face of the fabric. The goods are always woven white and no colors are ever used.

The face warp threads are generally finer than the back warp threads and are in the proportion of two threads for the face and one thread for the back.

cloths, as illustrated by the diagram Fig. 3. See dots o.

In the lightest and cheapest grades, neither any wadding nor back picks are used. In this case the back warp threads float on the back of the fabric, except when raising over the face picks to form the cord.

Design.

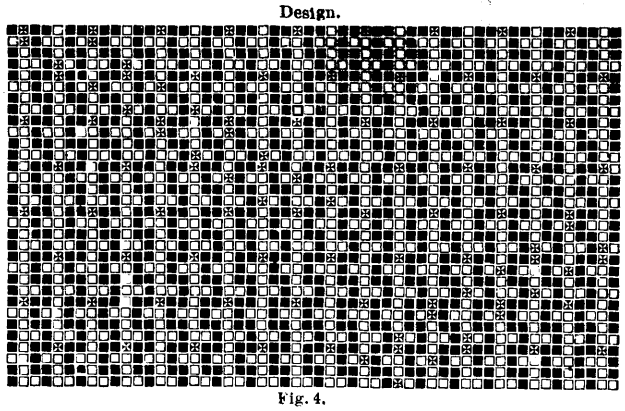


Fig. 4.

In the diagram Fig. 1, which is a sectional cut of a fabric woven with the design Fig. 2, the heavy black lines represent the back warp threads, and it will be noticed that they are raised over two of the face picks, represented by the small dots (.).

The heavy dots (.) represent the back picks, which interlace with the back warp threads only. The fine lines represent the face warp threads.

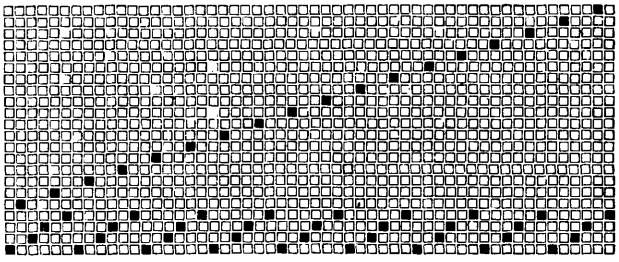
In the heavier and better grades of pique, heavy or coarse picks, called wadding, are used to increase the weight and also to give more prominence to the cord effect. They are introduced between the face and back

FIGURED PIQUE.

In the figured pique the binding of the back warp threads into the face cloth is not done in straight lines as in the plain pique, but the binding points are introduced so as to form figures.

These fabrics are woven in the white and the figures are purely the result of binding the face and back cloths together. As a result of this method of binding, the cloth is characterized by the embossed appearance of the figures. In the best grades heavy wadding picks are used and these tend to greatly heighten the raised effect of the figures. The effect produced is about the same as when two light

Drawing-in-Draft.



Reeding Plan.

Fig. 5.

cloths are laid together with wadding between and then stitched together on a sewing machine, the stitching being in the form of figures.

White Marseilles bedspreads are the highest and most elaborate form of piques, and in these the pattern covers the entire spread. Geometrical figures, birds, foliage and most every conceivable manner of form are used, and all being embossed, the ultimate effect is very fine. In the example which we shall take, a small figure pique is given, with the following for the

ANALYSIS OF THE FABRIC:

Width of warp in reed (without selvedge), 38 inches; width of fabric finished, 36 inches; ends per inch, 100; ends in warp, 3,600—1,200x3 reed.

Take-up of warp during weaving, 8

Chain Draft.

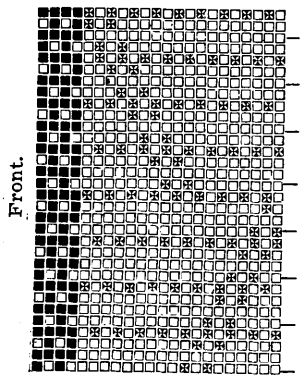


Fig. 6.

per cent; weight of fabric, per yard, from loom, 9¾ ounces; shrinkage of fabric in length during finishing, 2 per cent; finished weight 9 ounces.

Dressing: 3 threads in pattern. One thread 1-30s white carded peeler cotton; 1 thread, 2-30s white carded peeler cotton; 1 thread, 1-30s white carded peeler cotton; equals 3.

Filling: 4 picks repeat of pattern, 168 picks per inch. One pick, 1-30s white carded peeler cotton; 1 pick 1-9s white carded peeler cotton; 2 picks, 1-30s white carded peeler cotton; equals 4.

In Fig. 4 is shown the full design.

