed first by the experienced judgment of the manufacturer in buying a filling yarn which will produce the best results, namely, a fine nap, with minimum loss of strength as a thread, as a knowledge of the amount of filling twist and in a

Domet.

given count, less the percentage of twist, to create proper degree of slackness in the yarn, is found convenient when buying this kind of yarn.

Domet is made on a roller or cam loom, and as a cloth receives

NO FINISH, EXCEPTING THE NAP.

The selling width of the cloth is about 29½ inches. During the process of napping, a domet loses a small percentage of the filling weight. This waste is called fly, as it is used by shoddy manufacturers in the production of heavy backing yarns.

Warp colors used in domet stripes: dark blue, light blue, light brown, pink and light green.

Filling: all white for stripes, and in some grades, cotton and cotton shoddy mixed yarns give the fabric a dark tone, after the napping. The last-named grade is used extensively as a working shirt for machinists, as it doesn't show the soiled places very readily, and will tear easily if caught in the machinery.

Warp stripe domet: reed 800; 2 ends per dent, 31½ inches, 1-22s cotton warp yarns, 36 picks.

1-16s cotton filling, 11 turns twist (will produce good, close nap).

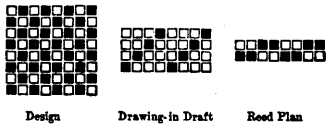
Selling width, 29½ inches.

Plain weave on four harness; drawn-in, 1, 2, 3, 4.

Weight, 2.3 ounces, about.

Amount of filling twist, less about 15 per cent, will give good results in napping.

Filling loses about ¼ per cent of its weight during napping process.



Design Drawing-in Draft Reed Plan

Carding Particulars.

The raw stock used for these goods should be American of about 1⅜ inch staple. The usual plan of mixing the cotton is followed of having the mixings as large as possible, but no other special attention need be given to it. At the pickers the only special feature to look out for is

THE SPEED OF THE BEATER.

This should be run at above the average speed because the cotton used generally contains more than the average amount of dirt, etc., found in cotton. The weight of the lap at the front of the finisher picker should be heavy. At the card the only special features to be careful of are the settings. These should be open because of the weight of the lap put in at the card and also because the production of this machine with this class of goods is large. The most special attention given to this class of goods is at

THE DRAWING FRAME,

three processes being the usual number run. The most important points to look out for are as follows: that the settings are all right, the top leather rolls are properly covered, and that they have no channels or are not hollowed out along their entire length, that the top rolls are kept properly varnished, that the stop motions are properly adjusted, and lastly, that the condensing or large front calender rolls are set so that the proper pressure is brought to bear on the cotton sliver being passed between them. It may be just as well to say

A FEW THINGS

here about the drawing frame which apply not only to the class of cloth under description, but also to all cotton yarns for all classes of work. Too little attention is given to the drawing frame. Just because it is one of the most simply constructed machines used in the card room, it generally receives the least attention. This should not be the case, however, because the drawing frame, unless properly looked

after, will make a great deal of difference to the appearance of the yarn made. If the drawing frame is properly looked after it will be found that the roving being made will be a great deal evener than if the drawing frames are left to look after themselves. Particular attention should always be given to the

DIFFERENT STOP MOTIONS

to see that they are doing what is required of them. It will be seen that if only one stop motion in a head does not work properly and allows an end to pass through the machine without stopping it, the resulting finished yarn is going to be lighter at that certain part and in this way make an uneven yarn. I know that it will be said that the drafts and doublings at the future machines

WILL HELP TO OVERCOME

this defect, but if the adjustment were made at the drawing frame this particular defect would not exist. Perhaps a good thing for card-room overseers to paste in their hats would be, "Watch your drawing frames, first, last and always." We have wandered somewhat from the subject under description and will conclude the carding end of it by saying that no special points, outside of the ones generally followed, need be given to the making of the roving. A great deal of the unevenness of the yarn, if any exists, is covered up because the cloth is napped.

Dyeing Particulars.

The colors in the fabric illustrated can be dyed in the yarn or raw stock. The dyeing particulars are as follows:

GRAY.

For 100 pounds of raw stock for dark gray, Cassella Color Co.:

1st bath: 15 pounds immedial black N. G.; 4 ounces immedial yellow D.; 10 pounds sodium sulphide; 7 pounds soda ash; 12 pounds cryst. Glauber's salt.

2d and standing bath: 7 pounds immedial black N. G.; 1 ounce immedial yellow D.; 5 pounds sodium sulphide; 3 pounds soda ash; 4 pounds cryst. Glauber's salt.

Enter stock, raw cotton, at the boil, and keep at 200 degrees F. for one hour.

Wash well with water and squeeze through rollers, and repeat operation of washing several times, till cotton is perfectly clean.

FOR LIGHT GRAY.

1st bath: 8 pounds immedial black N G, Cassella Color Co.; 3 ounces immedial yellow D, Cassella Color Co.; 8 pounds sodium sulphide; 6 pounds soda ash; 10 pounds cryst. Glauber's salt.

2d and standing bath: 5 pounds immedial black N G; 2 ounces immedial yellow D; 5 pounds sodium sulphide; 4 pounds soda ash; 5 pounds cryst. Glauber's salt.

Enter stock at boil, and keep at 200 degrees F. for one hour.

Wash well, as with darker shade. The immedial colors of the Cassella Color Co. are absolutely fast to washing and sunlight, and are free from sulphur, so that there is not the danger of tendering the fibre as with so many of the sulphur colors.

The immedial colors are gradually replacing the direct one-dip colors which have had so long a run, and which were used so extensively for the last 10 years or more.

The immedial colors are now made into blacks, blues, browns, yellows, greens, wines, and very soon there will be a full range of shades made, to match all colors required in cotton goods. The immedial blues are as fast as the indigo shades so long used for all fast colors.

PINK.

For 100 pounds raw stock, cotton: 20 pounds Glauber's salt; 2 pounds sal soda; 5 ounces diamine rose G D.

Enter at boil and boil one hour. Wash well in water.

BLUE.

For 100 pounds raw stock, cotton; 20 pounds Glauber's salt; 2 pounds sal soda; 1½ pounds diamine blue B X.

Enter at boil and boil one hour. Wash well in water. The diamine rose G D and the diamine blue B X are from the Cassella Color Co. and are very level dyeing colors and very fast to light and washing.

A variety of colors. of course, can be used in the dyeing of this fabric.

ZEPHYR GINGHAM.

Zephyr gingham is the finest grade of gingham made, and is a light-weight cotton fabric, composed of 1-40s to 1-60s cotton warp and filling yarns.

It is woven with either the plain weave or a small all-over dobby effect. It is made in very attractive patterns by using good fast colors in warp and

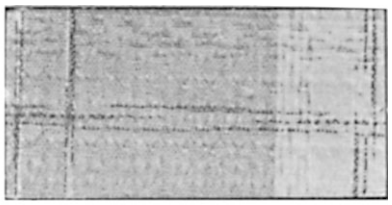
filling, and, as a cloth, has splendid wearing qualities.

From

TWO TO TEN COLORS

can be used in both warp and filling, the filling colors being governed by the number of shuttles the loom will run, and this number is increased by the introduction of fancy colored, printed yarns.

Zephyr gingham is made up into

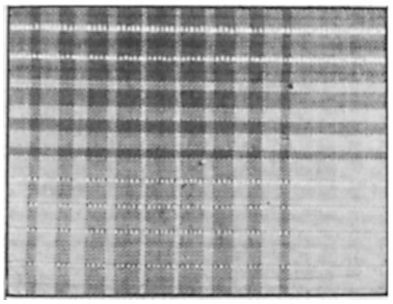


Zephyr gingham.

such patterns as light and dark tone, shaded plaids, corded and ribbed stripes, small checks and broad, delicately colored plaids, having a random printed yarn coloring, and this last combination is woven on a dobby loom, using as a design a small broken twill arrangement. The effect produced is something on the order of a jacquard pattern.

MIXED COLOR EFFECTS

are made by dressing the warp, one end white, one end fancy print, for,

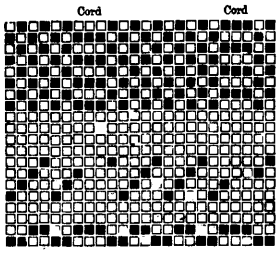


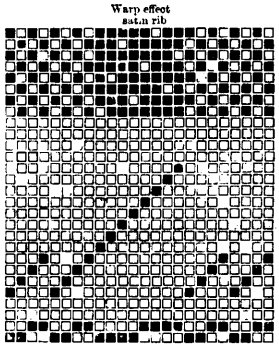
Zephyr gingham.

say, 100 ends, and then making a rib by using a satin weave for eight or ten ends of a dark color, such as black, blue or red brown. This style is made in stripes, as stated above, also in plaids by using all white filling to cross the one and one dressing in the warp and a correspondingly dark colored filling squared with the satin rib in the warp.

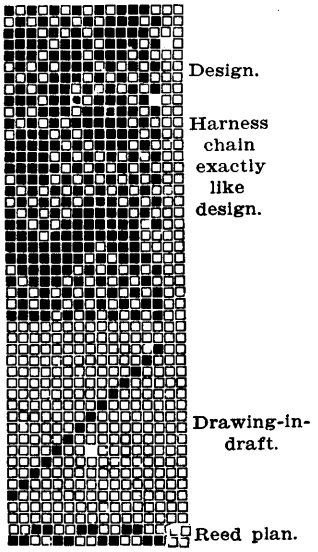
CORDED EFFECTS

are produced by drawing in 2, 3, 4, ends in one heddle and split, and this is





Fancy Dobby Weave Zephyr.



squared in the filling by using a correspondingly heavy thread, as, for instance, 3 ends 1-40s warp in one heddle and 1 pick of 3-40s in filling. This

would require such a loom as the Knowles 4x4 box dobby loom.

For a roller loom, using plain weave, and making a cord, draw warp in, as stated above, or make two cords side by side by drawing in two ends per heddle and four ends in split, and square this by two picks, each of 1-20s cotton filling.

Zephyr gingham can be woven on any roller loom. Of this style loom the 4x1 box is the more suitable. For more elaborate filling patterns there is the Crompton 6x1 box gingham loom, and for fancy weave effect take a loom having a spring bottom dobby motion attached.

COLORS FOR ZEPHYR.

Black, light blue, dark blue, light brown, pink, red, tan, ecru, canary, orange, new blue, old gold. Print yarns can be obtained of almost any color desired.

A good grade of zephyr gingham is made as follows:

Reed 1,500, two ends per split, 29 inches wide, 80 picks; weight, two ounces about; 1-50s cotton warp and filling; finish 27 inches.

COLOR EFFECT.

Warp pattern.

4 Brown.
4 Blue.
8 Brown.
6 Blue.
6 Brown.
8 Blue.
4 Brown.
8 Blue
1 White cord equals 3 ends.
8 Blue.
2 White.
1 White cord equals 3 ends.
2 White.
4 Blue.
4 White.
1 White cord equals 3 ends.
4 White.
2 Blue.
8 White.
1 White Cord equals 3 ends.
8 White.
2 Blue.
4 White.
1 White cord equals 3 ends.
4 White.
4 Blue.
2 White.
1 White cord equals 3 ends.
2 White.
8 Blue.
1 White cord equals 3 ends.
8 Blue.
4 Brown.
8 Blue.

SHADED PLAID.

Filling same as warp pattern.

Pattern continued.

6 Brown.
6 Blue.
8 Brown.
4 Blue.
4 Brown.
2 Black.
4 Brown.
1 White cord equals 3 ends.
4 Brown.
4 Black.
4 Brown.
1 White cord equals 3 ends.
4 Brown.
2 Black.

The finish consists of sprinkling and of running cloth through very thin sizing, after which it is tentered and calendered.

Carding Particulars.

Various grades of cotton as well as different lengths of staple are used for the class of goods described. The length of staple used for the former goods is about 1½ inches and generally American cotton is used. The mixings should be as large as possible so as to obtain an even yarn. It will be at once seen that if small mixings are used there will be some little difference in each mixing and just this little difference will show up in the finished yarn. This applies not only to this mixing for the class of goods described but to all mixings for all goods, and

THE MIXING

of cotton is one of the most particular points of carding, because if different lengths of staple are allowed to be mixed together, it is bound to cause trouble in addition to uneven yarn. Every bale of cotton should be separately stapled before it is allowed to be put into the mixing, and if the staple is longer or shorter than the cotton already mixed, it should be put one side.

The cotton should be run through openers and two processes of pickers, although a great many mills use three processes; but all the newer plants being built have only two processes of pickers. The

SPEED OF THE BEATER

should be about 1,050 revolutions per minute for the opener and 1,500 revolutions per minute for the breaker and 1,450 revolutions per minute for the finisher, a 12 to 13 ounce lap being made at the finisher picker.

The card should have closer settings than for the cloth described last week. Special attention should be given to the setting of the back plate to the licker-in. If this plate is set too close the cotton will be broken and if set too far away will cause bunches to come through. It is always just as well, when setting a card for new length of stock or changing over, to sample the cotton, both before it enters the card and after it leaves it, to compare the two staples and to see if they are of the same length. A good weight per yard for sliver at the card for this class of goods is 50 grains. On the former grades of the goods under description

THE COTTON IS COMBED.

This, of course, means extra expense because of the extra machines used, but it also makes the yarn evener because at the comber all the short fibres are taken out, leaving all the fibres of the same length. When combers are used only two processes of drawing are regarded, but when the combers are not used for this class of goods then three processes of drawing are used. For this class of goods only 15 per cent waste should be taken out at the comber.

At the speeders or fly frames the drawing sliver is put through the slubber, 1st intermediate, 2d intermediate and fine frames, the finished hank roving ranging from 8 to 12 hank. In the samples under description the hank used would be about 12. Watch the settings of the rolls at the fly frames and see that all your frames are set alike. These settings should be looked after all the time and should lapping or bunching occur it is a pretty good indication that something is wrong with your roll settings. If many frames are being run on the same stock,

IT IS VERY IMPORTANT

to have all the change gears the same, especially the draft gear. It sometimes happens that the wrong draft gear will be put on one frame and the result is that the yarn is delivered to the ring spinning room or mule room uneven. It will also cause a great deal of trouble in sizing the yarns. This trouble is greater if the wrong gear is put on one of the 2d intermediate frames because the draft gear on these machines is seldom changed and you might not look here for the trouble for a long time and until considerable annoyance had been caused.

Dyeing Particulars.

The colors in the fabric illustrated are dyed in the yarn. The dyeing particulars are as follows:

LIGHT TAN.

For 100 pounds yarn: 12 ounces immedial yellow D pat.; 2 ounces immedial olive B, pat.; 7 ounces immedial cutch G, pat.; 5 pounds sodium sulphide; 10 pounds cryst. Glauber's salt; 3 pounds soda ash. Enter yarn at boil and boil one hour. Wash well with two or three waters.

ECRU.

For 100 pounds yarn: 6 ounces immedial yellow D, pat.; 1 ounce immedial olive B, pat.; 4 ounces immedial cutch G, pat.; 5 pounds sodium sulphide; 10 pounds cryst. Glauber's salt; 3 pounds soda ash. Enter yarn at boil. Boil one hour. Wash well with two or three clean waters.

LIGHT BROWN.

For 100 pounds yarn: 8 ounces immedial brown B, pat.; 1 pound 4 ounces immedial cutch O, pat.; 5 pounds sodium sulphide; 10 pounds cryst. Glauber's salt; 3 pounds soda ash. Enter yarn at boil, and boil one hour. Wash well with two or three waters.

OLD GOLD.

For 100 pounds yarn: 2 per cent immedial yellow D, pat.; 6 per cent sodium sulphide; 12 per cent cryst. Glauber's salt; 3 per cent soda ash. Enter yarn at boil. Boil one hour. Wash well with two or three waters.

PINK.

For 100 pounds yarn: 6 ounces diamine rose G D, pat.; 2 pounds sal soda; 25 pounds Glauber's salt. Enter at boil. Boil one hour. Wash well in water.

NEW BLUE.

For 100 pounds yarn: 3 per cent immedial sky blue powdered conc.; 5 per cent sodium sulphide; 10 per cent cryst. Glauber's salt; 3 per cent soda ash. After treated with ½ per cent bichrome potash; ½ per cent bluestone. Wash well with water.

LIGHT BLUE.

For 100 pounds yarn: 1½ per cent immedial indone B, pat.; 1½ per cent immedial sky blue powdered conc.; 5 pounds sodium sulphide; 10 pounds cryst. Glauber's salt; 3 pounds soda ash. Enter at boil. Boil one hour. Wash well with water.

DARK BLUE.

For 100 pounds yarn: 5 pounds immedial indone blue, 3 B, pat.; 10

pounds sodium sulphide; 15 pounds cryst. Glauber's salt; 5 pounds soda ash. Enter at boil. Boil one hour. Wash well with water.

ORANGE.

For 100 pounds yarn: 5 pounds immedial orange C, pat.; 8 pounds sodium sulphide; 15 pounds cryst. Glauber's salt; 5 pounds soda ash. Enter at boil. Boil one hour. Wash well in two or three waters.

BLACK.

For 100 pounds yarn, 1st bath: 20 pounds immedial black N N conc; 12 pounds sodium sulphide; 20 pounds cryst. Glauber's salt; 5 pounds soda ash.

2d bath: 10 pounds immedial black N N conc.; 8 pounds sodium sulphide; 15 pounds cryst. Glauber's salt; 4 pounds soda ash.

Enter at boil. Boil one hour. Wash well in two or three clean waters.

The Finishing.

In the finishing process use: 4 to 8 ounces cornstarch, 4 to 8 ounces cocoanut oil, white softening, 1 gallon water. Mix cold, boil half an hour. Starch through mangle. Run over drying cylinders. Sprinkle, and calender through light calender. After starching, the goods are sometimes dried over the tenter frame to keep the pattern straight across the piece.

CRINOLINE.

Crinoline is a fabric composed of cotton warp, horsehair filling or all cotton yarns. It is sold in varying widths, and is used by tailors and dressmakers in stiffening clothing.

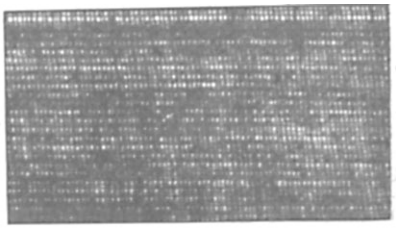
It is a cheap cloth of low texture and simple construction,

THE DISTINGUISHING FEATURE.

being the stiff finish with either a dull or highly glazed face on the cloth. Crinoline, having a horsehair filling, requires a loom of special construction to handle the hair, as it is hung in a neat bundle on the end of the loom, the hair being of a uniform length and color, generally black; the mechanism on the loom drawing a strand of hair from the bunch and placing it in the shed formed by the harness. A herring-bone twill weave is used in this grade of the cloth. Practically

THE SAME EFFECT

can be produced by using a glazed warp thread and a cotton filling. The glazing process is to take the cotton warp thread, and after charging heavily with a solution of sizing, the yarns are run through super-heated cylinders and rollers, the



Crinoline.

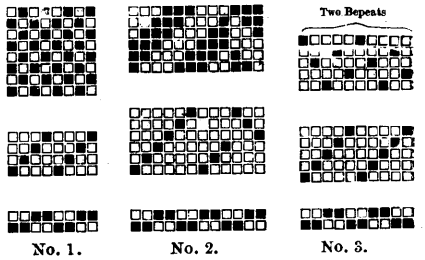
effect being a highly polished surface to the yarn.

Crinoline composed of regular cotton yarns is stiffened by weighting the fabric with sizing; the weight of the size, in some cases, equals 20 per cent of that of the yarns used in construction.

Crinoline is made generally on the roller or cam loom of 1-20s to 1-26s cotton warp and filling yarn, using 25 to 40 ends and picks per inch, the cloth losing about 10 per cent of its width from loom to finished width. The warps are sized 6 to 10 per cent and the woven cloth made to absorb 15 to 20 per cent of its weight, during sizing operation.

TO FINISH CRINOLINE

means to stiffen it. The cloth is



1. Crinoline. Plain Weave.
2. Crinoline. Herring-bone Weave.
3. Haircloth; 5 harness satin filling effect.

therefore taken direct from the loom to the size tubs, and after this operation it is run through the cylinders to dry it, after which the glaze finish is produced by the action of the heat-

ed rollers in the calender machine. The cloth is then rolled or lapped, to whatever size bolt desired, the bolted pressed in plate press, and the crinoline is ready for the packing cases.

Crinoline is usually made in either solid black or cotton in the gray.

CRINOLINE.

Plain weave; reed 700; 1 end per split; 27½ inches reed; 1-26s cotton warp and filling; 36 picks; 20 per cent size in finish.

Color, black; weight, 1.9 ounces; 16 square inches, weight 15.1 grains, finished weight; 16 square inches, weight 12.1 grains after sizing is removed.

Horsehair is used in manufacturing haircloth, a fabric used for furniture covering, the weave being a filling effect satin (generally about five harness), to throw hair on the face of the cloth. These satin weaves permit of about 15 per cent more ends and picks than are used in an ordinary weave. This is due to the long floats in either warp or filling effect satins.

Carding and Spinning Particulars.

Although the yarns used to make crinoline are what are called coarse yarns it must not be thought that they may be neglected in any way in the carding and spinning, because coarse yarns should not be thrown together any more than the finer counts of yarns. We should not turn our attention from the carding and spinning of coarse yarns and let them be run through the different machines until the required count is made, but we should give special attention to the production end of these yarns as it is here we can make the best showing. In coarse counts of yarns it should be our aim to get as large a production from each machine as possible and

NOT OVERLOAD THE MACHINE,

and at the same time produce as good a finished yarn as possible. Another thing, when making coarse counts of yarn we are not required to take out as large a percentage of waste as when we are making the firmer counts, and while enough waste should be taken out so that the yarn will not be bunchy, still it will be at once seen that the settings will not be as "close" as when the firmer counts of yarn are being made.

A low-grade, short-staple class of cotton is generally used for making the class of goods under description. Sometimes this is used straight but some mills use waste from the comber in the mixing as well as the low-grade cotton. Generally

TWO PROCESSES

of picking and opening are used, the speed of the beater being around 1,500 revolutions per minute, the beats per inch being between 42 and 45. The beater is run at a higher speed on short stapled cotton for two reasons: first, because it is necessary to run it at a higher rate of speed in order to get all the dirt out; and second, because it can be run at a higher speed because there is not so much liability of making neps, for the reason that the staple is short and does not ball up as easily as the long-staple cottons.

The weight of the whole lap at the finisher picker is about 40 pounds, or about 14½ ounces to the yard in length.

THE CARDS

are set so that the tops are about 12-1000 of an inch away from the cylinder wire (coarse wire being used on both cylinder and doffer fillets). The licker-in knives are set as close as possible without touching so that they may throw out as much dirt as possible. The draft of this machine should be about 100, the production from 750 to 1000 pounds for this class of goods and the weight of sliver per yard at the front about 65 grains per yard. The ones in charge of the cards should see that the cards are properly ground because when running large productions of low-grade cotton the wire on the fillet becomes dull and does not perform its duty.

TWO PROCESSES OF DRAWING

are used, generally 6 ends up. As the weight per yard of sliver is heavy at the drawing frame for this class of goods, a point to look out for is to see that the weights attached to the top rolls are sufficient to hold them down so that they will not jump. The weight of the sliver at the point of the finisher drawing should be about 75 grains and the speed of the front roll about 400 revolutions per minute; the hank roving at the slubbers about .40; at the first intermediate fly frame 1.40 and at the second intermediate 3.75 to 4.25 hank. From the second intermediate frame the roving goes to the spinning frame, where it is spun into the required yarn, or from

20s to 26s, being used for this class of goods, i.e., crinolines.

Dyeing Particulars.

Crinoline linings are generally dyed with a cheap logwood black.

Make up a solution of logwood extract at 6 degrees Tw. Add common wood acid, 6 degrees Tw., 1 pint acid, 1 gallon logwood, 6 degrees Tw. Run through two-box machine, pieces running into liquor 8 to 10 times, and through nip of two rubber rollers, liquor at the boil. Dry on cylinder drying machine, and run through chrome bath at ½ pound bichromate soda to 1 gallon water, and run through a steaming box to develop the color. Wash well in water. Starch, ½ pound dextrin, 1 gallon water. Boil the starch up for one hour before starching. Dry on cylinders or on tenter frames, as required. Some crinoline linings are calendered in friction calender, and afterwards embossed on embossing machine with a slash pattern.

Some crinoline linings are starched by hand in the tub, and stretched on a stenter frame and dried on the frame.

DAMASK FABRICS.

The name damask is technically applied to certain classes of fabrics, richly decorated with figures of foliage, fruits, scrolls and other ornamental patterns, usually of a large and elaborate character.

The weaves usually employed are twills(mostly satin) and the figures in the fabric are made by alternately exchanging warp for weft surface or vice versa.

The materials employed vary according to the purpose to which the fabrics are to be applied. In the manufacture of upholstery cloth for hangings and furniture covering, silk or worsted is used, while for tablecovers, towels, napkins, etc., linen is generally employed, except in the cheapest grades, when cotton is the material used.

The name was derived from the city of Damascus, when that city was a centre for the production of textile fabrics, and originally was applied only to silken fabrics, whose designs were very elaborately woven in colors and often with gold thread.

About the twelfth century the abovementioned city, even then long celebrated for the production of its looms, so far outstripped all other places for beauty of design, that her silken textiles were in demand everywhere, and thus, as often happens, traders fastened the name of Damascen or Damask upon every silken fabric richly wrought and curiously designed, no matter whether it came or not from Damascus.

In order to explain the modus operandi for the production of damask in this country, suppose we place ourselves in the position of a public designer, whose specialty is the designing of patterns for such fabrics.

THE SKETCH.

The first step in the operation is to prepare a dozen or more sketches, which are to be shown to manufacturers to take their choice. A specimen of such is illustrated at Fig. 1 (reduced), the original of which is drawn on ordinary tracing paper, the exact size, as it will appear in the cloth.

This design or sketch is to be made into a damask tablecover, having 50 threads warp and 44 picks weft per inch, the figure of which is to be a 5-leaf 4—1 satin twill (warp face) and the ground a 5-leaf 1—4 satin twill (weft face).

PROPER DESIGN PAPER.

The next step to be taken is to select the proper designing paper,the size of which,that is, the number of rectangles, warp and weft,in each large square, must be in the exact proportion to the number of threads (warp) and picks (weft) in one inch of the finished cloth. The mode of figuring is after the following manner:

Paper for warp ruled eight rectangles per large square; paper for weft ruled in the same ratio to eight as 44 is to 50.

Operation: x : 8 : : 44 : 50; therefore 44x8 equals 352 divided by 50 equals 7.04, answer. 7.04 is near enough to call it 7; therefore, 8x7 is the proper size of design paper required.

TIE-UP.

Then the tie-up must be considered, which in the present instance will be a 600-hook, with the tie-up as illustrated at Fig. 2 French system—point for border, and straight through for body, in six divisions.

The next process is to enlarge the design as it appears in the sketch, so that one repeat will exactly fit on 600 rectangles (warp) of the designing paper selected.

That portion of the border shown at A, in conformity with the tie-up should occupy the first 15 squares or 120 rectangles; that shown at B the next 15 squares or 120 rectangles; that por-

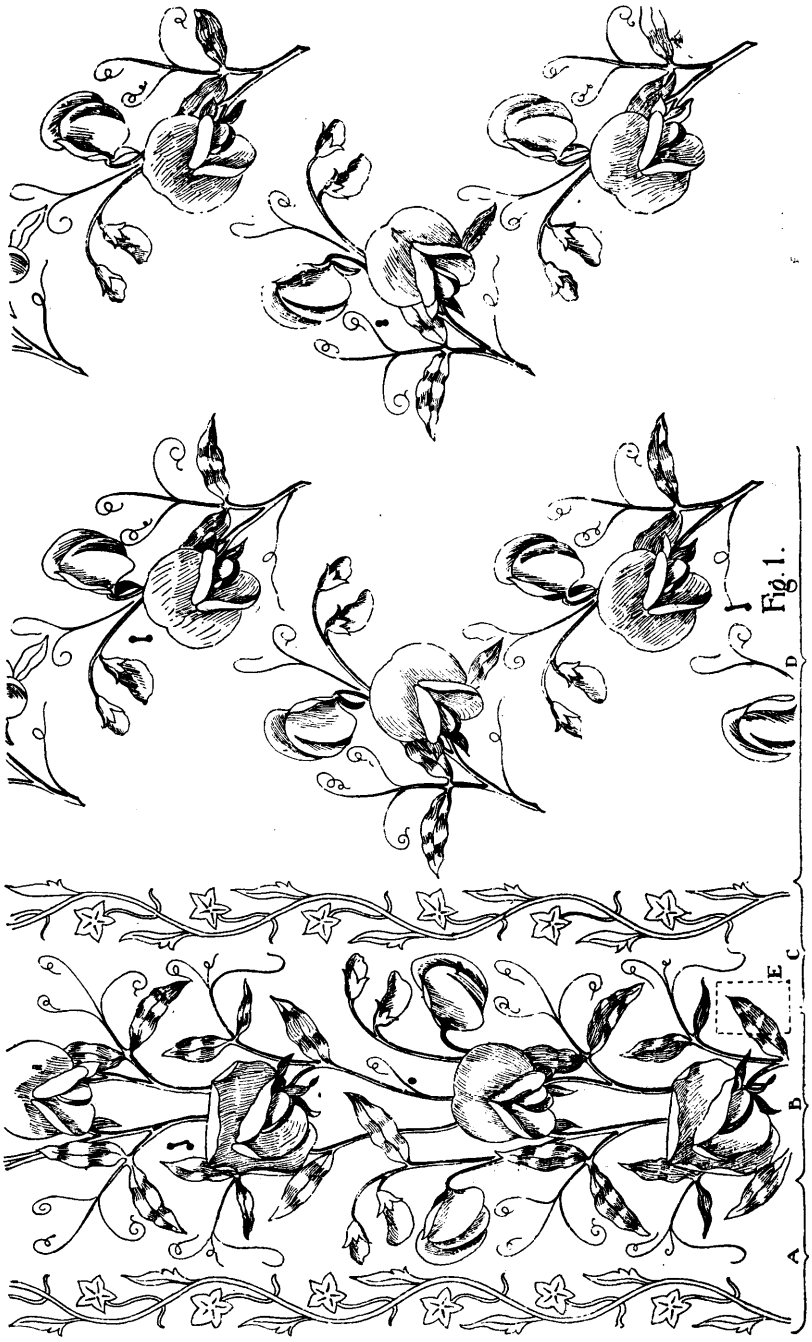


Fig. 1.

tion shown at C is not required on the design paper, because it is a repetition of that part shown at A, but simply reversed.

For the body of the design shown at D, 45 squares or 360 rectangles will be required, which will complete the 600 hooks of the machine. Summing them up they will be as follows:

Portion A = 15 sq. x 8 = 120 rectangles	} Border.	
Portion B = 15 sq. x 8 = 120 rectangles		
Portion D = 45 sq. x 8 = 360 rectangles	} Body.	
600 rectangles		

In order to ascertain how many squares or rectangles the design will occupy weft-wise the sketch must be measured, which in this case happens to be seven inches. Therefore 44 picks per inch times 7 inches equals 308 rectangles; but as 5, the number of threads in one repeat of weave (satin), will not divide into 308 evenly, 310 must be taken (310 divided by 5 equals 62). Therefore the design will occupy 600 rectangles (warp) times 310 rectangles (weft).

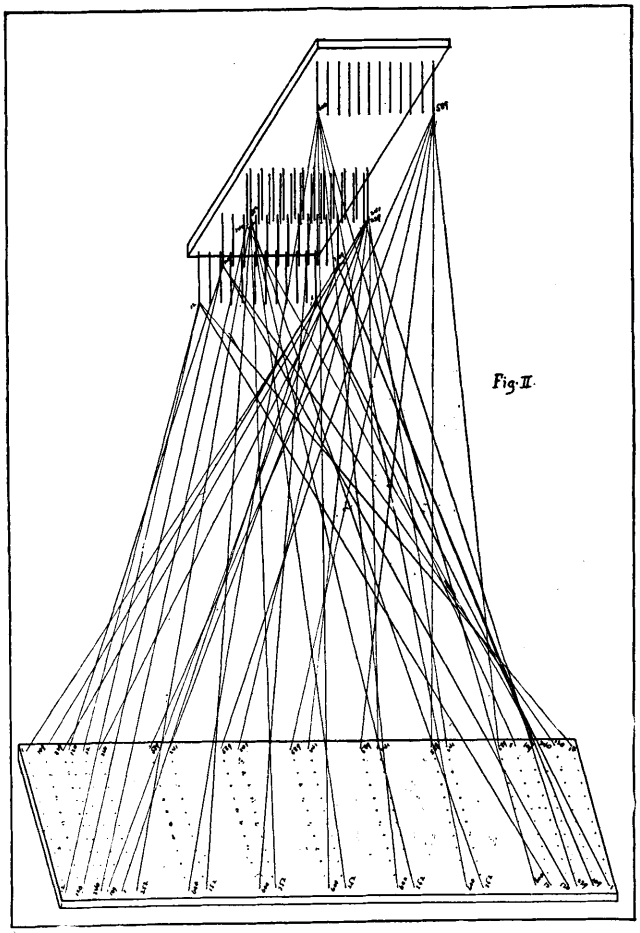


Fig. II.

PAINTING IN THE DESIGN.

After the design is transferred to the design paper, the next process is to paint in the weave, in the following manner, or as shown by a portion of the design, taken from sketch at E, and illustrated by Fig. 3.

1. Paint in the figure in solid red (vermillion or scarlet lake), keeping well within the lines.

2. Paint in the 1—4 satin twill in the ground, running the twill toward the right.

3. Paint in the 4—1 satin twill in the

figure by using black paint over the red. Twill to the left.

In joining the ground and figure twills great care must be exercised so as to effect a clear outline between figure and ground, which is done by the following method:

Where it is possible to bring a riser (black) of the ground beside a sinker (white) in the figure weave or vice versa, it must be done and in some cases, where the risers and sinkers will not join, it is well to alter the weaves slightly so as to effect it; and where it is impossible to do this, then the weaves of each must not be extended so as to actually join, but a certain length of weft in the ground must join a certain length of warp in the figure. (See portion of design, Fig. 3.)

When painting in the satin twill of the ground in the border of the design it is necessary that the twill should extend to the right for one-half the distance and to the left for the remainder, therefore, as this breaking of the twill line causes a slight imperfection, which is unavoidable, care must be used so as to make the break in such portion of the border as will render it unnoticeable.

Again it is necessary also to be careful so as to make the weave of the border join perfectly with that of the body; and this is done by carefully examining the tie-up so as to ascertain which warp threads will join each other in the cloth and take steps to make a perfect juncture.

In this particular instance, warp thread No. 1, which is the first of the border, is in juxtaposition with warp thread No. 241, which is the first of the body. (See Tie-up, Fig. 2.) Therefore the satin twill of the body, commencing with warp thread No. 241, should continue, without a break, the satin twill of the border finished at warp thread No. 1.

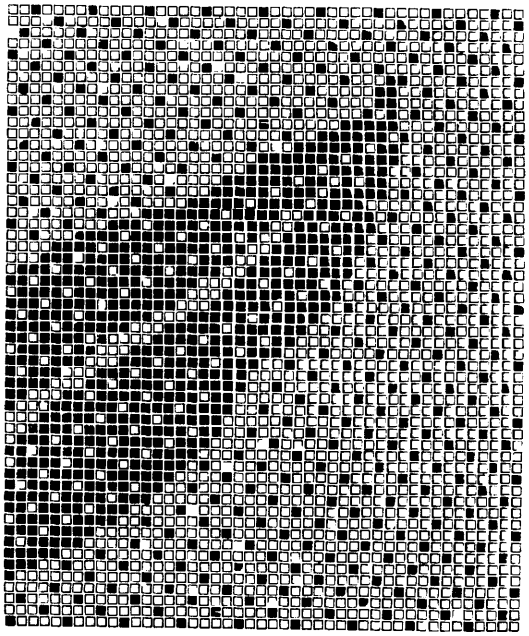


Fig. 3.

WEAVES TO USE.

Athough in the majority of damask fabrics nothing but satin twill weaves are employed (principally 5 and 8 harness), very good effects are sometimes obtained by combining other weaves with the satin twills. For instance, one side of a leaf may be painted in with a satin twill weave, and the other side may be a straight twill, thus giving the leaf a shaded effect, which may be very pleasing.

Another method of shading and the one generally employed is to gradually change from warp-up to weft-up or vice versa, as illustrated by Fig. 4.

TWO METHODS OF MAKING DAMASK.

In damask there is probably a greater field for the production of large figures than in any other class of weaving. There are two methods of weaving damask. First, by the use of the ordinary jacquard, which is discussed in the present article, and second, by the use of what is called the compound pressure harness.

By the first method, although very elaborate figures can be woven and a fine cloth produced, yet by the second method a command is obtained over four or five times as many warp threads as by the first, thus allowing the production of a fabric of much finer texture and even more elaborate ornamentation.

A description of damask weaving by

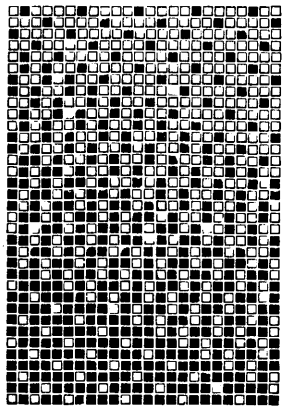


Fig. 4.

the use of the compound pressure harness will be given later.

Where damasks are made all of one color, which is generally the case, as in white linen tablecovers, the effect is given by the threads lying at right angles to each other, and the light falling upon them brings the pattern in bold relief and makes it easily visible.

FINISHING OF CLOTH.

As it is impossible in the scope of the present article to describe the bleaching, dyeing and finishing of all the various damask fabrics, we can at least say this—that in the case of the linen tablecovers, towels, etc., all the finishing required is bleaching, starching and pressing.

But as the beauty of the fabric largely depends upon its whiteness, it is essential that the bleaching of the cloth must be very carefully done.

It is on account of the excellence of her bleacheries that Ireland has been able to make Irish linen famous the world over.

Carding and Spinning Particulars.

Cotton damask is made in several grades and should be considered as being made in mills equipped with machinery for making medium and high-class goods. The grades of cotton used for this class of cloth are middling to good middling, the staple varying from 1¼ to 1⅜ inches strong, according to the grade of damask to be made.

THE MIXING

should be as large as possible and, if good waste is used, i. e., sliver waste from the front of the cards, and drawings, also sliver waste from sliver lap machines and combers, and cut roving waste from the slubber and fly frames, it should not be used in larger proportions than 1 to 3. In up-to-date mills and in fact most mills nowadays it is the general custom to have a waste machine into which the cut waste from the slubber and fly frames is picked. This is called

A WASTE MACHINE.

This machine is constructed so as to take out all the twist in the roving and generally has for this purpose two or three porcupine beaters, and the cut roving waste is delivered in a fluffy sheet, from which all the twist has been taken. The good sliver waste from the machines above mentioned is mixed with the raw stock, while the cut roving waste, after being run through the waste machine, is fed to a picker and made into a lap of the same weight as the lap being used at the finisher picker, for this class of goods, and then

THE WASTE LAP

is run through with the raw stock lap at the finisher picker in the proportion of three laps of raw stock to one of cut-waste, the cut waste being generally put so that it will come in the centre of the delivered lap.

The cotton, after being mixed, is put through a hopper opener and either two or three processes of pickers, two processes being best, the speed of beater being 1050 revolutions per minute for openers, 1,500 for breakers and 1,450 for finishers, also 1,450 revolutions per minute for intermediate pickers, when used. This gives about 42 beats per inch at the finisher. The weight of laps should be 40 pounds at breaker, 37 pounds at intermediate and 36 pounds at finisher.

THE CARDS

should be set close, the speed of the flats making incomplete revolutions every 50 minutes. The draft of the card for this class of goods is about 110 to 125, doffer 24 inches, about 13 revolutions per minute,26 inches doffer, about 12, the production being about 500 pounds per week. In the drawing frames the rolls should be set ⅛ of an inch longer than the staple between the first and second rolls, and increase ¼ of an inch between each set of rolls towards the back. The speed of the front roll should be about 400 revolutions per minute.

The general instruction given in a previous lesson on ginghams may be followed, except in the case of the hook roving.

IN THE FINER GRADES

of damask the comber is used and then only two processes of drawings are used instead of three, as is the custom when combers are not used.

Earlier in the lesson we have stated that cut-roving waste was used in the mixing. Cut roving results from badly made bobbins; bobbins not being marked, it being better to cut the roving off of these bobbins rather than to run the risk of getting them mixed up with other hanks of roving; bobbins on which there is a large amount of single or double, which is generally not allowed,but which will be made in spite of the most careful watching; bad bobbins resulting from breakdowns to machinery, and bobbins which are too small to send to the spinning or mule rooms. It is best to have

ONLY ONE HAND

to cut off these so-called bad bobbins. In larger mills one hand is employed to do this, but it is the general rule to have the third hands on fly frames do it. Under no consideration should the help (fly frame hands) be allowed to cut off the bad work which they make.

The cut roving should be sorted into piles of different lengths of staple, also into different piles, as to kinds; for example, Egyptian should not be put with Allan, even if of the same grade and length of staple.

WHEN CUTTING OFF ROVING

the hand should be careful not to cut the bobbin, because this in time will make the layers nearest to the bobbin stick to the wood, when they are again used. The bobbins containing a small amount of single and double should be pulled off by the hand making them, who may be found by the marks on the bobbin, if she allows the bobbin to go to the spinning or mule room. The hand gathering the roving waste should be careful not to mix the different staples and kinds and it should be taken to the picker room and placed in the different bins, provided for roving waste, which bins

SHOULD BE PLAINLY MARKED

as to staple and kind. The one collecting the waste should report all cut waste found and also those making an excessive amount of waste to overseer. The overseer should keep an account of this roving waste, as well as the good waste, so that he may at all times know just how much is made. In this way he is always in touch with the waste made in different departments and always know whether too much waste is being made. The boss picker is the best man to weigh all wastes, because it is to his department that the kick is made on account of bad laps. Reports are generally sent in once a week with the amount of waste for each day.

Damask Cloth Bleaching.

First, boil with 4 degrees Tw. caustic potash for 8 to 10 hours. Run through washing machine and place in kier for second boil, with 4 degrees Tw. caustic potash. Boil 8 to 10 hours.

The kier is the ordinary bleaching kier. After second boil, run through washing machine. Pass through solution of bleaching powder at ½ degree Tw. and plait down in bin for four hours. Pass through sulphuric acid ½ degree Tw. and wash well with washing machine, till all trace of acid is eliminated.

Starching: 8 to 10 ounces cornstarch; two ounces white cocoanut oil softening; one gallon water. Pass through starch mangle and dry on cylinder drying machine.

Damp pieces and give a calender finish.

ANOTHER HAMMOCK CLOTH.

Hammock cloth is a fabric composed of either jute, cotton, silk, silkaline or linen, and is intended for just such use as the name implies, that of a swinging couch or hammock. The all-cotton hammock is the most popular, and finds the readiest market. Hammocks composed of other material than all cotton are the exception, not the rule. The

TWO MOST IMPORTANT FACTORS

to be considered in the construction of

this fabric are: strength, and a pleasing color arrangement or combination, good yarns being used to provide the proper amount of elasticity of fabric, therefore strength.

Hammock cloth, when manufactured into that commodity known as hammocks, is more of a luxury than an actual necessity, being used only for outdoor purposes in warm weather. Hence the importance of attractive

COLORING.

Dry colors are used in cheap grades such as retail at about 75 cents. Fast colors are used in expensive grades, the price of which is from $1.50 upward. In all cases bright, rich, lively shades of color are necessary. Those colors most commonly used are red, blue, purple, pearl, black, white, green, as well as others in both light and dark shades.

Hammock cloth is most successfully woven on the dobby loom, the very cheap grades being made with a

SCRIM WEAVE

and from 6 to 8 ends and picks per inch, 3/8 cotton yarn. By using the dobby loom very rapid changes are possible, by altering the drawing-in draft wherever necessary. This is important in sampling and is rather expensive when applied to the jacquard loom.

In creating hammock styles, very elaborate imitation jacquard figures are produced by taking a design suitable for a dobby loom of about 20 harness, generally twill effects; and by dissecting the design and applying the parts (straight or reversed) to a series of broad and narrow colored stripes in the warp or warp pattern, we produce an effect

BOTH INTRICATE AND ATTRACTIVE.

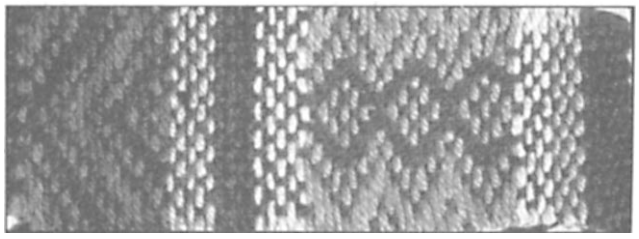
Care should be taken, however, to insert several small stripes of plain weave, as this prevents the cloth from pulling out of shape on account of the loose texture permitted by the use of twill weave.

In making a warp for a hammock, the colored and plain yarns are spooled upon six-inch spools. These are set up in the creel rack by the warper, in accordance with the pattern or color arrangement desired.