Fig. 5 illustrates the drawing-in draft on 22 harnesses—4 required for the face warp threads and 18 for the back warp threads. The reeding plan is also given.

Fig. 6 is the required chain draft.

LOOM REQUIRED.

For the plain pique a dobby loom having drop boxes and from 4 to 16 shafts only is required, but for the figured pique a loom of more intricate construction is required and the Crompton & Knowles Loom Company build a loom especially adapted for the purpose. Their jacquard machine, which is of the rise and drop type, is especially adapted for the weaving of Marseilles quilts, and has features that dispense with the so-called "plain card," using only the figure card.

FINISHING.

These fabrics, after being scoured and bleached, are hot pressed, rolled or folded, and are then ready for shipment.

Carding and Spinning Particulars.

Pique is made up in various ways and is constructed of yarns, the count of which varies from very coarse to very fine. The fabric which is described is considered as being made up of 1-30s and 2-30s in the warp and 1-30s and 1-9s in the filling. For making this grade of cloth the machinery found in the second division of mills would be used.

THE COTTON USED

would be a good grade of "peeler," of about 1 5-16th inches staple. This cotton would be brought from the storehouse and each bale sampled; all those bales not up to sample should be laid one side. The bales of the same length of staple should be opened and fed to the bale breaker alternately from each bale in small lots at a time. From the bale breaker the cotton is carried to the bins by lattice work or by trunking and a blower and fan. The mixing should be allowed to stand in the bins as long as possible before being used. so that the cotton will be free from moisture. It is at this point that the

GOOD WASTE

from the machines up to the slubber is mixed in, the sliver being torn into short lengths before being thrown into the mixing. The raw stock is put through an opener and either two or three processes of picking. If three processes of picking are used for the intermediate picker the same particulars are followed as in the case of the finisher except where noted.

The hopper of the opener should be always kept more than half full of raw stock, so as to feed an even sheet of

cotton to the breaker picker. The speed of a porcupine beater of this machine should be about 1,050 revolutions per minute. The speed of a two-bladed rigid type beater for the breaker picker should be 1,500 revolutions per minute, the fan speed being 1,400 revolutions per minute. The total weight of the lap at the front should be 40 pounds, or a 16-ounce lap. If an intermediate picker is used, the laps are doubled four into one and the

TOTAL WEIGHT OF THE LAP

at the front should be 37 pounds, or a 13-ounce lap. These laps are put up at the finisher picker and doubled four into one. At this point the cut roving waste is mixed in, in the proportion of one lap of waste to three laps of raw stock. The speed of the beater should be about 1,450 revolutions per minute, which gives the cotton passing through the machine about 42 beats or blows per inch. The total weight of the lap at the front should be 35 pounds, or a 12½-ounce lap. Look out for your fan drafts to see that they are properly regulated so as to obtain an even lap. The laps are then put up at the card.

THE CARD

should have a draft of not more than 100. The count of wire fillet used should be medium, the wire for the tops and doffer being one number finer than for the cylinder. The card should be ground at least once a month and should be stripped three times a day. The flats should make one complete revolution every 50 minutes. Use a large doffer, either 26 or 27 inches in diameter. The weight of the sliver should be 65 grains per yard, the production for a week of 60 hours being 750 pounds. The sliver is put through three processes of drawing frames, the speed of the front roll being 350 revolutions per minute. The doublings are 6 into 1. The draft of the first intermediate is about 5.5, the second 5.75, and the third 5.75; the sliver weighing at the front of the finisher about 72 grains per yard. The sliver is then put up at the slubber and made into .50 hank roving. This roving is then put through

TWO PROCESSES OF FLY FRAMES,

the hank roving at the first intermediate being 2.00 and at the second being 7.50. This makes all the roving for this cloth, except for the 9s. This is made from a 2.00 hank roving. The roving for warp yarns is taken to the spinning room and made into 30s yarn. From here it is spooled and part of it twisted into 2-30s yarn, after which it is warped and slashed. The filling yarn may either be mule or ring spun. We will consider this yarn to be ring spun. The particulars to use for No. 30s would be as follows: Gauge of frame, 2¾ inches; diameter of ring, 1⅜ inches; length of traverse, 6 inches; speed of spindle, 8,300 revolutions per minute; to spin 9s use 1⅝-inch diameter ring, 7-inch traverse, and a spindle speed of 6,200 revolutions per minute. Part of the 30s yarn is twisted into 2-30s.

Dyeing Particulars.

PEARL.

Dye in the jigger dyeing machine with 15 gallons liquor, 50 pounds weight of goods, 175 degrees F., one-half pound of soda ash, one-half pound sulphide sodium, 1 pound common salt, 3 ounces immedial black V ex., 1 ounce immedial brown B. Run the goods for 40 minutes; add in two portions the dyestuffs; rinse and aftertreat with ½ per cent bichromate potash, ½ per cent sulphate copper, at 170 degrees F., and rinse well. Give a weak soaping if required.

CREAM.

Dye with the same proportions as for pearl, and in the same way, with one-half ounce immedial yellow D, one ounce immedial cutch G.

BUFF.

Dye with same proportions as pearl, with 6 ounces immedial bronze A.

LIGHT SLATE.

Dye with same proportions as pearl, 6 ounces immedial black V.

DRAB.

As light slate; 2 ounces immedial black V; 6 ounces immedial bronze A.

LIGHT BROWN.

On the jigger, as pearl; 3 per cent immedial cutch G, 3 per cent sodium sulphide, 3 per cent soda ash, 15 per cent common salt.

LIGHT OLIVE DRAB.

Dye as pearl; one-half pound pyrogene yellow M; 14 ounces pyrogene olive N; 4 ounces pyrogene cutch 2G; aftertreat as pearl.

MADRAS GINGHAM.

Madras gingham is distinctly a shirting fabric and is an article of fine quality. Zephyr gingham is a dress gingham and is lighter and of softer finish than the madras gingham.

Madras gingham is distinguished from the common gingham by the fineness of the texture and the richness of the patterns employed. In the common gingham the plain weave is chiefly used and the patterns consist only of stripes and checks formed by contrasting colors—principally white with some other color—and is chiefly made on roller looms.

The Fabric.

Fig. 1.

In the madras ginghams

VARIOUS WEAVES ARE USED

in combination with the plain weave which is always used for the ground, while very often leno weaves are introduced for ornamentation.

The number of colors used in conjunction with white often reaches as high as five and six in a single pattern, while printed yarns are extensively used with fine effect.

Fig. 1 is a very neat illustration of a madras gingham in a leno stripe effect. The chief features of this pattern are the leno diamond stripe on a background of old rose, and the heavy cords of white and of tan. The blue stripe between the white cords is also a prominent feature.

ANALYSIS OF THE FABRIC.

Width of warp in reed (selvedge included), 29½ inches; width of fabric, finished, 28 inches; size of reed required, 1,600—ends per dent, 2 and 3; ends in warp, 2,616.

Take-up of warp during weaving as follows: 1-50s plain weave, 1½ per cent; 3-50s cords, 0 per cent; 3-50s leno whip threads, 50 per cent.

Number of beams required, 3 (on account of the various take-ups). Weight of fabric per yard from loom, 1¾ ounces.

Shrinkage of fabric in length during finishing, 2 per cent. Finished weight, 1.92 ounces.

Pattern for beaming:

136 threads per pattern.

19 repeats of pattern in warp.

x 4 threads 1-50s white cotton.
0 1 thread 3-50s white cotton.
x 2 threads 1-50s tan cotton.
0 1 thread 3-50s white cotton.
x 10 threads 1-50s white cotton.
* 1 thread 3-50 white cotton.
x 6 threads 1-50s fr. blue cotton.
* 1 thread 3-50s white cotton.
x 8 threads 1-50s white cotton.
0 2 threads 1-50s fr. blue cotton as 1.
x 8 threads 1-50s white cotton.
* 1 thread 3-50s white cotton.
x 6 threads 1-50s fr. blue cotton.
* 1 thread 3-50s white cotton.
x 10 threads 1-50s white cotton.
0 1 thread 3-50s white cotton.
x 2 threads 1-50s tan cotton.
0 1 thread 3-50s white cotton.
x 6 threads 1-50s white cotton.
0 1 thread 3-50s white cotton.
x 2 threads 1-50s tan cotton.
0 1 thread 3-50s white cotton.
x 10 threads 1-50s white cotton.
x 2 threads 1-50s fr. blue cotton.
* 1 thread 3-50s white cotton.
x 2 threads 1-50s fr. blue cotton.
* 1 thread 3-50s white cotton.
x 2 threads 1-50s fr. blue cotton.
x 8 threads 1-50s white cotton.
0 2 threads 1-50s fr. blue cotton as 1.
x 8 threads 1-50s white cotton.
x 2 threads 1-50s fr. blue cotton.
* 1 thread 3-50s white cotton.
x 2 threads 1-50s fr. blue cotton.
* 1 thread 3-50s white cotton.
x 2 threads 1-50s fr. blue cotton.
x 10 threads 1-50s white cotton.
0 1 thread 3-50s white cotton.
x 2 threads 1-50s tan cotton.
0 1 thread 3-50s white cotton.
x 2 threads 1-50s white cotton.