THE WARP

is made upon a section mill, each section being warped and run upon the mill the desired length; the number of sections in the completed warp is figured out by the warper, according to number of ends to be used, and the capacity of the creel rack.

To replenish a warp in the loom, if the same harnesses are to be used in the same manner as the warp just finished, the new warp is placed on the floor directly behind the loom to be filled, and the ends of both warps tied together by using a flat knot, the same as



Hammock Cloth.

is used in tying in carpet warps. This fabric requires

ABSOLUTELY NO FINISH

and is made up into hammocks immediately after leaving the loom.

Hammock cloth is made from 34 to 44 inches in width, and always of three or more ply yarns.

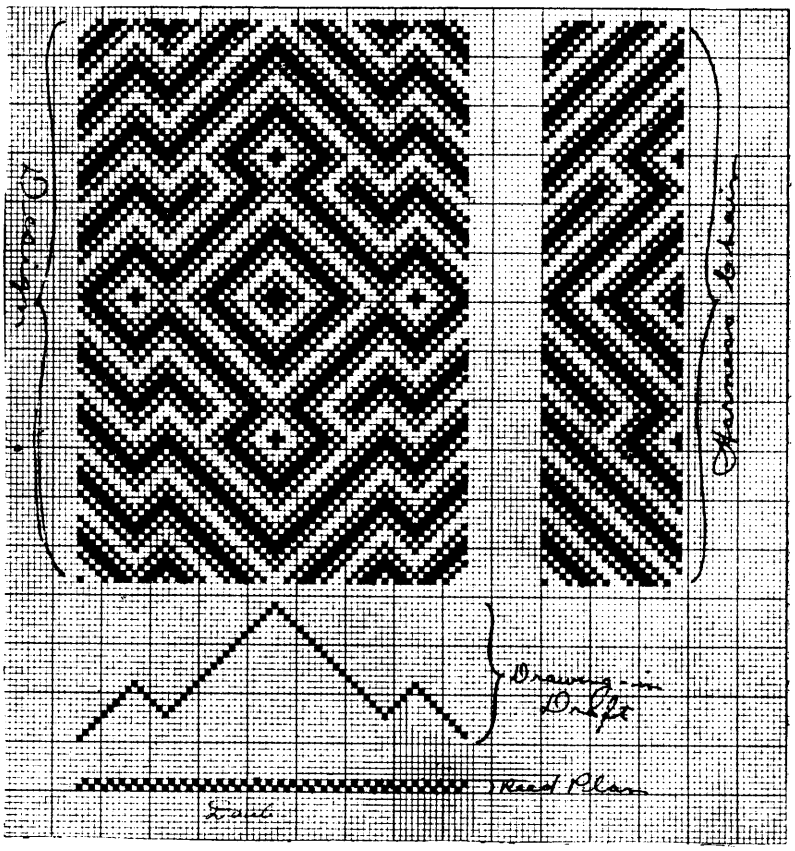
A good grade of hammock cloth can be produced by using: 3-10s cotton warp and filling; 750 reed, 42 inches wide; 18 ends, 16 picks per inch; weigh 8¼ ounces; measure about 38 inches from loom.

Warp pattern:

19 Light green	Read from top to bottom, then reverse.
8 White	
46 Navy blue	
4 Black	
23 Light Green	
4 White	
15 Light blue	
4 Light green	
29 Dark green	Do the same in drawing in.
4 White	
64 Navy blue	
8 White	
64 Navy blue.	
12 Black	
64 Light green	
10 Black	
378 ends	

Carding and Spinning Particulars

For this class of cloth, either a low-grade of short stapled cotton is used, or, as is more generally the custom, waste. When straight cotton is used, quantity is more to be looked out for than quality. By this it is not meant



that quality is not considered at all, but that quantity or production is

THE MOST IMPORTANT POINT

of the two for this class of goods. The quality should be the next point. Get all the production that is possible from every machine, but always have one thing in mind, that it is not always the greatest speed of the front roll together with the heaviest weight per yard of sheet, sliver, roving or yarn being delivered that gives the most production at the end of the week.

There is always a speed over which it is folly to drive a machine because, while the production may be greater for a short length of time, the ends breaking down at the front and the time lost in piecing them up constitute only one of the items that more than makes up for the loss in production of a more slowly driven machine, which will run more steadily and make even-er yarn.

ANOTHER THING

that must be taken into consideration when reading these articles is that, while we describe the different processes through which the cotton has to go to make the required finished yarn, for the cloth, also the general settings of the machines required it would be almost impossible for one mill to make every cloth that will be described so that it must be understood by the reader that when reading the details of the different grades and kinds of cloth that one mill makes only several cloths of the same grade. So,

IN ORDER TO AVOID CONFUSION in the future, let us divide the mills into three different parts, first those using waste and low-grade cotton; second, those low and middling grades of cotton, and third, those using middling and high grades of cotton. While the differences are not so great between the first and second and the second and third as between the first and third, still the differences are there in the number of processes used and the size of rolls also size of wire on certain machines. All that is asked of the reader is to consider which division of the mills the cloth under description belongs to and the rest will be very clear. Hammock cloth, of course, belongs to the first-named division.

For this class of goods the cotton is put through opener and picker; the speed of beater is one of the points to be looked after.

AT THE CARD

coarse wire is used on both fillets and the speed and setting of the doffer comb should be looked after to see that it is properly stripping the doffer. At the drawing frame a smaller second roll should be used so that the rolls may be set close enough together as the staple of the cotton being used is very short. At the slubber and fly frame this is also true. The one watchword with this class of goods is production.

Particulars for Dyeing Yarn.

LIGHT OLIVE.

One-half per cent benzo dark green GG; ¾ per cent chrysophenine; 20 per cent Glaubers; 2 per cent soda; enter at 120 degrees F. and raise to 180 degrees F., give six turns.

Benzo dark green GG, and chrysophenine are colors from Elberfeld Farbenfabriken.

VIOLET.

1¼ per cent benzo fast violet R; 20 per cent Glaubers; 2 per cent soda; enter at 120 degrees F.; give six turns to 180 degrees; color from Elberfeld Farbenfabriken.

YELLOW.

2½ per cent fast cotton yellow C, extra; 20 per cent Glaubers; 2 per cent soda; enter at 120 degrees F.; give six turns to 180 degrees F.; color from C. Bischoff & Co.

ORANGE.

2 per cent fast cotton orange 6R, Ex.; 20 per cent Glaubers; 2 per cent soda; enter at 120 degrees F.; give six turns to 180 degrees F.; color from C. Bischoff & Co.

RED.

3½ per cent benzo fast red GL; ½ per cent chrysophenine; 20 per cent Glaubers; 2 per cent soda; enter at 120 degrees F; give six turns to 180 degrees F.; color from Elberfeld Farbenfabriken.

BLACK.

5 per cent direct deep black E, extra 30 per cent Glaubers; 2 per cent soda; enter at 180 degrees F.; get up to boil, give eight turns; Farbenfabriken of Elberfeld.

PURPLE.

3½ per cent benzo fast violet R.; 30 per cent Glaubers; 2 per cent soda; enter at 150 degrees F.; and give eight turns; Elberfeld Farbenfabriken.

BLUE.

3½ per cent fast direct blue R.; 30 per cent Glaubers; 2 per cent soda; enter at 150 degrees F.; give eight turns at boil. C. Bischoff & Co.

BROWN.

3 per cent direct brown NX; 30 per cent Glaubers; 2 per cent soda; enter at 150 degrees F.; give eight turns at boil; C. Bischoff & Co. A great variety of colors are used in hammock cloths.

TERRY CLOTH OR TURKISH TOWELING.

Terry cloth or Turkish toweling is a fabric composed entirely of cotton yarns. In effect it is a single cloth, having rows of loops, formed by warp yarn, in regular order, on each side of the cloth.

In making this fabric, it is necessary to use two beams. No. 1 or the bottom beam contains the warp for making the body or ground of the cloth. No. 2, the top or terry beam, contains the warp for making the loops in the cloth or terry effect. Terry cloth is used in the manufacture of towels and Turkish bath robes, and, as to color, there are solid bleached towels, towels having side and cross border color effects, also stripe patterns for the bath robes, favorite colors being navy blue, old gold,

cherry red, light green, etc. The warps are of 2-20s to 2-30s cotton and the filling 1-20s to 1-30s cotton.

Terry cloth is a narrow fabric measuring about 25 inches from loom and can be made on the roller or cam loom or the dobby or jacquard loom, either style of loom of course having the terry motion attached; the jacquard machine being only necessary in making fancy border effects in conjunction with the filling box motion. Very good cross border patterns are produced on a mutual loom, having terry motion and dobby attached.

The terry weave is the three harness twill weave dissected, and the different parts of this weave placed together again in such a manner as to permit the forming of a series of loops on each side of the cloth in regular order, by the top or terry warp weaving slack, using only sufficient weight to permit of correct shedding.

In making terry on a roller or cam loom, four harnesses and four cams are necessary, two cams being warp effect and two cams filling effect. The top beam containing terry warp is drawn in on first and third harnesses and the bottom or ground warp on second and fourth harness, reeded two ends per split and placed in the loom, the first and third harnesses being strapped up to the first roller, the second and fourth harnesses being strapped up to the second roller. The harnesses are then connected with the treadles at the bottom of loom by means of jack straps, these treadles being in turn operated by the cams, which are set on a cam shaft.

The cams for this weave are those of a $\frac{2}{1,}$ $\frac{1}{2}$ 45 degrees twill, and are so arranged on the cam shaft as to produce the terry effect. The warps are drawn in 1, 2, 3, 4, weaving one terry, one ground end.

The cams are arranged as follows:

One $\frac{2}{1}$ Warp effect cam.

One $\frac{1}{2}$ Filling effect cam.

One $\frac{2}{1}$ Warp effect cam.

One $\frac{1}{2}$ Filling effect cam.

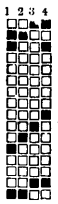
WEAVE.

First pick, first, fourth harness up, 2, 3, harness down. Second pick, first, second harness up; 3, 4, harness down. Third pick, first, second, harness down; 3, 4 harness up.

The terry motion is arranged thus:

At the bottom of the loom, near the side, there is a treadle, suspended in much the same manner as the cam treadles. To the treadle there is an iron (½ inch) rod attached and running up the inside of the loom and connected with an iron lever, which works upon a fulcrum, bolted to the loom side, the loom driving shaft rests in box or bearing on the side of the loom. This box is so shaped that it allows the shaft an eccentric motion, when the terry treadle is forced down by a cam, placed on the lower loom shaft for the purpose.

When the terry cam, revolving on the lower loom shaft, strikes the terry treadle, the rod connected thereto pulls down on the lever connected with the box in which is resting the driving shaft, the whole action throws the loom shaft and loom sley forward out of line, and the top warp working slack the reed draws the yarn through; then the terry treadle regaining its original position, the loom shaft settles back



Design.

Drawing-in Draft.

Reed Plan.

1st Terry. 2d Ground. 3d Terry. 4th Ground.

to its correct position and the next pick of the loom binds in the slack warp, thus forming the loop in the cloth—the terry motion in this case working for two picks and stopping for one.

In weaving toweling on a roller loom, it being of short lengths of terry, the weaver allows the cloth to weave terry for any desired length, and to weave solid cloth without the loop. He throws the terry motion out of gear by dropping an iron finger down on the treadle. This holds the terry treadle out of the way of the revolving terry cam. This iron finger is usually either raised or lowered by means of a cord, fastened to the inner side of the breast beam and near the end of the loom.

This finger can be worked automatically by the use of a dobby motion or jacquard machine.

The terry warp, by weaving slack and forming the loops, will weave out at the rate of about 100 per cent faster than the ground warp. It is then replaced by twisting another warp to it,

this operation taking place at the loom and without removing the harnesses.

A good grade of terry cloth can be made as follows:

Reed—900, two ends per dent, 27 inches in reed; 2-30s cotton ground warp; 2-30s cotton terry warp; 1-30s cotton filling; 36 picks. Width from loom, 25 inches.

To be drawn and woven as stated above for a roller loom.

Carding and Spinning Particulars.

Yarn to make terry cloth or Turkish toweling belongs to the second division of mills i. e., the mills making cloth from low and middling grades of cotton (raw stock). The yarn is generally made from cotton of about 1-inch staple. The mixings should be as large as possible and good waste is generally thrown into the mixing bin at such times as it is usual to collect it from the different machines. It is usual in all mills to gather this good waste, which is really no more than the tail ends of laps, from the pickers, sliver which has not been properly coiled in the cans at the cards, combers and drawing frames, also any waste that contains the proper length of staple, which has been made at the different processes, which from improper care or handling or some defect in machinery cannot be used at the succeeding machine. This waste is generally placed in cans and collected at regular intervals and carried to the picker room and thrown back into the mixing bins to be used over again and is considered as raw stock. Of course it is understood that the different kinds or grades of cotton are kept separate. This method includes all machines up to the slubber and the procedure is the same as described in a previous article.

OPENING AND PICKING.

The cotton is passed through an opener and two processes of picking, the weight of lap being about 40 lbs. at the breaker and 39 lbs at the finisher, the speed of the beater being 1,500 revolutions per minute. This is a little faster speed than is used for higher class of yarns, because there is apt to be more dirt and foreign matter in the lower grades of cotton and the more beats per inch you have the more it tends to clean your cotton.

There is a limit, however, to the speed at which to run the beater, because, if run at too great a speed, it will tend to put nips into the cotton which are impossible to comb or card out unless you take out the whole bunch of fibres contained in the nip, which is a needless waste of good cotton when a little care at the beginning would have saved the nip. Nips make bunches in the yarn and show up clearly in the finished cloth, and, while it is impossible to make yarn without nips, it is always the object of all good carders to make as few as possible.

CARD SETTINGS.

The settings at the cards should be as follows: Flats from cylinder 10-1000ths to 12-1000ths inch; doffer to cylinder 7-1000ths inch: licker-in from cylinder 10-1000ths; feed plate to licker-in 12-1000ths to 20-1000ths inch,according to what style of nose you are using; licker-in knives to licker-in about 12-1000ths inch; back and front knife plates 12 to 17-1000ths inch, from cylinder wire at the lower edge, although the setting distance of the front knife plate varies because this helps to regulate the amount of flat-top waste taken from the cotton on the cylinder; cylinder screen from cylinder wire 20-1000ths to 24-1000ths inch at its nearest point to wire, which is the centre or directly underneath the centre shaft of cylinder. The outer edges of the screen are generally set about ¼ of an inch away from the wire. The sliver should weigh about 65 grains to the yard at the front of the card, the production being about 800 pounds per week of 60 hours.

THREE PROCESSES OF DRAWING.

The work is then put through three processes of drawing, the revolutions per minute of front roll being 400, the production per week 1,650 lbs. per delivery, the sliver weighing about 70 grains per yarn. The settings for finisher drawing frame are as follows: front roll to second, 1⅜ inches; second roll to third roll 1½ inches; third roll to back roll 1⅝ inches. The slubber hank should be about .40 hank; first intermediate 1.50 hank; second intermediate five hank. The spinning frame makes the required 1-20s yarns from five hank roving. Some overseers use one less process of drawing and add one process of fly frames, in which case the hank roving at the different processes of fly-frames would be as follows: slubber .40; first intermediate 1.10; second intermediate 2.70; fine frame, five hank.

To make the yarn 2-20s, it is doubled at the twister, two ends of 20s yarn being fed and being twisted into one thread of yarn at the front, but being called 2-20s yarn.

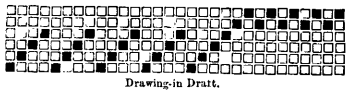
Bleaching and Finishing of Turkish Toweling.

If bleached in the ordinary way running through machine rollers in a bleaching works, the pieces will be drawn and sometimes damaged. Each piece is laid separately in a kier until the full amount of cloth has been placed therein, a solution of caustic potash at 5 degrees Tw. is run in, and boiled for 10 hours. Wash well and boil again with a 4 degrees Tw. of caustic potash. Wash well, and give a solution of sulphuric acid ½ degree Tw. Wash well and chemic with ½ degree Tw. chloride lime, for about four hours. Give an acid bath of ½ degree Tw. sulphuric acid. Wash well till all trace of acid has been eliminated.

The goods should be dried on a tenter frame. A light starching, to give more weight, can be given of 4-6 oz. cornstarch per gallon, starch to be boiled for one hour. Run through a rubber rolled mangle and dry on a tenter frame. If a half bleach is required, a boil of caustic potash and an acid bath are all that are required.

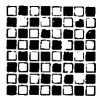
CRINKLE OR SEERSUCKER.

This weave can be produced on less harnesses, but this number allow more freedom for heddles.



Drawing-in Dratt.

Reed Plan.



Plain Weave for Crinkle.

Crinkle or seersucker is a wash fabric composed of cotton, cotton and silk or all silk, and can be easily woven in any power loom adapted to light and medium weight cotton goods, such as the old style roller loom, or the more modern dobby or jacquard. To make this fabric

TWO BEAMS ARE NECESSARY

as the crinkle or shrunken stripe is its peculiarity, hence the name. The part of the warp (which forms the crinkle in the cloth) is dressed on a separate beam and has only sufficient weight placed upon it to allow it (crinkle warp) to form a shed properly during weaving.

The ground or body of the cloth may be dressed upon one or more beams according to the difference in takeup, created by using combination weaves to form fancy corded or ribbed stripes in the body of the cloth.

To make a perfect crinkle fabric, use only

THE PLAIN WEAVE,

on both the ground and crinkle warps; as, for instance, if we desired to make a cloth having a plain stripe for 20 threads and a crinkle stripe for 10 threads, draw the plain or ground threads on four harnesses, straight draft, 1, 2, 3, 4 and the crinkle threads on two harnesses 1, 2 and reed the whole warp two ends per dent straight across from selvage to selvage.

The crinkle effect is produced by allowing this part of the warp to weave in slack, while the ground warp has the regular weight or tension placed upon it. In this way the slack warp very naturally forms a puckered or shrunken stripe in the fabric.

This fabric was in great demand some years ago, in fact about 1884, and was used extensively for ladies' wear in the line of summer outing dresses, petticoats, etc., but like most novelty fabrics it survived for a few seasons and was cast aside, being out of date, and something newer taking its place in the popular fancy.

A very good grade of crinkle cloth can be produced from the following:

STRIPE EFFECT (WARP PATTERN).

Reed, 1150—30 inches width in reed; 1-30s cotton warp and filling. (Regular yarns), 56 picks filling.

To bring out the puckered effect more prominently, draw crinkle warp two ends per heddle, four ends per dent. This necessarily increases the weight of the goods, also creating an opening for the working up of old stock yarns. Of course each manufacturer usually follows his own ideas of economy in constructing a fabric, consistent with the conditions and suggestions submitted to him by the trade through his selling agents concerning the nature and style of a sample fabric to be produced.

Following is the

FINISH

for goods constructed as per stripe effect: Goods are run through the washer, then through the cylinders or dryer, from the dryer to the tentering

machine. This operation stretches the goods to the original loom width if desired, also acting as an auxiliary dryer, after which they are run through the calender, which machine gives the cloth the appearance of having been newly ironed.

Carding and Spinning Particulars.

The mills making the style of cloth described above belong to the second division of mills given in a previous paper, i. e., those using low and medium staple and grade of cotton. These mills of course use the average settings on all machines with proper relation to the length of staple, etc. Of course, crinkle or seersucker is made of different counts of yarn in different mills, but these do not vary enough so that any change is made, except in the spinning room, which will be mentioned later. The seersucker under description will be considered to be made of 1-30s cotton yarn. The raw stock used for this yarn should be about 1 to 1⅜-inch staple.

IN THE MIXINGS

use other good waste, such as described in the last paper,also cut roving waste. As in previous mixings, make them as large as possible, and when possible put them through a bale breaker, and it would be a good idea to let the cotton stand as long as possible before using it (after mixing, of course). This allows it to expand and dry out and it is then in a better form for use. Different mills use different processes for the purpose of dyeing the cotton out and making the cotton mixing

AS FLUFFY AS POSSIBLE.

It is the general custom in up-to-date mills to use a blower in connection with the bale breaker. The cotton is fed into the bale breaker and junks are torn apart by the spikes on the rolls of the bale breaker and then the cotton is delivered on to an endless apron, which carries it over a chute into which the cotton drops. This chute allows the cotton to slide into a fan or blower, which revolves at a high rate of speed and the draft carries the cotton through, trunking either directly to the bin in which it belongs or drops it on to an endless lattice, which may be shifted to allow the cotton to drop into the bin where it belongs. It must be understood that cotton or raw stock is

COMPRESSED VERY TIGHTLY

into bales, and if some means were not taken to help the cotton regain its natural fluffy state the machines would have to do a great deal of heavy work for which they are not wholly built. Thus the bale breaker tends to separate the matted masses as they are taken from the bale and the air from the blower helps to air, dry and restore the cotton to a fluffy state, which is so desirable to obtain among carders. The cotton is allowed to stand as long as possible so that it will expand and dry out as much as possible before using,as the cotton in the bale collects more or less moisture from being in the cotton storehouses in general use.

The cotton used for 30s yarn is generally passed through

TWO PROCESSES OF PICKING,

if a blower is used. A good weight per yard of lap is 16 ounces and total weight of lap is 40 pounds at the breaker and 14½ ounces per yard and 39 pounds per lap at the finisher. The speed of the beater is the same as has been given for mills of the second division. At the card the draft should be about 100 to 110, which will give the weight of the sliver about 65 grains. The doffer should be speeded so as to give about 800 pounds production. The sliver is then generally run through three processes of drawing frames, a good draft of which is as follows: breaker, 5 plus; intermediate 4—; finisher 6; which will give the following weight of sliver per yard; at the breaker 74 grains; intermediate, 79 grains; and finisher,75 grains. Be careful of the settings of the rolls at the drawing. The hank roving at the slubber should be .45; at the first intermediate fly frame 1.40; at the second intermediate, or, as it is sometimes called, the roving frame, 3.5 hank and jack or fine frames, 7 to 7.5 hank. The roving is then carried to the spinning room where it is spun into 30s yarn. If yarn of a little higher or lower count is desired the draft gear is generally changed at this frame to give the required count.

Dyeing Particulars.

LIGHT BLUE.

For 100 pounds yarn, 1½ per cent immedial indone B pat.; 1½ per cent immedial sky blue cone; 5 per cent sodium sulphide; 10 per cent crystalline Glauber's salt; 3 per cent soda ash; enter at boil, boil one hour; wash well with water.

DARK BLUE.

For 100 pounds yarn: 8 per cent immedial indone blue Pat; 10 per cent sodium sulphide; 15 per cent crystalline Glauber's salt; 3 per cent soda ash; en-

ter at boil, boil one hour; wash well with water.

BLACK.

For 100 pounds yarn, 20 per cent immedial indone blue Pat; 10 per cent sodium sulphide; 15 per cent crystalline Glauber's salt; 3 per cent soda ash; enter at boil, boil one hour; wash well with water; second bath, one-half above proportions,

OLIVE GREEN.

12 per cent pyrogene olive N; 6 per cent sodium sulphide; 20 per cent Glauber's salt; 3 per cent soda ash; enter at boil; boil one hour, wash well with water.

BROWN.

12 per cent pyrogene brown G; 8 per cent sodium sulphide; 20 per cent Glauber's salt; 3 per cent soda ash; enter at boil, boil one hour; wash well with water.

FINISHING PROCESS.

Starch with six ounces cornstarch; six ounces cocoanut oil white softening; one gallon water; boil starch for 45 minutes; rinse through starch mangle; dry on tenter frame.

COTTONADE.

Cottonade is a heavy, coarse, single cloth, made of single yarn, generally 1-20s cotton warp and 16-cut wool spun, weaving woolen principle, all-cotton shoddy filling. It is used as a trousering, an important feature of which is the low selling price of the finished garment.

It is best adapted to the old-style roller or cam loom, and is made and woven on four harnesses, generally the $\frac{2}{2}$ twill, either right or left hand, or herring-bone weave effect (twill running at angle of 45 degrees). It is a narrow fabric, being set in the reed 30 inches, and receiving very little finish and is sold at 27 inches in width.

THE PATTERNS

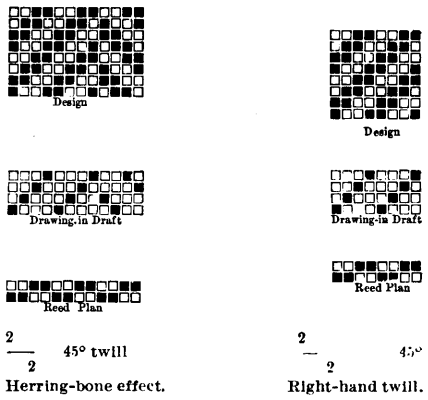
are usually on the dark side with a small percentage of bright color added to improve the tone: Black, dark slate and dark drab for ground colors, and an occasional red, pearl, light brown or an equivalent color to brighten the whole pattern.

In making a cottonade the object is to produce a cheap single-cloth trousering composed of a rather coarse but fairly strong single warp thread and a thick or lofty single filling thread, which combination in certain proportions gives the fabric a weighty appearance.

THE FILLING

is usually an all-cotton shoddy filling, made from old dark colored cotton rags. By willowing and pickering, the yarn is brought to the carded state. The fibres in an all-cotton shoddy are short, due to the process of reduction as stated above.

From the pickers the shoddy is run through the first and second breakers and then through the condenser or finisher card. The spool drum containing the roving is then taken from the condenser card and placed upon



the mule to be spun upon tubes, ready for the weaver.

The fibres being short, the shoddy will lose from 15 to 20 per cent of its weight during the carding and spinning, also from the 3 to 5 per cent of waste made by the weaver.

To find stock at picker:

Cottonade, 30 inches in reed; 32 picks; 16-cut cotton (woolen principle) shoddy; 32 times 30 equals 960 yards divided by 300 equals 3.2 ounces filling, plus 5 per cent loss equals 3.18 ounces; 16-cut times 300 equals 4,800 divided by 16 ounces equals 300 yards per ounce; 3.18 ounces at loom plus 20 per cent loss in carding, spinning equals 3.82 ounces at picker per yard of cloth.

Cottonade, reed 800-2 ends per split, 30 inches wide, 32 picks, 16-cut cotton (woolen principle) shoddy, 1-20s cotton warp.

Finish about 27 inches. To finish run through dry hot press.

Weigh 4¼ ounces about.

Warp pattern:
10 Black.
2 Dark slate.
1 Red.
1 Black.
2 Dark drab.
1 Black.
1 Red.
2 Dark slate.

Design—regular $\frac{2}{2}$ 45 degree right hand twill.

THE WEAVING.

To weave in roller loom, this warp is drawn in 1, 2, 3, 4, on four harnesses, and these harnesses suspended in the loom from the rollers by means of straps attached to hooks on the top of the harness or heddle shafts. The harnesses are then fastened to the loom treadles by means of jackstraps running from the bottom of the harness to said treadles, the treadles being operated by a series of cams, consistent with weave effect desired.

These cams are so arranged on the cam shaft that in revolving they strike the treadles, and this action, pulling the harness up and down, opens the shed. (Note—in a roller loom two or more harnesses are always attached to one top roller, and of necessity whatever pulls one down must pull the mate harness up, the cams always being arranged to permit this.)

In applying this weave the first and third harnesses are strapped to the first top roller and the second and fourth strapped to second top roller. This being the case, the action of the cams in opening the shed causes the raisers and sinkers on each successive warp thread in the repeat of the weave to start one pick later than that of the thread preceding it, thereby forming a twill line.

A warp to be woven $\frac{2}{2}$ twill, drawn on four harnesses 1, 2, 3, 4, and strapped up in this manner, and having the cams set properly should shed thus: First pick, first and fourth up; second and third down. Second pick, first and second up; third and fourth down. Third pick, second and third up; first and fourth down. Fourth pick, third and fourth up; first and second down.

The herring-bone weave effect is produced by drawing in the warp from front to back and back to front in the harness and using the same set of cams, set in the same manner and position, and the same harness strapping as in making a straight right hard twill.

Carding and Spinning Particulars.

For this class of goods the cotton yarn is generally made and spun in the same way as wool and worsted yarns, and is generally made in mills and on the machinery generally used for making worsted or woolen yarns. It will be understood that the methods of making yarn in a cotton mill and a woolen mill are entirely different, both as to the number of processes used and as to the machinery used. In fact, the fundamental principles for spinning yarn are entirely different in each mill, and as we are describing cotton fabrics in these articles we will proceed just as if the yarn used for this class of goods was made at a cotton mill and sold to a woolen mill, which is sometimes done.

THE RAW STOCK.

The raw stock used for this class of fabric would be of a low grade and generally mixed with comber or even card waste; the percentage of waste used would depend a great deal on the count of yarn to be made. In the fabric under description the count of the cotton yarn is 1-20s. The raw cotton would be opened up and run through a bale breaker, or it may be opened at the bin and not run through the bale breaker which will save the expense of one process, but the cotton will not be opened up as well and a more even yarn yarn will be made when bale breaker is used. As the cotton is opened at the bin it is mixed with the carded or combed waste in the proportion required; the cotton layers being taken from the bale and pulled apart as much as possible so as to let the air get at them and also so as to lighten the work of the opener. The cotton is taken and put into the opener which is generally attached to the breaker picker, either directly or indirectly by having the cotton carried through trunking (through which it is blown by a draft of air from a fan on the opener) which connects with the back part of the breaker picker. The opener machine may be on the same floor or may be situated on the floor above or below the breaker picker; but in mills, as they are now constructed, the opener is on the same floor and is considered as a part of the breaker picker.

PARTICULARS TO BE OBTAINED.

For this count of yarn the speed of the beater should be about 1,050 revolutions per minute. The hopper

on the opener should always be kept more than half full of cotton and it should be as large as possible, the reason for this being that a more even amount of cotton will always be presented to the pin beater by the lifting apron than when the hopper is less than half full. This is important, not only in reference to "cottonade fabrics," but also all classes of goods, because if it is less than half full it is apt to cause uneven yarn. The speed of the beater on the breaker and finisher pickers should be about 1,500 revolutions per minute, which gives the beats per inch about 42. The weight of the lap at the breaker picker should not be less than 40 pounds and at the finisher less than 39 pounds. A 39-pound lap gives a weight of lap per yard of 14½ ounces. The card is set so as not to take out too much waste, and wider settings are used than those given in a previous article. The draft used should be 100, the sliver at the front weighing 65 grains. Production at the card should be at least 900 pounds. The sliver is then run through two processes of drawing, the weight of sliver at the finisher being about 72 grains per yard. The production per delivery of the finisher drawing frame should be at least 1,600 pounds per week of 60 hours and the percentage of lost time at this machine not more than 15 per cent. The slubber is the next process and the hank roving made at this machine should be about .40. Three-process fly frames are used and the hank roving at the different processes should be as follows: 1st intermediate 1.10 hank; 2d intermediate 2.75 hank; five-frame from 4.50 to 5.00 hank. Care should be taken that the rolls are not spread too far apart on these machines and a good setting for rolls of this stock for slubbers and fly frames is as follows: Front roll to middle spread to 1¼ inches; middle roll to back roll 2 inches. The yarn is then taken to the spinning room where it is spun into 20s yarn, a soft twist being used.

Dyeing Particulars for Raw Stock.

BLACK.

For 100 pounds: 18 per cent pyrogene black B. D.; 12 per cent sodium sulphide; 8 per cent soda ash; 70 per cent salt. Enter at boil, boil one hour, and wash well in water.

PEARL.

One per cent pyrogene gray B; 2 per cent sodium sulphide; 2 per cent soda ash; 5 per cent salt. Enter at boil, boil one hour.

LIGHT BROWN.

Five per cent pyrogene brown G; 5 per cent sodium sulphide; 2 per cent soda ash; 5 per cent salt. Enter at boil, boil one hour, wash well.

RED.

Five per cent rosanthrene red A; 25 per cent Glauber's salt; 3 per cent soda. Enter at boil, boil one hour, rinse, diazotize for one-quarter hour with nitrite soda and muriatic acid, rinse.

Develop with beta naphthol and caustic soda for one-quarter hour. This red is brighter and faster than primuline red.

DIAZOTIZING BATH.

One and one-half per cent nitric soda, 5 per cent muriatic acid, 20 degrees be.

DEVELOPING BATH.

One and three-quarters per cent beta naphthol; 3 per cent soda ash.

DARK SLATE.

Two and one-half per cent immedial direct blue, B pat.; ¾ per cent immedial olive, B pat.; 5 per cent sulphide sodium; 2 per cent soda ash; 20 per cent Glauber's salt. Enter at boil, boil one hour.

DARK DRAB.

One and one-half per cent immedial brown, pat.; ¾ per cent immedial olive, B pat.; ¼ per cent immedial black, N B pat.; 20 per cent Glauber's salt; 2 per cent soda ash; 5 per cent sulphide soda. Enter at boil, boil one hour.

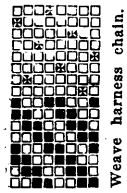
COTTON WORSTED—MEN'S WEAR.

Cotton worsted men's wear is a fabric composed of either 2-20s or 2-30s cotton warp and filling, and receives either a dry or wet finish. The weave, color arrangement and general construction are an exact duplicate of the finest worsted goods of the present time.

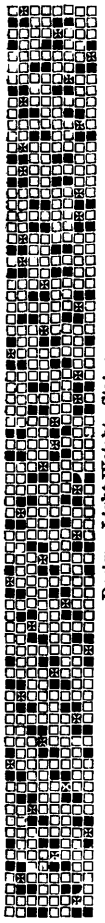
This fabric is used in the manufacture of men's suitings and trouserings, retailing at $7 to $12 per suit, for the middle class trade, and in effect has the neat dressy appearance of an imported cloth of high grade.

It is made in a light-weight grade

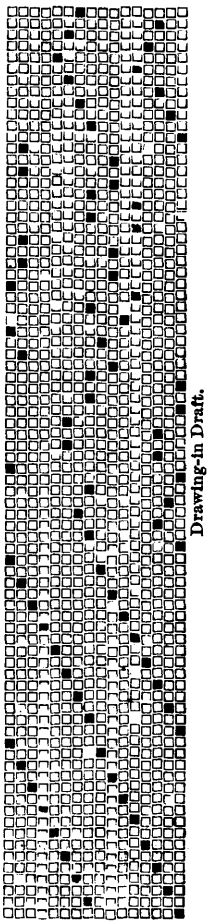
at 6 to 6½ ounces for spring and fall, and heavy weight at 8 to 8½ ounces for winter wear, both grades being produced in stripe, check, and indistinct plaid patterns.



Weave harness chain.



Design—Light Weight—Stripe.



Drawing-in Draft.

Reed Plan

Cotton worsted men's wear is usually woven on a Crompton & Knowles, Mutual or Fairmount loom, having either 4x1 or 4x4 filling boxes, and having a head motion attached such as the Crompton & Knowles, Mason, Ingraham, Stafford or Oldham, of from 16 to 25 harness capacity. Most all weave effects and combinations of weaves known in the worsted men's wear trade can be applied to this fabric. Care should be taken, however, in construction of weave, as the weave, when used in a worsted to produce a tightly bound rib effect, may appear more open in cotton worsted men's wear as the worsted fabric shrinks when scoured in finish and the cotton fabric is finished dry and is practically the same as when taken from loom, of course allowing for percentage of contraction between reed and cloth roll. Cotton worsted men's wear is usually made one face end and one back end, and reeded four ends per dent.

THE FACE WEAVE

when a twill, or fancy combination, is balanced on the back of the cloth by using an eight harness satin (warp effect on back) five as counter. The face weave should always be properly balanced. In making this style of goods, or a warp back fabric, the extra is placed there for the purpose of adding weight to the cloth, and if of a tighter nature, the face of the cloth will present a puckered or uneven appearance.

To dry finish cotton worsted men's wear, the yarns of which have been dyed from dry or cheap colors, that will not stand washing, the goods are taken from the loom and inspected, measured and sheared. Shearing is a process which means running the cloth through a machine, having a cutter composed of a series of blades set in a frame, which revolves in similar manner to that of a grass mower, the cloth being kept taut by being passed over and under several rods and rollers, which also remove wrinkles, and allow the cloth to be presented evenly to the cutter. The purpose of shearing is to remove all foreign substances from the face of the cloth, such as knots, lumps, etc., and the effect is a smooth, even cloth that readily takes on the appearance of a high-class worsted, after being run through the hot press.

The steam gauge on a hot press should register 50 pounds and the dial 135 pounds roller pressure when the cloth is run through this press. The effect of the pressure of the steam-heated rollers upon the cloth is to remove all wrinkles, liven up the colors, and to retain the width of cloth as taken from the cloth roll at the loom.

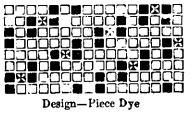
After being pressed, the cuts of cloth are rolled or sapped into bolts, the

ends of which are then stitched, the tags sewed on and the goods are ready to case and ship.

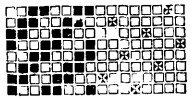
THE COLORS

used in cotton worsted men's wear are black, brown, light and dark shades of blue, slate, drab and steel, and to liven up a pattern use an occasional end of maroon, green, pearl or sky blue.

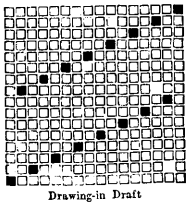
This line is also made in a piece-dye fabric, constructed from 2-20 and 2-30 cotton warps, and 1-30s worsted and 1-20 cotton filling. These yarns are woven in the gray and the cloth scoured and dyed in the piece, black or blue. When finished, this fabric resembles a very heavy serge. Finish, 28 inches.



Design—Piece Dye

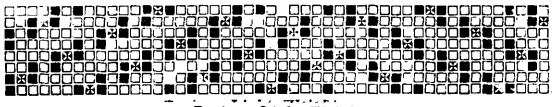


Weave Harness Chain

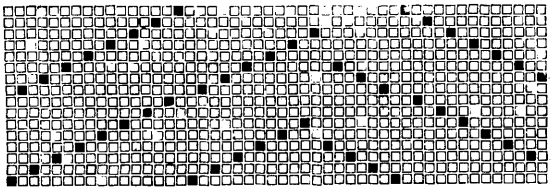


Drawing-in Draft

Reed Plan



Design—Light Weight—Stripe.



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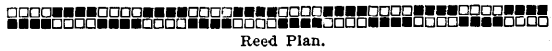
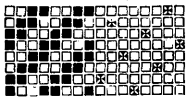


Reed Plan.



Weave Harness Chain.

Piece dye—worsted men's wear; reed, 500—eight ends per dent; 33 inches in reed, including selvage, 32x2.

1 end face 2-30 cotton warp; 1 end back 2-20 cotton warp, $\frac{2}{2}$ twill face, 8 harness satin back, 5 as counter.

1 pick 1-30s worsted; 1 pick 1-20 cotton; 56 picks per inch.

LIGHT-WEIGHT MEN'S WEAR.

Reed, 900—four ends per dent, 6½ ounces; 31½ inches in reed, including selvage 32x2; 2-30s cotton warp, one face and one back; 52 picks 2-30s black cotton filling. Dry finish equals shear and hot press. Weave twill combinations for face; weave eight-harness satin for back.

HEAVY-WEIGHT MEN'S WEAR.

Reed, 800—four ends per dent, 8½ ounces; 31½ inches in reed, including selvage 32x2; 2-20 cotton warp one face, one back: 52 picks, 2-26s black cotton filling. Dry finish equals shear and hot press. Weave, can use same as light weights.

Carding and Spinning Particulars.

Cotton worsted fabrics, like cottonade fabrics, are generally made and spun in the same manner as wool and worsted yarns and made in woolen mills. There are a few exceptions, however, where they are made in cotton mills. The count of the yarn used in cotton worsted fabrics varies from 20s to 36s, and is generally a doubled yarn. In the present article we will proceed as if the count of the finished yarn was to be 2-30s.

A mill making this class of goods would belong to the second division of mills (as classified in a previous article) i.e., a mill equipped with machinery for making yarns from low to medium grades of cotton.

THE MIXINGS

would be made in the usual manner, being run through a bale breaker into the mixing bin and at this point mixed with the sliver waste returned from the cards, drawing frames and combers (if there are any of these machines in the mill) and then it is run through an opener and through three processes of pickers. At the finisher picker laps of cut roving waste are mixed with raw stock in the proportion of three laps of raw stock to one lap of cut-roving

waste. In using cut-roving waste and also sliver waste it should always be of the same length of staple. It is

THE GENERAL PLAN

to use cut-roving waste as fast as it is made and not allow it to collect until a large quantity is on hand.

The method employed in most mills is to collect the cut-roving over a day (generally right after the noon hour) and take it to the picker room and run it through the roving or waste picker. From here it is run into a breaker picker and formed into laps of suitable weight. These are then mixed with the raw stock in the proportion above stated, as long as the cut-roving laps hold out (which should be as short a time as possible for obvious reasons). By doing this

A MORE EVEN YARN

is obtained than when the cut roving is allowed to collect for a week at a time before being put through the waste picker, because by the first plan you are mixing a small quantity of cut roving a good part of the time, whereas by the latter plan cut roving is only mixed with the raw stock once a week, while during the other five days nothing but the raw stock and sliver waste is being mixed. By the latter plan a more uneven yarn is bound to be made. The

SPEED OF THE BEATERS

on the different machines should not exceed 1,050 revolutions per minute at the opener, 1,500 revolutions per minute at the breaker picker, and on the intermediate and finisher pickers the speed should be slowed down so as not to exceed 1,450 revolutions per minute. This will give 42 beats to every inch of cotton fed to the finisher picker, which ought to be enough to thoroughly clean it. In giving the above speeds it is assumed that the rigid two-bladed type of beater is used. Different kinds of beaters, together with their advantages and disadvantages, will be given later when higher count yarns are described. The

WEIGHT OF THE LAP

at the breaker picker should be about 40 pounds or 16 ounces to the yard; at the intermediate about 37 pounds or 12 ounces per yard; at the finisher 39 pounds or 14½ ounces per yard. The settings at the card should be the same as described in last week's article per weight of sliver being 60 grains per yard and the production 850 pounds per week of 60 hours. The work is run through three processes of drawing, revolutions per minute of front roll at each process being 400 and the weight of the sliver at the finisher drawing 70 grains per yard. In order to help produce a perfect yarn, it is always a good rule never to draw more than you double at the drawing frame. For example, if you are feeding six ends at the drawing your draft should be six or under. The

PRODUCTION OF THE SLIVER

at the drawing frame should be about 1,600 pounds per delivery for a week of 60 hours. The next machine is the slubber, the hank roving at the front being about .40.

The yarn is run through three processes of fly frames and the hank roving made at each should be as follows: First intermediate, 1.20; second intermediate, 3.00; fine frame, 7.25 to 7.50. The yarn is then taken to the spinning room and made into 30s yarn; from here it is taken to the twister and made into 2-30s by doubling two yarns of single 30s yarns together.

Dyeing Particulars.

BLACK FOR YARN.

15 per cent immedial black N N; 12 per cent sodium sulphide; 5 per cent soda ash; 20 per cent Glauber's salt; enter at boil, boil one hour; wash well.

DARK BROWN.

8 per cent immedial dark brown A; 1 per cent immedial yellow D; ½ per cent immedial black N B; 10 per cent sodium sulphide; 5 per cent soda ash; 20 per cent Glauber's salt; enter at boil, boil one hour; wash well.

DARK BLUE.

3 per cent immedial indone B cone; 3 per cent immedial indone R cone; 3 per cent immedial direct blue B; 8 per cent sodium sulphide; 5 per cent soda ash; 20 per cent Glauber's salt; enter at boil, boil one hour; wash well.

PEARL.

For 100 pounds yarn: 2 ounces immedial black N R T; 8 ounces sodium sulphide; one pound soda ash; 5 per cent Glauber's salt; enter at boil, boil one hour.

DRAB.

For 100 pounds yarn: 2 ounces immedial black N B; 12 ounces immedial cutch G; one pound sodium sulphide; 5 pounds Glauber's salt; enter at boil, boil one hour.

SLATE.

For 100 pounds yarn: 2 pounds immedial direct blue B; three-quarters of a pound imedial olive B; 5 pounds sodium sulphide; 10 pounds Glauber's salt;

2 pounds soda ash; enter at boil, boil one hour.

STEEL.

For 100 pounds yarn: 12 ounces immedial black N B ; 2 ounces immedial yellow D; 2 pounds sodium sulphide; 2 pounds soda ash; 5 pounds Glauber's salt; enter at boil, boil one hour.

GREEN.

5 per cent pyrogene yellow M; 5 per cent pyrogene green B; 10 per cent sodium sulphide; 20 per cent Glauber's salt; 5 per cent soda ash; enter at boil, boil one hour; wash well.

MAROON.

25 per cent Glauber's salt; 6 per cent Rosanthren C B ; 5 per cent soda ash; enter at boil, boil one hour; wash.

Diazotize: 1½ pounds nitrate soda; four pounds hydrochloric acid; turn for 15 minutes; develop two pounds beta-naphthol; 2 pounds soda ash; turn for 15 minutes; wash well.

SKY BLUE.

2 pounds immedial sky blue; two pounds sodium sulphide; 5 pounds soda ash; 15 pounds Glauber's salt; enter at boil, boil one hour.

FIGURED SILK (LENO) WAISTING.

Figured waisting is a light-weight wash fabric, generally composed of 1-40 cotton warp and either single or two-ply silk or silkoline filling,1-60 silk and 2-60 mercerized or silkoline filling being in great favor for the past few years.

This fabric can be woven on either the dobby or jacquard loom having single or double box motion. Very

ELABORATE AND POPULAR STYLES

are created by using fancy granite weaves (filling effect) for ground, and for figuring use the filling effect of diamond, spot, crossed or curved twill weaves. These are so regularly arranged as to produce apparent jacquard patterns. Persian stripes can be produced by using bright colored extra warp threads and arranging the weave so as to raise them on the face of the cloth in Oriental or floral designs. Spots are sometimes woven into this fabric by using extra warp and clipping the long floats of yarn off the back of the cloth.

Very elegant styles are made by introducing leno or doupe weaving by means of white and colored fancy yarns to produce open or lace work in the cloth.

Figured waisting is made in both chambray and stripe pattern, always having white filling. For chambrays the following

COLORS

are serviceable: dark blue, light blue, brown, pink, red, pearl, steel, light green, tan, ecru, etc.

The combination of cotton warp and silk or silkoline filling creates a silky sheen on the face of the fabric as the light strikes it, and this in itself is its most important selling feature.

IN WEAVING

this fabric the take-up roller should be covered with fine sandpaper and this paper presents a more even surface to the cloth and does not draw the filling as is often the case where perforated tin is used as a covering on the take-up roller. The perforations usually cause small rough particles of tin to stick out prominently, and these catch on the long floats of the filling figure, and as the loom continues to run, the yarn clings to the roller and draws the filling, thereby spoiling the symmetry of the figure and causing imperfect cloth.

The tin covering very often causes clouded or thick and thin places in the cloth. Especially is this so when using a fine silk filling, and a great number of picks per inch.

To finish figured waisting the fabric is washed in a solution of soap and cold water, then dried by being run through the hot press. After the press of calender, the goods are folded on a folding machine (not lapped) in the same manner as sheeting, and after folding, each separate piece or cut is doubled in half and then wrapped in stiff paper, to keep out all dirt, after which it is ready to pack and ship.

(SILK) FIGURED WAISTING.

Reed, 1,300, 2 ends per dent; 38 inches in reed,to finish at 36 inches. 1,-300 means 1,300 splits to 36 inches of reed. Warp 1-40s cotton: filling 1-60s silk filling, 64 picks. Take-up of warp during weaving, 15 per cent; 1,300 reed by 38 inches equals 1,372 splits; 2 ends to 1 split equals 2,744 ends plus 40 ends

for selvedge equals 2,784 total ends in warp.

WARP PATTERN.

16 White.
2 Light blue.
6 White.
2 Light blue.
} 3 times.
16 White.
8 Cadet blue.
2 Sky blue.
2 Cadet blue
2 Sky blue.
12 Dark blue.
2 Sky blue.
2 Cadet blue
2 Sky blue.
8 Cadet blue.

134 ends in pattern = 67 splits.

19 repeats of weave and pattern plus 40 splits or 80 ends.

FIGURED (LENO) WAISTING.

Reed, 1,400—ends per dent, 2; 34½ inches in reed, including selvage; finish, 28½. Scour and calender.

WARP PATTERN.

88 Red 1-40 cot.
1 Black leno 2-20 merc.
4 White 2-40 cot.
2 White leno.
4 White.
2 White leno.
4 White.
2 White leno.
4 White.
1 Black leno.

112 ends = 68 splits.

Weight one yard, 2,286 ounces.

1752 ends + 15% take up = 2061 yds. 1-40 cot. =	.981 ozs.
40 ends + 15% take up = 47 yds. 1-40 cot. =	.002 ozs.
304 ends + 15% take up = 358 yds. 2-40 cot. =	.034 ozs.
88 ends black + 25% take up = 50 yds. 2-20 merc. =	.009 ozs.
114 ends white + 25% take up = 178 yds. 2-20 merc. =	.034 ozs.
56 picks x 34½ in. = 1932 yds. 2-60 merc. =	1.221 ozs.
Total	2.286 ozs.

Carding and Spinning Particulars.

Only mills having up-to-date machinery and also up-to-date ideas can hope to make figured silk leno. This class of goods requires a great deal firmer yarns than the other cloths that have been previously described, and these yarns are made in the third divisions of mills (as classified in a previous article), i. e., mills making yarn from middle to high-grade cotton. The

COUNTS OF YARNS.

for this class of goods vary from 30s to 60s warp and from 40s to 80s (single or double) filling. The filling yarn is generally mercerized and a great many times extra silk ends are used to produce a certain silk effect in the cloth. For the carding and spinning particulars we will consider the warp made up of 1-40s cotton yarn and the filling of 2-60s yarn.

THE COTTON USED

should be of a good grade and a great deal of Allan seed cotton is used. This is generally of 1⅜ to 1½ inches staple and should be as clean as possible.

In mixing this class of cotton, it is very important that all the bales mixed should be of the same length of staple, and the overseer, or in large mills both the overseer of carding and the cotton sampler, sample the cotton from every bale, and if it is not up to the standard staple and grade, the bale is laid aside either to be taken back by the cotton broker or used for making yarns, which can be made out of a shorter staple cotton. After this the cotton is put through a bale breaker (if the mill has one which it should) or the cotton may be mixed by hand, care being taken when this latter method is used that the layers of cotton taken from the bale are pulled apart as much as possible. The ones in charge of

THE MIXING

should watch the men while they are pulling the bales of cotton apart to see that they do not take too large layers from the bale and throw them into the mixing bin which they will do if possible so as to get through with the job as quickly as possible, for it is a dirty job at the best. The bins should be made as large as possible so as to accommodate as large a mixing as possible at one time, as large mixings help to make more even yarn than small mixings.

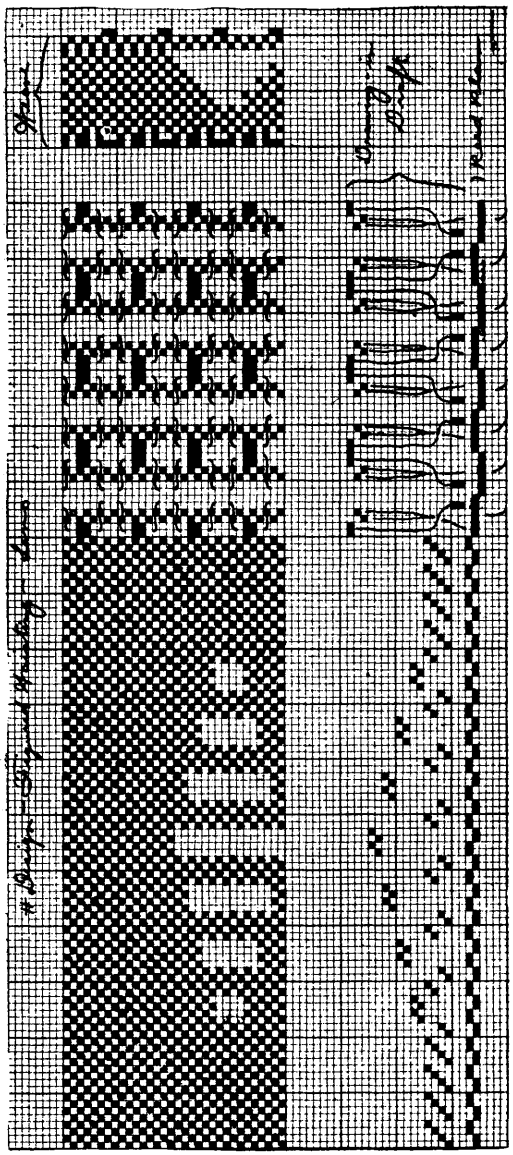
IN SOME MILLS

it is the custom to use two bins for mixing the same kind of cotton. The mixing is done as above described. But one bin is emptied at a time, while the cotton in the other bin is allowed to dry out while the cotton from the first bin is being used. Of course when one bin is empty it is immediately filled up again and the cotton is allowed to dry out in it until the second bin is emptied of cotton. When cotton is put through a bale breaker or any machine which opens the cotton up it is only necessary to use one bin and the cotton is or does not have to remain to air out, but may be used right away. The good waste from machines up to the slubber are used in the mixing, and cut-roving is run in at the finished picker (it having first been run through the roving waste machine and made into laps at a breaker picker). The raw cotton is taken from the bin and put through an opener and

TWO PROCESSES OF PICKING.

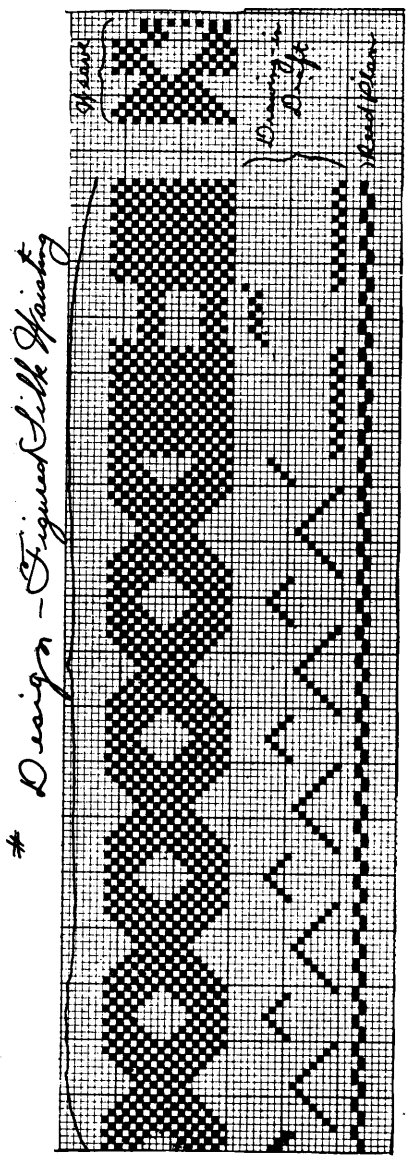
The speed of the opener beater should be about 1,000 revolutions per minute,

the breaker and finished beater (two-bladed) about 1,400 to 1,450 revolutions per minute. It may seem strange that the speed of the beaters on the opener and pickers should be about the same as when low-grade cotton was used, because the general rule followed is that the longer stapled cotton being used, the less the speed of the beater, because longer cotton being used a highly speeded beater is apt to and does put neps into the cotton, but it is necessary to run the beater at a higher rate of speed for this class of cotton because it is very dirty.



EXPERIMENTS should be made with the beater in order to get it to run just fast enough so that it will take out the dirt and foreign matter in the cotton, and the above speeds are given only as a basis from which to work. The weight of laps at

the breaker picker should be about 16 ounces to yard of laps and at the finisher about 11 ounces to yard of lap, or for the finer counts 10 ounces per yard of lap may be used. The total



weight of the lap is 35 pounds and at the finisher picker receiving about 42 beats of the beater for every inch feed. The method of finding

THE BEATS PER MINUTE

is to multiply the revolutions per minute of beater to one revolution per minute of feed rolls (this may be calculated through the gears on the picker in the usual manner). Multiply revolutions per minute of beater by 2 (or 3 if a three-bladed beater is used). Divide this product by the circumference of the feed roll. For example, suppose that the beater made 197.5 revolutions per minute and was a 2-bladed beater; then 197.5 times 2 equals 395 divided by 3 (diameter of feed roll) times 3.14 plus equals 41.9 beats per inch. Ans.

THE CARD.

The next machine is the card, and at this machine we see changes. In the first the wire fillets on the cylinder and doffer are finer. A good size wire to use is 35s on the cylinder and 36 or 37 on doffer and top flats. All parts are set closer to each other with the exception of the nose of the feed plate in relation to the licker-in. The feed plate should be set so that the licker-in will not take the fibres being delivered before they are free from the bit of the feed roll and feed plate. The speed of the top flats is sometimes increased by lagging the top flats driving pulley. This is for the purpose of having more working flats on the cylinder and which consequently results in taking out more waste. The

SPEED OF THE DOFFER

is a great deal less and thus the production is smaller, for it is quality first and quantity second with this class of goods. Of course the quantity must be looked to to see that the production is as large as possible,but it must not be at the expense of quality. Sometimes on the finer counts of yarn the speed of the licker-in is reduced, and it is found to be of a great benefit to the sliver delivered at the front, because it not only cleans the cotton more thoroughly, but it also tends to.

KEEP THE NEPS OUT

and not to put them in. If carders have not tried this it might be a good plan to lag the licker-in pulley to 10 or 10½ inches diameter, instead of nine inches as it now is when using long staple cotton, especially Sea Island cotton. The draft of the card should be about 125 to 140, the sliver at the front weighing about 45 grains to the yard and the production of the card being not over 500 pounds per week of 60 hours. Grind cards both often and light. The cotton for this class of goods is combed and

BEFORE REACHING THE COMBER

passes through the sliver lap and rib-

bon lap machines, generally 14 ends up at the sliver lap and six laps at the ribbon laps. The weight per yard of lap at the ribbon lap machine should be about 260 grains. As the ribbon lap machine is at the drawing frame, never draw more than you double. In some mills the ribbon lap machine is not used, but where it is used it saves about 1½ per cent waste at the comber.

THE COMBER

should be properly set so as to take out about 16 per cent waste, the weight of sliver at front being about 45 grains to yard. The speed of comber for this class of cotton should be not over 90 neps per minute. This class of cotton is very hard to comb and should be watched all the time to see that it is being handled properly. After the comber two processes of drawing are used, the sliver at the finisher weighing 70 grains per yard. The settings of the rolls should be as follows: front to second 1⅝ inches, second to third 1¾ inches, and third to back 1⅞ inches.

THE SLUBBER ROVING.

should be .55 hank and the first intermediate fly frame roving 1.50 hank; second intermediate 4.00 hank, and 12 hanks or packs for spinning 60s and .55 hank slubber 2.00 first intermediate and 8.00 fine frame for 40s. Care must be used in setting the rolls as well as in the adjustment of other parts of the fly frames. The cotton is taken to the mule spinning room and spun into the counts mentioned above, from here it is taken and put through the different processes required and sent away to be mercerized.

Dyeing Particulars.

FIGURED SILK AND LENO WAISTING.

DARK BLUE.

10 per cent tetrazo sulphur blue B, 8 per cent sulphide soda cone, 3 per cent sal soda,50 per cent common salt. Enter at boil, boil one hour, rinse quickly in cold water and give three washings in water.

The tetrazo sulphur colors can be obtained from the New York and Boston Dyewood Company.

BROWN.

10 per cent tetrazo sulphur brown R, 1 per cent tetrazo sulphur brown G, 9 per cent sulphide soda cone, 3 per cent sal soda, 80 per cent common salt. Enter at boil, boil one hour, rinse quickly in water and then thoroughly three times.

PEARL.

1 per cent tetrazo sulphur black R extra, 1 per cent sulphide soda cone, 2 per cent sal soda, 10 per cent common salt; rinse well quickly in water, and then thoroughly three times.

STEEL.

1 per cent tetrazo sulphur black Ex, 1 ounce tetrazo sulphur brown G, 1 per cent sulphide soda cone, 10 per cent common salt; rinse well quickly in water,and then thoroughly three times.

LIGHT GREEN.

1 per cent new methylene blue GG., ½ per cent thioflavine T, extra; enter at 120 degrees F. and get up to 160 degrees F. in 30 minutes, and turn five or six times and wash. To be dyed or yarn mordanted with tannic acid and tartar emetic.

TAN.

2 per cent tetrazo sulphur bronze, 2 per cent tetrazo sulphur brown G, 4 per cent sulphide soda cone, 3 per cent sal soda, 30 per cent common salt; enter at boil, boil one hour and wash well in three waters.

ECRU.

1 per cent tetrazo sulphur bronze, ¼ per cent tetrazo sulphur brown G, 1 per cent sulphide soda cone, 3 per cent sal soda, 20 per cent common salt; enter at boil, boil one hour, wash well in three waters.

RED.

4 per cent benzo fast red GL, 20 per cent Glauber's salt, 2 per cent sal soda, enter at 150 degrees F, give six turns to 180 degrees F., wash well in water.

PINK.

½ per cent diamond Rose GD, 2 per cent sal soda, 25 per cent Glauber's salt; enter at boil, boil one hour, and wash in water.

MEDIUM BLUE.

6 per cent pyrogene Indigo blue, 5 per cent sodium sulphide, 3 per cent soda ash, 25 per cent Glauber's salt; enter at boil, boil one hour, and wash well in water.

SKY BLUE.

2½ per cent immedial sky blue, 3 per cent sodium sulphide, 3 per cent soda ash, 30 per cent Glauber's salt; enter at boil, boil one hour; wash well in water.

DARK GREEN.

10 per cent pyrogene green B, 3 per cent pyrogene yellow M, 13 per cent sodium sulphide, 4 per cent soda ash, 30 per cent Glauber's salt; enter at boil,

boil one hour; wash well in four waters.

Finishing Particulars.

Starch with eight ounces cornstarch 6 ounces white cocoanut oil softening, 1 gallon water, boil one hour; dry over stenter frame and calender.

CORDUROY.

Corduroy is a narrow, all cotton fabric, the distinguishing feature of which is the perfect half-round regular ribs running warp ways through the cloth. As a fabric, it belongs to the general class of filling pile fabrics and is made of one system of warp and two of filling. The warp must be of good cotton staple to make a fine strong end. The pile filling should be of first-class cotton, soft spun, to blend more readily when the ribs are rubbed after being cut and brushed.

The warp and ground filling is woven either $\frac{1}{1}$, $\frac{2}{1}$ or $\frac{2}{2}$ twill, the pile pick weaves with either one, two, or three warp end, and floats over from three to 12 warp ends. The length of the float of pile filling depends upon the width of rib or cord desired in the fabric. The important point about the pile weave is to cause the pile filling to weave with the same two or three warp threads. This gives us lines of binding and lines of filling floats running warp ways.

The velvety ribs or cords, as noted upon the face of a corduroy,are created by first cutting the lines of floats of the pile filling. This operation is performed by hand with a very sharp steel knife, after which the ends of the floats are carefully brushed, and then rubbed together to the proper degree of consistency desired in ribs.

Corduroy is woven with from 160 to 500 picks of filling per inch; and is afterward dyed in dark blue, tan, buff, green and olive colors, to be used in making clothing for men.

It is also used for upholstery purposes, either in plain solid colors or the plain color has an elaborate floral design printed upon it. These printed patterns are usually in bright colors, such as red, yellow, light green.

IN PRINTING,

the design is first engraved upon a set of copper rollers. These are set into a regular machine, and as the cloth passes over them, the color being fed to the rollers automatically,the design is placed upon the face of the cloth.

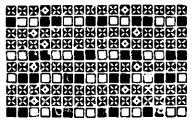
It is woven so as to finish from 27 to 31½ inches, the 27-inch for clothing and 31½-inch for upholstery.

This fabric requires a loom to be in good condition, as the beating in of such high number of picks per inch of filling is hard on the loom, and also necessitates slow production.

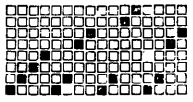
It is usually woven on dobby or witch loom, having single or double box.

Weaves are usually $\frac{1}{1}$ or $\frac{2}{1}$ or $\frac{2}{2}$.

Filling, 1 ground, 1 pile, 1 ground. 2 pile, or 1 ground, 2 pile, 1 ground, 1

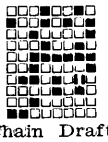


Design.



Drawing-in Draft.

Reed Plan.



Chain Draft.

Ground Weave $\frac{2}{2}$ twill.

⊞ Means floats of Pile Filling

⊡ Means sinking of Pile Filling under the warp for the purpose of binding in.

pile, this to be woven in a pick and pick loom.

Finish—Woven in the gray and dyed in the piece.

CORDUROY.

Four square inches equals 21.2 grains. Finished width, 31 inches equals 13.51 ounces.

48 ends per inch 2-28s cotton warp.
160 picks per inch 1-24s cotton ground filling.
240 picks per inch 1-20s cotton pile filling.

The above equals finished cloth.

Twenty pieces warp yarn, two inches equals 40 inches equals .65 grains; 40x 7000 equals 280000 divided by .65 equals 430769, equals 11965.8 divided by 840 equals 14.24 or 2-28s cotton warp yarn.

Eighty pieces ground filling, two

inches equals 160 inches equals 1.55 grains; 160x7000 equals 1120000, divided by 1.55 equals 722580, divided by 36 equals 20071.66, divided by 840 equals 23.89 or 1-24s cotton ground filling.

Weight of pile filling per one-half inch finished cloth two inches wide, equals 2.6 grains.

2.6 grains x 15½ equals 40.32x72 equals 3097.5 grains divided by 437.5 equals 7.08 ounces. Pile filling per yard, cloth 31 inches wide.

Forty-eight ends per inch finished times 31 inches equals 1488 yards plus 10 per cent take up in weaving equals 1653 yards of 2-28s cotton warp equals 2.249 ounces.

160 ground picks times 31 equals 4960 yards of 1-24s cotton filling equals 3.-936 ounces.

240 picks times 31 equals 7440 yards of 1-20s cotton pile filling equals 7.08 ounces.

7440 yards times 16 equals 119040 yards divided by 840, equals 1417, divided by 7.08 equals 1-20s pile filling.

CONSTRUCTION.

36 ends per inch in reed; 38¾ inches wide, 10 per cent take-up; 25 per cent contraction in width from reed to finished fabric; 18 per cent increase in weight in dyeing.

COLOR—DARK GREEN.

To be used for upholstery purposes.

$\frac{2}{2}$ twill weave.

Filling: 1 ground pick, 2 pile pick, 1 ground pick, 1 pile pick.

Carding and Spinning Particulars.

Yarn suitable for making corduroy is made in the second division of mills, given in a previous lesson. The raw stock used should be of a good grade cotton of about 1 inch staple. The mixings should be as large as possible for reasons already stated in previous lessons. One large group of mills, which make this class of goods, use a somewhat different machine for opening up the raw cotton from that which has been described, and instead of using an opener after the cotton is put through the bale breaker, it is fed to a machine called

THE WILLOW.

The cotton is fed into the machine in small lots and the machine pulls it apart and thoroughly airs it. Some overseers claim that this machine treats the cotton to a more thorough airing than when an opener is used. It is again claimed that, in consequence of this fact, the cotton may be used right from the bale or mixed at this machine. It is an English machine, and while this system is used to some extent in England, it is the general custom to use the opener in this country. Good sliver waste from the cards and drawing frames is used in the mixing, as is also the sliver and lap waste, from the comber room, when the mill is equipped with combers.

TWO PROCESSES OF PICKERS

are used with either a willow or an opener. Cut-roving waste is used and is mixed in at the finisher picker in the way that has been described in a previous lesson. If an opener is used, the speed of the beater should be about 1,000 to 1,100 revolutions per minute, with a speed of the fan about 350 revolutions per minute. The speed of the beater at the breaker picker should be about 1.500 revolutions per minute, and the speed of the fan about 1,400 revolutions per minute. A good weight for the lap made at the breaker picker is 40 pounds, while a good weight per yard of lap is 16 ounces. At the finisher picker the speed of the beater should be 1,450 revolutions per minute for a two-bladed beater, or 9.50 revolutions per minute for a three-bladed beater. The speed of the fan should be about 1,100 revolutions per minute with either beater.

A GOOD WEIGHT

for the lap would be about 38 pounds and the weight per yard 14 ounces. To get the grade of cotton used for this class of cloth clean, about 42 beats should be given to every inch of cotton fed at the back of the finisher picker. In other words, every inch of cotton should be struck 42 times before it is passed by the beater. With the above speed of the beater (1,450) this would be the number of blows that every inch of cotton received. Don't forget that it is very important to remove the fly from underneath the pickers at regular intervals during the day, because, if the fly is allowed to accumulate to any great extent, it might be drawn into the already cleaned cotton passing through the machine, and it is sometimes done as all persons working around cards know, as they have seen at various times large patches of fly on the lap of cotton. This of course requires the card

TO DO EXTRA WORK

and clean and take out this dirt. It very often results in bringing up the feed roll or the licker-in of the card, if not noticed in time to remove the fly. It will be seen that it is important

to keep the picker room clean at all times. It is very important to keep foreign matter, such as nails or pieces of metal, out of the cotton in the picker room, because of the liability of fires in the pickers, these being started by the foreign substance coming in contact with the quick moving beater blades and a spark being struck which ignites the cotton. This is apt to cause a bad fire if not promptly attended to. The

SETTINGS OF THE CARD

should be the same as given in a previous lesson on yarn, made in the second division of mills. The draft of the card should be about 100 to 125 for this class of cotton, the weight of the sliver at the front 65 grains to the yard; production, about 800 pounds per week of 60 hours. Three processes of drawing are used,the weight at the finisher drawing being 70 grains per yard. The hank roving at the slubber should be about .55. The two-process fly frame is used, the hank at the first intermediate being 2, and at the second intermediate 6.00 hank roving. The rule for settings at these machines for this hank of roving has been given.

The spinning frame spins all the required counts for this hank roving, which, of the corduroy under description, is 20s, 24s, and 28s, by changing the draft gear. The 28s yarn is then taken to the twister and doubled, so as to make 2-28s. A good sizing for the slasher for this class of goods is as follows: Water, 100 gallons; potato starch, 70 pounds; tallow, four pounds; turpentine, one pint.

Dyeing Particulars.

These goods are dyed at the jigger machine, a piece of 30 pounds being dyed. Care must be taken not to crush the pile.

One-dip colors are used for some goods, but, as the sulphur colors are so much improved, the bottom color is dyed with sulphur colors, and the goods topped with brighter aniline colors.

COLOR NO. 1—BLACK.

Blacks are sometimes dyed with a sulphur black as a bottom color. For 30 pounds of cloth (all of these colors are for 30 pounds of cloth): 15 gallons liquor, 3 pounds immedial black V Ex., 2 pounds sodium sulphide, 3 pounds sal soda, 3 pounds common salt. Dissolve in separate tub, boil and strain through cotton cloth. Add to jig, in two portions, at first two ends. Run for 30 minutes at boil. Rinse in jig. Aftertreat with 1 pound bichromate potash, one-half pound sulphate iron. Rinse well and dye logwood black. Rinse well and top with a paint color as Prussian blue, or dye with a basic color.

ANOTHER BLACK.

Dye as color No. 1, with immedial black, and top with oxydiamine black AM, and rinse. Top with basic color or paint with Prussian blue.

DARK BLUE.

2-4 pounds immedial blue C, 2-4 pounds sulphide sodium, 3 pounds soda ash, 3 pounds common salt at 175 degrees F. Run 30 minutes. Aftertreat, cold 15 gallons liquor, 4 pounds peroxide soda, 6 ounces ammonia. Run 20 minutes.

For further batches, half the amount of drugs will suffice. The color can be shaded up with basic colors.

TAN.

1 pound immedial brown B, 1 pound sodium sulphide, 2 pounds sal soda, 3 pounds common salt. Run at boil for 30 minutes. Top with Bismarck brown.

BUFF.

1 pound immedial bronze A, 2 ounces immedial yellow D, 2 pounds sodium sulphide, 2 pounds sal soda, 3 pounds common salt. Run at boil 30 minutes. Rinse and aftertreat. 1 pound bichromate of potash.

PEARL.

3 ounces immedial black V extra, 1 ounce immedial brown B, 1 pound sodium sulphide, 2 pounds sal soda, 2 pounds common salt. Run at boil 30 minutes. Aftertreat, ½ pound bichromate potash, ½ pound sulphate copper.

RED

2 pounds diamine fast red F, 10 pounds Glauber's salt. Run one hour at boil. Rinse. Aftertreat, ½ pound fluoride chrome. Top with diamine scarlet or safranine.

GREEN.

1 pound immedial black V extra, 2 pounds sodium sulphide, 2 pounds sal soda, 3 pounds common salt. Run 30 minutes at boil. Rinse. Top with solid green crystals O.

LIGHT GREEN.

½ pound katigen chrome blue 5G, 1 pound sodium sulphide. 2 pounds sal

soda, 3 pounds common salt. Run 30 minutes at boil. Rinse. Top with auramine and green.

OLIVE.

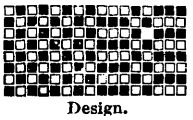
1 pound pyrogene olive N, 2 pounds sodium sulphide, 2 pounds sal soda, 3 pounds common salt. Run 30 minutes. Rinse. Top with auramine and Bismarck brown.

DARK BROWN.

2 pounds sulphur brown, 4 ounces sulphur black, 3 pounds sodium sulphide, 3 pounds common salt. Run 30 minutes. Rinse. Top with auramine green, Bismarck brown or paint a brown on top, or dye a catechu and chrome bottom, and top with the above brown.

DIMITY.

Dimity is a light-weight cotton wash fabric, the distinguishing feature of which is the cords or ribs running



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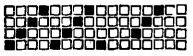

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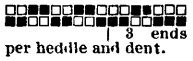


3 ends per heddle and dent.

Reed Plan.

Chain Draft.

warpwise through the cloth, and produced by doubling the warp threads in either heddle or reed in sufficient quantity to form the rib desired.

Dimity is a ladies' summer dress fabric and is made of regular cotton yarn, from 1-60s to the very finest counts in both warp and filling, and is made in white and colors, solid white being used in the more expensive grades (warp and filling).

Dimity is made in ribbed stripe effects, and in such colors as ecru, pearl, light blue and blue. These colors are sometimes printed upon the face of the fabric, after it has been woven in the white.

Jacquard scroll and other figures are printed upon the white dimity to create elaborate patterns.

Dimity is always woven with a plain weave $\frac{1}{1}$, and by printing fancy floral designs upon the white surface of the cloth, that compactness of texture is retained which the plain weave alone can give. If, for instance, the floral effect were woven into the cloth, ends and picks remaining the same as for the plain weave, there would be created loose places warpwise of the cloth, due to the warp floats in forming figures.

Dimity, being a light-weight fabric composed of very fine yarns, is therefore best adapted to the lightest running looms. A plain or dobby loom would be the most suitable for this fabric; one capable of weaving from two beams, as these are usually woven.

Dimity is made in grades having from 64 ends and picks per inch to 100 and more ends and picks per inch, the count of the yarn varying in accordance with the degree of texture desired.

Dimity as a dress fabric has a rather soft feel, and so receives but very slight amount of starch in finishing, which process includes washing, drying and calendering the goods, which are afterward rolled or lapped into bolts, "each cut or piece constituting a bolt." Each bolt or piece is then folded, the paper bands put on, and the goods are ready to pack and ship.

Construction.

One square inch equals .6 grain.

28½x36 equals 1,026x6 equals 615.6 divided by 1 square inch equals 615.6 divided by 437.5 equals 1.407 ounces per yard; 28½ inches wide finished.

40 pieces white warp yarn x 1¼ inches equals 50 inches equals .16 grains; 50x7,000 equals 350,000, divided by 1-6 equals 2,187,500, divided by 36 equals 60,762, divided by 840 equals 1-72s cotton warp.

35 pieces white filling yarn x 1½ inches equals 52½ inches equals 1.6 grains. 52½x7,000 equals 367,500 divided by .16 equals 2,296,875 divided by 36 equals 63,691 divided by 840 equals 1-76s cotton filling.

28½ inches wide finished, 106 ends per inch finished, 84 picks per inch finished, equals 29 3-5 inches in reed, 100 ends per inch, 80 picks per inch loom.

1,800 reed—2 ends per dent (ground),

cord—3 ends per dent and heddle, 5 per cent take-up in weaving.

3,021 ends plus 5 per cent equals 3,180 yards 1-72s cotton warp equals .841 ounces, 84 picks times 28½ inches equals 2,394 yards 1-76s cotton filling equals .6 ounces, total 1.441 ounces; 1.441 ounces per yard finished.

Carding and Spinning Particulars.

Dimity, or rather the counts of yarn required to make this style of cloth, requires first-class machinery and it is, therefore, made in the third division of mills as given in a previous article. The grade and length of staple of the cotton used varies with the weight per yard of the cloth being made and may be composed of 1½-inch. Allen cotton to 2-inch Sea Island cotton. For this lesson we will consider the counts to be 80s and the cotton used to be 1⅝-inch Sea Island. The mixings should be large and cotton allowed to dry out before being worked. As Sea Island cotton is comparatively a clean cotton it

REQUIRES LESS CLEANING

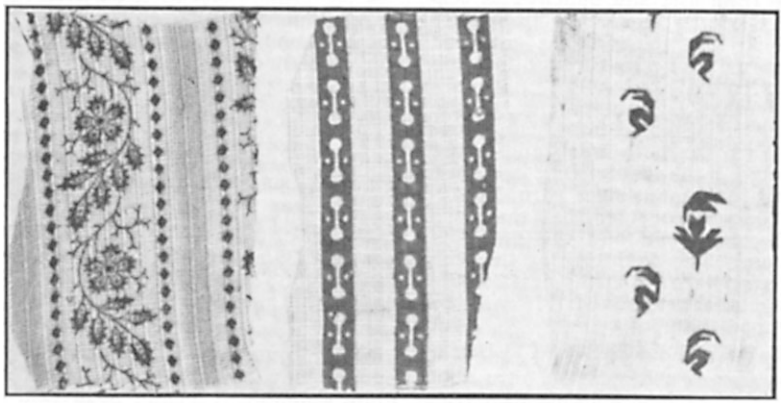
than other cottons, and another reason for putting it through less processes in the picker room is because of its length. If run through too many beaters the cotton is apt to be filled with neps. For Sea Island cotton of medium to long staple, i. e., from 1⅝ to 2¼ inches, it is better to use only opener and one process of picking as compared with two processes of picking for other grades of cotton. The should not exceed 1,000 revolutions per minute, for a rigid two-bladed beater. This gives the cotton passing through the finisher picker about 29 blows or beats per inch. The laps should not be as heavy as when lower grades of cotton are used and a good weight of lap at the finisher picker is 30 pounds or 10 ounces to the yard. The card setting points should be set as close as possible with the exception of the feed plate to the licker-in. The space between these two parts should be increased to the correct length of the staple being used. The

DRAFT OF THE CARD

should be increased to 125 or even 150, the speed of the licker-in made slower by lagging the licker-in pulley to 10½ inches, the speed of the flats speed of the beater should also be slower and at the finisher picker increased and the sped of the doffer slower. The production of the card for fine counts of Sea Island yarn should not exceed 350 pounds per week of 60 hours, the weight per yard at the card being 40 grains per yard. The stock is then passed to the comber room and is here passed through the sliver lap and the ribbon lap machines and from here to the comber. Generally seaking, 14 ends are doubled at the sliver lap machine and the weight of the lap at the front is about 230 grains. Six laps are put up at the ribbon lap machine and the

WEIGHT OF LAP DELIVERED

is about 200 grains per yard. In very fine work only five laps are put up at the ribbon lap machine. The comber used is what is termed a six-headed comber, and the draft of this machine



SAMPLES OF DIMITY.

is considerable. The amount of waste taken out at the comber is more than that taken out of all the rest of the card room combined and for the cotton under description is from 20 to 25 per cent. The weight of the sliver being delivered is about 34 grains and the production of a six-head comber making 85 nips per minute is about 240 pounds per week of 60 hours. The cotton is next put through two processes of drawing, the weight at the finisher drawing being 55 grains per yard. The slubber makes this sliver into a .80 hank roving.

THE HANK ROVING

at the first intermediate is 2.25; at the second intermediate 5.00 hank and at the jack 18.00 hank. Care should be taken with the settings of the rolls at all the machines, and also the cotton in process should be kept as free from dirt and bunches as possible. Cleaners should be frequently picked so that the bunches gathered on them will not pass through into the cleaned cotton.

The cotton is next carried to the spinning room, some mills using ring frame yarn for both warp and filling and some mills using ring spinning for warp and mule spun yarn for filling. We will consider that the warp yarn is ring spun and the filling is ring spun. The doublings at the ring frame are 2 into 1 and the draft of the machine about 9 minus. It will be understood that

ONLY THE LATEST STYLES

of ring frames can spin 80s yarn, and to do it it is desirable to have the guide rolls rotate so that the roving being drawn over them will not be broken. For 80s yarn a good gauge of spindle is 2¾ inches with a 1¼ diameter ring and a 4½-inch traverse. The size traveler to be used varies and the correct one is only found by experimenting, but a good foundation to work from is a 22-0 traveler. The standard warp twist is 4.75 x square root of count. The speed of the spindles should be 9,400 revolutions per minute and the production about .32 pounds per spindle per week.

The filling is made at the mule and all that need be said about this machine is that the twist is less only 3.25 x the square root of the counts being put in. A good size to use for slasher is as follows: Water, 100 gallons; potato starch, 54 pounds; Yorkshire gum, 2 pounds; soap (white), 172 pounds; paraffin wax, 1 pound.

Dyeing Particulars.

PINK.

For 100 pounds of cloth, 1 ounce benzo fast pink 2BL, 10 per cent soap, 150 degrees F.

LIGHT SKY BLUE.

½ per cent immedial sky blue powder, 1 per cent sodium sulphide, 1 per cent soda ash, 10 per cent Glauber's salt; wash well and top with 1 ounce Methylene blue O O.

LIGHT GREEN.

4 ounces brilliant benzo green B, ⅛ ounce chrysophenine, 10, per cent soap, 150 degrees F.

PEARL.

4 ounces immedial black NRT, ½ per cent sulphide sodium, ½ per cent soda ash, 2 per cent Glauber's salt.

GRAY.

4 per cent immedial black NRT, ¼ ounce immedial olive-B, ½ per cent sulphide soda, ½ per cent soda ash, 2 per cent Glauber's salt.

LIGHT SLATE.

½ pound immedial direct blue B, ¼ ounce immedial olive B, ½ pound sulphide soda, ½ pound soda ash, 2 per cent Glauber's salt.

SLATE.

1½ per cent immedial black NRT, 1½ per cent immedial direct blue B, 3 per cent sodium sulphide, 1 per cent soda ash, 10 per cent Glauber's salt.

ECRU.

½ per cent immedial bronze A, ⅛ ounce immedial yellow D, 1 pound sodium sulphide, 1 pound soda ash, 10 pounds Glauber's salt.

LIGHT TAN.

½ per cent immedial cutch G, ½ per cent immedial orange C, 1 per cent sodium sulphide, 1 per cent soda ash, 10 per cent Glauber's salt.

NAVY BLUE.

3½ per cent immedial indone B, 2½ per cent immedial direct blue B, 5 per cent sodium sulphide, 2 per cent soda ash, 20 per cent Glauber's salt.

SCARLET.

5 per cent benzo fast scarlet 8 BS, 30 per cent Glauber's salt, 2 per cent soda ash.

SALMON.

4 per cent benzo fast orange S, 1 ounce benzo fast scarlet 8 BS, 10 per cent Glauber's salt, ½ per cent soda ash.

MAUVE.

4 ounces benzo fast violet R, 2 ounces

benzo fast blue BN, 10 per cent Glauber's salt, ½ per cent soda ash.

Finishing Particulars.

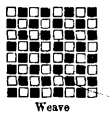
Mix up cold ½ pound white German dextrine, 1 gallon water, boil one hour, and starch through mangle and dry over tenter frame.

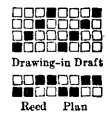
CHAMBRAY.

Chambray is a light-weight, single cloth fabric, that is always woven with a plain weave and always has a white selvedge. It is a staple fabric of many years' standing, being next in the line of cotton goods after the better grades of gingham. In effect it is a cloth having but one color in the warp, and woven with a white filling, this combination producing a solid color effect, the white filling having the chance of reducing any harshness of warp color in the cloth.

COMPOSITION.

Chambray is composed of one warp


Weave


Drawing-in Draft

Reed Plan

and one filling, either all cotton, cotton and silk, or all silk. It is made 27 to 30 inches in width and of 1-30s cotton warp to 1-60s silk, the count of yarn being governed by the weight per yard desired. The weight per finished yard is 2 to 3½ ounces.

GOOD COLORS

for the warp are navy blue, dark brown, pink, lavender, black, nile green, etc.

This fabric is woven on any and all plain looms that will weave other light-weight cloths, the lightest running looms being the best on account of being easier on the fine warp yarns employed. It can be woven successfully on the Mutual or Fairmount, Mason, Colvin, Lowell and other roller looms.

Chambray, when made of cotton warp and filling, receives a regular gingham finish, and the loom width can be restored to the goods during the finishing by the process of tentering.

TENTERING

means the running of the goods over a machine, fitted underneath with a series of coils of steam pipe; the top of the machine is fitted with an endless chain (on either side). This chain has a row of steel needles standing erect upon its face.

These chains are adjustable. This permits of altering the space between the chains, the idea being to set the chain the width desired, and as the machine runs, pass the needles through either selvedge, and the cloth is stretched to the width desired.

To finish chambray, first run through the sprinkler, then through a solution of warm size, to stiffen the fabric. After the sizing the goods are tentered, to widen and partly dry them, then run through the cylinders to complete drying and last the calender to remove wrinkles, and to produce smooth, evenly ironed finish.

1 square inch equals 1.23 grains.

27x36 equals 973x1.23 equals 1,195.56 divided by 1 equals 1,195.56 divided by 437.5 equals 2.736 ounces per yard.

27 inches wide finished.

15 pieces light blue warp yarn x 4 inches equals 60 inches equals .58 grains—6 per cent weight size equals .5,452 grains—15 per cent take-up equals .4,635 grains.

60x7,000 equals 420,000 divided by .4,635 equals 906,148 divided by 36 equals 25,176 divided by 840 equals 1-30s warp.

30 pieces white filling yarn x 2 inches equals 60 inches equals .55 grains.

60x7,000 equals 420,000 divided by .55 equals 763,636 divided by 36 equals 21,214 divided by 840 equals 1-36s filling.

78 ends per inch finished and 60 picks per inch finished equal 72 ends in reed per inch and 56 picks in loom per inch.

6 per cent size on warp; 15 per cent take-up on warp; weaving.

1,300 reed, 2 ends per dent.

27 inches wide finished including selvedge.

78 ends x 27 inches equals 2,106 plus 32 ends white selvedge equals 2,138.

2,106 blue ends + 15% take-up = 2,477.65
yards 1-30s warp.....= 1.573 ozs.
32 white ends + 15% take-up = 37.65
yards 1-30s selvedge.....= .023 ozs.
60 picks per inch x 27 inches = 1,620
yards 1-26s white filling.....= 1.186 ozs.
2.782 ozs.

2.782 ounces per yard.

Carding and Spinning Particulars.

The required machines, etc., to make chambray belong to the second

division of mills as given in a previous lesson. For this class of goods a 1¼ to 1½-inch staple American cotton may be used. Mixings should be large so that the yarn will always be as uniform as possible. After being run through the bale breaker, the cotton should be passed through an opener and two processes of picking. The usual points that have already been given in connection with the picker room should be looked after and need not be repeated here. The speed of the beater on opener is 1,050 revolutions per minute, fan 350 revolutions per minute, and be sure to keep hopper on this machine at least three-fourths full of cotton all the time that the machine is working. The speed of a two-bladed rigid beater at the breaker is 1,500 revolutions per minute and the speed of the fan 1,400 revolutions per minute. The lap at this machine weighs 16 ounces to the yard or about 40 pounds for the total weight of lap. The speed of the beater at the finisher should be about 1,450 revolutions per minute and the fan 1,100 revolutions per miunte, the weight of the lap, 14 ounces, the total weight of the lap being 39 pounds. Cut roving waste is mixed in with the good waste at the finisher picker as usual. The settings of the card should be about as given in a previous lesson when the settings for mills making madium counts of yarn were given in detail. The draft of the card should be about 100 and the speed of the licker-in 300 revolutions per minute. The wire used should be No. 34 on cylinder and 35 on doffer and flats. The cards should be ground at least once a month and stripped three times a day, for this class of goods. The weight per yard of sliver should be about 65 grains and the production per week 750 pounds. The cards should be cleaned thoroughly at least twice a day and the fronts should be cleaned at least twice more; the strips should be connected four times a day at regular intervals, for if this is not done the strips are apt to get under the stripping comb and onto the flats, thus bringing up the comb and wire on to the flats. The flats should be ground at least once a month and a great deal of care should be taken with the setting of the grinding roll. because if this roll is set heavier on one side than on the other the cotton will not be evenly carded.

THREE PROCESSES OF DRAWING.

Three processes of drawing are used for this class of goods, the speed of the front roll being [illegible] revolutions per minute and the weight of the sliver at the finisher drawing should be 72 grains per yard. Production for 60 hours, 1,620 pounds per head per week. A good setting for the rolls for 1¼ inch staple would be as follows: 1½ inches between front and second rolls, 1⅝ inches between second and third rolls and 1¾ inches between third and back rolls. The slubber rolls are read as follows: Front roll to middle roll 1⅝ inches; middle to back roll 1½ inches. The slubber makes the sliver into a .55 hank roving. The hank roving at the first intermediate is 2.00 and fine frame 6.00 hank. Keep the bunches out of the roving as much as possible and change the top leather rolls frequently. Watch all your frames to see that no one frame is making too much bad work either by a poor hand or through the machine not being properly regulated. The 6.00 hank roving is taken to the spinning room and spun into 30s yarn. To do this, the following is given as the best equipped frame: For filling for 30s yarn most any high grade spindle may be used and good results obtained; gauge of frame 2¾ inches; diameter of ring 1⅝ inches; length of traverse 6 inches and twist per inch 19.17. For 30s warp yarn, gauge of frame 2¾ inches; diameter of ring 1⅝ inches; length of traverse 6½ inches; twist per inch 26.02.

A good size that may be used at the slasher for this class of goods is as follows: Water, 100 gallons; corn starch, 50 pounds; tallow, 3 pounds; turpentine, 1 gill; boil 30 minutes.

Dyeing Particulars.

RED.

3½ per cent benzo fast red G L; 1 per cent chrysophenine; 30 per cent Glauber's; 2 per cent sal soda.

LAVENDER.

¼ per cent benzo fast violet R; 2 ounces benzo fast blue B N; 30 per cent Glauber's; 2 per cent sal soda.

NILE GREEN.

5 per cent katigen green 2 B; 5 per cent sulphide sodium; 2 per cent soda; 20 per cent Glauber's.

PINK.

5 per cent diamine rose, B D; 30 per cent Glauber's; 2 per cent sal soda.

OLIVE.

3 per cent immedial olive B; ½ per

cent immedial black N B; 1 per cent immedial brown B; 30 per cent Glauber's; 4 per cent sodium sulphide; 2 per cent soda.

BLACK.

15 per cent immedial black N N; 15 per cent sulphide sodium; 30 per cent Glauber's; 3 per cent soda.

NAVY BLUE.

4 per cent immedial indone B; 5 per cent immedial indone R; 9 per cent sodium sulphide; 30 per cent Glauber's; 3 per cent soda.

DARK BROWN.

15 per cent tetrazo sulphur brown B; 1 per cent tetrazo sulphur black; 16 per cent sodium sulphide; 30 per cent Glauber's salt; 3 per cent soda.

DARK SLATE.

2 per cent immedial black N B; 2 per cent immedial direct blue B; ¼ per cent immedial yellow D; 30 per cent Glauber's salt; 3 per cent soda; 5 per cent sulphide soda.

DARK GREEN.

8 per cent immedial dark green B; 1 per cent immedial yellow D; 10 per cent sodium sulphide; 30 per cent Glauber's; 3 per cent soda.

LIGHT BROWN.

3 per cent thion brown G; 3 per cent sodium sulphide; 1 per cent soda; 20 per cent Glauber's.

Finishing Particulars for Chambrays.

STARCH.

¾ pound corn starch; 1 gallon water, mix cold, and boil ½ hour; dry on cans and give a light calender.

CANTON FLANNEL.

Canton flannel is a narrow, heavy, all-cotton fabric, having a twill effect on one side of the cloth and a long, soft nap on the other side. It is always made with one warp and one filling. The weave generally is a $\frac{1}{3}$ twill for the winter weights, and $\frac{1}{2}$ twill for summer weight. The warp is composed of regular cotton yarns to which a very small percentage of size has been added, say 2 or 3 per cent, just sufficient to allow the yarn to withstand the operation of weaving. The filling is spun from a good grade of cotton, and is made with a slack twist to enable it to nap more readily, as this portion of the cloth is that which gives the fabric its one distinguishing feature.

THE TWILL WEAVE

is used in the construction of this fabric, because it permits of long regular floats in the filling effect of the weave, and these floats present an excellent surface from which to raise a nap. The other side of the cloth, being the warp effect of the twill weave, serves to create the diagonal rib or twill lines.

These goods are made to sell at 27 to 30 inches in width, at about 5¼ ounces, winter weight, composed of 1-10s to 1-6s warp and filling; also 3¼ ounces, summer weight, composed of 1-20s to 1-14s warp and filling, the heavy, coarse yarn in each instance being the filling.

Canton flannel can be woven on any single box-plain loom.

Summer weight three ounces.

Winter weight five ounces.

The nap is raised on the cloth by running the goods through a machine built especially for this purpose. The machine consists of an iron frame having a series of rollers set within it, and over these rollers the cloth passes. The napping itself is done by a roller similar to a fancy on a woolen card. The cloth in passing over the wooden rollers at length passes between the wire toothed roller and a wooden roller. The cloth is being drawn through the machine automatically in one direction, and the wire-toothed roller revolves in the opposite direction, and being set for a nap of desired height or loftiness, the wire, coming in contact with the soft filling yarn, brushes the fibre in such a manner as to cause it to stand out from the body of the filling thread, hence the nap.

Canton flannel is taken direct from the loom, measured, napped and folded; then is ready to pack and ship.

CANTON FLANNEL.

4 square inches equals 9.25 grains. 27¼ inches selling width. 27¼ x 36 equals 981 x 9.25 equals 9,074.25 divided by 4 equals 2,268.56 divided

by 437.5 equals 5.185 ounces per yard. 27¼ inches finished.

15 pieces warp x 3 inches equals 45 inches equals 1.14 grains.

45 x 7,000 equals 315,000 divided by 1.14 equals 276,315.78 divided by 36 equals 7,675.44 divided by 840 equals 9.14 or 1-10s cotton warp.

8 pieces filling x 5 inches equals 40 inches equals 1.18 grains.

40 x 7,000 equals 280,000 divided by 1.18 equals 237,288.13 divided by 36 equals 6,591.33 divided by 840 equals 7.84 or 1-8s cotton filling.

CONSTRUCTION.

Reed 540 — 30 3-5 inches, including selvedge of 32 ends, 4 ends per dent. 5 per cent take-up in weaving.

68 ends per inch finished and 48 picks per inch finished equals 60 ends per inch in loom and 44 picks per inch in loom. $\frac{3}{1}$ 45s twill weave. 1-10s cotton warp. 1-8s cotton filling.

68 ends per inch x 27 equals 1,836 plus 32 equals 1,868 ends plus 5 per cent take-up equals 1,956 yards of 1-10s cotton warp equals 3.725 ounces.

48 picks x 27¼ equals 1,308 yards. 1-8s cotton filling equals 3.114 ounces.

3.725 ounces warp.
3.114 ounces filling.

6.839 ounces from loom.

6.839 ounces loom.
5.185 ounces finished.

1.654 ounces loss in napping.

Carding and Spinning Particulars.

Canton flannel, or rather the counts of yarns to make this class of cloth, consists of a low grade of cotton of about three-fourths to one inch in staple, and the mills making Canton flannel belong to the first division of mills. The bales of raw stock are not sorted out as carefully as is the custom when fine yarns are to be made, but all the bales should be stamped to get the length of staple as near uniform as possible. Larger mixings are used for this class of goods than when fine goods are being made, because more cotton is used, due to a larger production being turned off at each process. The cotton is sometimes passed through a bale breaker, but more often is

MIXED BY HAND,

i. e., taken from the bale and broken into small bunches and thrown directly into the mixing bin. The cotton is allowed to stand as long as possible to dry out and is then put through the opener. In some mills the waste from the comber and card is put into the mixings in very small proportions, but more generally only the good waste is put in. The speed of the beater should be 1,050 revolutions per minute, it being remembered that the lower grades of cotton are dirtier than the higher grades and longer stapled cotton. It may seem strange to some of our readers that the speed of the beater of the opener is 1,050 revolutions per minutes for both low, medium and even high grades of cotton, but it must be remembered that the staples of the cottons differ and the speed of the beater really is based on so many blows or beats per minute; so that cotton having a staple of three-fourths an inch receives twice as many beats per inch as cotton one and one-half inches in length, all other conditions remaining the same. The above not only applies to the beaters on the openers, but also to all the pickers. In these lessons it is taken for granted that a two-bladed beater of the ridged type is used, and for a three-bladed beater, the speed should be less, or as two is to three. Special speeds should be used for other makes of beaters, such as the vertical beater, porcupine beater and Kirschner beaters. Two processes of picking are used. The weight per yard of lap is 40 pounds or 16 ounces to the yard. The speed of the finisher beater is 1,450 revolutions per minute, and the finished lap weighs 39 pounds or 14½ ounces to the yard. The bars under the beaters should not be too close together so that the dirt and foreign matter in the cotton cannot drop through into the waste recepticle after it has been separated from the cotton and the dirt, etc., should be thus removed at regular intervals so as not to choke these beater bars and thus allow the dirt to pass through with the good cotton. This class of goods should be carded on coarse wire. The

DRAFT OF THE CARD

should not exceed 100, and a draft of 90 is much better as the stock will be handled better. The speed of the beater should be 300 revolutions per minute and a 26-inch diameter doffer should be used when possible. The production of the card should be from 900 to 1,000 pounds of sliver per week of 60 hours. Two processes of drawing are used, the speed of the front roll at each being 400 revolutions per minute, the weight of the sliver at the finisher being 70 grains per yard, six ends being put up at the back. The hank roving made at the slubber should be about .50, or, say, .55. This is made into 1.00 hand at the first intermediate and into a 4.00 roving at the second intermediate. The 1.00 hank roving is spun

into a soft twisted 6-count cotton yarn in the spinning room, and the 4.00 is made into 20s soft twist yarn. A warp frame to make 6s should have the following particulars: Gauge of frame 3 inches, diameter of ring 2¼ inches, length of traverse 7 inches, or even more than this length may be used. For a filling frame for 20s, use 2¾-inch gauge of frame, 1½ inch diameter of ring and 6½ inches length of traverse. Remember that this class of goods requires a soft twist.

Dyeing Particulars.

The pieces are run through the napping machines and the fibre well raised, before the dyeing operation.

The pieces are dyed in the jig machine, or continuous dyeing machine, where the pieces are run over rollers, 6-10 times through the dyeing liquor, and then passed through two squeeze rollers. In the continuous machine the nap is not laid as much as in the jig.

The colors generally dyed are one dip direct colors, bright shades being mostly called for.

LIGHT BLUE.

One per cent tetrazo sky blue; 20 per cent Glauber's; 1 per cent sal soda.

LIGHT BROWN.

Two per cent tetrazo brown B; ½ per cent tetrazo yellow D; 25 per cent Glauber's; 1 per cent sal soda.

PINK.

One-half per cent diamine rose B D; 15 per cent Glauber's; 1 per cent sal soda.

RED.

Four per cent benzo purpurine 4 B; 30 per cent Glauber's; 3 per cent sal soda.

HELIOTROPE.

One-half per cent benzo fast violet R; ¼ per cent benzo fast blue B N; 20 per cent Glauber's; 2 per cent sal soda.

GREEN.

Three per cent diamine green G; ½ per cent diamine fast yellow B; 30 per cent Glauber's; 3 per cent sal soda.

SCARLET.

Four per cent diamine scarlet B; 30 per cent Glauber's; 3 per cent sal soda.

OLIVE.

Two per cent benzo dark green G G; 2 per cent chrysophenine; 30 per cent Glauber's; 3 per cent sal soda.

ORANGE.

Two per cent benzo fast orange S; 30 per c nt Glauber's; 3 per cent sal soda.

BLUE.

Four per cent diamine brilliant blue G; 30 per cent Glauber's; 3 per cent sal soda.

ECRU.

One-quarter per cent immedial yellow D: ¼ per cent immedial cutch G; 2 per cent sodium sulphide; 2 per cent soda; 20 per cent Glauber's salt.

SLATE.

One-half per cent benzo fast black; ½ per cent benzo fast blue B N; 30 per cent Glauber's salt; 2 per cent sal soda.

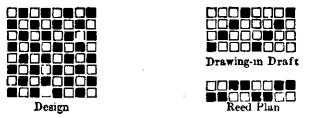
MAROON.

Three per cent diamine fast red F; 1 per cent diamine bordeaux B; 30 per cent Glauber's; 3 per cent sal soda.

When the pieces are dyed, well rinsed and dryed, they are run through the napping machine to finish the goods and raise the fibres.

DUCK.

Duck is a heavy weight, single cloth fabric, made from all-cotton yarns. But one warp and one filling are necessary and these are usually of coarse, two-ply yarns woven into a cloth having a high texture. Duck has a stiff, hard feel, which fact imparts to it the splendid wearing qualities for which it is popularly known as a staple material. It is used principally in the manufacture of sails, tents, car curtains, etc., or for any other purpose, requiring a good water-tight fabric, which will withstand rough usage. Duck is made



IN A VARIETY OF GRADES

weighing from 7 ounces to the yard, 27 inches wide, to 25¼ ounces per yard, 60 inches wide. The lighter weights in this fabric are used extensively for awnings. These goods are either stripes or solid colors and are never plaided.

The majority of these goods are made all white.

Nearly all known textile colors are at times used in making color effects in this line, the most popular being dark brown and white, indigo blue and white, tan and white, tan and white twist and tan; all of which are fast colors.

Duck, being a hard, stiff fabric, caused by using coarse yarn at high texture, necessitates the use of

A HEAVIER LOOM

than that used for an ordinary cloth. The duck loom was built for this very purpose, and is entirely satisfactory, as it is a plain, single box cam loom, each part being heavier than its corresponding part in an ordinary light running plain loom.

Duck is made also in light weights for use as an outing trousering for men in solid black; also in pale blue, ecru, pink, etc., for ladies' shirtwaist suits.

To finish this fabric, it is taken from the loom and measured, then washed and sized, then dried and pressed.

If a fancy, solid color is desired, the goods are dyed in the piece after the first washing.

DUCK (AWNING STRIPE).

4 square inches equals 11.7 grains. 31 inches wide finished.

31 x 36 equals 1,116 x 11.7 equals 1,305.72 divided by 4 equals 3,264.3 divided by 437.5 equals 7.461 ounces per yard, 31 inches wide.

15 pieces tan warp yarn x 2½ inches equals 37½ inches equals 1.6 grains. 37½ x 7,000 equals 262,500 divided by 1.6 equals 164,062 divided by 36 equals 4,557 divided by 840 equals 2-12s cotton.

7 pieces tan filling yarn x 2½ inches equals 17½ inches equals .2 grains. 17½ x 7,000 equals 122,500 divided by 2 equals 6,125,000 divided by 36 equals 17,013 divided by 840 equals 1-20s cotton.

CONSTRUCTION.

Reed 900—2 ends per dent, 31 inches finished width. 20 per cent take-up in weaving.

52 ends per inch finished and 38 picks per inch finished equals 50 ends per inch reed and 36 picks per inch loom.

52 x 31 = 1,612 ends + 20 per cent take-up
= 2,015 yards 2-12s warp.....= 6.396 oz.
38 x 31 = 1,178 yards 1-20s filling.....= 1.121 oz.
7.517 oz.

Warp pattern: fancy colored (broad) stripes, plain weave $\frac{1}{1}$.

(HEAVY) DUCK (ARMY).

4 square inches equals 17.2 grains. 28½ inches finished width. 28½ x 36 equals 1,026 x 17.2 equals 17,647.2 divided by 4 equals 4,411.8 divided by 437.5 equals 10.08 ounces per yard.

17 pieces warp yarn x 2½ inches equals 42½ inches equals 2.4 grains. 42½ x 7,000 equals 297,500 divided by 2.4 equals 123,958.3 divided by 36 equals 3,443.3 divided by 840 equals ¼ or 3-12s cotton.

10 pieces filling yarn x 2 inches equals 20 inches equals .5 grains. 20 x 7,000 equals 140,000 divided by .5 equals 2,800,000 divided by 36 equals 77,777 divided by 840 equals 1-9 or 2-18s cotton.

CONSTRUCTION.

Reed 800—2 ends per dent, 28½ inches finished width, 31 inches in reed, 29 picks per inch filling. 20 per cent equals take-up in weaving, shrinkage in length finishing. 8 per cent equals contraction in width in weaving.

48 ends per inch finished and 32 picks per inch finished equals 44 ends per inch reed and 29 picks per inch loom.

48 ends per inch x 28½ inches = 1,368 ends
+ 20% = 1,710 yards 3-12.....= 8.14 oz.
32 picks per inch x 28½ inches = 912 yards
2-18 .....= 1.93 oz.
10.07 oz.

Plain weave $\frac{1}{1}$

(HEAVY) DUCK (CAR CURTAINS).

Reed 800—2 ends per dent, 20 per cent take-up in weaving.

48 ends per inch finished and 29 picks per inch finished equals 44 ends per inch in reed and 26 picks per inch in loom.

38 inches wide finished equals 16 ounces per yard.

2-8s cotton warp and filling, 50 inches wide, equals 21 ounces.

Warp stripe patterns, 60 inches wide, equals 25¼ ounces.

Filling all white, plain weave.

Carding and Spinning Particulars.

Duck is made from various grades of raw cotton, according to the use to which it is going to be applied. Even Sea Island cotton of the longest staple has been used to make duck cloth, but this is the exception rather than the rule. When the longer and higher grades of raw stock are used, the cloth made is generally used for sail, and the Sea Island cotton was used to make into duck for one of the yachts which raced for the international cup. For the average use, however,

THE STOCK USED

is of about one inch staple and of a medium low grade of cotton. The class of mills making duck belongs to the first division of mills as given in a previous lesson. The cotton is put through a bale breaker and from here is passed on to the mixing bin. At this bin good waste is mixed in, and sometimes, in the lower classes of ducking, comber waste and card waste are mixed in in small quantities. When waste is mixed with raw stock, it is mixed in certain fixed proportions, and should not be done in a haphazard

way, because waste always makes the mixture give more or less trouble while in the earlier processes of handling than is the case when cotton is used by itself. The cotton, after being mixed, is allowed to stand as long as possible before using, for reasons already given in previous lessons, and then is run through an opener and two processes of picks. As the lower grades of cotton are generally dirtier than the higher grades, a

HIGHER SPEED OF THE BEATER IS REQUIRED,

so that the speed of the opener should be about 1,100 revolutions per minute, while the speed of the breaker picker should be at least 1,500 revolutions per minute, while the speed of the beater of the finisher picker should be 1,450 revolutions per minute, or about 42 beats per inch of stock.

The lap at the breakers should weigh at least 40 pounds or 16 ounces to the yard, while at the finisher picker the lap should weigh 39 pounds or about 15 ounces to the yard. If waste is used in the mixture, generally a great deal of trouble is found from what is called licking, i. e., where the lap does not unroll as it should, but layers adhere to one another. If the lap is not fixed it will be seen that

UNEVEN YARN WILL RESULT.

There are various causes for laps licking, two of the principal ones being the presence of too much waste in the mixture, the remedy for which is obvious; and second, that the current of air in the picker is not properly directed so that the greater part, if not all the cotton, after it has passed the beater, is not blown as it should be onto the top cage, but the air is so directed that the cotton falls on both cages and a split in the lap is bound to occur and cause licking at the next process. Licking is always the cause of a great deal of trouble and should be stopped as quickly as possible. The lap is passed onto the card, which, for this class of goods, is provided with a heavy wire. The

DRAFT OF THE CARD

should be about 90 to 100. The sliver should weigh at least 65 grains to the yard and the production should be as large as possible, a good average ranging from 900 to 1,000 pounds per week. Cards should be stripped on this class of goods three times a day, and some overseers advocate four times a day, but this extra stripping is to be questioned as to advisability. The speed of the licker-in for this class of goods is 300 revolutions per minute. The cotton sliver is passed through three processes of drawing, the weight of the finished slivers being 70 grains. From here it is passed to the slubber and made into .55 hank roving. From here it is passed through the first intermediate and made into 1.10 hank, and onto the second intermediate and made into 3.00 hank. From here it is passed to the spinning room. For awning stripes, this three hank roving is made into 12s warp and 20s filling, and for coarser ducking into 12s warp and 18s filling. Good specifications for a filling ring frame are as follows: Gauge of frame, 2¾ inches; diameter of ring, 1⅝ inches; length of traverse, 6½ inches; and for a warp ring frame, gauge of frame, 3 inches; diameter of ring, 2⅛ inches; traverse, 7 inches. The yarn is then taken to the twister and doubled as required.

Dyeing Particulars.

FOR AWNING DUCKS.

As the colors for this fabric must be fast as possible to sunlight and rain, so the color will not fade, or run into the white stripes, only absolutely fast colors are dyed. The yarn is generally dyed in the warp.

INDIGO BLUE.

Indigo blue has been dyed for these goods until recently, but immedial blues have been found to withstand exposure even better than indigo.

Four and one-half per cent immedial indone B; 4½ per cent immedial indone R; 9 per cent sulphide sodium; 3 per cent soda, and 30 per cent Glauber's.

TURKEY RED.

First, mordant with a solution of alizarine oil, 10 per cent; squeeze and dry; heat of bath 200 degrees F.

Second, pass through acetate of alumina at 8 degrees Tw.; dry in hot air.

Third, dung with cow dung and chalk, at 120 degrees Tw., and rinse.

Fourth, dye with 10 per cent alizarine, 20 per cent, 2 per cent alizarine oil, ¼ per cent tannic acid; get up to boil in 45 minutes; boil one hour.

Fifth, dry without washing and oil 5 per cent alizarine oil; dry.

Sixth, steam in steaming box one hour.

Seventh, soap in three clean baths till warps are clean.

BUFF.

Pass through solution 10 gallons water, one pint nitrate iron, 33 degrees Tw., squeeze, pass through solution 10 gallons water, one pint caustic soda,

and rinse. Repeat operation till shade is dark enough; rinse well.

CHROME YELLOW.

Pass through solution 10 gallons water, one pound white sugar lead, squeeze, pass through solution 10 gallons water, one pound bichrome, four pounds common salt; rinse well.

CHROME ORANGE.

Pass through solution of sugar lead, 24 degrees Tw., squeeze. Pass through hot lime water, squeeze, chrome, two ounces to gallon boiling, squeeze; run through hot lime water and rinse.

LIGHT BROWN.

Four per cent immedial cutch C; 4 per cent immedial brown B; 8 per cent sulphide soda; 3 per cent soda; 30 per cent Glauber's; rinse, after treated to make color much faster: 2 per cent blue stone; 2 per cent chrome; 3 per cent acetic acid; rinse and soap.

DARK BROWN.

Six per cent immedial cutch G; 6 per cent immedial brown B; ¼ per cent immedial black N R; 10 per cent sulphide sodium; 3 per cent soda; 30 per cent Glauber's; rinse, after treat: 2 per cent blue stone; 2 per cent chrome; 3 per cent acetic acid; rinse and soap.

MAROON.

Six per cent immedial maroon B; 6 per cent sulphide sodium; 3 per cent soda; 30 per cent Glauber's; rinse, after treat: 1 per cent blue stone; 1 per cent chrome; 3 per cent acetic acid; rinse and soap.

LIGHT GREEN.

Three per cent immedial indone B; 2 per cent immedial yellow D; 5 per cent sulphide sodium; 3 per cent soda; 25 per cent Glauber's; after treat; 3 per cent blue stone; 3 per cent chrome; 3 per cent acetic acid.

DARK GREEN.

Eight per cent katigen indigo B; 4 per cent katigen chrome brown 5 G; 8 per cent sulphide sodium; 3 per cent soda; 25 per cent Glauber's; after treat: 3 per cent blue stone; 3 per cent chrome; 3 per cent acetic acid; rinse and soap.

BLACK.

Fifteen per cent immedial black N N; 13 per cent sodium sulphide; 3 per cent soda; 30 per cent Glauber's; rinse, after treat: 3 per cent blue stone; 3 per cent chrome; 3 per cent acetic acid; rinse and soap.

DARK SLATE.

Three per cent immedial black V Ex.; 3 per cent sodum sulphide; 2 per cent soda; 20 per cent Glauber's; rinse, after treat: 1 per cent blue stone; 1 per cent chrome; 2 per cent acetic acid; rinse and soap.

ARMY DUCK.

Army duck has been always dyed the old, reliable cutch and chrome brown. First, pass through a boiling solution of cutch logwood and fustic or cutch alone, and then through solution of boiling chrome and sometimes a weak solution of nitrate of iron for after treatment; rinse and soap.

Army duck can be dyed with sulphur colors: 5 per cent immedial cutch O; 1 per cent immedial brown R R; rinse and treat: 1½ per cent blue stone; 2 per cent chrome; rinse and soap.

STRIPES—HICKORY STRIPES.

This is an all cotton light-weight fabric, averaging about five ounces per yard finished. In appearance it resembles ticking, although it is of lower texture and has a softer feel, due to the process of finishing. It is always woven with a $\frac{2}{1}$ regular 45 degrees right-hand twill (warp effect) and in two colors, blue and white or brown and white in the warp and all white filling, thus forming warp stripe patterns.

It is used in the rural mountain districts of a few of the middle and southern states as a material for men's pants and shirts, as these two garments constitute about all the clothing necessary in such sections for most all seasons of the year. It is

A TOUGH PLIABLE FABRIC,

having good wearing qualities and on the principle of economy is well adapted to the needs of the poorer white laboring class of the South.

This fabric is made of regular cotton yarns, 1-14s and 1-16s warp and filling, and is woven to finish about 27 inches in width.

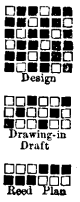
It can be woven on any plain loom and is usually drawn in on cotton harness, as these are

cheaper, in the estimation of the southern cotton manufacturer, as he can use up old stock in the spinning of cotton harness cord, and in this manner, to a certain extent, create a by-product as against the cost of equipping the plant with wire heddles and other necessary findings—harness rods, frames, etc.

To finish hickory stripe, the cloth is taken from the loom and measured, then it is sheared, sized and pressed, it is then rolled or lapped and is ready to pack and ship.

CONSTRUCTION.

Four square inches equals 9.25 grain. 27x36 equals 972x92 equals 8,991.00



divided by 4 equals 2,247.75 divided by 437.5 equals 5.137 ounces per yard.

15 pieces blue warp yarn times 4 inches equals 60 inches equals one grain. 60x7,000 equals 420,000 divided by .1 equals 4,200,000 divided by 36 equals 116.666 divided by 840 equals 1-14s cotton. 15 pieces white warp yarn times 4 inches equals 60 inches equals .1 grain. 15 pieces white filling yarn times 4 inches equals 60 inches equals .9 grains. 60x7,000 equals 420,000 divided by .9 equals 466,666 divided by 36

10% contraction in width in weaving.
5% take-up in length in weaving.
6 2-3% shrinkage in length in finishing.
6% size on warp.

Warp pattern.
6 Blue.
3 White.
3 Blue.
3 White.

15 ends per repeat.

equals 12,962.96 divided by 840 equals 1-14s cotton.

Reed 800—3 ends per dent, 30 inches in reed, including selvedge, 27 inches finished. Filling — all white. 74 ends per inch finished and 60 picks per inch finished equals 66 ends per inch loom, 56 picks per inch loom.

74 ends per inch times 27 inches equals 1,998 ends plus 24 selvedge equals 2,022 ends; 1,998 divided by 15 equals 133 repeats plus 3 ends.

9 blue ends per pattern times 133 equals 1,197 plus 3 equals 1,200 blue ends. 6 white ends per pattern times 133 equals 798 white ends, 24 white ends selvedge.

1,200 blue ends + 5% take-up =
1,263 yards 1-14 cot. =.....1,718 ozs.
798 white ends + 5% take-up = 840
yards 1-14 cot. =.....1.142 ozs.
24 white selvedge = 25.26 yards
1-14 cot. =..... .034 ozs.
56 picks white filling x 30 = 1,680
yards 1-14 cot. =.....2.285 ozs.

5.179 ozs. per yd.

Finish equals sizing and pressing weave $\frac{2}{1}$ warp effect 45 degrees twill.

Dyeing Particulars.

BLUE.

Dye in the warp—1½ per cent immedial indone 3B, 4 per cent immedial indone B, 4 per cent sodium sulphide, 3 per cent soda, 30 per cent Glauber's, rinse well.

DARK SLATE.

4 per cent immedial black NR, 4 per cent sodium sulphide, 3 per cent soda, 20 per cent Glauber's, rinse well.

BLACK.

1 per cent katigen black S W, 15 per cent sodium sulphide, 3 per cent soda, 30 per cent Glauber's, rinse well.

DARK BROWN.

15 per cent katigen brown V, 15 per cent sulphide sodium, 3 per cent soda, 30 per cent Glauber's, rinse well; starching, one gallon water, one-half pound cornstarch, mix cold, boil one hour, run through starch mangle and dry, give a light calendering.

TICKING.

Ticking is a single cloth, of either medium or heavy weight, and is composed of single cotton yarns from 1-14s to 1-22s in warp and filling or combination of both, such as 18s warp and 20 filling. It is a good, stout cloth, having fine wearing qualities, and is used principally for making bed ticks and pillow and bolster cases. It is generally made with what is known as a bed-tick weave or $\frac{2}{1}$ or $\frac{3}{1}$ twill, either right or left handed 45s twill broken or herring-bone. It can be woven in any power loom, but is best

adapted to and most always woven in the

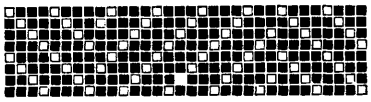
PLAIN SINGLE BOX LOOMS.

Ticking belongs to the family of stiff, hard face cotton fabrics. This feature is created by using twill weaves (warp effect), and these weaves permit of the use of a more than ordinary high warp texture. For instance, take $\frac{3}{1}$ twill: In this weave there are interlacings of each warp thread in every four picks of filling, thus allowing ends to lie closely together—hence permitting an increase in ends per inch.

These goods are usually made in two colored warp patterns—dark blue and white, red and white.

WHITE FILLING IS USED IN ALL CASES.

Fast colors should be used in warp as bed-ticks are sometimes ripped



Design and Weave.

Drawing-in Draft.

Reed Plan.

open and the cloth washed. In this case the light and air renew the coloring on the yarns.

Ticking is woven with from 60 to 84 ends and picks per inch in the loom, according to grade required. The greater the number of warp threads the stouter the fabric in proportion to counts of yarns used.

To finish these goods, they are brushed and sheared to remove all lumps and foreign substances from the face of the cloth. Then the cloth is sized and calendered, which acts in the same manner as a hot press, after which the cloth is lapped or rolled into bolts, then stitched, and is ready to pack and ship.

CONSTRUCTION OF TICKING.

Reed 725—33 inches, 4 ends per dent. 1-16s warp, 1-20s filling, 74 picks; 12½ per cent take-up in weaving; 10 per cent size on warp, 7 per cent size of cloth in finish; $\frac{3}{1}$ herring-bone twill weave; finish equals 31½ inches, and includes brushing, shearing, sizing and calendering.

WARP PATTERN.

16 White.
2 Blue.
2 White.
8 Blue.
2 White.
2 Blue.

1 square in. = 2.9 grains.

31½ times 36 equals 1,134 square inches times 2.9 equals 3,288.6 grains divided by 437.5 equals 7.51 ounces.

18 piece warp yarn, 2 inches equals 36 inches equals .55 grains; 36 x 7,000 equals 252,000 divided by .55 equals 45,818 divided by 36 equals 12,727 divided by 840 equals 1-16s warp yarn.

20 pieces filling yarn 1½ in. equals 30 inches equals .34 grains.

30 x 7,000 equals 210,000 divided by .34 equals 617,644 divided by 36 equals 17,156 divided by 840 equals 1-20s filling yarn.

92 ends per inch finished equals 86 in reed.

78 picks per inch finished equals 74 in loom.

92 x 31½ equals 2,898 plus 24 equals 2,922 ends.

1,473 ends white equals 12½ per cent take-up equals 1,683 yards.

1-16s cotton warp equals 2 ounces.

1,449 ends blue equals 12½ per cent take-up equals 1,656 yards.

1-16s cotton warp equals 1.97 ounces plus 22 per cent increase by dyeing equals 2.22 ounces.

White warp yarn equals 2 ounces plus blue warp yarn equals 4.22 ounces plus 10 per cent size equals 4.64 ounces.

78 picks x 31½ equals 2,457 yards 1-20s filling equals 2.34 ounces.

Warp weight equals 4.64 ounces plus filling weight equals 2.34 ounces plus 7 per cent size in finishing equals 7.50.

Carding and Spinning Particulars.

The yarns used in ticking are made in mills of the first division as given in a previous article. The length of the raw stock used varies in different mills according to the grade of ticking to be made, but is generally ⅞ to 1⅛ inches in length. This does not mean that raw stock of from ⅞ to 1⅛ inches is used in the same mixing, but that the mixing is made up of stock of uniform length.

THE MIXINGS

for this class of goods are generally made by hand and the bins should be made as large as possible so as to accommodate large mixings. It would be better to have two large bins instead of one, so that one lot of raw stock could be opened and dried out

while feeding the machines from the other bin. On this class of goods comber waste is used in some mills and the cut roving waste is also mixed as has been before stated. An opener and

TWO PROCESSES OF PICKING

are used and the lap should be made as heavy as possible without, of course, making it so heavy that it will bring up the cards and finisher picker. Keep the hopper of the opener as full as possible and you will find that an evener lap will be made. The speed of the fan of the opener should be 1,100 revolutions per minute. The speed of the beater (of a two-bladed, rigid type) should be at least 15,000 revolutions per minute, and the weight of lap about 40 pounds or 20 ounces in weight per yard. The lap is put up at the breaker and doubled four into one and delivered so as to weigh 14½ ounces per yard or about 39 pounds for the whole lap. The

SPEED OF THE BEATER

on this machine should be 1,450 revolutions per minute. The beats per inch that the cotton would receive would be about 42. See that all your drafts on the picker are properly regulated so that a lap will be obtained that will not split. Of course, this is not the only reason that makes a lap split, but it is one of the principal ones. Another cause for split laps is found in putting too much waste in the mixing. The lap is then put up at the card which should be provided with coarse wire fillet. The

DRAFT OF THE CARD

should not exceed 100. The weight of the sliver should be about 65 grains per yard and the production about 1,000 pounds per week of 60 hours. The cards should be ground at least once every month, having the grinding rollers on for at least a half a day. Of course, grinding means loss of production, but it has to be done; otherwise, bad work will result, and if you keep your wire sharp you will find that you will have less trouble with your cards and a great deal less kicking on account of poor work.

THE SETTINGS

that should be used for this class of goods have been given in a previous lesson. The card sliver should be put through two processes of drawing, the sliver weighing 75 grains per yard at the finisher-drawing frame. Remember to never draw more than you double. The sliver is passed through the slubber and the hank roving should be about .40. Set the rolls for ⅞-inch stock on this machine as follows: Front to middle, 1⅛ inches; middle to back, 2 inches. Two processes of fly frames should be used, the hank roving being made at the first intermediate about 1.40, and at the second from 3 to 3.40.

THE SPINNING.

This roving is then taken to the spinning room where it is spun into the required count. For 16s the following would be a good equipment for a warp frame: gauge of spindle, three inches; diameter of ring, two inches; length of traverse, seven inches; and for a filling frame: gauge of spindle, 2¾ inches; diameter of ring, 1½ inches, and length of traverse, from 6½ to 6¾ inches, according to twist put in; the more twist the more length of traverse may be used. The production for a spinning frame for 16s, with the speed of front roll 139 revolutions per minute, twist 19 and revolutions of spindles 8,300, would be about 3.15 pounds per spindle per week. For a filling frame for 16s, with front roll speed of 159 revolutions per minute, twist, per inch 13, speed of spindles 6,500 revolutions per minute, the production would be about 3.34 pounds per spindle per week.

Dyeing Particulars.

Formerly ticking had only blue stripes dyed indigo blue. For some time a variety of colors have been introduced, and now many colors are used, some with narrow stripes mixed with broad stripes, having from three to five or more different colors in the same pattern.

BLUE.

Dyed with indigo or one of the sulphur blues.

Eight per cent pyrogene indigo; 8 per cent sulphide sodium; 3 per cent soda ash; 20 per cent common salt.

This color can be aftertreated with 1½ per cent chrome; 1½ per cent copper sulphate; 3 per cent acetic acid, 125 degrees F.

ECRU.

One-quarter per cent tetrazo cutch brown; ⅛ per cent tetrazo black N; 2 per cent soda; 20 per cent Glauber's salt.

LIGHT BROWN.

Three per cent Thion brown G; 2

per cent soda; 3 per cent sulphide soda; 20 per cent Glauber's salt.

LIGHT SLATE.

Three-fourths per cent Thion black B; 1½ per cent sal soda; 1 per cent sulphide soda; 10 per cent Glauber's salt.

RED.

Three per cent tetrazo red, 4 B; 2 per cent sal soda; 20 per cent Glauber's salt.

DARK BROWN.

One and one-quarter per cent Thion black B; 5 per cent Thion brown G; 3 per cent sal soda; 6 per cent sulphide soda; 20 per cent Glauber's salt.

LIGHT BRONZE.

One-quarter per cent tetrazo chlorine yellow G G; ¼ per cent tetrazo black N; ¼ per cent tetrazo brown R; 1 per cent sal soda; 20 per cent Glauber's salt.

DRAB.

One-eighth per cent benzo fast black; ¼ per cent chloramine yellow M; 1-16 per cent benzo fast red G L.

LIGHT OLIVE.

One-half per cent benzo dark green G G; ½ per cent chrysophenine.

DARK OLIVE.

Four per cent benzo dark green G G; 2 per cent chrysophenine. The above three colors are each dyed with 20 per cent Glauber's salt and 2 per cent sal soda.

DARK SLATE.

Two and one-quarter per cent benzo fast black; ⅛ per cent benzo fast blue B N; 2 per cent sal soda; 20 per cent Glauber's salt.

WINE.

Four per cent benzo fast scarlet 8 B S; 1 per cent benzo fast violet R; 2 per cent sal soda; 20 per cent Glauber's salt.

LIGHT FAWN.

One-half per cent diamine brown M; ⅛ per cent diamine brown 3 G; 2 per cent sal soda; 20 per cent Glauber's salt.

STEEL.

One-half per cent diamine steel blue L; ½ per cent diamine black B H; ¼ per cent diamine fast yellow B; 2 per cent sal soda; 20 per cent Glauber's salt.

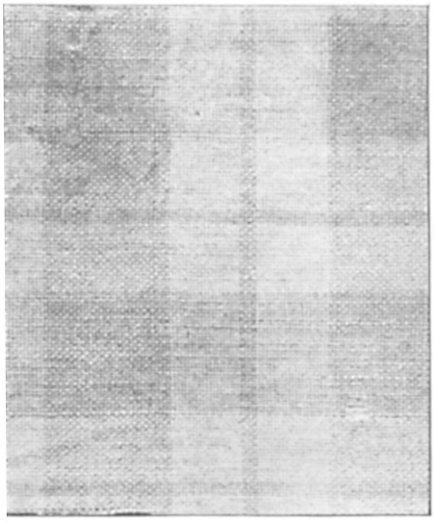
OSNABURG.

Osnaburg is a coarse single cloth composed of all cotton yarns, 1-16s, 1-18s, 1-20s, warp and filling, and is made in warp stripe patterns and in checks, the colors invariably being indigo blue and white or dark brown and white.

It is manufactured into overalls and jumpers or mock shirts, and is used in the South by the colored farm and plantation laborers. It is a strong fabric, having

EXCELLENT WEARING QUALITIES,

and is especially adapted to any purpose wherein it must sustain rough usage. It is occasionally substituted for canvas or duck in making awnings for back porches in northern cities. In this case the stripe patterns are used.



Osnaburg.

The check patterns, "produced by using the same pattern in warp and filling," are usually broad effects, belonging, in fact, to the plaid order of patterns. These checks measure from one to two inches either way.

WOVEN WITH A PLAIN LOOM.

Osnaburg is always woven with a plain weave $\frac{1}{1}$, and in the stripe patterns the stripe is made with warp, all white filling being used. This line can be woven on any plain sheeting

loom as it requires but one filling box. The check patterns are made on Mason box loom, Fairmount or Bridesburg loom, or any loom having a box motion attached.

In arranging check or plaid patterns the strong, long or broad way of the pattern indicates the filling and the greatest number of threads per inch indicate the warp, and to square a check or plaid pattern means to practically produce the same color effect in the filling as in the warp. Hence the filling pattern (total number of picks).

MUST BE REDUCED

so as to create a check or plaid pattern in which the filling arrangement is just noticeably longer in effect than in the warp pattern, the supposition being that as checks or plaids are worn they are always observed at an angle of several degrees, thereby in a sense overcoming any reasonable excess in the length of filling pattern, as compared with that of the warp.

Osnaburg is sometimes sized in the finishing, and at other times is not, this point being optional with the manufacturer in accordance with purpose for which the cloth is intended to be used. Generally it is taken from the loom, measured, run through the brusher, and after being lapped or rolled is pressed and put in the case and shipped.

Construction—30-inch Finish.

Reed, 900—33¾ inches in reed, including 16 ends selvedge, two ends per dent; 1-16s warp and filling; 46 picks per inch filling; 10 per cent take-up; 1,696 plus 16 equals 1,712 ends in warp. 1,696 divided by 80 equals 21 patterns plus 16 ends plus selvedge.

WARP PATTERN.

36 blue 20 white 4 blue 20 white	}	Filling same.
80		

40 ends blue per pattern x 21 equals 840 plus 16 equals 856 ends blue; 40 ends white per pattern x 21 equals 840 plus 16 equals 856 ends white; 46 picks x33¾ equals 1,752 yards filling equals 876 yards blue, 876 yards white.

Carding and Spinning Particulars.

As the cloth under description in this issue is made and used in the South, it is to a great extent made only in southern mills and the machines required to produce this class of yarns belong to the first division of mills previously given, i. e., the mills making low and medium count yarns. The counts of the yarn required to make this class of goods vary from 1-14s to 1-20s warp and filling, but for this article we will assume the warp and filling yarns to be 1-20s. These yarns are made from a short staple low-grade cotton of about ⅞ inch staple.

THE MIXINGS

should be as large as possible and the mixing is generally done by hand in southern mills. It is run through 2 processes of picking and an opener and waste is sometimes used in the mixture, i. e., card strips and comber waste (when it is possible to obtain it). Too much waste should not be used because of the trouble that it gives on the machines of the card room, such as licking, etc.

THE HOPPER

should be kept as full as possible so that the amount of cotton fed to the opener will be as uniform as possible. It will be understood that if the hopper is allowed to get almost empty before filling it up the lifting apron of the hopper will not carry or lift as much cotton on its spikes and oftentimes there will be little or no cotton presented to the evener roller. This is sure to produce an uneven lap at the front of the breaker picker. If on the other hand the hopper is always kept full of cotton the lifting apron will always have a surplus of cotton on it, this surplus being struck off by the evener and dropped back into the hopper again. It will thus be seen that to keep the hopper more than half full all the time is

ONE OF THE MOST IMPORTANT POINTS

of the picker room, because, if you have an uneven lap to start with, you will have to make the succeeding machines overwork to obtain an even yarn. The speeds of the various parts of the picker should be about the same as given in the last article and the weight

856 ends blue + 10% take-up =	951 yards 1-16s =	1.135 ounces	Warp.
856 ends white + 10% take-up =	951 yards 1-16s =	1.135 ounces	
	876 yards 1-16s =	1.043 ounces	Filling.
	876 yards 1-16s =	1.043 ounces	
		4.356 ounces.	

Brush and press.

of the finished lap should be at least 39 pounds at the finisher picker. Always keep laps enough of the card room so that, if an accident happens to the picking machinery, the cards will not be stopped for laps. Keep at least 10 per cent ahead.

The wire fillet used on the cards should be coarse, that used on the cylinder being

ONE NUMBER COARSER

than that used on the doffer and flats. A great many mills in the South use No. 33 wire on the cylinder and No. 34 or No. 35 on the doffer and flats. On this class of goods use as large a diameter doffer as possible, either a 26 or 27-inch. Grind cards often and keep top flats sharp,because, if the flats are dull, good carding cannot be obtained. The draft of the card for this class of goods should not exceed 100. The speed of the licker-in should be at least 350 revolutions per minute. The

WEIGHT OF SLIVER

at front should be about 65 grains per yard. The sliver is put through two processes of drawing, the weight of sliver at the front of the finishing being about 70 grains per yard. The settings of the drawing frame rolls should be as follows: for ⅞-inch stock,front to second roll, 1⅛ inches; second to third, 1⅜ inches; third to back, 1⅞ to 2 inches. The slubber roving should be .50 hank.

Two processes of fly frames are used. the hank roving at the first intermediate being 1.50 and at the second 4.00 hank. Always look out for bunches at the fly frames and be sure that your steel rolls are set to the best advantage. Keep your

TOP LEATHER ROLLS

in perfect condition and do not run one that is cut, bruised, uneven or channeled. See that the traverse guides are all working so as not to make channeled rolls. The cotton roving is taken to the ring spinning room and here made into the required count of yarn. The following are good particulars to be used on 20s warp and filling on spinning frames: warp, gauge of spindle 2¾inches; diameter of ring 1½ inches, length of traverse 6½ inches; for filling, gauge of spindle, 2¾ inches, diameter of ring 1½ inches; length of traverse 6½ inches; speed of spindles, 7,250 revolutions per minute. Use any of the best spindles on the spinning frame. The yarn is taken to the spooler room and spooled and then run on a warp beam,thence to the slasher where it is sized and then is ready for weaving unless the yarn has to be dyed before being woven as in the present article. Then the method differs somewhat.

Dyeing Particulars.

Light blue is dyed with the ordinary indigo blue vat, but as sulphur blues are faster to exposure and washing, they are mostly dyed.

LIGHT BLUE.

1 per cent immedial indone 3B, ½ per cent immedial indone B, 2 per cent sulphide sodium, 2 per cent soda, 20 per cent Glauber's.

DARK BROWN.

4 per cent immedial cutch O, 6 per cent immedial brown A, ½ per cent immedial black NG, 10 per cent sodium sulphide, 3 per cent soda, 30 per cent Glauber's.

SLATE.

1½ per cent katigen black SW, 2 per cent sulphide sodium, 2 per cent soda, 30 per cent Glauber's.

RED.

5 per cent benzo fast red 4 BS, 3 per cent sal soda, 30 per cent Glauber's.

LIGHT ORANGE.

2 per cent immedial orange C, 2 per cent sodium sulphide, 3 per cent soda, 20 per cent Glauber's.

DRAB.

1 per cent immedial black NG, 1 per cent immedial brown A, 2 per cent sodium sulphide, 30 per cent Glauber's, 3 per cent soda.

SHEETING.

Sheeting is a light-weight, single cloth, composed of all cotton yarns, from 1-18s to 1-40s warp and filling, standard goods weighing 2½ to 6 yards per pound. It is sold in both the gray and bleached state, the bleaching being done after the cloth is woven.

Sheeting is never made in colors or patterns, but always in solid bleached or unbleached effects, and is woven on any and all single box roller looms, such as Draper, Lowell, Mason, Colvin, Kilburn & Lincoln, etc., cotton harness being used in most cases.

The Draper loom has the peculiar advantage over the other looms, in that it has an automatic warp stop motion, which stops the loom when a warp end breaks, also having a filling hopper or magazine which holds 18 filling bobbins, the filling replenishing itself in the shuttle as the bobbin be-

comes empty. All the looms have an automatic let-off motion to regulate the warp.

Sheeting warps are all made on

THE SLASHER,

there being either four or six beams to a set, and these are filled with yarn run from spools set in the creel rack of the warp mill. Each beam has a proportionate number of the total warp ends, viz., 2,000 ends, four beams, equals 500 ends per beam. These beams are set in regular order at the further end of the slasher frame. The total warp ends are then run through a solution of size, and around the hot cylinder, and then upon a beam, thereby sizing and beaming the warp at one operation.

Sheeting requires nothing in the way of finishing, except being run through a plate folder, on which machine, having a brush attached, the cloth is at once brushed and folded in any desired length of fold.

36 inches is the standard width for sheeting.

CONSTRUCTION.

Always a $\frac{1}{1}$ plain weave.

4 square inches equals 4.15 grains.

36 x 36 equals 1,296 x 4.15 equals 5,378.4 divided by 4 equals 1,344.6 divided by 437.5 equals 3.07 ounces per yard.

30 pieces yarn (warp) x 2½ inches equals 70 inches equals .89 grains minus 6 per cent size equals .83 grains. 70 x 7,000 equals 490,000 divided by .83 equals 590,361 divided by 36 equals 16,399 divided by 840 equals 19.5 or 1-20s warp.

60 pieces yarn (filling) x 1½ inches equals 90 inches equals .89 grains. 90 x 7,000 equals 630,000 divided by .89 equals 707,864 divided by 36 equals 19,662 divided by 840 equals 23.41 or 1-24s filling.

48 ends per inch plus 44 picks per inch equals 44 ends in reed and 42 picks in loom.

Reed 800—2 ends per dent, 38 inches, including 16 ends selvedge, 6 per cent size on warp 10 per cent take-up on warp, 5½ per cent contraction in width.

1,728 plus 16 equals 1,744 ends plus 10 per cent take-up equals 1,937 yards 1-20s warp equals 1.83 ounces; 42 picks x 38 equals 1,586 yards, 1-24s filling equals 1.25 ounces; total 3.08 ounces.

Standard grades equals 36 inches wide.

52 ends, 52 picks, 1-20s cotton warp and filling; 6 per cent size, 5½ per cent shrinkage in width in weaving; 38 inches in reed; 4.10 yards per pound.

64 ends, 64 picks, 1-32s warp, 1-40s filling; 6 per cent size, 5½ per cent shrinkage in width in weaving; 38 inches in reed; 5.86 yards per pound.

Carding and Spinning Particulars.

The counts of the yarns used in making sheetings vary in different parts of the country in different mills and even in the same mill two grades of sheetings are sometimes made. The mills that make sheetings may belong to any one of the three divisions as given in a previous article. In this article we will consider the sheetings in two grades, the first being made up of 18s warp and the finer grade made up of 40s warp and filling. The first or

COARSE GRADES OF SHEETINGS

are made in the first division of mills and the staple of cotton used would be about one inch in diameter. The mixing would in most cases be performed by hand and should be as large as possible. It would be put through two processes of picking, first being

Plain Weave

Drawing-in Draft

Reed Plan

run through an opener. The speeds of the various parts on the machines in this room would be as follows: Speed of beater on openers, 1,050 revolutions per minute; fan, 350; speed of beater on breaker picker, 1,500 revolutions per minute; speed of fan, 1,400 revolutions per minute; speed of beater on finisher picker, 1,450 revolutions per minute; speed of fan, 1,100 revolutions per minute. The

WEIGHT OF THE LAP

at the different machines for this class of goods would be as follows: At the front of the breaker picker, 40 pounds or 16 ounces to the yard; at the front of the finisher picker, 39 pounds or 14½ ounces to the yard. Always keep the hopper of the opener full. The above speeds and number of processes could also be used for fine sheetings, using 40s yarn with the following exceptions: Instead of being mixed by hand, a bale breaker and conveying trunks would be used, and the staple of cotton would be about 1⅜ inches. The weight of the lap at the breaker would be about the same, but at the finisher picker would be less or about 35 pounds for the total

weight of lap or 12½ ounces to the yard. Always have laps of both classes uniform in weight, and, if the laps vary one-half pound in either direction from standard weight, they should be set aside and put back into mixing. Use cut roving in the mixing, mixing it as shown in a previous article. Double four into one in the picker room. The

SETTINGS FOR THE CARD

for the coarse sheetings should be wide, because of the large weight of cotton lap being passed through, and coarse wire should be used, 33 on the cylinder and 34 on tops and doffer. The drafts should not exceed 100 and the production should be about 900 pounds per week of 60 hours, the weight of the sliver being 65 grains to the yard. The settings for the finer sheetings at the card should be closer and a fine wire fillet should be used. The draft of the card should not be less than 100 and the production should not exceed 600 pounds per week of 60 hours. Grind cards and tops as often as possible and strip three times a day on both grades of sheetings. Go over the settings after each grinding and keep cards clean.

The coarser grade of sheeting is put through

TWO PROCESSES OF DRAWING,

the weight per yard of the sliver at the front being 70 grains per yard, the doublings being six into one and the speed of the front roll 400 revolutions per minute. The finer grade of sheeting is put through three processes of drawing, the other particulars being the same, excepting the settings, which are wider. Good settings are as follows: For one inch stock, front to second roll, 1⅛ inches; second to third roll, 1¼ inches; third to back roll, 1½ inches; for 1⅜ inch stock, from front to second, 1½ inches; second to third, 1⅝ inches; third to back, 1¾ inches. Keep bottom steel rolls clean and top leather rolls should always be in perfect condition. Varnish those rolls at regular intervals and always keep a supply of extra varnished rolls on hand, so that imperfect rolls may be taken out at any time and replaced by rolls in good condition. The hank of the roving at the front of the slubber should be .55 to .50 in each case. The coarser sheeting yarn has to be put through two processes of fly frames, the hank at the first intermediate being 1.50 and at the second 5 hank.

THE ROVING

for making the finer sheeting passes through three processes of fly frames, the hank roving at the different processes being as follows: First intermediate, 1.50; second intermediate, 4, and fly frame, 10. The roving for both grades of sheetings are spun into yarn on the ring spinning frame. The particulars for a warp frame for spinning 18s being No. 4 Draper, McMullen or Whitin spindle; gauge of frame, 2¾ inches; diameter of ring 27 inches; traverse, 7 inches; speed of spindle, 9,400 revolutions per minute, turning off about 2½ pounds per spindle per week of 60 hours. For a warp frame making 40s yarn, use No. 2 Draper, McMullen or Whitin spindle, gauge of frame 2¾ inches; diameter of ring, 1⅝ inches; traverse, 6½ inches; speed of spindle, 10,000 revolutions per minute, producing about .95 pounds per spindle per week of 60 hours. The warp yarn is spooled and warped and run through the slasher. A good

SIZE MIXTURE

for 18s yarn, one set of beams, 1,500 to 2,000 pounds, is as follows: 160 gallons of water, 100 pounds starch, 20 to 40 pounds sizene (according to make), 2 to 8 pounds tallow, according to results. For 68 x 68 heavy sheetings, with 22s warp yarn, use 100 gallons water, 70 pounds potato starch, 4 pounds tallow and 1 pint of turpentine.

CHEVIOT SHIRTING.

Cheviot shirting is a narrow, all-cotton fabric, weighing from four to five ounces per yard of 27 inches width finished and is composed of single or double ends in the warp and single filling. The effect of the double ends is entirely different from that produced by a two-ply thread, and is really meant to create a rib weave effect.

This fabric is made of cotton yarns, from 1-16s to 1-22s in the warp and filling, and the cloth contains from 40 to 46 double ends per inch in warp and 36 to 40 picks per inch in the filling. Another grade is made by weaving 36 to 62 single ends per inch in the cloth, and 19 to 52 picks per inch in the filling finished.

BY THE FIRST METHOD

there is produced a cloth that is at once stout and pliable, and having excellent wearing qualities. This cloth is used principally in the manufacture of shirts and mock shirts for the use of workmen accustomed to rough, dirty work, such as miners and railroad men, and those similarly em-

ployed. It is made in stripe pattern, usually of the darker tones of fast colors, such as dark blue, dark brown, etc., in the warp, and filling to match. In these warp stripe patterns the dark colors form the body or ground of the pattern and the white warp forms but a narrow pin stripe in the cloth. Then there are the light patterns, in which nearly all the bright colors are used, such as light blue, orange, red, light green, etc. In this case the body or ground of the cloth is formed by the white warp, and the bright color forms the pin stripe in the cloth. Print yarns are occasionally introduced in the light colored patterns to create mixed color effects. The filling in the light patterns is always white. In making cheviot shirting there is rather

A HEAVY SIZE

placed upon the warp yarn. This permits of the cloth retaining quite a percentage of size after weaving, and as this fabric receives nothing but sprinkling and pressing after leaving the loom, the excessive amount of size gives the fabric a better cover, feel, and apparent bulk, which is its most distinguishng feature as a material for workmen's shirts.

Cheviot shirting can be woven upon any plain roller loom, either single or double box, such as the Mason, Lewiston, Lowell, Colvin, Kilburn and Lincoln, Mutual or Fairmount looms. It is generally drawn in and woven on 4 harnesses so as not to crowd the heddles in weaving, as would be the case if but 2 harnesses were used. Most all cheviot shirting is woven with a plain weave, although sometimes a $\frac{2}{1}$ warp effect, 45 degree twill weave, is used.

CHEVIOT SHIRTING.

1 square inch equals 1.83 grains. 27x36 equals 972x1.83 equals 1,778.76 divided by 1 square inch equals 1,778,-.76 divided by 437.5 equals 4.065 ounces per yard.

44 pieces white warp yarn x ½ inch long equals 22 inches equals .35 grains. .35 grains minus 10 per cent size on warp equals .315 grains. 22x7,000 equals 154,000 divided by .315 equals 48,888 divided by 36 equals 1,357 divided by 840 equals 1-16s cotton.

110 pieces blue warp yarn x ½ inch long equals 55 inches equals .9 grains. .9 grains minus 10 per cent size on warp equals .81 grains. 55x7,000 equals 385,000 divided by .81 equals 475,308 divided by 36 equals 13,203 divided by 840 equals 15.71 or 1-16s cotton.

15 pieces blue filling yarn x 2 inches long equals 30 inches equals .45 grains. 30x7,000 equals 210,000 divided by .45 equals 466,666 divided by 36 equals 12,-962.8 divided by 840 equals 15.43 or 1-16s cotton.

CONSTRUCTION.

Reed, 700, 4 ends per dent; 28½ inches in reed including selvedge.

532 plus 10 equals 542 splits or 2,168 ends; 1-16s cotton warp yarn.

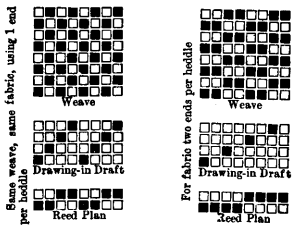
38 picks per inch; 1-16s blue cotton filling yarn.

10 per cent size on warp; 5¼ per cent contraction in width in weaving.

8 per cent take-up in length of warp in weaving.

Finish equals sprinkle and press equals 27 inches finished width.

Plain weave, warp drawn in on 4 harnesses.



WARP PATTERN.
8 blue.
2 white.
2 blue.
2 white.

14 ends per pattern.

2,128 ends in warp divided by 14 equals 152 repeats in pattern. 10 blue ends per pattern x 152 equals 1,520 plus 40 ends blue selvedge equals 1,560 ends, 1-16s blue warp yarn. 4 white ends per pattern x 152 equals 608 ends, 1-16s white warp yarn.

1,560 ends, 1-16s blue warp yarn plus 8 per cent take-up equals 1,695 yards equals 2.017 ounces. 608 ends, 1-16s white warp yarn plus 8 per cent take-up equals 660 yards equals .785 ounces. 38 picks, 1-16s blue filling yarn x 28½ inches equals 1,083 yards equals 1.265 ounces; total 4.067 ounces.

4.067 ounces per yard, 27 inches wide finished.

Carding and Spinning Particulars.

The mills which make the counts of yarn required for cheviots belong to the second division, given in a previous article. This is one of the coarser

yarns made in this division and is manufactured from stock of about 1 inch in staple. The mixings should be as large as possible and are generally done by hand, although this division of mills is generally equipped with a bale breaker. Of course, if the bale breaker is not too hard pushed or is stopped on account of all the other bins of better grades of cotton being full, then the raw stock for this class of goods will be run through the bale breaker. The bale breaker is capable of handling 80,000 to 90,000 pounds per week and requires about 2 iron horse power to drive it.

IF FLOOR SPACE IS AVAILABLE

two mixing bins should be used instead of one for reasons before stated. The cotton, after being dried out, should be run through two processes of picking and an opener. Keep the hopper of the opener as near full as possible to make an even lap at the front. Keep the pin roller of the opener clear of all cotton, so that it may be able to do its duty. On some makes this roller is a great deal of trouble, which is caused by the cotton adhering to it and winding around it until it does not strike the cotton from the lifting apron properly. This is especially true when sliver waste (from all machines which make sliver) is mixed in with the raw stock at the bins (as is customary). The speed of the opener beater for this class of cotton should be 1,100 revolutions per minute. The speed of the breaker beater should not exceed 1,500 revolutions per minute.

THE WEIGHT OF THE LAP

at the front should be about 40 pounds or 16 ounces to the yard of lap. Care should be taken that the drafts on both the breaker and finisher pickers are regulated to the best advantage so as to obtain a smooth, firm, even lap at the front. To do this the draft is directed so that the cotton, after being acted upon by the beater, is blown on the top cage. The laps made at the breaker are put up at the back of the finisher picker and doubled 4 into 1. The speed of the finisher picker beater should be 1,450 revolutions per minute, which gives this grade and staple of cotton passing by it about 42 beats to the inch. The weight of the total lap at the front should be about 39 pounds, which gives what is known as a 14½-ounce (to the yard) lap.

OILING.

Take care to oil all rapidly moving parts of the pickers at regular and frequent intervals and keep all fly from collecting under these machines. See that the pickers are properly cleaning the cotton, and don't make the card do the picker's work. The laps from the finisher picker are put up at the back of the card, the draft of which (for this class of goods) should not exceed 100. The wire fillet used should also be not too coarse. Always keep an eye on the settings and watch the flat waste, because from the appearance of this waste we are able to tell whether the cotton is being properly carded or not.

THE SLIVER

should weigh about 65 grams per yard and the production should be around 900 pounds per week of 60 hours. Keep card wire sharp. The sliver is next run through 3 processes of drawing, the doubling being 6 into 1. The weight of the finisher drawing should be about 70 grains. The slubber roving should be about .50 hank and there should be two processes of fly frames. The roving at the first intermediate should be 1.50 and at the second either 4 or 4.50, according to whether warp or filling yarn is to be made from it, the fine hank being made into 22s filling yarn and the coarser hank roving being made into 16s warp yarn. The yarn for this class of goods is spun on

A RING SPINNING FRAME.

the particulars of which are as follows: For warp frame spinning 16s use McMullen, Whitin or Draper No. 4 spindle; gauge of frame 2¾ inches; diameter of ring, 2 inches; length of traverse, 7 inches; speed of spindle, 9,400 revolutions per minute; for filling frame making 22s, spindle as above except No. 2 Draper; gauge of spindle, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 6½ inches; speed of spindle, 7,400 revolutions per minute.

Dyeing Particulars.

Following are good formulas for the colors used in dyeing cheviot shirtings:

LIGHT GREEN.

2 per cent immedial yellow D; 4 per cent immedial indone 3B; 5 per cent cent sodium sulphide; 3 per cent Glauber's; 3 per cent soda.

ORANGE.

4 per cent immedial orange C; 4 per

cent sodium sulphide; 3 per cent soda; 30 per cent Glauber's.

DARK BLUE.

3 per cent immedial indone 3 B; 3 per cent immedial indone R; 2 per cent immedial indone B; 11 per cent sodium sulphide; 3 per cent soda; 30 per cent Glauber's.

DARK BROWN.

2 per cent thion black B; 8 per cent thion brown G; 10 per cent sodium sulphide; 3 per cent soda; 30 per cent Glauber's.

SLATE.

2 per cent thion black B; 2 per cent sodium sulphide; 2 per cent soda; 20 per cent Glauber's.

RED.

5 per cent benzo scarlet 4 BS; 3 per cent sal soda; 30 per cent Glauber's.

YELLOW.

1 per cent chloramine yellow M; 3 per cent sal soda; 20 per cent Glauber's.

SALMON.

½ per cent benzo fast orange S; 2 per cent sal soda; 20 per cent Glauber's.

OLIVE.

5 per cent pyrogene olive N; 5 per cent sodium sulphide; 3 per cent soda; 30 per cent Glauber's.

BLACK.

15 per cent katigen black S W; 15 per cent sodium sulphide; 3 per cent soda; 30 per cent Glauber's.

After dyeing, all of the colors mentioned must be well rinsed with three waters. A light soaping at the boil must then be given, followed by another rinsing. The colors will be fast to washing and will not bleed into each other.

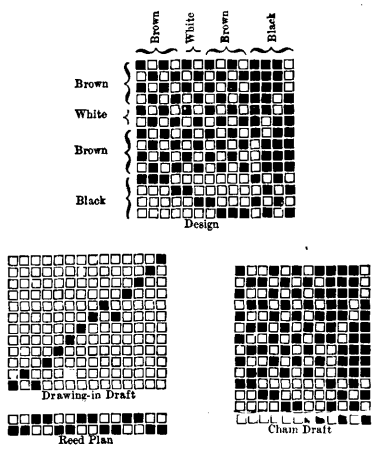
NOVELTY DRESS GOODS.

Novelty dress goods is a light-weight single cloth fabric, made from single and two-ply cotton yarns in both warp and filling, and is woven in large and small plaids, also solid colors. The distinct feature of this fabric is the prominence given the heavy yarns, which are always woven with a fancy weave in such a manner as to form an all-over effect in imitation of a jacquard pattern. The ground or body of the cloth is usually woven with a plain weave, $\frac{1}{1}$.

In the better grades of novelty dress goods, merino and silkoline yarns are often used. In making this class of goods it is sometimes necessary to use two beams in weaving, as the difference of take-up in the ground and fancy yarns will not permit of one beam being used.

Novelty dress goods are made to weigh from 3 to 5 ounces per yard; generally 1-20s to 1-30s cotton ground warp and filling yarns, and 2-20s to 2-40s, and 1-8s to 1-12s yarns are used to produce overplaided or novelty weave effects.

This fabric is made in all dress goods colors and goods patterns produced by using dark green, brown,



dark or cherry red, navy blue, etc., for ground color and crossing these with black.

Cotton novelty goods can be woven in any power loom having a box motion and dobby or head motion attached. Mutual or Fairmount 4x1 box looms, having either Ingraham, Oldham or Stafford top, are all right for this line.

To finish these goods, they are measured, then brushed and run through a steam box to liven the colors, after which they are rolled and pressed, ready to pack and ship.

CONSTRUCTION.

27 inches finished.

4 square inches equals 5.7 grains. 27 x36 equals 972x5.7 equals 5,504.4 divided by 4 equals 1,385 divided by 437.5 equals 3.165 ounces per yard.

20 pieces black warp yarn x 2 inches equals 40 inches equals 1 grain. 40x

7,000 equals 280,000 divided by 1 equals 280,000 divided by 36 equals 7,777 divided by 840 equals 2-20 black warp.

38 pieces brown warp yarn x 2 inches equals 76 inches equals .92 grains. 76 x7,000 equals 532,000 divided by .92 equals 578,260 divided by 36 equals 16,-062 divided by 840 equals 1-20 brown warp.

12 pieces white warp yarn x 2 inches equals 24 inches equals .27 grains. 27x 7,000 equals 168,000 divided by .27 equals 622,222 divided by 36 equals 17,-284 divided by 840 equals 1-20 white warp.

24 pieces black filling yarn x 3 inches equals 72 inches equals 1.45 grains. 72x7,000 equals 504,000 divided by 1.45 equals 347,586.2 divided by 36 equals 9,655.17 divided by 840 equals 1-12 black filling.

17 pieces brown filling yarn x 3 inches equals 51 inches equals .5 grains.

51x7,000 equals 357,000 divided by .5 equals 7,140,000 divided by 36 equals 198,333 divided by 840 equals 1-24 brown.

12 pieces white filling yarn x 3 inches equals 36 inches equals .35 grains. 36x7,000 equals 252,000 divided by .35 equals 7,200,000 divided by 36 equals 200,000 divided by 840 equals 1-24 white filling.

50 ends per inch finished and 48 picks per inch finished equals 44 ends per inch in reed and 43 picks per inch in loom.

10 per cent take-up on white and brown warp, 2 per cent on black warp.

WARP PATTERN.

4 Brown
2 White
4 Brown
4 Black } Filling same.

32 ends white selvedge.

Reed 800—2 ends per dent.

30½ inches in reed including selvedge.

95 repeats of pattern plus 4 ends.

1,334 ends plus 32 ends selvedge. 8 brown per pat. x 95 patterns equals 760 plus 4 equals 764 plus 10 per cent take-up equals 848.88 yards 1-20 equals .8084 ounces. 4 black per pat. x 95 patterns equals 380 plus 10 per cent take-up equals 400.00 yards 2-20 equals .7619 ounces. 2 white per pat. x 95 patterns equals 190 plus 10 per cent take-up equals 211.11 yards 1-20 equals .2010 ounces. 32 white selvedge plus 15 per cent take-up equals 37.64 yards 1-20 equals .0358 ounces. Total warp weight, 1.8071 ounces.

8-14 of filling equals brown or 740.56 yards 1-24 equals .5877 ounces. 4-14 of filling equals black or 370.28 yards 1-12 equals .5877 ounces. 2-14 of filling equals white or 185.14 yards 1-24 equals .1469 ounces. Total 3.1294.

3.1294 ounces finished, 27 inches wide.

Carding and Spinning Particulars.

The yarns for novelty dress goods would probably be made in mills of the second division. For this class of goods three or more different counts of yarns are generally used, the counts varying from 4s to 40s, the medium yarn being from 20s to 30s. For the cloth under description we will consider that the yarns used are as follows: 8s, to produce one effect and 2-20s another, both of these yarns being used on the face of the cloth, and 1-30s for the ground warp and filling yarns. In some mills it is the custom to make all these counts of yarns from one staple and grade of cotton to save time and to reduce the number of mixings in order that the cotton may pass up to a certain point on the same machines, the only difference being that the finer yarns are run through one more process of fly frames. While this undoubtedly saves time and machines and may be done when the counts of yarn used in the cloth do not vary a great deal, still it is generally the case to have two or even three different mixtures, one for the very coarse, one for the medium and one for the fine yarns. In this lesson we will consider that there are

TWO MIXINGS,

or in other words, two grades and staples of raw stock used, one for the 8s and another mixing for the 20s to 30s yarn. For 8s yarn the staple of the raw stock should be from ⅞ to 1 inch in length and for the finer counts, cotton of from 1⅛ to 13-16 inch staple may be used. The ⅞-inch stock would probably be mixed by hand, i. e., taken from the bale and pulled into small bunches and spread in the mixing bin by the help. In this mixture all good waste of the same length of staple is used, the roving waste being treated, as previously mentioned; sometimes, but not often, comber waste is used, but a large percentage should not be used.

FOR THE FINER COUNTS

the raw stock would be run through a bale breaker or, if no bale breaker was in the mill equipment, then the cotton would be mixed by hand the same as cotton for the coarser counts except that no comber waste would be used. Two processes of picking and an opener would be used with both processes. All the points in connection

with the opener given in former articles should be carefully observed; the speed of the fan of the breaker should be about 1,500 revolutions per minute for both stocks and the weight of the laps 40 pounds or 16 ounces to the yard. The speed of the fan at the finisher picker should be a little less than at the breaker picker and the speed of the fan about 1,100 revolutions per minute. This gives the cotton passing under the action of the beater about 42 beats or blows per inch. The weight of the lap of the ⅞-inch stock should be 39 pounds or 14 ounces to the yard, and for the finer counts of yarn, 35 pounds or 12½ ounces to the yard. The

DRAFT OF THE CARD

for the coarser count should not exceed 100 and for the finer count should not be less than 100. The same size of wire fillet may be used for both grades or, generally speaking, No. 33 wire fillet for cylinder and No. 34 wire fillet for doffer and top flats. The main points of difference would be in the setting of the card for the different stocks, the longer staple of cotton requiring the closer settings, the production for the ⅞-inch stock being 900 pounds and for the 1⅛-inch stock from 750 to 800 pounds per week of 60 hours. The doffer of the card should be as large as possible in both cases, either 26 or 27 inch diameter. Keep

THE CARD WIRE

sharp and be sure that the wire on the flats is of uniform length, because, if this is not the case, bad work is bound to result on account of the fact that even settings of the flats with the cylinder cannot be obtained. The weight per yard of the sliver would be the same in both cottons or 65 grains per yard. The ⅞-inch stock would be put through two processes of drawing and the longer staple three processes, doubled 6 into 1 in both cases. The weight of the sliver at the finisher drawing would be the same, or 72 grains per yard. The same hank roving would be made at the slubber, or .55 hank, although the

SETTINGS OF THE ROLLS

of both of the last named processes would be different. Only one process of drawing would be used on the ⅞-inch stock and at the fly frame it would be made into 1 hank roving and from here passed to the spinning room. For the 1⅛-inch stock two processes would be used. At the first intermediate the slubber roving would be made into 2 hank roving and at the second the roving for 20s count yarn would be made into 4 hank and for the 30s count would be made into 6 hank. The roving would then be taken to

THE SPINNING ROOM,

where the required count would be spun. The particulars for a warp frame making 20s yarn have been given in a previous lesson; for a warp frame making 8s, the following particulars may be used; any high-grade spindle, length of traverse, 7 inch, gauge of spindle, 3¼ inches, diameter of ring, 2⅛ inches, speed of spindle, 8,100 revolutions per minute. For a warp frame making 30s use gauge of spindle, 2¾ inches, diameter of ring, 1⅝ inches, length of traverse, 6 inches, speed of spindle, 9,800 revolutions per minute. The yarn is then spooled and warped and dyed. For some of the effects produced in this class of goods two yarns of different colors are twisted together; for this a machine known as a twister is used, one thread of each color being twisted together.

Dyeing Particulars.

DARK GREEN.

4 per cent tetrazo brilliant green J; 30 per cent Glauber's; 3 per cent sal soda.

RED.

4 per cent tetrazo fast red 4 B; 30 per cent Glauber's; 3 per cent sal soda.

LIGHT SKY BLUE.

1 per cent tetrazo blue, 6 B new; 20 per cent Glauber's; 2 per cent sal soda.

WINE.

3 per cent tetrazo corinth; 30 per cent Glauber's; 3 per cent sal soda.

DARK BLUE.

3 per cent tetrazo blue B X; 30 per cent Glauber's; 2 per cent sal soda.

DARK BROWN.

3 per cent tetrazo dark brown; ½ per cent tetrazo black brown; 30 per cent Glauber's; 2 per cent sal soda.

LILAC.

2 per cent tetrazo chlorine lilac 4B; 2 per cent sal soda; 20 per cent Glauber's.

LIGHT SLATE.

¼ per cent tetrazo black N; ¼ per cent tetrazo brilliant blue B B; 2 per cent sal soda; 25 per cent Glauber's.

DARK SLATE.

1½ per cent tetrazo black N; ½ per cent tetrazo blue 3 B; 2 per cent sal soda; 30 per cent Glauber's.

OLIVE.

¼ per cent diamine fast yellow B;

3 per cent diamine bronze G; 2 per cent sal soda; 30 per cent Glauber's.

BLACK.

5 per cent tetrazo black N; 3 per cent sal soda; 30 per cent Glauber's.

NAVY BLUE.

3 per cent tetrazo blue B X; ½ per cent tetrazo blue 4 R; 3 per cent sal soda; 30 per cent Glauber's.

The above colors are for first baths, for a standing bath. One-third of the color can be taken away from these amounts. After dyeing, yarn must be well rinsed in water.

DRILL.

Cotton drill is a medium weight, single cloth, weighing from 4 to 6 ounces and composed of coarse all-cotton yarns, warp and filling. It is always made with a small uneven sided twill weave, generally $\frac{2}{1}$ (warp effect) twill weave.

Drill is sometimes made from yarns in the gray and afterwards dyed in the piece, or in solid warp color effects, such as indigo blue and dark brown, white filling being used in each instance.

It can be woven in any single box roller loom, such as Draper, Lowell, Lewiston, Colvin, Mason, or Kilburn & Lincoln, and is usually drawn in and woven on cotton harness, as these are light in weight and wear better than wire heddles for this style of cotton goods.

THE WARP

is beamed on the slasher, the warp proper being divided into a certain number of sections, in accordance with the number of ends to be used in the drill warp. These sections are beamed on the warp mill, the yarn being run on to the beam from the spools in the creel rack. The several section beams, when completed in the warp mill, are assembled in the beam rack at the end of the slasher and the yarn from each beam is run through the size tub and over the drying cylinder of the slasher at the same time, on to the slasher beam, thus making a complete warp, the sizing and beaming being done at one operation.

Slasher warps do not have a lease in them, the yarn being kept nearly straight in place by the use of a slasher comb, which is, in fact, a shallow reed having one open side. The comb is pressed through the threads, while they are spread taut in the slasher frame and a wooden cap is then fastened upon the open side of the slasher comb, thereby holding the yarn in place for the operation of drawing in.

The drawing in is performed by girls, without the aid of a hander in, as is the case when pattern warps are drawn in from a lease.

The drawer in for drill uses a three-bladed hook (a blade for each harness) and the harnesses or heddles are hung upon a rack immediately in front of the beamed warp. The drawer in, if experienced, will pick out three heddles and three ends at one time, and continue to do so until the total warp ends are threaded through the harnesses or heddles.

To finish colored drill, the goods are taken from the loom and run through the brusher, to remove all lint and waste threads, after which they are put through the size tubs and then dry pressed.

CONSTRUCTION.

4 square inches equals 9.95 grains. 30x36 equals 1,080x9.95 equals 10,746 divided by 4 equals 2,686.5 divided by 437.5 equals 6.14 ounces per yard finished.

30 pieces blue warp x 2½ equals 75 inches equals 1.9 grains. 75x7,000 equals 525,000 divided by 1.9 equals 276,315.8 divided by 36 equals 7,675.43 divided by 840 equals 1-10s cotton.

30 pieces white filling x 1½ equals 45 inches equals .55 grains. 45x7,000 equals 315,000 divided by .55 equals 572,727 divided by 36 equals 15,909 divided by 840 equals 1-18s cotton.

66 ends per inch finished and 48 picks per inch finished equal 63 ends per inch loom and 44 picks per inch loom. 10 per cent take up in weaving minus 6½ per cent contraction in reed. 16 ends selvedge. 30 inches finished equals 32 inches in $\frac{2}{1}$ twill weave. 750 reed minus 3 ends per dent. Finish equals size and dry press.

66x30 equals 1,980 plus 16 equals 1,996 plus 10 per cent equals 2,218 yards 1-10s cotton warp equals 4.224 ounces. 48 picks x 30 equals 1,440 yards, 1-18s cotton filling equals 1.523 ounces.

4.224 ounces warp.
1.523 ounces filling.

5.747 ounces loom weight.

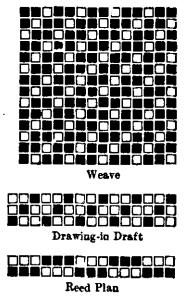
Carding and Spinning Particulars.

The machinery used to make the counts of yarns for the kind of

cloth under description would be found in mills of the first and perhaps of the second division, as given in a previous lesson. As the yarns are made from a short staple, low-grade cotton, the mixing will probably be done by hand; i. e., the bales of cotton would be opened at the mixing bin and the cotton separated into small parts and piled up in the bin until it was full. The good waste from cards and drawing frames would also be mixed in with the raw stock, and in the cheaper grades of drill comber waste is sometimes used in small quantities. The same length of staple may be used for both warp and filling yarns and they may be run through the same machines up to the fly frames, and here

THE ONLY DIFFERENCE

is that the roving to make the filling yarn is run through one more process of fly frames than the warp yarn. The mixing is taken from the bins and thrown into the hopper of the opener and this hopper is always kept full. Keep the pin beater free from cotton, so that an even sheet of cotton may be



6.140 ounces finished.
5.747 ounces loom.

.393 ounces = sizing in finishing.

About 6½ per cent of size.

passed up to the beater, the speed of which should be about 1,050 revolutions per minute. In modern mills this opener is built in connection with the breaker picker, and the cotton, after passing the beater, is thrown on to a moving lattice and is brought to the feed rolls of the breaker picker, which in turn condenses it and passes the beater which should have a speed of 1,500 revolutions per minute. See that the draught of this picker and also the finisher picker is so directed that the cotton, after passing the beater, will be blown upon the top of the pair of cages, as this will

HELP TO MAKE AN EVEN LAP

at the front end. The weight of the lap at the front end of the breaker should be about 40 pounds or about 16 ounces to the yard. The laps are then put up at the finisher picker and doubled four into one. The speed of this beater should be 1,450 revolutions per minute and the weight of the finished lap about 39 pounds or 14 ounces to the yard. The cotton receives about 42 beats to the inch at this machine. The draft of this machine is very small and very rarely exceeds 3. All heavy and quickly moving parts should be oiled frequently and keep the room clean. The laps are then put up at the card. The draft of this machine should not exceed 100 for this class of goods.

THE SETTINGS

should be wide, because it is the object to get off as many pounds as possible for this class of goods. Keep the wire sharp by frequent grindings. The speed of the licker-in should be about 300 revolutions per minute. The speed of the top flats should be one complete revolution in 40 minutes and the speed of the doffer from 13½ to 14 revolutions per minute. The diameter of the doffer should be as large as possible, say 26 or 27 inches. The production should be about 800 pounds for a week of 60 hours.

THE SLIVER

should weigh about 65 grains to the yard. The sliver is run through three processes of drawings, the weight at the finisher drawing being 70 grains. The doublings at the different processes of drawing should be 6 into 1 and the drafts should not exceed 6. The speed of the front roller should be 400 revolutions per minute. The slubber is the next process, and here the sliver should be made into a 50 hank roving. The warp yarn is then put through one more process of fly frame and made into 1.25 to 1.50 hank roving and from here passed to the spinning room. The filling yarn is put through one more process and is made into 2.50 hank roving and then passed on to the spinning room.

THE SPINNING FRAME

then draws the roving into the required hank by having the correct draft gear put on. Good specifications for both the warp and filling frames are as follows: for warp frame, for spinning 10s yarn, gauge of spindle, three inches: diameter of ring, two

inches; length of traverse, 7 inches; speed of spindle 8,600 revolutions per minute; twist per inch, 15.02; for filling frame spinning 18s yarn, gauge of spindle, 2¾ inches; diameter of ring, 1½ inches; speed of spindle, 7,200 revolutions per minute; length of traverse, 6½ inches; twist per inch, 13.79. The warp yarn is then spooled, warped and run through a slasher.

Dyeing Particulars.

Drills are yarn dyed, blue and brown, indigo or sulphur blues, cutch or sulphur browns.

PYROGENE INDIGO BLUE.

10 per cent color; 20 per cent sulphide sodium; 8 per cent soda ash; 35 per cent salt; 2 per cent mineral oil, 1 hour at 200 degrees F. Aftertreated with

1½ per cent bichrome; 1½ per cent sulphate copper; 3 per cent acetic acid, 9 degrees Tw. Well rinsed and soaped. A soap made of

2 per cent paraffin wax; 2 per cent glue; 2 per cent dextrine is considered very suitable. Turn for 15 minutes at 120 degrees F. Squeeze and dry.

BROWN.

5 per cent immedial cutch O; 1 per cent immedial dark brown A; 3 per cent immedial brown B; 8 per cent sulphide sodium; 3 per cent soda ash; 30 per cent Glauber's salt. Turn at 200 degrees F. for one hour, rinse and aftertreat:

1½ per cent bichrome; 1½ per cent sulphate copper; 3 per cent acetic acid, 9 degrees Tw.; 30 minutes at 200 degrees F. Rinse, and soap with a weak solution at boil.

A variety of shades are piece dyed on drills and used for various purposes, where a very strong cloth is required.

SLATE.

3 per cent thion black B; 3 per cent sulphide sodium; 3 per cent soda ash; 20 per cent common salt. Rinse well and soap.

BLACK.

15 per cent thion black G; 15 per cent sulphide sodium; 3 per cent soda ash; 30 per cent common salt. Rinse well and soap.

BUFF.

1 per cent thion brown G; ¼ per cent thion yellow R; 2 per cent sulphide sodium; 2 per cent soda ash; 30 per cent common salt. Rinse well and soap.

OLIVE.

4 per cent immedial olive B; ½ per cent immedial black N G; ½ per cent immedial yellow D; 5 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's salt. Rinse well and soap.

SKY BLUE.

3 per cent immedial sky blue powder; 3 per cent sodium sulphate; 3 per cent soda ash; 30 per cent Glauber's salt. Rinse well and soap.

GREEN.

10 per cent katigen green 2 B; 10 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's salt; rinse well and soap.

DARK BOTTLE GREEN.

10 per cent immedial dark green B; 2 per cent immedial yellow D; ½ per cent immedial black N G; 13 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's salt. Rinse well and soap.

RED.

5 per cent diamine fast red; 3 per cent sal soda; 30 per cent Glauber's salt. Rinse and aftertreat with 1 per cent fluoride chrome.

FLANNELETT E.

Flannelette is a narrow, light-weight fabric composed of all cotton yarns, from 1-30s to 1-14s in the warp and filling, the filling being soft spun to permit of the raising of a very slight nap on the back of the goods.

The cloth is woven with bleached yarn (warp and filling), the color effects being afterwards printed upon the face of the goods by the printing machine.

Flannelette is made with simple one or two colored stripe patterns, either black and white, or indigo blue and white, and in elaborate all-over floral designs in imitation of jacquard patterns, the ground colors being of a dark tone, and the figure of either harmonious or contrasting combinations of color. The finished fabric is sold by the retailer at 8 to 10 cents per yard, 27 inches wide, and is used very extensively in the manufacture

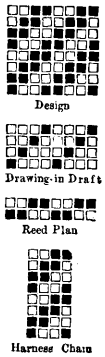
of ladies' wrappers, kimonos, etc., for house wear, and which, when soiled, can be thrown into the family wash and cleaned.

THE PRINTING OPERATION

is performed by an automatic machine, which consists of a series of rollers or drums, over which the cloth is passed to hold it taut, and smooth all wrinkles so that the goods present an even surface to the printing roll.

Upon this roller the design or pattern is engraved, and the liquid color being fed upon it as it revolves, the cloth passes over the surface, and retains an exact impression of the design (in colors) that has been engraved upon the roller.

Flannelette can be woven in any single box roller loom, such as Draper, Lowell, Lewiston, etc., and the finish means taking from the loom and



brushing off, to remove loose threads, then running through the napper to produce a nap on the back of the goods, after which the fabric is printed.

CONSTRUCTION.

27 inches finished.

4 square inches equals 4.85 grains. 27x36 equals 972x4.85 equals 5,714.20 divided by 4 equals 1,428.55 divided by 427.5 equals 3.034 ounces per yard, 27 inches wide.

20 pieces white warp x 2½ equals 50 inches equals .35 grains. 50x7,000 equals 350,000 divided by .35 equals 1,000,000 divide by 840 equals 1-30s cotton warp.

16 pieces white filling x 2 equals 32 inches equals .3 grains. 32x7,000 equals 224,000 divided by .3 equals 746,666 divided by 840 equals 1-24s cotton filling.

Reed 1,460 —29 1-3 inches—2 ends per dent; 16 ends selvedge, 10 per cent take-up; 2,376 ends, 1-30s white cotton warp (ex. of selvedge); 59 picks, 1-24s white cotton filling (soft spun); $\frac{2}{2}$ 45s twill weave (warp effect on face); finish equals very light nap on the back of the fabric or filling effect.

88 ends per inch finished and 64 picks per inch finished equals 81 ends in reed and 59 picks in loom.

88x27 equals 2,376 plus 16 equals 2,392 ends plus 10 per cent take-up equals 2,658 yards 1-30s warp yarn equals 1.687 ounces. 64 picks x 27 equals 1,728 yards 1-24s filling equals 1,371 ounces. Total 3,058 ounces.

Carding and Spinning Particulars.

The processes of machinery for making the required count of yarns for flannelette may be found in either the better class of the first division or in the second division of mills, as given in a previous lesson. A medium to low grade of cotton of from ¾ to 1⅛ inch staple may be used, according to the grade or mill in which the flannelette is made. Generally speaking, a cotton of ⅞-inch staple is used. In the first division of mills the mixing would be done by hand, but in the second division the equipment would probably include a bale breaker, and unless the mixing was pressed for the cotton would be run through this machine, and as this machine will take care of 80,000 pounds of cotton there is not much danger of it being overworked.

THE MIXING

should be as large as possible and in the lower grades of flannelette the mixing would include a small percentage of comber waste, as well as the good sliver waste from the cards, drawing frames and comber rooms (if equipment contains same). The better grades of flannelette would not use waste. Roving waste would be used in both mixings, but this stock would not be mixed until the finisher picker process, and here the waste should not be mixed in a greater proportion than 1 to 4. In the modern equipments of mills generally only two processes of picking, with an opener, are used; but as there are a great many mills, which use three processes of picking, the particulars will be given for

THREE PROCESSES OF PICKING.

For this class of goods the rigid type of beater is used on all picking machines. Keep the hopper of the opener more than half full to help obtain an even lap. The speed of the beater of

the opener should be about 1,000 revolutions per minute. This machine is generally used in connection with the breaker picker, and after the cotton has passed the beater, it is passed under a pair of wooden rollers onto an endless lattice which carries it to the feed rolls of the breaker picker. The speed of the beater of this machine should be about 1,500 revolutions per minute and the weight of the laps at the front about 40 pounds or about 16 ounces to the yard.

THE DOUBLINGS

of the intermediate picker should be four into one and the speed of this beater should be the same as the finisher picker, or 1,450 revolutions per minute. The speed of the fan at this machine should be about 1,050 revolutions per minute. The speed of the driving shafts on this and on the finisher picker should be about 375 revolutions per minute. The weight of the lap at the front should be a little less than at the breaker, or about 37 pounds or a 12-ounce lap. The same particulars may be used for the finisher picker with the following exceptions: Speed of fan, 1,100 revolutions per minute and the weight of the lap about 39 pounds or about a 14-ounce lap. These particulars will answer for both warp and filling. The lap is put up at the card which should have a draft of about 100. Set the doffer to a 5-gauge and use as large a doffer as possible, either a 26 or 27 inch. The

PRODUCTION OF A CARD

for this class of work should be about 800 pounds, with a 65-grain sliver, for a week of 60 hours. On this class of goods no combing is used, but a three-process drawing. See that the proper weights are attached to the top rolls. The doublings are generally six into one, although eight into one are used in some mills. Don't draw more than you double. The draft should be about 5 at each process; speed of front rolls 400 revolutions per minute. Watch your settings of the top rolls at these machines. The hank roving made at the slubber should be about .55. Only one process of fly frames is used for warp, the hank roving being made about 2. Use square root of hank x 1.1 for twist. For the filling, two-process of fly frame is used, the hank roving being 2 at the first intermediate and 3.75 to 4.00 hank at the 2d intermediate. Use square root of hank x 1.2 for twist. The roving is now carried to

THE SPINNING ROOM

where it is made into the required count of yarn. For 14s warp yarn use the following particulars for spinning frame: Size of spindle, any first class; gauge of spindle, 3 inches; diameter of ring, 2⅛ inches; length of traverse, 7 inches. For this class of goods a soft twist is used for the warp yarn, as little as possible being put in, but be sure and put in enough so that the yarn will not break back in the loom. For a filling frame for 30s yarn use as follows: Gauge of spindles, 2¾ inches; diameter of ring, 1½ inches, length of traverse, 6½ inches. The warp yarn is then spooled, warped and put through the slasher.

Dyeing Particulars.

SKY BLUE.

½ per cent eboli blue 6 B; 20 per cent Glauber's; 2 per cent sal soda.

PINK.

½ per cent dioxyrubine G; 20 per cent Glauber's; 2 per cent sal soda.

YELLOW.

½ per cent fast cotton yellow C, extra; 20 per cent Glauber's; 2 per cent sal soda.

SCARLET.

3 per cent diamine scarlet B; 30 per cent Glauber's; 3 per cent sal soda.

WINE.

4 per cent diamine Bordeaux B; 30 per cent Glauber's; 3 per cent sal soda.

RED.

4 per cent diamine fast red F; 30 per cent Glauber's; 3 per cent sal soda.

CINNAMON BROWN.

3 per cent diamine brown 3 G; 30 per cent Glauber's; 3 per cent sal soda.

BLACK.

15 per cent pyrogene black B; 20 per cent sodium sulphide; 3 per cent soda ash; 40 per cent Glauber's.

DARK BROWN.

4 per cent chrysophenine; 2 per cent benzo fast black; 2½ per cent benzo fast red L; 30 per cent Glauber's; 3 per cent sal soda.

MYRTLE GREEN.

3 per cent benzo green G G; ½ per cent chrysophenine; ½ per cent benzo fast black; 30 per cent Glauber's; 3 per cent sal soda.

SLATE.

1 per cent benzo fast black; ½ per

cent benzo fast blue B N; ⅛ per cent benzo fast red L; 30 per cent Glauber's; 3 per cent sal soda.

HELIOTROPE.

2 per cent tetrazo lilac B; 30 per cent Glauber's; 3 per cent sal soda.

NAVY BLUE.

5 per cent tetrazo indigo blue C; 30 per cent Glauber's; 3 per cent sal soda.

ORANGE.

3 per cent tetrazo chlorine orange R; 30 per cent Glauber's; 3 per cent sal soda.

LEMON YELLOW.

1½ per cent tetrazo lemon yellow; 30 per cent Glauber's; 3 per cent sal soda.

DENIM.

Denim is a strong, medium-weight, single-cloth fabric, weighing from 4½ to 5 ounces per yard and composed of single cotton yarn in warp and filling.

It is usually made with a small, uneven-sided twill weave, such as $\frac{2}{1}$ 45° twill, and in solid color warp effects, generally indigo blue or dark brown, and white filling. White selvedge is used in all grades.

A grade known as covert cloth is made of twist yarn in the warp, and dark colored, single filling. The twist yarns are usuallly blue and white and the cloth of a similar texture to that of the regular denim.

In effect denim is a stout, twilled fabric, having excellent wearing qualities, and is made to sell at 10c. to 15c. per yard, retail. It is used principally in the manufacture of overalls, to be worn by workmen who operate machinery, or by those who perform hard, rough labor of any description.

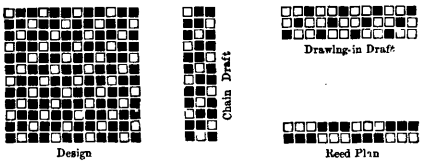
Denim can be woven in any single box roller loom, such as Mason, Lowell, Lewiston, Colvin, etc., the warp being prepared on the slasher, in the same manner as a sheeting warp. It is then drawn in on the harness or heddles, in accordance with weave desired.

The finish of this fabric is a rather heavy sizing, after which the goods are dried and pressed.

Denim is sometimes dyed in the piece, in light shades of tan, blue, etc., and the goods made up into summer outing skirts for ladies' wear.

1 square in. equals 2.6 grains. 27 x 36 equals 972 x 2.6 equals 2,527.2 divided by 1 equals 2,527.2 divided by 437.5 equals 5.77 ounces per yard, 27 inches wide finished.

20 pieces blue warp x 1 inch equals 20 inches equals .5 grains. 20 x 7,000 equals 140,000 divided by .5 equals 2,800,000 divided by 36 equals 7,777.77 divided by 840 equals 1-9s warp.



15 pieces white filling x 3 inches equals 45 inches equals .65 grains. 45 x 7,000 equals 315,000 divided by .65 equals 484,615 divided by 36 equals 13,461.43 divided by 840 equals 1-16s filling.

CONSTRUCTION.

$\frac{2}{1}$ twill 45°

68 ends per inch finished and 42 picks per inch finished equals 63 ends in reed and 40 picks in loom.

Reed 750—29 inches—3 ends per dent. 10 per cent take-up—32 ends selvedge. 40 picks, 1-16s white cotton filling.

1,836 ends blue yarn and 32 ends white yarn selvedge equals 1-9s cotton warp.

1,836 + 32 equals 1,868 + 10 per cent take = 2,076 yards 1-9 warp =.....4.39 ozs.
42 picks x 27 inches = 1,134 yards 1-16 filling =.....1.35 ozs.

5.74 ozs.

Carding and Spinning Particulars.

Denim is constructed of yarns that are made in either the first or second divisions of mills as given in a previous lesson. In the second divison of mills the raw stock would be run through a bale breaker, as this class of mills would undoubtedly contain this machine in their equipment. In the first division of mills the mixing would be done by hand. When bale breakers are used, it is of great advantage to have a blower in connection with them. This blower is generally placed at the delivery end of the machine and blows the cotton, after it has passed through the bale breaker, through trunking onto an endless lattice which deposits it in the mixing bins. A blower is of advantage because it opens the cotton and the current of air helps to dry it and the cotton does not have to dry out in the

mixing bins as is the case when a blower is not used. Mixing is

A VERY IMPORTANT PART

of the card room and too little attention is generally given to it. It will be understood that if the cotton is not properly mixed, this defect cannot be remedied at any subsequent machine. Cotton of the same length of staple should always be used, cotton of the same nature, and where waste is used the percentage should be as small as it is possible to make it. The same mixing may be used for making of both the warp and filling yarns, a medium to low grade being used of a staple length of about one inch (ranging from ⅞ to 1⅛ inches, according to the quality of denim being made). A small percentage of comber waste may be used, but is not advisable. The good sliver waste from the cards and drawing frames is mixed with the raw stock and the roving waste is mixed in the manner described in a previous article. The cotton would be put through two processes of picking and an opener. Keep the hopper of the opener well filled with cotton so that the lifting apron will always be carrying up a full load of cotton to the pin roller. The

SPEED OF THE BEATER

of the opener should be about 1,050 revolutions per minute, the speed of the fan being about 350 revolutions per minute. If porcupine beater is used, the speed should be about 1,150 revolutions per minute. The speed of a two-bladed beater of a rigid type of the breaker picker should be about 1,500 revolutions per minute, the speed of the fan being about 100 revolutions less. The total weight of the lap at the head end should be about 40 pounds, or 20 ounces to the yard. The doublings at the finisher picker are 4 into 1 and the speed of the beater (2 bladed rigid type), 1,450 revolutions per minute, which will beat the cotton sheet presented to it about 42 times per inch in length. The weight of the lap in the front should be as heavy as possible and at the same time not overwork the card. A good weight would be 39 pounds or a 14-ounce lap (for a 38 inch lap). The

DRAFT OF THE CARD

should not exceed 100 and should be not less than 90. The sliver should weigh 65 grains per yard and the production about 850 pounds for a week of 60 hours. Keep your card wire sharp and be sure that your top flats are ground even, because close and accurate settings cannot be obtained when the wire on the flats is not of a uniform length. Large doffers should also be used. The sliver would then be put through two processes of drawing frames, the speed of the front roll (1½ inches diameter) being 400 revolutions per minute on each set. The draft should not be more than the doublings and the sliver should weigh about 70 grains per yard.

THE PRODUCTION

being about 260 pounds per delivery per day of 10 hours. When metallic rolls are used, the production would be considerably greater or about 350 under the conditions noted above. Metallic rolls are coming more and more into use, especially on the lower counts of yarns, and also on a heavy sliver; although they can be used on all grades and lengths of staple, they are not generally used, but not through any fault of the rolls, as they are suitable for producing fine work. The slubber draws the sliver into .55 hank and the one-process fly frames used makes the roving into a 1.75 hank roving. Sometimes two different hanks are made at the fly frame, one for the warp and one for the filling yarns; where this is the case, the warp yarn is made from one hank roving and the filling from 2.00 hank. The particulars for the warp spinning frame for No. 9s are as follows: Front roll, one in. diameter; gauge of frame, 3 in.; diameter of ring, 2¼ in.; length of traverse, 7 in.; for a filling frame making 16s use gauge of frame, 2⅜ in.; diameter of ring, 1⅝ in.; length of traverse, 6½ in. The warp yarn is then spooled, warped and put through the slasher.

Dyeing Particulars.

BLUE.

6 per cent katigen indigo B; 6 per cent katigen indigo 5 G; 12 per cent sulphide sodium; 4 per cent soda ash; 30 per cent salt; after treat with 1½ per cent bichrome, 2 per cent copper sulphate and 4 per cent acetic acid. Rinse well and soap.

BLACK.

15 per cent immedial black N N; 15 per cent sodium sulphide; 30 per cent Glauber's salt; 4 per cent soda ash. Rinse well and soap.

BROWN.

6 per cent thion brown G; 6 per cent thion brown B; 2 per cent thion yellow R; 14 per cent sulphide sodium; 4

per cent soda ash; 30 per cent salt; after treat 3 per cent bichrome, 3 per cent sulphate copper; 5 per cent acetic acid. Rinse well and soap.

SLATE.

5 per cent pyrogene black B; 5 per cent sodium sulphide; 2 per cent soda ash; 20 per cent salt. Rinse well and soap.

DARK GREEN.

10 per cent immedial green G; ½ per cent immedial black N B; 10 per cent sulphide sodium; 4 per cent soda ash; 30 per cent Glauber's salt. Rinse well and soap.

RED.

8 per cent diamine fast red F; 30 per cent Glauber's salt; 3 per cent soda crystals. Rinse and after treat 2 per cent fluoride chrome at 160 degrees F.

BOURRETTE.

Bourrette is a light weight, single cloth fabric, weighing from 4½ to 6 ounces, composed of two-ply cotton warp, and either wool. merino or a combination of cotton and wool shoddy filling. Both the warp and the filling have an occasional end or pick of fancy bourrette or nub yarn added for effect; hence the name.

In appearance bourrette cloth is a semi-rough-faced woolen fabric, having small fancy colored lumps on the yarn, scattered throughout the goods in accordance with the effect desired. The cloth when finished is used principally in the manufacture of ladies' fall suitings.

THE WEAVE

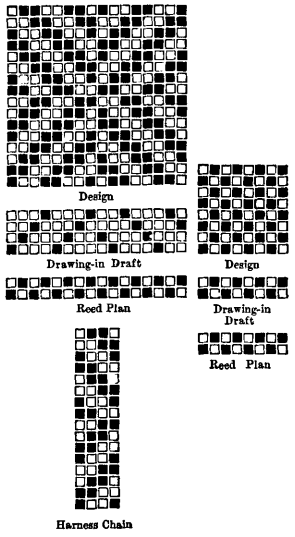
is usually a $\frac{1}{1}$ plain weave, or a mixed twill effect, such as can be produced from the regular $\frac{2}{2}$ 45 degrees twill, viz.: diamond or entwining twill weaves. These weaves, in connection with certain warp and filling patterns, such as 1 black, 1 fancy twist or 2 black, 2 fancy twist, create very elaborate styles, as this color arrangement serves to hide the rigid outline of the design, and thus has a tendency to complicate the general appearance of the weave used in the fabric.

The fancy effects in twist that can be adapted to this line are made by twisting the following colors together, viz.:

Black and white.
Black and light blue.
Black and light green.
Black and old gold.
Black and red.
Black and light brown.

These twist yarns serve the purpose of brightening up the general appearance of the goods.

Bourrette cloth can be woven in any power loom, excepting those styles



wherein a single pick of the fancy yarn is introduced in the filling, in which case the Knowles 4x4 pick and pick dobby loom is very serviceable.

TO FINISH THIS FABRIC,

the goods are taken from the loom and measured, after which they are brushed then scoured in a solution of soap and cold water, then tentered and dried and pressed.

The bourrette yarn is made by twisting two cotton threads and a worsted thread together, the worsted being allowed to deliver more quickly than the cotton threads, at regular intervals.

The excess which is delivered is twisted around the cotton threads in the one place, thereby forming a lump on the twisted yarn, as the worsted yarn is run at a varied speed, and is not regularly distributed around the cotton threads.

CONSTRUCTION.

4 square inches equals 7.61 grains.
33x36 equals 1,188 times 7.61 equals

904,068 divided by 4 equals 2,260.17 divided by 437.5 equals 5.11 ounces, 33 inches wide from loom.

23 pieces black warp times 2 equals 46 inches equals 1.41 grains.

46x7,000 equals 322,000 divided by 1.41 equals 228,368 divided by 36 equals 6,343.5 divided by 840 equals 2-14s.

22 pieces twist warp times 2½ equals 55 inches equals 2 grains.

55x7,000 equals 385,000 divided by 2 equals 178,804 divided by 36 equals 5,216.8 divided by 840 equals 2-12s.

30 pieces black merino filling times 2 equals 60 inches equals 3 grains.

60x7.000 equals 420,000 divided by 3 equals 140,000 divided by 36 equals 3,888 divided by 300 equals 1-12s cut.

10 per cent up.

Reed,400 minus 1 end per dent minus 36 inches wide, including selvedge of 16 ends 2-14s black, 24 picks, 1-12 cut merino equals 75 per cent wool and 25 per cent cotton.

Warp pattern: 1 black equals 2-14s cotton; 1 twist equals 2-12s cotton.

24 picks times 36 equals 864 yards 1-12 merino equals 3.84 ounces.

192 ends black plus 16 equals 208 plus 10 per cent take-up equals 231 yards 2-14s equals 6.28 ounces; 192 ends twist plus 10 per cent take-up equals 213 yards 2-12s equal .676 ounces, total, 5.144 ounces per yard loom.

Finish—Scour, tenter and steam press, to loom width.

Carding and Spinning Particulars.

In the class of goods under description it will be noticed that there is a very small percentage of cotton contained in its make up. If the cotton yarn that this class of goods contains was made in a cotton mill, the following particulars would be a good foundation on which to base the speeds, weight and processes through which the raw stock would have to pass before being turned out into 2-ply 12s or 2-14s yarn, as the case may be. This class of yarn may be made in the first division of mills, and the cotton would be hand mixed and put in the bins. The mixing should be allowed to dry out as much as possible before using, and a better plan would be to have two large mixing bins so that when one was in use the other one might be filled and the cotton dried. This is not always done, because most picker rooms are pressed for floor space.

THE RAW STOCK

should be put through two processes of picking and an opener. The good waste from pickers, cards and drawing frames should be put into the mixing bin before running it through the opener. Always keep the hopper of the opener more than half full and gauge your stripping roller so that quite a heavy weight of cotton is passed to the action of the beater. The speed of the beater for the opener should be about 1,000 revolutions per minute, the speed of the fan about 350 revolutions per minute. This machine is used in connection with the breaker picker and the speed of the beater (2 bladed rigid type) should be about 1,500 revolutions per minute. The weight of the lap at the front should be about 40 pounds or a 20 ounce lap to the yard. The laps from the breaker picker are put up at the finisher picker and doubled 4 into 1. The speed of the beater at this machine should be about 1,450 revolutions per minute, which gives about 42 blows per inch of cotton fed. The

WEIGHT OF THE LAP

should be about 40 pounds or a 14½ ounce lap. Care should be taken to see that the variation in the total weight of the laps delivered at the front of the finisher picker is not more than three-quarters of a pound from standard weight for raw stock to make goods under description,and the amount of variation for the finer classes of goods should not exceed one-half a pound from standard. When laps are found to vary more than above noted, they should be placed at the back of the finisher picker and run over. If a great degree of variation is found, i. e., if the standard is 40 lbs., and laps are delivered which weigh 39¼, 41, 39, 40¾, and so on, it shows that the picker needs adjustment, and on all makes of machines there are devices to regulate these small variations. The laps are put up at the card and the draft of this machine should not exceed 100.

THE WIRE FILLET

should be coarser, so as to stand the pressure of the weight and amount of cotton to be passed through. This wire should be kept sharp by frequent grindings with the grinding rollers. The weight of the sliver should be about 65 grains to the yard and the production of a card for 60 hours on this class of goods should be not less than 850 pounds. The cotton is put through two processes of drawing. The speed of the front roller in each case should be 400 revolutions per minute. On this grade of cotton it would be of

great advantage if metallic rolls were used. The weight of the sliver at the front of the finisher drawing frame should be about 70 grains to the yard. The sliver at the drawing frames should be weighed about three times a day to see that it is the proper weight. The slubber roving should weigh about .50 hank. Only one process of fly frames is used and the hank at this should be about 1.50. The roving is then carried to

THE SPINNING ROOM,

when it is spun to the required count yarn. The particulars to spin 12s on a warp frame are as follows: gauge of frame three inches; diameter of ring, 2⅛ inches; length of traverse, 7 inches; twist per inch, 16.45; speed of spindle, 9,000 revolutions per minute. The same particulars may be used for making 14s yarn with the following exceptions, that somewhat different particulars are required for the spinning frame. The warp yarn is then spooled and taken to the twister when it is made into 2-ply or 2-14s as the case may be, after which it is sized at the slasher.

Dyeing Particulars.

BLACK.

10 per cent immedial brilliant black B, 10 per cent sulphide sodium, 3 per cent soda ash, 30 per cent Glauber's.

For the threads of colored yarn which are mixed with the black and white, fast sulphur colors are dyed.

For union yarn a one-dip aniline union black is generally dyed.

LIGHT BLUE.

10 per cent pyrogene indigo, 20 per cent sulphide sodium, 10 per cent soda ash, 35 per cent salt, 3 pints mineral oil.

LIGHT GREEN.

8 per cent pyrogene green G, 16 per cent sulphide sodium, 6 per cent soda ash, 30 per cent salt.

OLD GOLD.

4 per cent pyrol bronze, 2 per cent pyrol yellow, 6 per cent sulphide sodium, 3 per cent soda ash, 30 per cent Glauber's.

RED.

5 per cent benzo fast red, 3 per cent sal soda, 30 per cent Glauber's.

LIGHT BROWN.

10 per cent thion brown G, 10 per cent sulphide sodium, 3 per cent soda ash, 30 per cent Glauber's.

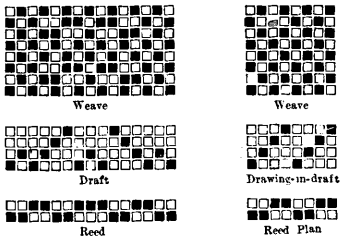
OLIVE.

4 per cent immedial olive 3G, 1 per cent immedial cutch O, 3 per cent soda ash, 30 per cent Glauber's, 5 per cent sulphide sodium.

FANCY SHIRTING.

Fancy shirting is a light-weight, single cloth wash fabric, weighing from two to three ounces per yard, and composed of regular, single, cotton yarns, 1-26s to 1-40s in warp and filling.

It is made in simple stripe patterns either printed on the woven, bleached



Idea for fancy weave

fabric, or of fast colors, dyed upon the warp. Combinations of each are sometimes formed to create attractive styles.

THE WEAVE

used is either the plain $\frac{1}{1}$ or this combined with a fancy rib or basket weave.

Fancy shirting is made to retail at 8 to 12½ cents per yard, and is used in men's outing and working shirts, ladies' and children's waists, blouses and summer suits. It is from the consumer's standpoint a practically inexpensive material, which, when the garment becomes soiled, can become a part of the family wash and be readily renovated.

Those grades in which the plain weave alone is used are best adapted to the plain single box roller room. The fancy styles,in which a more elaborate weave effect is desired, require a loom having a dobby or witch top attached. The Knowles 1x1 loom, hav-

ing a Stafford dobby top, is very popular for this style of cloth.

THE FAST WARP COLORS,

generally used in connection with the bleached or white yarns to create a range of patterns for this fabric, are: Dark blue, dark green, black, red, lavender, pink, ecru, tan, light green, light blue and violet.

FINISHING.

To finish this fabric the goods are taken from the loom and run through the washer, after which they are very lightly sized, then dried by the process of tentering (this also prevents undue shrinkage in width). After drying run through the calender to press out wrinkles,also to bring up a clear, even face. Then the goods are ready to lap and fold in readiness for the shipper.

CONSTRUCTION.

4 square inches equals 4.18 grains.

27x36 equals 972x4.18 equals 4,062.96 divided by 4 equals 1,015.74 divided by 437.5 equals 2.319 ounces per yard, 27 inches wide.

12 pieces blue warp times 1½ equals 18 inches equals .16 grains.

18x7,000 equals 126,000 divided by .16 equals 787,500 divided by 36 equals 21,878 divided by 840 equals 1-26s blue warp yarn (cotton).

12 pieces white warp times 1½ equals 18 inches equals .16 grains.

18x7,000 equals 126,000 divided by .16 equals 787,500 divided by 36 equals 27,878 divided by 840 equals 1-26s white warp yarn (cotton).

19 pieces white filling times 2 equals 38 inches equals .25 grains.

19x7,000 equals 266,000 divided by .25 equals 1,064,000 divided by 36 equals 29,833 divided by 804 equals 1-36s white filling yarn (cotton).

27 inches finished.

Reed, 1,150 minus 29 inches minus 2 ends per dent; 54 picks minus 1-36s white cotton filling; 1-26s cotton warp; 10 per cent take-up; 1,858 ends in warp plus 32 white selvedge.

WARP PATTERN.

3 white.
*1 light blue } 7 times.
3 white. }
1 light blue.
3 white.
2 white in 1 heddle.
8 light blue.
2 white in 1 heddle.

47 ends per pattern, 39 repeats of pattern plus 25 ends. Start at *.

16 blue ends per pattern times 39 repeats equals 624 plus 7 equals 631 blue ends.

31 white ends per pattern times 39 repeats equals 1,209 plus 18 plus 32 ends selvedge equals 1,250 white ends.

631 blue ends 1-26s plus 10 per cent equals 701 yards equals .513 ounces; 1,250 white ends 1-26s plus 10 per cent equals 1,388 yards equals 1.001 ounces; 54 picks times 29 1-36s filling equals 1,566 yards equals .828 ounces; total, 2.342 ounces.

Finish, wash, size, calender.

Carding and Spinning Particulars.

The fabric known as fancy shirting is made up of yarns, the counts of which vary from 20s to 60s, according to the mills making them, and also according to the grade being made. For the particulars that will be described below we will consider that the shirtings are made up of 1-26s warp and 1-40s filling. It is not customary for both yarns to be made out of the same length of staple or grade of cotton, although in some instances this may be done. For the 40s yarn a good grade of raw stock of about 1¼ to 1⅜ inches stock should be used and for the 20s yarn a cotton of about 1 1-16 to 1 3-16 inch staple may be used with advantage. The raw stock in both cases should be put through the bale breaker and deposited in their different bins, being allowed to stand as long as possible before using. This is for the purpose of drying out the cotton as it is easier to work when in this condition. An opener and two processes of picking are generally used, although it is the custom in many mills to use three processes. When the latter is the case,the particulars given for the finisher picker may be used,except that the speed of the fan is not so great, also that the laps are of a little lighter weight. The hopper of the opener should be kept well filled so that an even amount of cotton will be always fed to the feed roll of the breaker picker. The speed of the beater (2 bladed rigid type) should be about 1,000 revolutions per minute; the fan, about 350 revolutions per minute. The speed of the beater of the breaker should be about 1,500 revolutions per minute and for the finisher picker 1,450 revolutions per minute. This gives the cotton passing through about 42 beats per inch. The weight of lap at the breaker picker is 40 pounds, or 16 ounces to the yard. At the finisher (and intermediate picker if used) the doublings are four into one. The roving cut waste is mixed at the back of

the finisher picker in the usual manner. The weight of the laps at the delivery end of the finisher picker is 35 pounds for the longer stapled cotton and 39 pounds for the shorter, or a 12½ ounce lap for the filling yarn and a 14½ ounce lap for the warp yarn. The cards are set about the same in both cases, except where they are required to be set according to the length of staple.

The draft of the card should not exceed 100 for the warp yarn and should not be less than 100 for the filling yarn. As large a doffer as possible should be used with both stocks, and the weight of the sliver should be about 65 grains. The production would be 750 pounds per week of 60 hours for the filling cotton and 850 pounds for the warp yarn. Always keep the wire sharp and never under any circumstances allow it to become dull. Grind cylinder and doffer wire at least once a month for half a day and grind top flats twice a month with "dead roller." Strip cards three times a day, both cylinder and doffer. Some overseers strip cylinders twice and doffers three or four times. This, they claim, saves time as the doffer may be stripped while running and the sliver is not as uneven as when both doffer and cylinder are stripped at the same time. In the mills making fine yarns it is the general custom to strip three times a day. Three processes of drawing are used for both warp and filling. The only difference made in these machines is that the rolls are spread differently for the different lengths of staple. The weight of the sliver should be about 70 grains in both cases.

The slubber makes this sliver into 50 hank roving, the standard twist being obtained by multiplying the square of the hank roving by the constant 1. On the finer classes and long stapled cotton the front top rolls of the slubber are varnished, but this class of goods does not require this to be done. The roving for the warp yarns is put through two processes of fly frames, the hank at the first intermediate being 1.50 and at the second intermediate 3. The filling roving is put through two processes of fly frames, the hank roving at the first intermediate being 2, and at the second intermediate 5. The twist standard is obtained by multiplying the square root of the hank by 1.1 for both cottons. Take special care of your top rolls to see that they are in perfect condition and not channeled, cut, uneven, oil soaked, dry at the bearings, loose or unevenly weighted. Look out for the settings of all fly frame rolls. The roving is carried to the spinning room, where it is drawn into the required count. For 26s count warp yarn a frame with the following particulars may be used: Gauge of frame 2¾ inches, diameter of ring 1¾ inches, length of traverse 6½ inches, twist per inch 24 plus, speed of spindle 9,700 revolutions per minute. For a filling making 40s, the particulars have been given in a previous lesson. The warp yarn is then spooled, warped and run through a slasher.

Dyeing Particulars.

DARK BLUE.

5 per cent immedial blue C, 5 per cent immedial blue C R, 1 per cent immedial black N N, 10 per cent sodium sulphide, 30 per cent Glauber's, 3 per cent soda ash.

DARK GREEN.

15 per cent thiogene green B, 15 per cent sodium sulphide, 3 per cent soda ash, 30 per cent Glauber's.

BLACK.

15 per cent melanogen black G, 15 per cent sodium sulphide, 3 per cent soda ash, 30 per cent Glauber's.

RED.

6 per cent primuline, diazotized and developed with Beta naphthol.

LAVENDER.

¼ per cent diamine blue, 3 R pat., after treated with ½ per cent sulphate of copper at 160 degrees F.

PINK.

½ per cent diamine rose B D, 30 per cent Glauber's, 3 per cent sal soda.

ECRU.

2 per cent katigen yellow brown G G, 2 per cent sodium sulphide, 20 per cent Glauber's, 2 per cent soda ash.

TAN.

5 per cent thion brown G, 5 per cent sodium sulphide, 2 per cent soda ash, 20 per cent Glauber's.

LIGHT GREEN

on a tannin and tartar emetic mordant. Dye ½ per cent thioflavine T, ½ per cent new methylene blue G G.

LIGHT BLUE.

2 per cent immedial sky blue, 2 per cent sodium sulphide, 2 per cent soda ash, 20 per cent Glauber's.

VIOLET.

1 per cent diamine blue 3 R pat., after treated with ¾ per cent sulphate of copper at 160 degrees F.

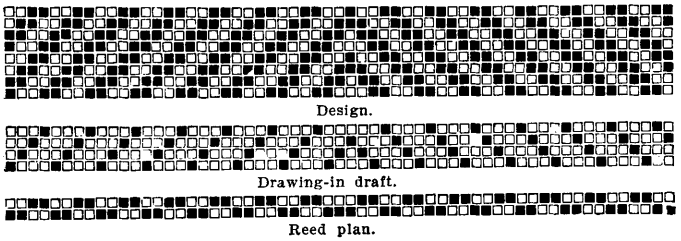
TAPE.

Tape is a very narrow fabric, composed of either cotton or linen yarns in warp and filling, and usually made with a point or broken twill weave, the break in the weave occurring in the centre of the tape, and the twill lines running in a right and left hand direction.

It is made of all bleached yarns. It is made of regular yarns about 1-26s to 1-30s and 1-40s cotton and is used as a trimming, in the manufacture of clothing, also used as a binding in innumerable cases, such as paper boxes, etc., and is sold by the roll, each roll containing a certain number of yards.

A fair grade of tape weighs about 20 yards per pound.

This fabric is woven in a broad loom having a light dobby head motion attached, similar to that which is used on a hair cloth loom.



Design.

Weave

Drawing-in draft.

Reed plan.

In weaving this fabric, the loom is arranged to produce several rolls at the same operation, it being very narrow. There are perhaps 20 rolls all weaving at once, as the warp yarn for each roll is beamed upon a small spool, thereby acting independently of every other roll on the same loom. The warps are all drawn through the same harness or heddles, which are worked from the dobby motion.

The peculiar and important part of a tape loom is the filling arrangement or shuttle motion.

Being a one shuttle fabric, each warp has its separate shuttle, all the shuttles being operated at the same time, and by one motion. The shuttle, in traveling from one box to its mate, describes a half moon movement, and this is accomplished by a sliding rod beneath the race board, and so set that at each pick of the loom the rod moves from left to right and on the next pick right to left, and for each piece of tape being woven there must necessarily be a shuttle, and for each shuttle there is an attachment placed on the aforesaid rod in such a position that the rod in moving causes the said attachment to move the shuttle from one box to the other in the same direction as the rod is taking.

Tape requires as a finish, washing and drying on the cylinder, after which it is wound into rolls and is ready to pack and ship.

CONSTRUCTION.

Reed, 1,650 minus 5/8 inches width in reed, 59 ends, 46 picks, $\frac{2}{2}$ point twill, 30 ends minus 29 ends left.

Carding and Spinning Particulars.

The counts of yarn used to make tape vary from 20s to 40s, according to the grade of tape required. In this article we will consider the warp yarn to be 1-36s and the filling 1-40s. These counts of yarn would be made in the second division of mills as given in a previous lesson. For this fabric the yarn would be made out of a medium grade cotton of from 1 to 1¼ inches in length. The bales of raw stock would be brought to the mixing room and stapled and those bales of the same length of staple would be opened and run through a bale breaker (if the mill contained one, or through a willow, or it may be mixed by hand) and passed by suitable means to

THE MIXING BIN.

It should be allowed to stand here as long as possible, so that the cotton may be opened up to the air, which dries it, and makes it easier to work than when it is not allowed to stand in the bins. At this point the good waste from the pickers, cards and drawing frames should also be mixed in with the raw stock. The cotton is then put through an opener and either two or three processes of picking, generally two. If three processes of picking are used, the intermediate process presents almost the same particulars as the finisher picker. In this instance, we will consider that only

TWO PROCESSES OF PICKING

are used. The hopper should be kept as nearly full as possible, so that an even lap may be made. The cotton is fed to the feed rolls of the breaker picker and after passing comes under the action of the beater which, if it is a rigid two-bladed type, should make about 1,450 revolutions per minute, the speed of the fan being about 1,050 revolutions per minute. The weight of the lap at the front should be about 40 pounds or a 12-ounce lap. The doublings at the finisher picker are 4 into 1. The speed of the fan should be about 1,450 revolutions per minute, and the fan 1,100 revolutions per minute. This gives the cotton sheet about 42 beats per inch fed. Watch your drafts. The weight of the lap at the front should be about 39 pounds or a 14½ ounce lap. When roving waste is mixed with the raw stock, it should first be put through

A SPECIAL PROCESS

to take out the twist, and through a breaker picker to make laps, and these laps are put up behind the finisher picker. These laps are mixed with the raw stock in a proportion of one lap roving waste to three laps of raw stock. The laps are put up at the card, the draft of which should not be less than 100. In speaking of cards we refer to the so-called English card and not the American card. The wire fillet of this card should be about No. 34 wire on cylinder and No. 35 wire on doffer and flats. This is equivalent to 110s and 120s, English count, and gives 79,200 points per square inch for cylinder and 86,400 points per square inch for doffer and top flats. Grind the wire so as to keep it sharp and strip three times a day.

THE SLIVER

at the front of the card should weigh about 65 grains per yard and a production of 800 pounds should be turned off for a week of 60 hours.

Use as large a doffer as possible, either a 26 or 27 inch one. The sliver is put through three processes of drawing frames, doubling six into one, the speed of the front roll being 400 revolutions per minute, and the weight of sliver at the finisher drawing 70 grains to the yard. Always keep a stock of freshly varnished rolls on hand, so that if those in the frames become worn or damaged in any way they may be replaced at once. All the rolls should be varnished and changed at least once every two weeks. Drawing frames should be cleaned at least once a month. The

SETTINGS OF THE DRAWING FRAME ROLLS

should be looked after frequently to see that they have not slipped. The sliver is then passed to the slubber which draws and twists it into .50 hank roving. Watch your leather covered rolls to see that they are perfect. The roving is then put through three processes of fly frames, the hank roving at the first intermediate being 1.50 and at the second 3.50 hank and at the jack, 9. to 9.50 for both counts of yarn, the doublings being two into one in every case. Use the standard multiplier for twist previously given. The roving is then taken to the spinning room and made into the required count. The particulars for a warp yarn of 36s count are as follows: Gauge of frame, 2¾ inches; diameter of ring, 1⅝ inches; length of traverse, 6½ inches; speed of spindle, 10,200 revolutions per minute.

MERCERIZED VESTING.

Mercerized vesting is either a light or heavy weight cotton wash fabric weighing from 5 to 8 ounces per yard, finished, and is made of one, two or three warps and one or two fillings. When made of one warp and filling, a light weight can be produced in case the warp and filling are both mercerized yarns.

The warp for the face of the cloth ranges from 2-20s to 2-60s mercerized cotton, and the filling from 1-10s to 1-16s cotton.

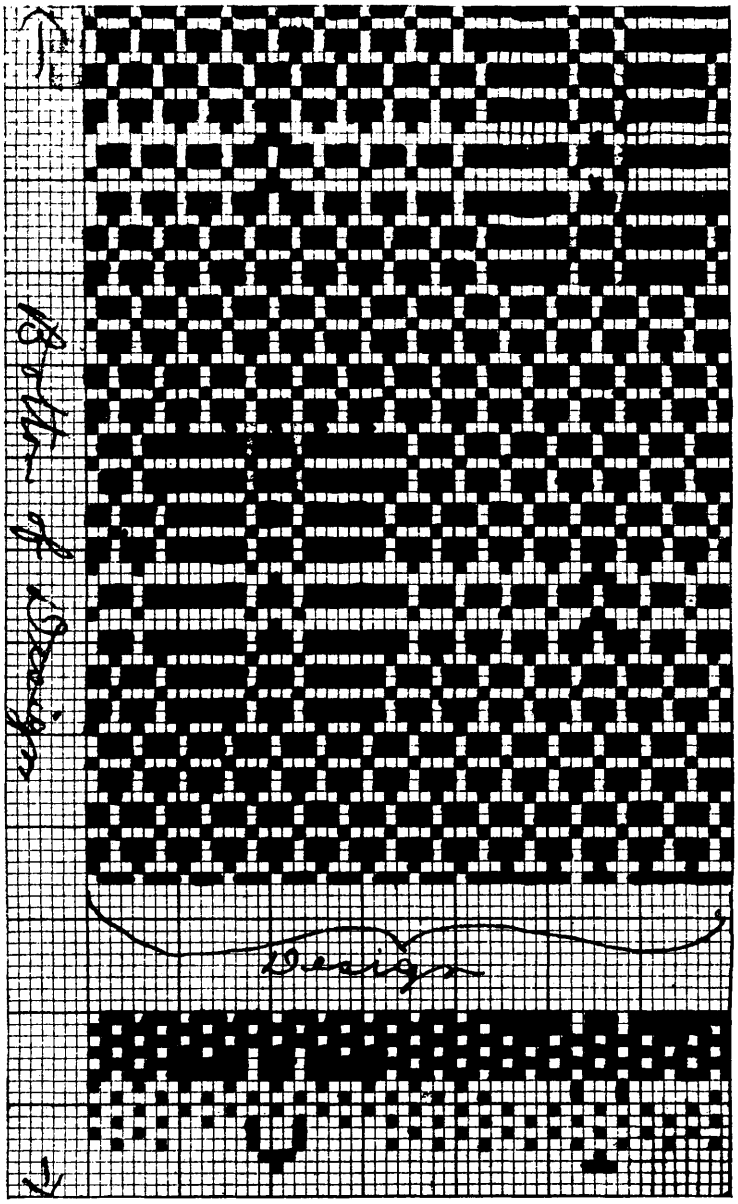
The styles range from granite and basket weave effects in solid white, to the more elaborate figured patterns, such as are created by forming spots on the face of the cloth, from warp effect diamond, cross and curved twill weaves, so arranged as to scatter the design in regular formation, in imitation of jacquard designs.

ADDING WEIGHT.

The extra back warp is for the purpose of adding weight to the fabric, also permitting greater scope in face weave effects, the idea being to so arrange the face weave as to thoroughly cover the coarse filling, the back warp binding the filling into the cloth, under the figure floats of the face weave.

In making a vesting having a back warp, always use a two-ply yarn for this warp, as a single yarn will bead

in the weaving, which means a loss of time every few hours in removing same, and the warp will not shed properly when the yarn is beaded, which causes the reed to cut the yarn. The quickest way to remove the beads from the yarn in the shed is to loosen the top of the reed cap, and lay the reed up-on the cloth. The beads may then be either cut off, or drawn through the reed. If the latter method is used, the beads form a line of small lumps upon the face of the cloth, from one selvedge to the other. While this in itself is not a serious imperfection, it means that the cloth must be cut at this point



Harness Chain.

to remove the lumps, which to a certain extent destroys the utility of the piece in manufacturing the garments.

EITHER A DOBBY OR JACQUARD.

This fabric can be woven on either the dobby or jacquard loom. Most of the popular imported jacquard effects can be imitated successfully on the dobby loom, having either single or double box filling motion. It is best adapted to the Knowles Gem Harness loom, or the Fairmount, 4x1, box loom, having the Ingraham head motion attached.

To finish this fabric, the cloth goes from the loom to the measuring machine, after which it is scoured, during which operation the goods are run through a solution of soap and cold water to remove all stains such as mill dirt and grease spots. After washing it is calendered or pressed, and each piece is folded and doubled up in heavy paper and tied with a cheap tape. It is then ready to pack and ship.

A style having great vogue in the spring of 1904 was a mixed effect, produced by using an all white mercerized warp, and black mercerized filling, the ground weave being 1 up, 1 down and the figure, small, double-headed triangles.

Reed, 700 minus 30 inches in reed 4 ends per dent in reed; 2-20s white mercerized warp, 2-20s black mercerized filling; 48 picks. Weight about 7½ ounces.

CONSTRUCTION.

62 ends face finished, 31 ends back finished, equals 93.

1 square inch equals 3 grains; 60 picks finished; 29x36 equals 1,044x3 equals 3,132 divided by 1 equals 3,132 divided by 437.5 equals 7.16 ounces per yard.

$\frac{2}{1}$ face ends, back ends.

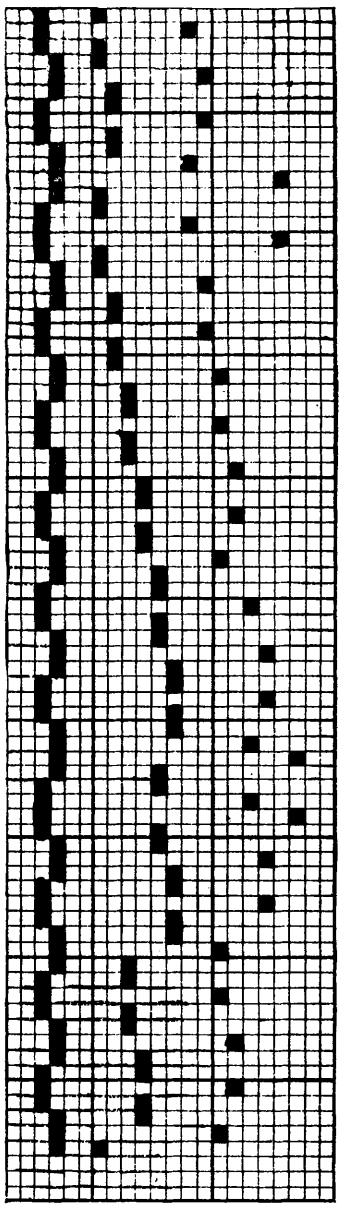
30 inches in reed including selvedge; 29 inches finished. Scour and calender.

16 pieces mercerized face yarn times 3 inches equals 48x7,000 equals 336,000 divided by .95 grains equals 353,684 divided by 36 equals 9,824.5 divided by 840 equals 11.69 or 2-20s mercerized yarn.

8 pieces back yarn times 2 equals 16 x7,000 equals 112,000 divided by .18 equals 62,444 divided by 36 equals 17,345.5 divided by 840 equals 20.64 or 2-40s back warp yarn.

17 pieces filling yarn times 2 equals 34x7,000 equals 238,000 divided by .7 equals 340,000 divided by 36 equals 9,444 divided by 840 equals 11.24 or 1-12s filling yarn.

3 pieces fancy color (spot) yarn times 3 equals 9x7,000 equals 63,000 divided by .1 equals 630,000 divided by 36 equals 17,500 divided by 840 equals



Reed Plan. Drawing-in Draft.

20.8 or 2-40s extra warp (for figuring) yarn.

30 inches in reed, 30 dents per inch in reed, 900 minus 10 splits equals 890

splits, 40 ends 2-40s cotton selvedge, 76 ends in repeat of pattern equals 23 repeats plus 32 ends.

1,780 ends 2-20s mercerized face ends, 890 ends 2-40s cotton back ends, 40 ends 2-40s cotton selvedge ends, 94 ends 2-40s cotton colored ends, equals 900 splits or 30 inches in reed.

3 1-3 per cent contraction in width in weaving, 5 per cent take-up, 6 2-3 per cent shrinkage in length in finishing.

1,780 ends plus 5 per cent take-up equals 1,873.7 yards, 2.20s mercerized equals 3.568 ounces, 890 ends plus 5 per cent take-up equals 936.8 yards 2-40s cotton equals .892 ounces, 94 ends equals 94 yards 2-40s cotton equals .009 ounces, 40 ends plus 5 per cent take-up equals 421 yards 2-40s cotton equals .04 ounces, 56 ends 1-12s filling times 30 inches equals 1,680 yards 1-12s cotton equals 2.666 ounces; total, 7.175 ounces finished.

Carding and Spinning Particulars.

The counts of yarn required to manufacture the fabric under description would be made in the third or possibly in the second division of mills, as given in a previous lesson. It will be understood that a great many grades of fancy vestings are made and that the range of the counts of the yarns is also varied. For this article we will consider that the warp yarn count is 2-60s and that the filling yarn is 16s count. The grade of cotton used for the finer count should be good and the length of the staple about 1½ inches, although cotton from 1⅜ to 1⅝ inches may be used. For the coarser yarn a cotton with the staple of 1 inch may be used. The two different cottons would be

TREATED ALIKE

up to a certain point and unless otherwise noted what is said may be applied to both cottons. The cotton raw stock should be first brought to the bale breaker and there stapled and graded by the overseer and all bales not up to the proper standard laid aside. Several bales should be opened and placed around the bale breaker and fed to this machine alternately; that is, first a section from one bale and then a section from another, until all the cotton is fed, and not one bale fed until it is all gone. By the first method a more even mixing is obtained. Two processes of picking and an opener are generally used, and after allowing the cotton to stand in the bins as long as possible, where the good sliver waste from the cards, sliver lap and ribbon lap machines, combs, drawing frames and slubber is

MIXED WITH THE RAW STOCK,

the cotton is fed to the hopper of the opener. This machine is really the first machine that evens the cotton so that a certain weight of cotton will be delivered for a certain length. In order to accomplish this the hopper should be kept as nearly full as possible so that the lifting apron will always be loaded. The speed of the beater of this machine is about 1,050 revolutions per minute, having a fan speed of 350 revolutions per minute. The cotton is delivered from this machine to the feed rolls of the breaker picker. The speed of a rigid two-bladed type of beater should be about 1,500 revolutions per minute, the fan speed being 1,400 revolutions per minute. The

WEIGHT OF THE LAP

delivered at the front should be about 40 pounds or a 16-ounce lap for the finer counts and 20 ounces for the coarser counts. The laps are then put up at the finisher picker and doubled four into one. It is at this point that the cut roving waste is mixed in, this waste having gone through a special process to take out the twist. Mix one lap of cut waste to three of raw stock laps. The speed of the beater for this class of goods should not exceed 1,450 revolutions per minute with a fan speed of about 1,100 revolutions per minute. This class of goods should not receive more than 42 beats per inch, and for the longer staple cotton the beats per inch should be dropped to 32 to 36. If the cotton receives too many beats it is apt to put neps in and if not beaten enough, the dirt will not be taken out. The

STANDARD WEIGHT

of the finer yarn lap should be about 35 pounds, or about 12 ounces per yard. The coarser yarn lap should weigh 39 pounds, or about 14 ounces per yard. The variation from the standard weight of laps should not be more than one-half pound either way and laps which vary more than this should be run over. The laps are put up at the card and the draft for the finer count should not be less than 100 and the coarser one not over 100. Close settings should be used for the 60s yarn and some overseers speed up the top flats so that a greater amount of waste will be taken out. The same wire

may be used for both counts, i. e., 34s (American number) for cylinder and 35 or 36s for top flats and doffer. Use as large a doffer as possible. In the longer staples some overseers slow down the

SPEED OF THE LICKER-IN.

They say that the speed of this part is too fast for long staples and it tends to put neps into the cotton. The weight of the sliver for the 60s yarn should be about 50 grains, and for the 16s about 65 grains per yard. The production for the finer yarn is 500 pounds per week of 60 hours, and for the coarser yarn 65 grains per yard. Strip cards three times a day, although some overseers strip the doffer four times. The sliver for the finer yarn is combed and the coarser yarn goes direct to the drawing frame. We will first follow the

COURSE OF THE COTTON

for the 60s yarn. It is first put through the sliver lap machine, the doublings being 14 into 1, the weight of the lap being 300 grains per yard. Six of these laps are put up at the ribbon lap machine, the weight of lap at front being 260 grains per yard. The laps are then put up at the comber, the doublings being generally six into one, although eight into one is sometimes used. The speed of the comber should be about 90 nips per minute, draft 29, percentage of waste taken out 18, and the weight of the sliver about 45 grains per yard. This sliver is then put through two processes of drawing, the doublings being 6 into 1. The weight of the sliver at the finisher drawing frames is 70 grains per yard. See that your drawing frames are well oiled, the top rolls being oiled twice a day, but also see that no oil gets on the leather. See that all weights are properly adjusted and the trumpet holes the right size, also that the stop motions are all adjusted properly. The sliver is then passed to the slubber, where it is drawn into .50 hank roving. It then passes through

THREE PROCESSES OF FLY FRAME,

the hank roving at the first intermediate being 1.50, and the second 4.00 hank, and at the jack frame 13 hank. The sliver for 16s is put through three processes of drawing, the weight of sliver at the finisher drawing being 70 grains per yard, the hank roving at the slubber .50. This roving is only put through two processes of fly frames, the hank roving being made at the first about 1.50, at the second 4.00 hank. The doublings in all cases are 2 into 1. The roving is passed to the

RING SPINNING ROOM,

when it is made into 60s count. The following particulars would be used for a frame spinning this count: Gauge of spindles, 2¾ inches; diameter of ring, 1 5-16 inches; length of traverse, 5 inches; revolutions per minute of spindles, 10,000; twist per inch, 34.68. For filling, either mule or ring frames may be used. If ring frames are used, use the follow particulars: Gauge of spindle, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 6½ inches. The warp yarn is then twisted into 2-ply 60s at the twister, then spooled and then put into the warper, where it is warped on beams, and from here is passed to the slasher.

Dyeing Particulars for Mercerized Vesting.

Following are the dyeing particulars for mercerized vesting:

Dyed mercerized yarn for spots.

RED.

Turkey red, or primuline red, primuline red dyeing.

6 per cent primuline red, 30 per cent Glauber's; diazotized 1½ pounds nitrate soda, 5 pounds sulphuric acid developed, two pounds Beta naphthol, well rinsed and soaped twice and rinsed in hot water.

SKY BLUE.

5 per cent immedial sky blue, 5 per cent sodium sulphide, 3 per cent soda ash, 30 per cent Glauber's, rinse well, and give a soap bath, rinse well and dry.

NAVY BLUE.

8 per cent immedial dark blue B, 8 per cent sulphide soda, 3 per cent soda ash, 30 per cent Glauber's, rinse well, soap, and rinse in hot water, and dry.

BROWN.

10 per cent thion brown G, 10 per cent sulphide sodium, 3 per cent soda ash, 30 per cent Glauber's, rinse and soap as above blue.

DARK GREEN.

10 per cent katigen dark green 2B, 2 per cent katigen blue Black B, 2 per cent katigen yellow GG, 14 per cent sodium sulphide, 30 per cent Glau-

ber's, 3 per cent soda ash, rinse and soap as above.

OLIVE.

8 per cent pyrogene olive G, 8 per cent sodium sulphide, 3 per cent soda ash, 30 per cent Glauber's, rinse and soap as above.

MAROON.

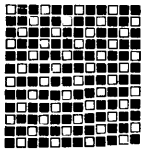
10 per cent immedial Bordeaux G, 10 per cent sodium sulphide, 28 per cent Glauber's, 3 per cent soda ash, rinse and soap as above.

BLACK.

15 per cent immedial black NN, 15 per cent sodium sulphide, 30 per cent Glauber's, 3 per cent soda ash, rinse and soap as above.

JEAN.

Jean is a narrow, hard-faced cotton fabric, weighing from 4 to 4½ ounces per yard, and is usually made of a hard-twisted warp yarn, about 1-20s cotton, and either a wool or a wool


Weave


Drawing-in Draft


Reed Plan

shoddy filling. The fabric is made with a small, uneven-sided twill weave, warp effect face, viz.: $\frac{}{1}$ 45° twill, the cloth being of a slate black color.

Jean is used principally in the manufacture of ready-to-wear trousers, retailing at 85 cents to $1 per pair, for workmen who perform hard, rough and dirty work, and who do not wear overalls. For this purpose it is the most serviceable fabric on the market, the garment when worn being popularly known as Kentucky jean, which has this distinct advantage, that upon its becoming soiled, a good washing will readily cleanse and remove all dirty marks, and apparently toughen the cloth, although causing it to shrink somewhat.

"KENTUCKY JEANS"

are worn by laborers, railroaders, moulders, machinists, loom fixers, general male mill help, etc., and with a small amount of care will wear well for two or three years.

Jean is made with one warp and one filling, and can be woven in any single box, roller loom, good results being obtained from the Fairmount or Bridesburg.

The warp yarn is generally of a cheap grade of cotton, and receives about two extra turns of twist per inch, in excess of the required amount of twist in the regular yarn of a similar count. It is this fact which causes jean as a fabric to have such a hard feel.

The filling is usually a mixture, containing about 40 per cent cotton and 60 per cent wool shoddy, the yarn being spun on the woolen principle.

The wool shoddy is made by pickering and carding dark colored woolen rags, after which the cotton and shoddy are made into a mixing of relative proportions and the lot run through the mixing picker. The stock is then carded and spun, the yarn receiving sufficient filling twist, the result being a dark colored, lofty thread, a suitable filling for this fabric jean.

The warp is dyed a rather grayish black, with cheap dry color, and the warp and filling colors combined in the weaving produce a fabric of a decidedly slate black appearance.

Jean receives a dry finish, being brushed, sheared and pressed, after which it is rolled or lapped, then packed into cases, for shipment.

CONSTRUCTION.

Reed 800—30½ inches plus 2 ends per dent. 10 per cent take-up in weaving, 36 picks 1-20s cut wool shoddy, 1-20s cotton warp.

Finish equals 27 inches.

44.4x30½ equals 1,354 ends plus 10 per cent equals 1,480 yards 1-20s cotton warp equals 1.41 ounces. Warp, 36 picks times 30½ equals 1,098 yards, 1-20s cut wool shoddy equals 2.92 ounces filling.

1.41 ounces warp, 2.92 ounces filling, equals 4.33 ounces.

4.33 ounces weight, 27 inches wide.

Carding and Spinning Particulars.

The yarn used for this class of goods is constructed by two entirely different systems. The filling is generally composed of a mixture of wool or wool shoddy and cotton. The filling yarn is therefore made in a woolen mill. It is understood that entirely different machines are used, and the method of mixing is entirely different from that used in a cotton mill, although the

names of the machines in many instances are alike. The warp yarn is made of all cotton stock and is therefore spun into yarn in a cotton mill, and below will be found the carding and spinning particulars for making this count of yarn of jean fabric. Of course, these may and are deviated from in many mills, but not to any great extent.

THE RAW STOCK

generally used is of a low grade and about one inch in staple. This class of yarn is spun in mills of the first division as given in a previous lesson and the mixing would be done by hand. The bales of cotton would be sampled and all those of the same length would be put into the mixing bin. For this class of goods a small percentage of comber waste is sometimes mixed with the raw stock and some mills use the card waste. The percentage is generally small, however. The good waste from the pickers, cards and drawing frames is always used and mixed at this point. The raw stock is run through an opener and two processes of picking.

The hopper should always be kept full. The speed of the beater should be 1,050 revolutions per minute, and the fan 350 revolutions per minute. The speed of the breaker picker beater is about 1,500 revolutions per minute, the fan speed being 1,400 revolutions per minute.

THE WEIGHT OF LAP

at the front of this machine is about 40 pounds or 16 ounces to the yard. The doubling at the finisher picker is four into one and the speed of the beater (two-bladed rigid type) 1,450 revolutions per minute, which gives the cotton passing through it about 42 beats per inch. The speed of the fan is about 1,100 revolutions per minute. The weight of the total lap is about 39 pounds, or 14½ ounces to the yard. Clean out from under the pickers frequently so that the fly will not collect and be drawn back into the good clean cotton passing through.

The draft of this picker should be about 2.75. The laps are then put up at

THE CARD.

This machine should not have a draft of more than 100. The doffer should be as large as possible and the wire fillet used should be No. 33 wire (American count) for cylinder and No. 34 for doffer and flats. The flats make one revolution about every 45 minutes. The cards should be stripped three times a day and ground once a month. The weight of the sliver should be 65 grains to the yard, and the production for a week of 60 hours should be between 950 and 1,000 pounds. This sliver is then run through

TWO PROCESSES OF DRAWING FRAMES.

The settings used at one mill for this stock and staple are as follows: Front roll to second, 1¼, second to third, 1¼, and third to back, 1½ inches. The doublings at this machine are six into one and the speed of the front roller 400 revolutions per minute. The draft at the finisher machine is about 5.75. The weight of the sliver should be about 75 grains per yard. The drawing sliver should be sized at least twice a day and four times would be much better.

The sliver is then drawn into .50 hank roving by the slubber and three processes of fly frames, the hank roving being as follows: 1.50 at the first intermediate, 3.50 at the second, and 8.00 at the jack frame. The usual care should be given to the rolls, etc., and

THE ROVING

at the jack frame should be sized once a day. The roving is then put through a warp spinning frame, the particulars being as follows: Gauge of frame, 2¾ inches; diameter of rings, two inches, length of traverse, seven inches. This yarn is hard twisted and receives about two complete turns more per inch than usually used for cloth yarn; that is, the regular twist per inch for this count is 21.24 turns per inch, but for this cloth is 23.24. The speed of the spindle is about 9,400 revolutions per minute. This yarn is taken to the spoolers and spooled from the spools, is warped and put through the slasher. A good sizing is made as follows: Water, 100 gallons; potato starch, 70 pounds; tallow, four pounds; turpentine, one pint.

Dyeing Particulars.

DARK SLATE.

2½ pounds thion black G, 2½ pounds sulphide sodium, one pound soda ash, 20 pounds salt.

BLACK.

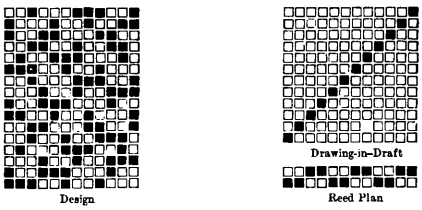
15 pounds thion black G, 15 pounds sulphide sodium, three pounds soda ash, 30 pounds salt.

CRETONNE.

Cretonne is a light-weight single cloth, all cotton fabric, weighing from 2 to 5 ounces per yard, and composed of yarns ranging from 1-40s to 1-20s in the warp and 1-20s to 1-7s in the filling.

It is usually woven with either the plain weave $\frac{1}{1}$, $\frac{2}{2}$, twill 45 degree, or a fancy effect resembling a granite weave, such as is used as a foundation weave in dress goods. The fabric is woven with either an all bleached or gray cotton warp and filling, the patterns being fancy stripes and all over floral effects printed in bright colors upon one side of the goods.

This gives the printed or face side of the fabric somewhat of the appearance of an elaborately figured jacquard design. Those colors found most effective for this purpose are bright



Harness chain same as design.

and medium shades of red, blue, green, yellow, etc., and a good jet black.

Cretonne is made in widths from 25 inches to 36 inches, the narrow grades being the lightest in weight.

The various grades are used for couch covers, draperies, lambrequins, and comfortables or bed quilts.

THE WEAVING.

Being a one-shuttle fabric, plain weave or twilled, cretonne can be woven on the single box roller loom such as the Mason, Draper, Lowell, Colvin, Lewiston, or Kilburn and Lincoln. The fancy grades in which mixed weaves are desired, necessitate the use of the Knowles Fairmount, or similar looms, with a dobby or head motion attached. The warp for cretonne, being either gray or bleached yarn, is prepared in a manner similar to that of weaving a plain ordinary sheeting.

Those grades in which the plain weave or $\frac{2}{2}$ twill weave are used are drawn in and woven upon four harnesses. If, however, a fancy weave is desired, the warp must be drawn in and woven upon a number of harnesses, in accordance with the number of ends in one repeat of weave desired.

As printing the colored pattern upon this fabric constitutes the finish thereof, the goods are taken from the loom and run through the brushing machine, to remove all dust, dirt or loose ends.

THE FIGURED PATTERN

to be produced upon the cloth has been engraved upon bronze rollers, which have been set up in the printing machine. The colors are fed automatically to the rollers, which, in revolving, register the colors upon the face of the cloth, as it passes between them. The cloth is then dried by being run through heated rollers or drums, and the fabric is then ready to be folded into suitable lengths to be packed and shipped.

Four square inches equals 7.95 grains.

29x36 equals 1,044x7.95 equals 8,299.-80 divided by 4 equals 2,074.95 divided by 437.5 equals 4.742 ounces per yard, 29 inches wide.

20 pieces white warp yarn equals x2½ inches equals 50 inches equals .55 grains, 50x7,000 equals 350,000 divided by .55 equals 636,363 divided by 36 equals 17,399 divided by 840 equals 1-20s cotton warp yarn.

12 pieces white filling yarn times 4 inches equals 48 inches equals 1.55 grains.

48x7,000 equals 336,000 divided by 1.55 equals 216,774 divided by 36 equals 6,021.5 divided by 840 equals 1-7s cotton filling yarn.

15 cents per yard, 29 inches finished.

CONSTRUCTION.

Reed, 900 minus 30 1-3 inches minus 2 ends per dent, 52 ends per inch finished,40 picks per inch finished, equals 50 ends in reed, 38 picks in loom, 10 per cent take-up in weaving.

52x29 equals 1,508 plus 10 per cent equals 1,675 yards 1-20s cotton warp yarn, 40x29 equals 1,160 yards 1-7s cotton filling yarn, 1,675 yards, 1-20s cotton warp equals 1,595 ounces, 1,160 yards 1-7s cotton filling equals 3.156 ounces equals 4,751 ounces.

10 cents per yard, 25¼ inches quality $\frac{2}{2}$ twill, four square inches equals 3.9 grains.

25¼x36 equals 909x3.9 equals 3545.1 divided by 4 equals 886.2 divided by 437.5 equals 2.025 ounces per yard, 25¼ inches wide.

Carding and Spinning Particulars.

The division of mills making cretonnes would be the second (or those mills equipped with machinery for making yarns the counts of which vary from 20 to 80s). The counts of yarn used for cretonne vary from 1-20s to 1-40s warp and from 1-7s to 1-20s filling, according to the quality of cretonne required. In speaking of the second division of mills we do not mean to say that the count of yarn is always within these limits, but that when buying machinery, the specifications for the different machines are made out according to whether the machines are to use low, medium or a fine grade of raw stock. Of course, it often happens that yarns of a lower count or of a higher count are made on this machinery, but the great bulk of the yarns turned off are within the limits. For example, take cretonne: All grades of cretonne may be made in the same mill, although the count of the yarn varies from 7s to 40s, or in some cases even a finer yarn than this is used. For this article we will consider that the filling yarn is 1-20s and the warp yarn is 1-40s. The length of staple used would be from 1 1-16 to 1¼ inches of a medium grade of cotton. The bales of raw stock would first be sampled and several bales of practically the same length of staple placed around the bale breaker and fed to this machine in small portions alternately from each bale. In this manner it is mixed better than if one entire bale was fed.

If a bale breaker is not used the method would be just the same except that it would be done by hand. The lower count would use cotton of a length of 1 1-16 inches and the higher count 1¼ inches. Both cottons would be put through an opener and two processes of picking. Keep your hopper of the opener well filled (over half full). The speed of the beater for both grades of cotton should be about 1,050 revolutions per minute; the speed of the fan about 350 revolutions per minute. See that your pin roller is always clean, because if the cotton is allowed to accumulate, it cannot perform its duty properly. The cotton is fed to the feed rolls of the breaker beater and passed on to the beater, the speed of which should be about 1,050 revolutions per minute; a rigid two-bladed type. The total weight of the lap at the front should be about 40 pounds, or 16 ounces to the yard for both cottons. The laps are doubled at the finisher picker four into one, the cut roving being mixed in at this point in the proportion of three laps of raw stock to one of bobbin waste. The speed of the beater should be about 1,450 revolutions per minute with a fan speed of 1,100 revolutions per minute. This gives the cotton passing through about 42 beats per inch. See that the grid bars under the beaters are properly set. The total weight of the lap at the front should be 39 pounds for the shorter staple cotton and 35 pounds for the longer, or a 14-ounce lap for the 1 1-16-inch staple and 12½-ounce lap for the 1¼-inch staple cotton.

Keep the picker room clean and always calculate to have enough laps of each kind of cotton ahead so that if breakdowns occur the cards will not be stopped for want of laps. The draft of the finisher picker is about 3. The cards should be set as before described in a previous lesson, except that the feed plate should be set to the licker-in, according to the length of the staple. Cards should be stripped three times a day and ground at least once a month. The wire fillet should be made of 34 wire (or 110s English count) for cylinder and 35 (or 120s English count) for doffer and flats. Use as large a doffer as possible, say 26 inches at least. The draft of the card should be about 100 for both stocks. The weight of the sliver at the front of the card should be about 65 grains. The production should be 825 pounds for the shorter staple and 600 pounds for the longer one for a week of 60 hours. The card sliver is next put through three processes of drawing frames. A few of the more particular points to look out for are, scour the frames at least once a month, keep your leather top rolls in perfect condition and well oiled and barnished. See that all knock-off motions are in working order to prevent single and double; keep the weight of your sliver uniform by sizing it at least twice a day and three times a day for fine yarns, doubling six into one at all frames. The weight of the sliver at the finisher drawing should be about 70 grains per yard. The drawing sliver is drawn into .50 hank roving at the slubber, the standard twist being found by multiplying the square root of hank by 1. The roving for the 20s yarn goes through two processes of fly frames, the hank at the first intermediate being 2 and at the second 5 hank. The 40s yarn roving is put through three processes, the hank roving at each process being as follows: first, 1.50; second, 3.50 and

third, 9 to 9.50 hank, the doublings at all frames being two into one. The sliver is then passed to the spinning room. In case the filling yarn is spun on a ring frame the following would be good particulars for the frame spinning 20s: Gauge of frame, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 6½ inches; speed of spindle, 7,300 revolutions per minute; twist per inch, 14.50; and for a warp frame spinning 40s: gauge of frame, 2¾ inches; diameter of ring, 1⅝ inches; length of traverse, 6½ inches; twist, 28.45. The warp yarn is then spooled, warped and run through a slasher.

Dyeing Particulars.

RED.

5 per cent benzo fast red, 4 B S, 30 per cent Glauber's, 3 per cent soda.

YELLOW.

2 per cent chrysophenine, 30 per cent Glauber's, 2 per cent sal soda.

LIGHT BLUE.

1 per cent diamine sky blue F F, 30 per cent Glauber's, 1 per cent sal soda.

LIGHT GREEN.

1 per cent diamine fast yellow FF, 1 per cent diamine sky blue PF, 30 per cent Glauber's, 1 per cent sal soda.

ORANGE.

2 per cent tetrazo orange, C R, 30 per cent Glauber's, 1 per cent sal soda.

MAROON.

3 per cent tetrazo Corinth G, 30 per cent Glauber's, 2 per cent sal soda.

HELIOTROPE.

3 per cent heliotrope B B, 30 per cent Glauber's, 2 per cent sal soda. On a tannin and tartar emetic mordant dye the four following shades:

MALACHITE GREEN.

2 per cent malachite green; also for

MEDIUM BLUE.

2 per cent methylene blue.

PINK.

1 per cent rhodamine 5G.

PURPLE.

1 per cent methyl violet 3 B.

BLACK.

15 per cent thion black G, 15 per cent sulphide sodium, 5 per cent soda ash, 30 per cent salt.

SLATE.

2 per cent thion black G, 2 per cent sulphide sodium, 2 per cent soda ash, 30 per cent salt.

LIGHT BROWN.

8 per cent thion brown G, 8 per cent sulphide sodium, 3 per cent soda ash, 30 per cent salt.

DARK BROWN.

12 per cent thion brown G, ½ per cent thion black G, 12 per cent sodium sulphide, 3 per cent soda ash, 30 per cent salt.

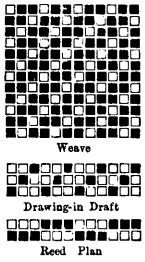
Cretonnes are also printed with very large picture designs of very bright colors, of very strong contrast generally. Some styles are of a simple character with small flowers and twigs on a white or cream-colored ground.

Other styles are of startling reds and other bright colors, on a dark brown, maroon or black ground, or on any dark colored ground to make a contrast.

The colors are printed with fast alizarine or tannin colors, which will be fast to sunlight and washing. Brightness of shade is required in most cases.

SILESIA.

Silesia is a light-weight single cloth fabric, having a rather high texture, and weighing about three ounces per yard. It is composed of all cotton



yarns 1-30s to 1-40s in warp and filling and is usually made with a $\frac{2}{1}$ 45 degree right-hand twill weave. It is used principally as a lining for ladies' and men's clothing. A

VERY IMPORTANT FEATURE

in connection with this fabric is the highly glazed or polished face of the goods, which is due to the action of the heated roller in the calendering machine upon the sizing, which the goods have absorbed in the process of finishing, just previous to the calendering operation.

Silesia is woven of yarn in the gray state and is dyed in the piece, in such colors as black, dark blue, brown,

slate, drab, steel, etc. It is woven on any single box roller loom, such as the Mason, Lowell, Lewiston, Colvin, etc.

The warp is made upon an Entwistle or Draper warping mill, and beamed upon the Lowell slasher. It is then ready to be drawn in on cotton harness, and woven in a manner similar to a drill.

TO FINISH THIS FABRIC.

The goods are taken from the loom and brushed, then run through a solution of soap and cold water to remove all dirt, after which they are rinsed in cold water.

The goods are now dyed in the piece, after which they are sized, then tentered to keep from shrinking in width, also to dry the cloth. After tentering, the goods are run through the calender to produce the smooth, glazed finish upon the face of the cloth. The finished fabric is then ready to prepare for packing and shipping.

Four square inches equals 5.4 grains.

27x36 equals 972x5.4 equals 5,248.8 divided by 4 equals 1,312.2 divided by 437.5 equals three ounces per yard, 27 inches wide finished.

24 pieces warp yarn times 1½ inches equals 36 inches equals .3 grains; 36x 7,000 equals 252,000 divided by .3 equals 840,000 divided by 36 equals 23,333 divided by 840 equals 1-28s warp.

30 pieces filling yarn times 1½ inches equals 45 inches equals .33 grains; 45x7,000 equals 315,000 divided by .33 equals 924,242 divided by 36 equals 25,673 divided by 840 equals 1-30s filling.

CONSTRUCTION.

Reed, 1,012 minus 28.7 inches in reed minus three ends per dent, 90 ends per inch finished and 72 picks per inch finished, equals 86 ends in reed and 69 picks in loom.

10 per cent take-up on warp in weaving 6 per cent size on warp in weaving.

1-28s cotton warp,1-30s cotton filling.

Color—slate or drab.

90x27 equals 2,430 plus 10 per cent equals 2,700 yards 1-28s cotton warp, 72x27 equals 1,944 yards 1-30s cotton filling.

2,700 yards 1-28s cotton warp equals 1.837 ounces, 1,944 yards 1-30s cotton filling equals 1.234 ounces, equals 3.071 ounces.

Finish equals brush and calender.

Carding and Spinning Particulars.

The yarns used in making silesia vary from 30s to 40s. These counts of yarn would be made in a mill of the second division as given in a previous lesson. Mills making this class of goods are now generally equipped with a bale breaker. After the cotton is stapled and the bales sorted out, according to the length of staple and grade of cotton, several bales are placed around the bale breaker and the cotton fed to this machine alternately from each bale. By this method the

COTTON IS MORE THOROUGHLY MIXED

than if a whole bale was fed to the machine at once. The cotton is then dropped on an endless lattice and carried to its proper bin. This latter is generally movable in either direction so that it may be placed in position to drop the cotton into its proper bin. The mixings should be as large as possible and cotton of a fair grade having a staple of 1⅛ to 1¼ inches for this class of goods. The mixings should be allowed to stand as long as possible and the good waste from the pickers, cards, drawing frames and back of slubber should be mixed in at this place. The waste from the above machines is collected at regular intervals, and may be mixed as fast as collected. Little system is used in mixing the waste into the raw stock, but the picker room boss should watch to see that the waste man keeps the different lengths of staples, kinds and grades of cotton by themselves. Otherwise trouble is bound to occur at the latter machines. The raw stock is put through an opener, and sometimes three but more often

TWO PROCESSES OF PICKING.

The hopper of the opener is filled with cotton and started up and should be kept well filled all the time it is in motion. The speed of the beater of this machine for this class of goods should be 1,050 revolutions per minute with a fan speed of 350 revolutions per minute. Keep your pin beater clean and see that it is adjusted to the proper distance from the lifting apron so that the correct amount of cotton will be fed to the breaker picker. The total weight of the laps for both the warps and filling yarn should be about 40 pounds or 16 ounces to yard of lap. These laps are put up at the finisher picker and doubled four into one. The speed of the beater is 1,450 revolutions per minute, with a fair speed of 1,100 revolutions per minute. This gives the cotton about 42 beats per inch of cotton fed. The beats per inch given

to cotton do not vary much on all classes of cotton, except in the case of Sea Island, of a long staple. In the latter case the speed of the beater is slowed down so that the cotton receives from 29 to 34 beats per inch. The total weight of the lap at the front end of the finisher is 35 pounds or 12½ ounces to yard of lap. The

BOBBIN WASTE COTTON

is mixed at this point, it first having gone through an extra process to take out the twist. This waste is made into a lap and then put up at the finisher picker and mixed in proportions of three laps of raw stock to one lap of bobbin waste. The draughts of the picker should be looked after to see that the currents of air are properly directed so as to obtain the best advantage in making an even, firm lap that will not lick up at the card. Too much waste in the mixing will also tend to make a lap split or lick up at the card.

THE CARD

should have a draft of not less than 100. The settings should be the same as given in a previous lesson and the cylinder and doffer stripped three times a day. The cylinder and doffer should be ground once a month and the flats about once in every three weeks. The weight of the sliver at the front should be about 65 grains per yard. Use the same count of wire for cylinder and doffer as given in the last article.

The card sliver is put through three processes of drawing. In some mills the cotton is put through a railway head. This machine doubles from 8 to 16 ends and this at the front passes through a trumpet, which automatically evens it. When this process is used, one process of drawing frames is left out. The weight of the sliver at the front of the finisher drawing should be about 70 grains per yard. See that your leather top rolls are well varnished and otherwise in perfect condition. The following directions will be found excellent for making the varnish to use on the rolls: three ounces glue (use a gelatin fish glue), one ounce of acid (acetic). Let this dissolve and then add color and 10 or 12 drops of oil of origanum. In warm weather a little borax may be added. The sliver is taken from the drawing frame and run through the slubber, where it is made into a .50 hank roving. The slubber roving is then put through

THREE PROCESSES OF FLY FRAMES

for both warp and filling yarns, the hank roving being as follows: First intermediate, 1.50; second intermediate, 4 and 7.50 hank at the jack frame for the warp yarn and 8. for the filling yarn. See that your fly frame rolls are spread to the proper distance and look out for the shape of your full bobbins to see that the taper of the ends is neither too blunt nor too sharp. If the former, it is liable to run over both on the frame and in handling,and if the latter,only a small amount of roving can be wound on each bobbin. The warp yarn is spun in the ring spinning frame, but the filling yarn may be either spun on a ring frame or a mule, but is generally done on the former machine. The particulars for a warp frame spinning 36s yarn has already been given in a previous lesson. Those used for a filling frame spinning 40s are as follows: Gauge of spindles, 2¾ inches; diameter of ring, 1 5-16 inches; length of traverse, 5½ inches; speed of spindle, 8,800 revolutions per minute; twist per inch, 23.72. The warp yarn is then spooled, warped and put through a slasher.

Dyeing Particulars.

Silesias are dyed on the jig machine at the full width of the piece.

CREAM.

A few grains of fast cotton yellow C Ex, 5 pounds Glauber's, one-half pound sal soda.

LIGHT ECRU.

1-16 ounce fast cotton yellow C Ex, 1-16 ounce, direct orange T G.

ECRU.

1-16 ounce fast cotton yellow C Ex, 1¼ ounces fast cotton brown G, 5 pounds Glauber's, ½ pound sal soda.

LIGHT SLATE.

2 ounces fast cotton yellow C Ex, 4 ounces direct black S. 5 pounds Glauber's, ½ pound sal soda.

SLATE.

1 pound direct black S, 4 ounces fast cotton yellow C Ex, 10 pounds Glauber's, 1 pound sal soda.

DARK SLATE.

2 pounds diamine black B H,4 ounces diamine fast yellow A, 4 ounces oxydiamine black A, 20 pounds Glauber's, 2 pounds sal soda.

LIGHT DRAB.

4 ounces diamine fast yellow A, 4 ounces diamine brown B, 4 ounces

diamine black B H, 10 pounds Glauber's, 2 pounds sal soda.

DRAB.

½ pound diamine fast yellow A, ½ pound diamine black B H, 6 ounces diamine brown B, 10 pounds Glauber's, 2 pounds sal soda.

LIGHT TAN.

½ pound diamine fast yellow A, ½ pound diamineral brown G, 10 pounds Glauber's, two pounds sal soda.

TAN.

2 pounds diamine catechine 3 G, 1 pound diamine fast yellow B, 10 pounds Glauber's, 2 pounds sal soda.

OLD GOLD.

3 pounds diamine fast yellow B, 2 pounds diamine catechine 3 G, ½ ounce diamine black B H, 10 pounds Glauber's, 2 pounds sal soda.

PEARL.

1-16 ounce diamine brilliant blue G, 5 pounds Glauber's, 1 pound sal soda, aftertreated ¼ per cent copper sulphate.

SKY BLUE.

6 ounces diamine sky blue F F, 5 pounds Glauber's, ½ pound sal soda.

BLUE.

2 pounds diamine blue R W, 5 pounds Glauber's, ½ pound sal soda.

RED.

6 per cent primuline, 25 per cent Glauber's, 3 per cent sal soda.

Diazotized 1½ per cent nitrate soda 5 per cent sulphuric acid. Developed two pounds beta naphtol.

SCARLET.

4 pounds benzo fast scarlet 4 B S, 30 pounds Glauber's, 3 pounds sal soda.

MAROON.

5 pounds tetrazo corinth B, 30 pounds Glauber's, 3 pounds sal soda.

HELIOTROPE.

½ pound heliotrope B B, 10 pounds Glauber's, ½ pound sal soda.

PINK.

½ pound tetrazo pink B U, 20 pounds Glauber's, ½ pound sal soda.

YELLOW.

1½ pounds chlorine yellow G G, 20 pounds Glauber's, 2 pounds sal soda.

ORANGE.

2 pounds benzo fast orange S. 30 pounds Glauber's, 3 pounds sal soda.

DARK GREEN.

3 per cent benzo dark green G G, 2 per cent chrysophenine, 1 per cent direct black B.

GREEN.

3 per cent brilliant benzo green B, ½ per cent chrysophenine, 30 per cent Glauber's, 3 per cent sal soda.

NAVY BLUE.

5 per cent diazo black B H N, 30 per cent Glauber's, 3 per cent sal soda.

LIGHT BROWN.

6 per cent thion brown G, 6 per cent sodium sulphide, 30 per cent Glauber's, 3 per cent soda ash.

BROWN.

6 per cent diamine brown B, 1 per cent diamine yellow B, 1 per cent diamine catechine G, 30 per cent Glauber's, 3 per cent sal soda.

DARK BROWN.

2 per cent benzo fast black, 2½ per cent benzo fast red L, 4 per cent chrysophenine, 30 per cent Glauber's, 3 per cent sal soda.

BLACK.

15 per cent thion black B, 15 per cent sodium sulphide, 3 per cent soda ash, 30 per cent Glauber's.

LAWN.

Lawn is a light-weight, single cloth wash fabric, weighing from 1¼ ounces to 2¼ ounces per yard and in widths from 36 inches to 40 inches finished. It is composed of all cotton yarns (bleached) from 1-40s to about 1-100s, and is always woven with a plain weave $\frac{1}{1}$.

PLAIN LAWN

is made of solid white or bleached yarn in both the warp and filling. The fancier grades, or those having a color effect, are produced by printing vines, floral stripes, small flowers, etc., in bright colors, in scattered effects upon the face of the goods, the warp and the filling in all cases being bleached yarns. The patterns are always printed, never woven.

Lawn is made in various grades ranging in price from 5 cents to 12½ and 15 cents per yard, and it is used principally in the manufacture of ladies' and children's summer dresses, sash curtains, etc. Being a rather sheer fabric, lawn is best adapted to

those light running looms in which the action of shedding is easiest upon the fine yarns used in this style of goods. The warp for this fabric is dressed or beamed upon a regular dressing frame. It is then drawn in on 4 harnesses to permit of freedom in shedding.

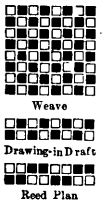
The plain weave requires but two harnesses, but where there are a great number of ends in the warp, the yarn would be very much crowded if the warp was drawn in on two harnesses. Therefore, four or more harnesses are used.

Lawn, when finished, should have a very soft, smooth feel. Therefore the finishing process includes brushing, very light starching or sizing, then calendering or pressing.

16 square inches equals 6.9 grains.

40x36 equals 1,440x6.9 equals 9,936 divided by 16 equals 621 divided by 437.5 equals 1.419 ounces per yard, 40 inches wide finished.

40 pieces white warp yarn x 3½ in-



ches equals 140 inches equals .5 grains.

140x7,000 equals 980,000 divided by .5 equals 1,960,000 divided by 36 equals 54,444 divided by 840 equals 1-66s cotton warp.

46 pieces white filling yarn x 2½ inches equals 100 equals .35 grains.

100x7,000 equals 700,000 divided by .35 equals 2,000,000 divided by 36 equals 55,555 divided by 840 equals 1-66s cotton filling.

CONSTRUCTION.

40 inches finished.

64 ends per inch finished, 62 picks per inch finished equals 60 ends in reed and 58 picks in loom.

Reed, 1,080; 42¾ inches in reed. 2 ends per dent.

5 per cent take-up on warp in weaving.

64@40 equals 2,560 ends plus 5 per cent take-up equals 2,694 yards.

62 picks x 40 inches equals 2,480 yards.

2,694 yards, 1-66s cotton warp equals .748 ounces; 2,480 yards, 1-66s cotton filling equals .712 ounces, total, 1.460 ounces.

Carding and Spinning Particulars.

The counts of yarns from which lawn is made vary according to the quality of lawn being made. This varies from 40s to 100s. The yarns are made in the third division of mills, as given in a previous lesson or those mills which make high count yarns. In this article we will consider the warp yarn to be 60s and the filling yarn to be 100s. For these two counts raw stock of two different lengths of staple and grade of yarn would be used. For 100s a Sea Island cotton of about 1⅝-inch staple may be used and for the warp yarn an Allen cotton of about 1½ inches staple. The two cottons would be treated differently at every process and so we will describe the two cottons at each process. The Allen cotton would be put through the bale breaker, in the manner ascribed in the article of last week, and carried to its proper bin. At this point the

GOOD WASTE IS MIXED IN.

It is not the general custom to run the Sea Island cotton through the bale breaker, but to mix it by hand great care should be taken that all the bales mixed are of a uniform length and that the grade of each bale is up to standard. Those bales not up to standard should be shipped back to the broker. The good waste is mixed in at this point, but be sure that the waste boy only puts in Sea Island cotton for, if a shorter staple cotton gets in, it will cause trouble at subsequent machines. The Allen cotton is put through two processes of picking and an opener. For this class of cotton three processes of picking would be better, for, as it is a very dirty cotton, the extra picking would help to clean it. The speeds of all the picking machines previously given may be used for this cotton. The weight of the lap at the breaker picker should be about 40 pounds or a 16-ounce lap. The doublings are four into one at the finisher, the total weight being 3.5 pounds or a 12-ounce lap. If an intermediate picker is used, the total weight of the lap should be about 37 pounds or a 12-ounce lap. The

SEA ISLAND COTTON

is only put through an opener and one process of picking, the reason for this being that the staple is so long that if two processes are used the extra beating that it receives tends to put neps into the staple. The speeds of the opener are slowed down and the speeds of the finisher parts are as fol-

lows: The speed of a rigid two-bladed beater should not exceed 1,000 revolutions per minute. The total weight of the lap should be about 30 pounds or about a 9-ounce lap to the yard. The roving waste should be mixed in at the finisher picker process, as previously explained. The cards should be set close for both cottons, the main difference being in the setting of the feed roller to the licker-in, which should be set according to the length of staple. The usual points that have been given in previous lessons should be looked out for when running Allen cotton, the weight of the sliver in front being 65 grains to the yard and the production being about 500 pounds for a week of 60 hours, the draft being not less than 100. For Sea Island

ADDITIONAL CARE

has to be taken; also certain speeds have to be altered. It has been found that by slowing the speed of the licker-in less neps are put into the cotton and still the cotton is cleaned. In fact, one overseer using this class of cotton lagged his licker-in pulley so as to obtain an extra diameter of 1½ inches and found the results excellent, the sliver showing fewer neps than when the usual speed of the licker-in was used. On this cotton it is the general practice to use high drafts and sometimes a draft of 165 is used, but for general purposes a draft of about 130 is used. The flats are speeded so as to make one complete revolution every 45 minutes, the extra speed being obtained by lagging the pulley on the cylinder that drives the flats. This, of course, takes out more waste, but it makes less work for the combers to do. The weight of the sliver at the card is about 45 grains per yard. Strip and grind cards the same as stated in previous articles.

THE WIRE FILLET.

used for cards making sliver for high class yarns is generally firmer than that previously given, and if cards are used for high count yarn the size of the fillet should be as follows: Cylinder No. 34 wire or 110s English count; doffer and top flats, No. 36 wire or 130s English count. The production of a card on Sea Island cotton varies from 325 to 450 pounds per week of 60 hours. Four hundred pounds is a good average. From the cards both cottons are taken to the comber room and the doublings at the sliver lap are 14 into one. The weight of the Allen lap at the front is 320 grains per yard and the Sea Island weighs 250 grains per yard. The cottons are then put through the ribbon lap machine, where the Allen is doubled 6 into one, but it is the general custom to double the Sea Island only 5 into one, the weight of lap at the front end being 260 grains per yard for Allen and 200 grains for Sea Island. The laps are taken to the combers, where they are doubled 6 into one. The speed of the combers should be about 85 to 90 neps per minute for Allen and 75 to 80 for Sea Island. The amount of waste taken out at the comber is important. a good average for Allen is 18 per cent and for Sea Island 20 to 25 per cent. The

WEIGHT OF THE SLIVER

for Allen is about 42 and for Sea Island about 36 grains per yard. After passing through the comber the sliver is put through two processes of drawing, the weight of the sliver at the front being 60 grains per yard for Sea Island and 70 grains for Allen. On all machines when leather top rolls are used for Sea Island, stock should be kept in the best of shape and oiled and varnished frequently. The speed of the front roll on the finisher drawing for Sea Island should be about 320 revolutions per minute or 80 revolutions per minute slower than for Allen. The slubber draws the sliver into .50 hank roving for Allen and .80 hank for Sea Island. The Sea Island is put through three processes of fly frames, the hank roving being as follows: First intermediate, 2.25; second intermediate, 5.00; jack frame, 18 hank; and for Allen: First intermediate, 1.50; second intermediate, 4.00; jack frame, 12 hank. The twist per inch put into Sea Island cotton is a little less than the usual amount used for other cottons, the standard for jack frames being square root of hank x 1.2. The filling yarn is mule spun and the warp yarn ring spun, the following particulars being used: Gauge of frame, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 6 inches; speed of spindle, 10,000 revolutions per minute; twist per inch, 34.86. The warp yarn is then taken to the spoolers and from here to the warpers, where it is run on beams and taken to the slasher. The following is a good size to use: 100 gal. water, 54 pounds potato starch, 2 pounds Yorkshire gum, 1½ pounds soap.

Finishing Particulars.

Lawns have to be very carefully handled in the bleaching process.

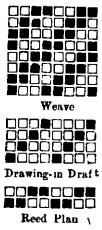
They are starched with an ordinary starch mangle with from 8 to 12 ounces best white German dextrine per gallon, mixed cold, and boiled for one hour, with a little blueing added to shade required.

They are then finished on the stenter machine, dryed with hot air, care being taken to keep the pieces perfectly straight. Some bleachers handle each piece separately from start of process to finish, bleaching, starching by hand in a tub and drying in a frame in the stenter stove. By so doing the pieces do not get drawn and the filling is always straight across the piece.

Lawns are often tinted light shades of blue, pink, cream, ecru, pearl, green and other light tints with direct colors added to the starch, the direct colors being used generally. The basic and acid colors are also tinted to make bright colors.

TARTAN PLAIDS.

Tartan plaid is a narrow, lightweight, single cloth fabric, weighing from 2 to 2¼ ounces per yard finished, and is composed of regular cotton yarns from 1-20s to 1-26s in warp and



filling. It is always woven about 23½ inches in the reed, to finish about 22 inches wide. This is done to prevent it from coming too close to the gingham lines.

Tartan plaids are generally woven with a $\frac{2}{2}$ 45 degree, right hand twill weave, and are always woven in plaid patterns in imitation of the imported worsted fabric of this name.

Each line of patterns has a standard name, which represents a significant style of color arrangement, such as Rob Roy, dress Stewart, Royal Stewart, Malcolm, Fraser, McGregor, Sinclair, Gordon, Drummond, Macpherson, etc.

Those colors most used are red, green, black, white, brown, drab, wine, dark green, scarlet, dark blue, etc.

IN THE ROB ROY STYLE

the pattern takes the form of a broad, two-colored check, 1¼x1¼ inches, either black and red, or black and white, viz.: 72 black, 72 red in warp and filling. The dress Stewart pattern is composed principally of white yarn. The Royal Stewart has a decided red color effect. The Gordon pattern a very green color effect, etc.

Aniline colors are used in dyeing the yarns for this fabric, the warp yarns being given an extra run, to insure an even shade, which, while not being exactly a fast color, is strong enough to withstand the action of a rather wet finish (gingham finish).

The Fairmount 4x1 box roller loom is used for the 2, 3 and 4 shuttle tartan plaids and the Knowles 4x4 gingham loom for those styles having more than four colors in the filling.

The warps for this fabric are ordered from the spinner in either 720 yards, 1,080 yards, 1,200 yards or 1,500 yards lengths, and have either 1,000 ends, 1,200 ends, 1,400 ends, or 2,000 ends, in them.

The most popular are 720, or 1,080 yards and 1,400 ends.

The warp is dyed in bulk and the necessary number of ends of each color are then split off. When all the colors have been split or separated, the splittings, or separated bunches of ends of each color, are assembled in the beaming frame, and the yarn is arranged as per pattern in the rathe comb, and the warp run through this rathe on to the beam. After beaming the warp is drawn in in the regular manner.

To finish this fabric, the goods are taken from the loom and run through the brusher, then through the sprinkler, after which they are very lightly sized, then run upon the tentering machine to prevent undue shrinkage in width, also to assist in drying, then calendered, but not to a glossy finish.

CONSTRUCTION.

Style—Rob Roy—finished 22 inches wide; reed, 1,080—23½ inches in reed, two ends per dent; 1-26s cotton warp—10 per cent take-up; 1-22s cotton filling—40 picks; $\frac{2}{2}$, 45 degree, right-hand twill weave, 16 ends extra for selvedge.

Warp pattern: 72 black x 72 reed, total 144, all equal 9 patterns plus 112 ends.

1424 ends in warp (including selvedge).

Start 29 red at x, end 28 red at x.

704 ends black plus 10 per cent equals 780 yards 1-26s warp equals .5715 ounce; 720 ends red plus 10 per cent equals 800 yards 1-6s warp equals .5860 ounce; 48 picks times 23½ equals 564 yards, 1-22s filling equals .488 ounces and 564 yards, 1-22s filling equals .488 ounce, equals 2.1335 ounce. 2.1335 ounces per yard, 22 inches wide.

Finish—very light size, tenter, calender.

Carding and Spinning Particulars.

The yarns used in the manufacture of tartan plaids are made in mills of the first and second division,as given in a previous lesson. The counts of yarn vary according to the mill in which they are made and the counts taken as examples for this article are 1-22s filling yarn and 1-26s warp yarn. The cotton used for these goods is of a fair grade and a staple varying from ⅞ inch to 1 1-16 inches. We will consider the staple to be one inch. The cotton is stapled and put through a bale breaker and from here is passed by a series of lattice aprons to the mixing bin. Use as large a mixing as possible at one time, because the less mixings the evener the yarn will be. The good waste from the machines up to the slubber is mixed into the raw stock at this point, the collections of this waste being made at regular intervals. The raw stock is sometimes put through

TWO PROCESSES OF PICKING

and an opener and sometimes through three processes of picking and an opener. It has been found that two processes of picking will clean the cotton properly, and at the same time will not be so apt to put neps into it. When two processes of picking are used, the particulars of the intermediate picker given below may be dropped. the other particulars remaining the same as given. The hopper or feed box of the opener should always be kept at least half full and generally a porcupine beater is used. The speed of this beater should be about 1,050 revolutions per minute, with a fan-speed of 350 revolutions per minute. The cotton is then passed to the feed rolls of the breaker picker. Keep the pin beater of this machine free from cotton, as it has to be watched to see that the sliver waste does not tangle around it. This roll is more troublesome on some makes of machines than on others. The

SPEED OF THE BEATER

(which generally is of a two-bladed rigid type) is 1,500 revolutions per minute,the fan speed being 1,400 revolutions per minute. The weight of the lap at the front should be about 40 pounds total weight or a 16-ounce lap. Some system of marking has to be employed so that the laps of other grades and lengths of staple will not become mixed and thus cause trouble later on. Of course, like staples and weights of laps may be placed together, but it is the general custom to mark the laps at the end as they are taken off the machine with different colored crayons. For example, 1 1-16 may be marked brown, 1⅛ blue, 1 1-16 salmon, etc. This is not generally done at any except the finisher picker. The laps are doubled four into one at the intermediate picker, the speed of the beater being 1,450 revolutions per minute, and the speed of the fan 1,050 revolutions per minute. The weight of the lap at the front is about 37 pounds. These laps are put up at the finisher picker and doubled four into one. It is at this point that

THE ROVING WASTE

is mixed in in a proportion of one lap of roving waste to three laps of raw stock. The cotton receives about 42 beats per inch fed. The total weight of the lap is about 39 pounds,or about a 16-ounce per yard lap. The speed of the beater is about 1,500 revolutions per minute, and the speed of the fan 1,100 revolutions per minute. The laps are then put up at the card. The card is set to accommodate this stock as described in a previous lesson, the speed of cylinder being 160 revolutions per minute. The speed of the licker-in is 300 revolutions per minute. Flats make one complete revolution every 40 minutes. The draft should not exceed 100. Use a large diameter doffer.

Strip three times daily and grind at least once a month. The weight of the sliver is 65 grains per yard. The production is about 900 pounds per week of 60 hours. The sliver is then put through

THREE PROCESSES OF DRAWING,

being doubled six into one, the speed of the front roller being 400 revolutions per minute, the weight of drawing at the finisher being 70 grains. Some of the points that are to be looked out for are as follows:

Stop motions, rolls, laps and oiling. The sliver is next taken to the slubber and made into .40 hank roving,the usual standard for twist being used. Look out for the shape of your bobbins The slubber roving is put through three processes of fly frames, doubling two into one. The hank roving at the first intermediate is 1.10, at the second 2.70 hank and at the jack frame five hank.

The rovings are then taken to the spinning room and made into the required yarn.

THE FILLING YARN

may be taken to either the mule or ring spinning room. If taken to the ring spinning room, the following are good particulars to use for frame making 22s yarn: Gauge of frame,2¾; diameter of ring, 1½ inches; length of traverse, 6½inches; twist per inch, 15.-25; speed of spindles, 7,400 revolutions per minute. For a warp frame spinning 26s use gauge of frame, 2¾ inches; diameter of ring, 1¾ inches; length of traverse, 6 inches; speed of spindles, 9,700 revolutions per minute. The warp yarn is then spooled, warped and put through a slasher.

Dyeing Particulars.

RED.

4 per cent diamine fast red F, 30 per cent Glauber's, 3 per cent sal soda.

GREEN.

1½ per cent diamine sky blue FF, 1½ per cent diamine fast yellow FF, 30 per cent Glauber's, 3 per cent sal soda.

BLACK.

15 per cent thion black G, 15 per cent sulphide soda, 30 per cent salt; 3 per cent soda ash.

BROWN.

5 per cent benzo fast orange S, 2 per cent chrysophenine, 2½ per cent benzo fast black, 30 per cent salt, 2 per cent soda ash.

DRAB.

¾ per cent benzo fast black, ½ per cent chrysophenine, 3 ounces benzo fast red G L, 30 per cent Glauber's, 2 per cent sal soda.

SLATE.

½ per cent benzo fast black, ¼ ounce chrysophenine, ¼ ounce benzo fast red GL, 30 per cent Glauber's, 2 per cent sal soda.

SCARLET.

5 per cent diamine scarlet B, 30 per cent Glauber's, 2 per cent sal soda.

DARK GREEN.

6 per cent diamine black HW, 4 per cent diamine fast yellow B, 30 per cent Glauber's, 2 per cent sal soda.

WINE.

6 per cent diamine Bordeau B, 30 per cent Glauber's, 3 per cent sal soda.

BLUE.

4 per cent brilliant benzo blue 6 B, 30 per cent Glauber's, 3 per cent sal soda.

DARK BLUE.

15 per cent pyrogene indigo B, 15 per cent sodium sulphide, 30 per cent salt, 3 per cent soda ash, 2 pints mineral oil.

YELLOW.

2 per cent chloramine yellow M, 30 per cent Glauber's, 2 per cent soda ash.

BAYADERE.

Bayadere is a fabric in which the pattern consists of a stripe running across the width instead of the length of the material. Such patterns are almost entirely confined to ladies' and children's dress goods, and may be composed entirely of cotton, as in the cheapest grades, of cotton and worsted in the medium, or entirely of worsted or worsted and silk in the best grades.

The fabric considered in this article is a medium grade cloth of ladies' dress goods, and is composed of worsted, silk and cotton and weighs 5½ ounces per yard, 36 inches wide, finished.

The pattern is a zigzag stripe, extending across the fabric in the direction of the weft on a rep ground.

Figure 1 shows the full design for the one repeat of the pattern, and is complete on 132 warp threads and 30 picks.

Figure 2 is the drawing-in draft and is complete on 13 harnesses.

Figure 3 is the reeding plan.

Figure 4 is the chain draft.

The arrangement of the warp and weft threads is as follows:

Warp, 2 threads blue 2-50s worsted

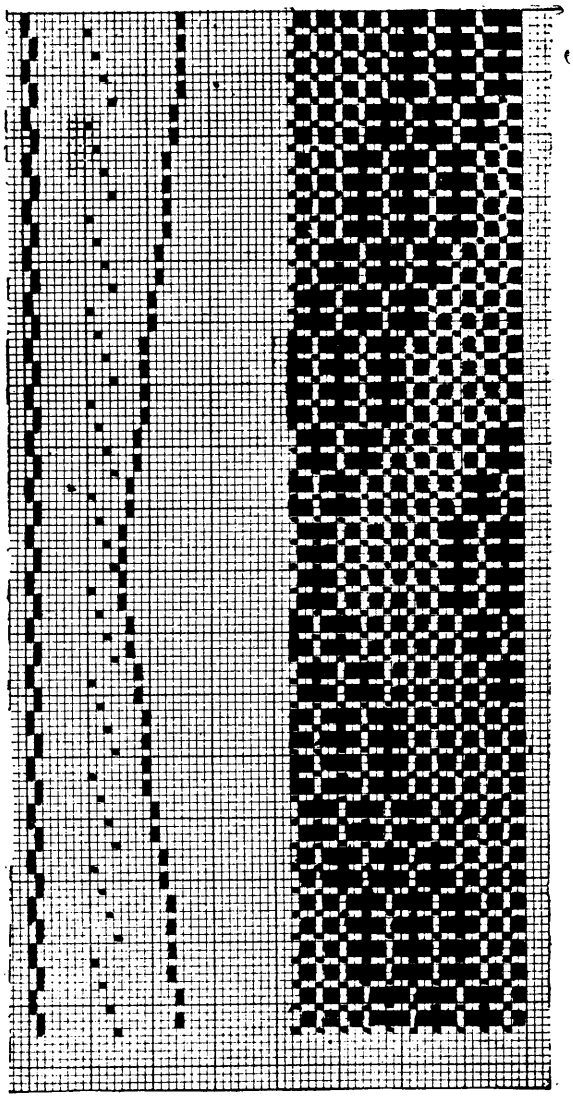
(xx Ohio), 1 thread brown 2-60s cotton (carded peeler); 3 threads in pattern.

Weft, 1 pick light blue 40-2s spun silk, 2 picks brown, 20-cut cotton (wool spun); 3 picks in pattern.

When drawing-in, cotton must always come on first four shafts, and worsted on the last nine shafts.

Almost any dobby loom might be used having the required number of harnesses and shuttle boxes.

Fig. 3. Fig. 2. Fig. 1.



20 reed, 3 threads per dent—60 threads per inch. Reeded 38½ inches wide for 36 inches finished, 40 picks per inch.

The above warp must be made on two beams: cotton threads on top beam, worsted threads on bottom beam.

In regulating the tension of the two beams, considerable care must be used in order that the rib in the ground may be made as clear and distinct as possible. This may be accomplished by having relatively more weight on the cotton beam than on the worsted, which is an important feature in the

manufacture of all fabrics of a rep character, and which is fully illustrated by the small sketch, Figure 5. It will be noticed that the cotton (thin) threads are held very nearly straight, while the worsted are forced to bend around the heavy picks of the weft. The take-up of the worsted threads is therefore much greater than that of the cotton, being about eight per cent, while the cotton is only about two per cent.

The worsted warp then must be made relatively longer.

In introducing the weft threads, the

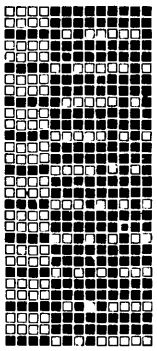


Fig. 4.

silk pick must always enter when the cotton warp threads are up in the ground portion of the cloth.

THE FINISHING.

In finishing fabrics of this character everything depends upon the quality of the cloth—the fabric just described having a dry finish, viz.: after being burled and mended, it is brushed and pressed and rolled and is then ready for shipment.

In the best grades, however, the cloth must be scoured, tentered, sheared, brushed and pressed before being rolled and made ready for shipment.

Carding and Spinning Particulars.

The machines used in making the count of yarn required for the warp yarn of bayadere will be found in the second division of mills, as given in a previous lesson. Bayaderes, as has been stated, may be composed of all worsted, or all cotton yarns or a mixture of worsted and cotton yarns, or a mixture of worsted, silk and cotton. In fact, there may be almost any combination of these three fibres. The best grades of bayadere are made up of worsted and silk yarns. For this article we will consider that the fabric is composed of all three kinds of raw stock, worsted, silk and cotton. For the warp, 2-60s yarn is used and for the filling a 20-cut cotton yarn is used. The filling yarn is spun in a woolen mill and so

THE WARP YARN

will be the one considered under the above heading.

For this count of yarn a peeler cotton is used of about 1¼ inches staple. This cotton should be of a good grade and should be run through a bale breaker. The principal part of the mixing is done at the bale breaker for this cotton. The cotton is brought from the storehouse and sampled and the bales having the same length of staple are put together. Those having a staple or grade not up to mark are laid one side. Several bales are opened and placed around the bale breaker and the attendant feeds from each bale alternately until all the cotton is gone. As many bales as possible and convenient should be opened

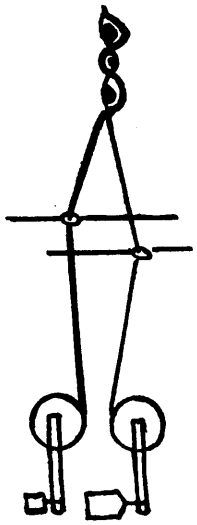


Fig. 5.

and placed around the bale breaker at one time because a

MORE EVEN MIXING

will thus be obtained and the yarn will run a great deal evener. After passing through the bale breaker the stock is conveyed automatically to the mixing

bins. If the mixing is done by hand, the same points have to be looked out for, the only difference being that several hands are used instead of a machine. At the bins the good waste is mixed. The raw stock is then passed through two or three processes of picking and an opener. If only two processes of picking are used, then the particulars given for the intermediate picker may be left out, the other particulars given remaining the same. The hopper of the opener should always be kept more than half full. The speed of

THE BEATER

is 1,050 revolutions per minute. Generally a porcupine style of beater is used for this machine, with a fair speed of 350 revolutions per minute. The cotton is then passed to the breaker picker. The speed of the beater (two-bladed rigid type) is about 1,500 revolutions per minute, that of the fan, 1,400 revolutions per minute. The weight of the laps at the front should be about 40 pounds, or a 16-ounce lap. The laps are put up at the intermediate picker and doubled four into one. The speed of the beater should be 1,450 revolutions per minute. That of the fan 1,050 revolutions per minute. The weight of the laps at the front end should be about 37 pounds, or a 12-ounce lap for peeler cotton to make this class of goods.

The laps are put up at the finisher picker and doubled four into one. It is at this point that the

CUT ROVING IS MIXED IN

(it having been previously put through a special picker, which takes out the twist and leaves it in a fluffy, untwisted state and then it is put through a picker and made into a lap of the same weight as the laps from the intermediate picker), in the proportion of three laps of raw stock to one lap waste. The speed of the beater for this machine is 1,450 revolutions per minute, with a fan speed of 1,100 revolutions per minute. This gives the cotton passing through 42 beats or blows per inch. The weight of the lap at the front is 35 pounds, or a 12½-ounce lap. Watch all the points that have previously been pointed out. The variation from standard should not be over 8 ounces either side for the total lap. The lap is next taken to the card. The

SETTINGS OF THE CARD

for this division of mills have been previously given.

The draft should not exceed 100; speed of licker-in, 300 revolutions per minute; speed of flats, 1 revolution every 45 minutes; weight of sliver, 65 grains; production about 650 pounds for week of 60 hours. Strip three times a day, grind once a month, and use as large a doffer as possible. The sliver is next put through three processes of drawing, the doublings at each process being six into one, the weight of the finisher drawing being 72 grains per yard, and the revolutions per minute of front roll 350. Either metallic or leather covered rolls may be used at this machine. If the former are used, see that they are properly set and keep them well scoured; if the latter are used, keep them in good repair, well varnished, and oiled. For this length of staple the following

SETTINGS

of the bottom steel rolls may be used: Front roll to second roll, 1½ inches; second roll to third, 1⅝ inches; third roll to back, 1¾ inches. The sliver is put through the slubber and made into .55 hank roving. Three processes of speeders or fly frames are used, the hank roving being as follows: at first intermediate 1.50; at the second, 4, and at the jack frame, 12. The usual points are to be looked out for in connection with fly frames. The roving is then passed to the spinning room and made into 60s yarn. For a warp frame making this count use the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 6 inches; twist per inch, 34.86; speed of spindle, 10,000 revolutions per minute. The yarn is then taken to the twister and doubled or twisted into a two-ply yarn. It is then passed to the spooler and from here to the warper and from here to the slasher.

Dyeing Particulars.

BROWN.

5 per cent diamine brown B, 1 per cent diamine fast yellow B, 30 per cent Glauber's, 2 per cent sal soda.

LIGHT BLUE (SILK).

1 per cent patent blue, pure, 5 per cent acetic acid.

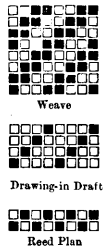
BLUE (WORSTED).

3 per cent patent blue A, 20 per cent Glauber's salt, 5 per cent sulphuric acid.

BOUCLE.

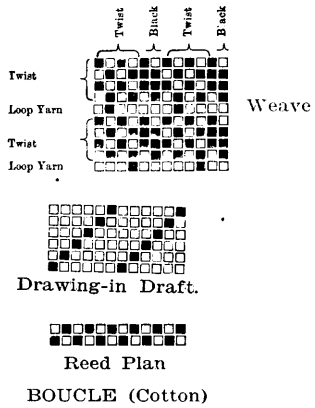
Boucle is a single cloth, dress goods fabric, weighing from 7 to 8 ounces per yard, 44 inches wide finished, and composed of plain and fancy twist (cotton) yarn in warp and filling, also having a worsted loop yarn in the filling.

Boucle is used principally as a novelty dress fabric for ladies' spring and fall suitings, the distinguishing feature of the cloth being the small loop in the filling yarn, which curls over the face of the goods.



BOUCLE (Woolen)

Warp, all brown. Filling, 3 brown, 1 worsted, 1 loop.



BOUCLE (Cotton)

COTTON BOUCLE

is generally made with a fancy combination weave, and the all-wool grades with a straight twill weave.

In the fabric boucle the loop yarn is always a worsted filling thread, twisted with a single cotton thread, generally dyed black. The color effects are either solid color in warp and filling with the loop yarn in contrast, or end and end patterns, created by using fancy colored cotton twist yarns. The colors most used are: Brown, dark blue, cadet blue, light green, drab, etc., or these same colors are twisted with a black thread for twist effects. Boucle is usually woven in the pick and pick loom, owing to the fact that there is never more than one pick of loop filling put in at one place, the arrangement generally being 4, 5, 6, 8 picks, cotton or cotton twist, to one pick of worsted loop yarn.

The woven fabric (loom) of this name is very closely imitated by a knitted fabric of similar appearance, which is a light-weight grade of astrakhan.

THE KNITTED FABRIC

is made of cotton yarns, wound in cone shape and placed upon the knitting frame, no warp being required, and the thread which forms the loop is a regular worsted thread, dyed black and wound upon a small bottle bobbin. The loops on the face of the cloth are formed by the loop wheels in the machine throwing the worsted thread between the stitching places, upon the face of the cloth in such a manner as to form a loop.

WARP PREPARATION.

The yarns can be taken direct from the twister and spooled upon small 6-inch spools and these spools assembled in the creel rack at the warp mill and the warp made in sections upon the mill drum, and afterwards run off the drum upon the loom beam: or, the yarns are taken from the twister and the entire number of spools required are placed upon a creel rack and the whole warp made by being run around an upright mill drum, which is an upright framework centred upon an axle and turned by a crank, and having a circumference of from 20 to 50 yards.

If made upon an upright mill, the warp, when finished, is pulled off and beamed.

To finish boucle, the goods are taken from the loom, and scoured in a solution of soap and cold water, after which they are rinsed in cold water, tentered and pressed.

CONSTRUCTION.

Reed, 720—49½ inches—1 end per dent, 20 picks per inch; 2-12s cotton warp and filling.

Warp pattern: 4 black and blue twist, 2 black.

Filling pattern: 4 black and blue twist, 1 black loop yarn.

Carding and Spinning Particulars.

The machines on which the counts of yarn are made in the manufacture of boucle will be found in the first division of mills, as given in a previous lesson. The warp yarn is made from a cotton fibre, as is the filling yarn, but this class of cloth has an extra filling, which is spun from a worsted fibre. This worsted filling is what is known as a loop yarn and when woven into the cloth gives it a rough surface. The loops are obtained by different methods, this one being a three-ply yarn.

THE YARN

to make the filling warp yarns for boucle is made from raw stock having a staple of about one inch. This raw stock is generally mixed, in large quantities, by hand. If two mixings are made, it is a great deal better, for then one mixing can be standing and drying out while the other mixing is being used. The good waste is mixed at this point and sometimes, although on a poor quality of goods, a small percentage of comber waste is used in the mixing. The raw stock is run through an opener and three processes of pickers. The hopper or feed box of the opener should be kept more than half full in order to obtain as even a feed as possible. The speed of the beater is 1,000 revolutions per minute.

The cotton sheet is then passed on to the feed rolls of the breaker and is struck from them by the beater, which, if of the rigid two-bladed type, makes 1,500 revolutions per minute. The total weight of the lap at the front is 40 pounds, or a 16-ounce lap. These laps are doubled, four into one, at the intermediate picker, of which the beater makes 1,450 revolutions per minute. The total weight of the lap at the front of this machine is 39 pounds, or 14½ ounces to the yard. The laps are next

DOUBLED FOUR INTO ONE

at the finisher picker. It is at this point that the cut roving waste is mixed in in the proportion of one lap cut roving to three laps raw stock. The beater of this machine makes 1,450 revolutions per minute, which gives 42 beats per inch of cotton fed. The total weight of lap at the front is 39 pounds, or a 14½-ounce lap. It will thus be seen that the doublings in a picker room, where three processes of picking are used, will be 16 against a total draft of 14.6, the individual drafts at the pickers being about 1.86 at breaker and 2.80 at the intermediate and finisher pickers. The laps are put up at the card, the draft of which for this class of goods should not exceed 100. The speed of the licker-in is 300 revolutions per minute, the top flats making one revolution every 45 minutes. The card fillet of work of this class should use No. 32 wire for cylinder and No. 33 wire for doffer and top flats (No. 32 wire equals 90s English count and No. 33 wire equals 100s). Grind wire once a month, strip three times a day, both cylinder and doffer, although some overseers strip the doffer once more. The weight of the sliver should be about 65 grains per yard and the card should produce between 900 and 950 pounds per week of 60 hours. See that your knifeblades under the licker-in are properly set. The two-knife arrangement is better than the one knife. Use

A LARGE SIZE DOFFER.

In setting your doffer to the cylinder use a No. 5 gauge. Two processes of drawing are generally used and for this class of work it is the general custom to use metallic rolls, as they are better adapted to this class of work than the leather covered top rolls. In calculating the production turned off for metallic rolls always add 33 1-3 per cent over that calculated for leather covered rolls. The sliver weighs about 70 grains per yard and with 400 revolutions per minute of front roll produces 2,100 pounds per week of 60 hours. The roving is then put through the slubber and made into 40 hank roving. It is then run through

TWO PROCESSES OF FLY FRAMES,

where it is made into 1.25 hank at the first intermediate and 2.50 at the second. The roving is then taken to the spinning room. The particulars used for a warp spinning frame making 12s yarn would be as follows: Gauge of frame, 3 inches; diameter of ring, 2⅛ inches; length of traverse, 7 to 7½; speed of spindles, 19,000; and for a filling frame spinning 12s use: Gauge of spindle, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 7 inches; speed of spindle, 6,600. The yarn is then spooled, twisted into 2-ply 12s and warped, after which it is run through a slasher.

Colors for Boucle.

Following are good formulas for deing boucle:

BROWN.

10 per cent thion brown G, 10 per cent sulphide sodium, 30 per cent Glauber's, 3 per cent sal soda.

DARK BLUE.

10 per cent immedial indone B, 10 per cent sulphide sodium, 30 per cent Glauber's, 3 per cent sal soda.

CADET BLUE.

8 per cent immedial sky blue, 8 per cent sulphide sodium, 30 per cent Glauber's, 3 per cent sal soda.

LIGHT GREEN.

4 per cent immedial sky blue, 3 per cent immedial yellow D, 7 per cent sulphide sodium, 30 per cent Glauber's, 3 per cent sal soda.

DRAB.

3 per cent thion black G, ½ per cent thion brown G, 3 per cent sulphide soda, 20 per cent Glauber's, 2 per cent sal soda.

SLATE.

2 per cent immedial black N N, 2 per cent sulphide soda, 20 per cent Glauber's, 2 per cent soda ash.

BLACK.

15 per cent immedial black N B, 15 per cent sulphide soda, 30 per cent Glauber's, 3 per cent soda ash.

SCARLET.

6 per cent diamine scarlet B, 3 per cent sal soda, 30 per cent Glauber's.

RED.

6 per cent benzo fast red 4 B, 30 per cent Glauber's, 3 per cent sal soda.

COMBED YARN GOODS—COTTON LININGS.

Cotton lining is a single cloth, all cotton fabric, weighing from 2 to 2½ ounces per yard, the goods finished at 20¼ inches, including ¼ inch for white selvedge. All combed cotton warp yarns are used in the production of this fabric, which, when finished, is used principally in the manufacture of sleeve linings, and as a stiffening in the more expensive grades of ladies' and men's clothing.

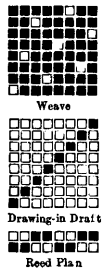
The object of treating the cotton while in the sliver state, to the additional process of combing, is to further assist in the operation of straightening out, or paralleling of the cotton fibres. Combed cotton, after being spun into yarn, produces a smooth, round, even thread.

SLEEVE LININGS

are made of combed yarns which after being dyed the required color are glazed or polished, and this process, in connection with the weave employed, generally an eight harness satin warp effect face, gives to the yarn in cloth the appearance of a close woven hair cloth fabric. The finished fabric has a very smooth, hard, even face, though not a harsh feel.

Linings are usually made in solid black color, or in fancy bright colored stripes, upon a black ground. The colors forming the stripe patterns are cherry red, cadet blue, yellow, red, brown, etc.

The glazing machine consists mainly of a large copper cylinder, four or



five feet in diameter. This cylinder is heated to a high degree of intensity by either gas or steam.

As the cylinder revolves, there are a series of rollers working against its surface, and running in an opposite direction. These rollers are set in the machine frame above the cylinder and at regular distances, in much the same manner as the workers and stripper on a woolen card.

The yarn is fed to the machine through a pair of feed rollers, from which it passes over the face of the cylinder, and under the small rollers, or, in other words, between the cylinder and the small rollers, after which it is delivered by a pair of rollers, similar to the feed rollers. The yarn is run through the machine twice, the object being to submit all parts of its surface to the friction, to cause the glaze to come up.

Linings can be woven in a single

box roller or clipper loom. Lots of trouble is thus developed by the fancy strapping required to produce the satin weave effects.

Good results are obtained by using plain, single box loom, having a dobby or witch top attached.

To finish this fabric, the goods are taken from the loom and lightly starched, then run through the calender two or three times to set the smooth, glazed finish.

CONSTRUCTION.

Reed, 1,000—23 inches in reed, two ends per dent; 62 picks 1-30s black cotton filling, 1-20s cotton (glazed warp) yarn.

Warp pattern: 10 black, 4 cadet blue, 10 black, 4 yellow. Weight, about 2¼ ounces; finish, 20¼ inches. Eight harness satin weave; warp effect face.

Carding and Spinning Particulars.

Cotton linings are made of various counts of yarn, according to what grade of linings is wanted. In this article we will consider that the cotton warp yarn is 1-20s combed, and the filling yarn 1-30s. The yarn for linings of this grade would be spun in mills of the second division, as given in a previous lesson, although yarns for linings are made in all three divisions of mills.

THE RAW STOCK

used should be of a fair grade, with a staple of about 1 5-16 inches. This is put through a bale breaker and from here carried by a series of endless lattices to its proper bin.

The bins to hold the different grades of cotton should be plainly marked on both ends, showing the kind, grade and length of staple, so that no mistakes will occur through guesswork. If different lengths of staple get mixed together it will cause a great deal of trouble at the machines, having their rolls set at a certain distance of one length of staple.

The cotton is fed to the bale breaker in the manner described in the last lesson. The cotton is allowed to dry out as much as possible before being fed to the opener. The good waste is mixed in at the bins. This class of cotton passes through an opener and either two or three processes of picking (generally two processes being used). If only two processes are used the particulars given for the intermediate picker may be omitted. Use the different speeds of the opener and pickers as given in a previous lesson. The total weight of the lap at the front end of the breaker picker is 50 pounds, or 16 ounces to the yard. This is put up at the intermediate and

DOUBLED FOUR INTO ONE

and this lap at the front end has a total weight of 37 pounds, or 12 ounces to the yard. This lap in turn is put up at the finisher picker and doubled four into one. It is at this point that the cut roving waste is mixed in in a proportion of three laps of raw stock to one lap of cut roving. The total weight of lap at the front is 35 pounds, or 12½ ounces to the yard. The laps are then put up at the card, the draft of which should not be less than 120. A large doffer should be used; the card should be stripped three times a day and ground at least once a month.

The cylinder speed is 160 revolutions per minute; speed of licker-in, 300 revolutions per minute. The top flats should make one complete revolution every 35 minutes. The production of the card should be 500 pounds per week of 60 hours, the weight of the sliver being 50 grains per yard. The sliver (in cans) to be used for warp yarn is collected and passed to the

SLIVER LAP MACHINE,

or, as it is sometimes called, the small doubler; here it is doubled 14 into 1 and made into a lap. This sheet of lap weighs 395 grains to the yard. Six of these laps are put up at the ribbon lap machine, or, as it is sometimes called, the large doubler. These are doubled into one sheet of lap, which weighs 260 grains per yard. Six of these laps are put up at the comber and made into a sliver weighing 45 grains per yard. The speed of the comber should be about 90 nips per minute. The machine is set so as to take out 18 per cent of waste. The draft of this machine for this class of cotton should be about 27.50.

This sliver is then put through two processes of drawing, the weight of the sliver at the front of the finisher drawing being 70 grains per yard. The speed of the front rolls of this machine is 350 revolutions per minute. Either metallic or leather covered top rolls may be used. The sliver is put through the slubber and made into .50 hank roving. This roving is passed through

TWO PROCESSES OF FLY FRAMES,

the hank roving at each being as follows: At first intermediate, 1.50; at second intermediate, 4.50. This is then

taken to the ring spinning room and spun into 20s yarn, using a frame having a spindle gauge of 2¾ inches, a 2-inch diameter ring, a 7-inch length of traverse, a spindle speed of 9,400 revolutions per minute, and a twist per inch of 21.24. This yarn is next spooled, then warped, after which it is put through the slasher.

The weights and processes used for

THE FULLING YARNS

are different from the above. Starting at the card, the draft should be about 100; the flats make one complete revolution every 50 minutes; the sliver weighs 65 grains per yard.and the production is 700 pounds per week. This is then put through three processes of drawing, the weight of the sliver at the finisher drawing being 73 grains per yard. The slubber roving is .55 hank. This is put through two processes of fly frames, the hank roving being as follows: At the first intermediate 2.00 and at the second 7.25 hank. This roving is then taken to either the ring spinning or the mule room and spun into 30s yarn. If the former, use a frame having a gauge of 2¾ inches; diameter of ring, 1⅜ inches; length of traverse, 6 inches; speed of spindles, 8,300 revolutions per minute; twist per inch, 19.17.

Dyeing Particulars.

Many of the cheap linings are dyed a logwood black. By some people logwood black is asked for, because the goods gain in weight, as logwood feeds the goods, adds weight and substance, and all artificial blacks reduce the weight of the cloth.

The logwood bath generally used is the steam black. First, the goods are padded in a solution of logwood about 5 degrees Tw., dried over steam cans, run through a solution of bichromate of soda four ounces to the gallon, and then run through a steam box, and afterwards rinsed well in water. A one-dip aniline black is also dyed in some cases, and the oxidized aniline salt black is dyed to a large extent.

The new sulphur blacks are being gradually introduced and may,in time, supersede all other blacks. But for most purposes the black obtained by logwood is all that is required.

The black and colored prints are printed with resist colors, and afterwards padded with aniline black, and finished with calendered, bettle or schreiner finish. Most finishes are very bright and glazed.

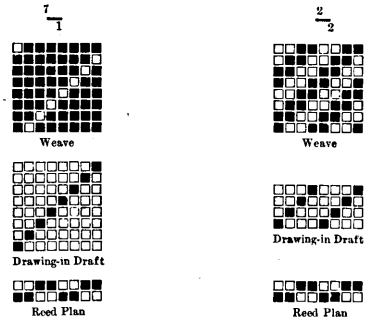
CASHMERE TWILL.

Cashmere twill is a light-weight, single cloth, weighing from 2½ to 3 ounces per yard, finished at 27 to 28 inches wide, and composed of about 1-20s cotton warp, and 1-16s to 1-20s cotton or cotton shoddy filling.

It is usually woven with an even or uneven sided twill weave, such as $\frac{2}{2}$ or $\frac{7}{1}$, the warp being all black, of dyed yarn, and the pattern being printed upon the face of the goods after the weaving operation.

THE PATTERNS

are generally small effects, produced by printing drabs or grays upon the black ground in imitation of twist



yarn effects, the whole forming somewhat the appearance of a fancy mixed woolen fabric.

This style of cloth was used principally in the manufacture of ladies' fall novelty suitings, and can be woven on either the plain roller loom or a medium weight loom having dobby or witch attached.

To finish this fabric, the cloth is taken from the loom and run through the printing machine to produce the pattern upon the face of the fabric, after which the goods are lightly sized and calendered.

CONSTRUCTION.

Reed, 700—30 inches in reed, 2 ends per dent—16 ends selvedge $\frac{2}{2}$ 45 degrees twill weave; 1-20s cotton warp (black); 42 picks 1-16s cotton filling.

1,166 ends plus 16 equals 1,182 ends plus 5 per cent take-up in warp in weaving equals 1,227 yards 1-20s cotton warp equals 1.17 ounces; 42 picks

times 30 inches equals 1,260 yards 1-16s cotton filling equals 1.5 ounces.

1.17 ounces warp weight plus 1.5 ounces filling weight equals 2.67 ounces per yard.

Carding and Spinning Particulars.

The warp yarn used in the manufacture of cashmere twills may be made in either the first or second division of mills as given in a previous lesson. The filling yarn may be made in a cotton mill or in a woolen mill. For this article we will consider the warp and filling yarns to be 1-20s. For this count of yarn a medium grade of cotton should be used. A bale breaker would not be used, although it would improve the yarn. The mixing would be done by hand and as large a mixing as possible would be made at one time. By doing so there will be a saving time and also a more even yarn will be secured. The bales of cotton should be sampled and mixed in the manner described in a previous lesson.

As the mixing is done by hand it should be allowed to stand as long as possible, so as to dry out, thus making the cotton

EASIER TO HANDLE.

It is at this point that the good waste from the machines up to the slubber is used. This waste should be pulled apart as much as possible before being thrown into the mixing so that it will not work around the pin beater of the opener as it is apt to do when left coiled up. The cotton is put through an opener and two processes of picking.

The speed of the beater of the opener should be about 1,700 revolutions per minute. The hopper should always be kept half full and the fly cleaned out at frequent and regular intervals. The speed of a two-bladed rigid type beater of the breaker picker for this stock should be about 1,500 revolutions per minute. The total weight at the front is 40 pounds or 16 ounces to the yard.

THE LAPS

are doubled four into one at the finisher picker, and it is at this point that the cut roving waste laps are mixed in in the proportion of three laps of raw stock to one lap of cut waste. The speed of this beater (two bladed rigid type) is 1,450 revolutions per minute. This will give the cotton passing through the machine about 42 beats per inch of cotton fed. The total weight of the lap at the front should be 39 pounds or 14 ounces to the yard. Take good care of your machines and keep them well oiled, cleaned, and set and the work will be greatly improved, both as to appearance and production. The lap is put up at the card and the draft should not exceed 100. The flats should make one complete revolution every 45 minutes.

THE CARDS

should be cleaned at least twice a day and the fly taken from underneath once a day. The stripe waste should be gathered four times a day. The cards should be stripped (doffers and cylinders) three times a day and ground once a month, except in the case of accidents, when they should be ground until the wire is level and sharp. Light grinding should always be used. Use as large a doffer as possible, use either one having a 26 or 27 inch diameter. The production of a card on this stock should be about 800 pounds for a week of 60 hours. The card sliver is then put through

THREE PROCESSES OF DRAWING FRAMES.

Metallic rolls may be used to great advantage on this grade of stock. The sliver at the front of the finisher drawing frame should weigh about 70 grains to the yard. The slubber draws this sliver into .40 hank roving. It is then put through the fly frames. The roving for warp yarns is then taken to the ring spinning room and the roving for filling may be taken to either the ring spinning or the mule room. For this class of goods the filling yarn is generally ring spun. For a warp frame spinning 20s use the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 2 inches; length of traverse, 7 inches; twist per inch, 21.24; speed of spindle, 9,400 revolutions per minute. For a filling frame use a frame having a 2¾ inches gauge, 1½ inches diameter ring, 6½ inches length of traverse, the yarn having 14.50 turns per inch, and the speed of the spindles is 7,300 revolutions per minute. The warp yarn is then spooled, warped and put through a slasher.

Dyeing Particulars.

BLACK WARP.

15 per cent sulphur black, if for jet black, immedial N N, if for blue black, immedial N B, 15 per cent sodium sulphide, 30 per cent Glauber's, 3 per cent soda ash. Dyed in a warp dyeing machine. After the goods are woven and cleaned with a good soaping and rins-

ing, they are sent to the printer and printed with different patterns and styles, to imitate mixed woolen fabrics, and are then finished and made up like woolen goods.

BAYADERE MADE ENTIRELY OF MERCERIZED COTTON.

In a previous article a description was given of a "bayadere" fabric, in which the materials of which it was constructed were cotton, worsted and silk and whose foundation was a "rep" weave.

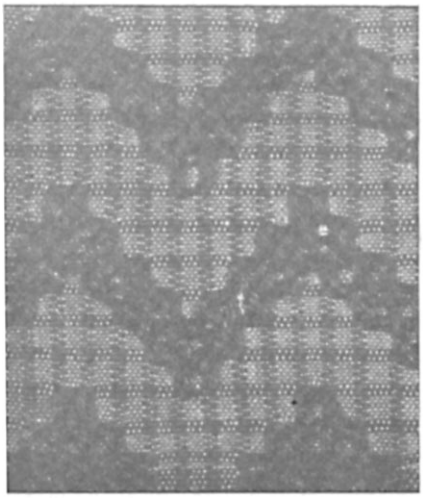


Fig. 1.

It is now intended to show another "bayadere" fabric, but which is composed entirely of mercerized cotton and whose structure is based upon the plain weave, the finished width 36 inches and the weight 4¾ ounces per finished yard.

Such a fabric is shown in Fig. 1, which is a very good illustration of this class of patterns, whose chief feature is the zigzag stripe extending across the cloth in the direction of the weft.

The size and elaborate effect of this pattern make it resemble a jacquard effect, but it can in fact be produced on a comparatively low number of harnesses.

Fig. 2 shows the full design. which is complete on 64 warp threads and 48 picks.

As before mentioned,the plain weave is used as the

BASIS OF THE FULL DESIGN,

and between the stripes (ground) all the threads are interlaced on the plain weave and form a single cloth; but the stripes themselves . (figure) are formed by lowering all the fine threads (marked | at top of full design, Fig. 2) and raising all the coarse threads (marked .) to the surface of the cloth and thus forming a double cloth, with each of the two single cloths thus formed interlaced with the plain weave, throughout the stripe or bayadere.

Fig. 3 illustrates the drawing-in draft, which requires 18 shafts, 10 for the ground and 8 for the figure threads.

Fig 4 shows the reeding pan.

The material and arrangement of the threads are as follows:

Warp: 6 threads 2-40s blue mercerized cotton (one in a heddle), four threads 2-20s black mercerized cotton (two in a heddle); total, 10 threads in one repeat of pattern.

950 reed—38½ inches wide to finish 36 inches, 40 picks per inch.

Filling: 6 picks 2-40s blue mercerized cotton (single),2 picks 2-20s black mercerized cotton (double); total, 8 picks in one repeat of pattern.

Fig. 5 shows the chain draft required. The back picks must positively come on the bars marked.

It will be noted that the black 2-20s cotton used in the warp is introduced 2 threads in one heddle, and in the weft the same yarn is wound double, or two threads on a bobbin, which is done for the following reason: In many cloths from which this particular pattern was derived the black cotton used was very much heavier, that is, about 2-10s or 2-12s, with one thread introduced in one heddle, instead of two threads, which made the fabric appear very coarse and open in texture; therefore, by using two threads of 2-20s the same weight of yarn is employed, but being finer and the two threads lying side by side, the cloth is given a much finer and closer texture.

COLORS.

In cloths of this description the bayadere stripe is generally black, which gives very great freedom in the choice of colors for the ground, as any good color may be combined with black, without any danger of the other suf-

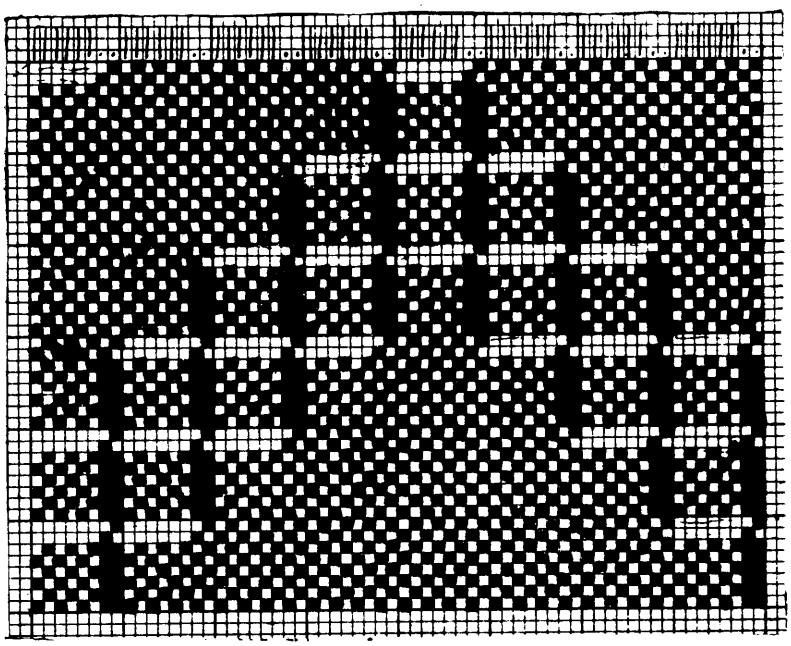
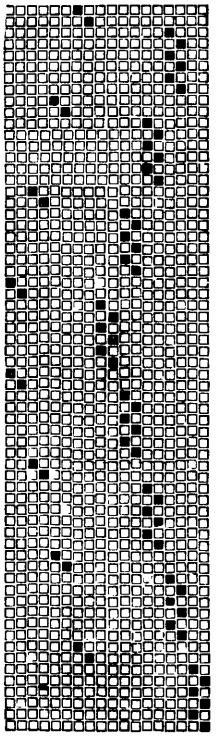


Fig. 2.



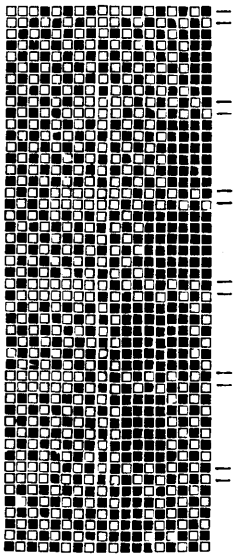
Drawing-in Draft.

Fig. 3.

Reeding Plan.

Fig. 4.

Chain Draft.



Front.

Fig. 5.

fering by being placed in juxtaposition.

THE REQUIRED LOOM.

In selecting the kind of loom for weaving the above cloth, almost any make of loom can be used which will carry 20 shafts and have the capacity of carrying at least 2 shuttles.

FINISH.

A dry finish only is required for this fabric and the process is as follows: After being burled and mended the cloth is brushed and steamed and then pressed so as to give as much lustre as possible. After being rolled, the cloth is then ready for shipment.

Dyeing Particulars.

PURPLE.

On a tannine and tartar emetic mordant, dye in fresh bath, 1 per cent methylviolet 3R.

On tannine mordanted yarn dye with ½ per cent rhodamine 5G, which dyes a pink; for a rose use 2 per cent color.

SCARLET.

3 per cent diamine scarlet, 30 per cent Glauber's, 3 per cent sal soda.

CHINA BLUE.

On tannine mordanted yarn dye 1 per cent new methylene blue GG.

SKY BLUE.

3 per cent diamine sky blue, 30 per cent Glauber's, 3 per cent sal soda.

NAVY BLUE.

4 per cent diamine black B H, 30 per cent Glauber's, 3 per cent sal soda.

TURQUOISE BLUE.

On a tannine mordant dye 1½ per cent turquoise blue G.

EMERALD GREEN.

On a tannine mordant dye 2 per cent emerald green cryst.

LIGHT BROWN.

½ per cent diamine fast yellow B, 1 per cent diamine brown B, 20 per cent Glauber's, 3 per cent sal soda.

BROWN.

2 per cent tetrazo brown R, 1 per cent tetrazo brown G G, 30 per cent Glauber's, 3 per cent sal soda.

RED.

4 per cent benzo fast red 4 B S, 30 per cent Gauber's, 3 per cent sal soda.

HELIOTROPE.

2 per cent tetrazo lilac R, 30 per cent Glauber's, 3 per cent sal soda.

ORANGE.

2 per cent tetrazo orange TR, 30 per Glauber's, 3 per cent sal soda.

SLATE.

½ per cent diamine black B H, ½ per cent oxydiamine black A, 30 per cent Glauber's, 3 per cent sal soda.

PIQUE.

Pique is a heavy cotton material woven in corded or figured effects. The goods are used for such purposes as

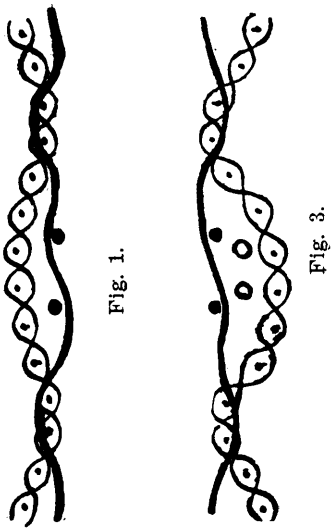


Fig. 1. Fig. 3.

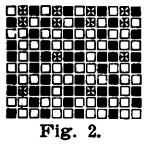


Fig. 2.

ladies' so-called tailor-made suits, vestings, shirt fronts, cravats, bedspreads and the like.

The plainest and most common fabrics of pique are those in which the pattern consists of straight cords extending across the cloth in the direction of the weft. In

THE CONSTRUCTION

of these fabrics both a face and a back warp are required and the cords are produced by all the back warp threads being raised at intervals of 6, 8, etc., picks over two or more picks of the face cloth, which has a tendency to draw down on the sur-