Total 136 threads.

Put threads marked x on bottom beam.

Put threads marked 0 on middle beam.

Put threads marked * on top beam.

1-50s cotton must be well sized.

Number of threads of each color in

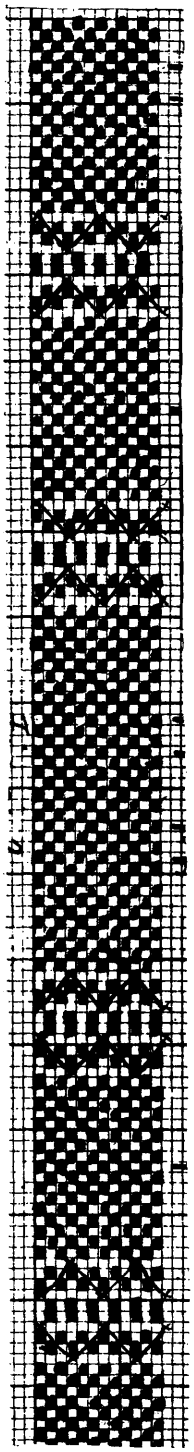
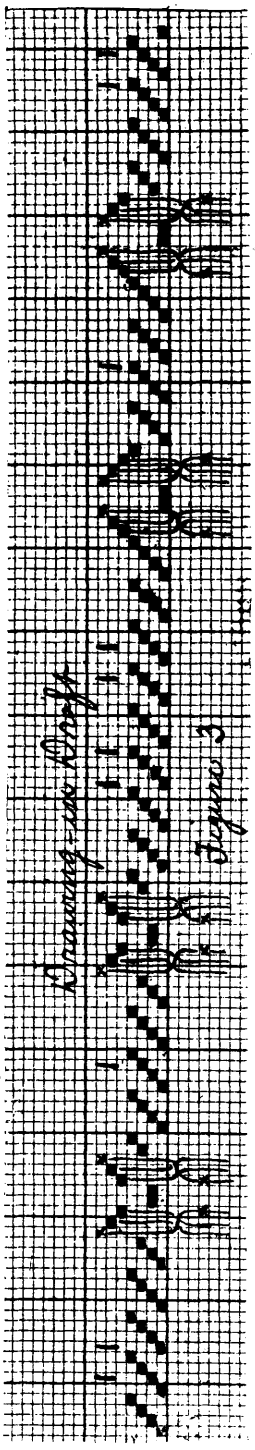


Fig. 2.



Reeding Plan.
Fig. 4.

pattern: 1-50s white, 84; 1-50s tan, 28; 1-50s fr. blue, 8; 3-50s white, 16; total, 136.

Number of threads of each color in warp: 1-50s white, 1,628; 1-50s tan, 532; 1-50s fr. blue, 152; 3-50s white, 304: total, 2,616.

Filling: 72 picks per inch; all white 1-60s cotton.

The full design is illustrated at Fig. 2, and is complete on 136 warp threads and 12 picks. The drawing-in draft is illustrated at Fig. 3, and is complete on 7 harnesses and 2 doup shafts.

Fig. 4 is the reeding plan.

Fig. 5 is the harness chain draft for 12 bars.

THE LOOM REQUIRED.

Ordinarily to produce a leno fabric like the madras cloth above analyzed a close shed loom is required, and with the harnesses raising and lowering at every pick it necessarily requires a comparatively slow speed; but the Crompton & Knowles Loom Company build a dobby (open shed) known

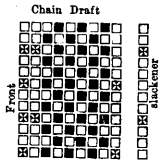


Fig. 5.

as the Stafford dobby, which is especially adapted for the weaving of leno cloths and all descriptions of cotton goods that can be produced on 20 harnesses, which is the limit of its capacity. This is the best loom that is on the market to-day for weaving these goods. The loom should be built with a 42-inch reed space and with 4x4 boxes.

FINISH REQUIRED.

After these goods are received from the looms they must be examined carefully and all spots of dirt and grease removed, the selvedges trimmed and all runners (that is, filling pulling in at the sides) and also bunches and large knots must be taken out.

They are then run through a starching machine and given a medium starching.

They are then run through a calender, which flattens out the threads and removes all wrinkles and gives the cloth a much smoother surface, besides giving it an appearance of finer texture.

After measuring and rolling, the pieces are put in a hydraulic press and submitted to a pressure of many tons weight. They are then labeled and papered and are then ready for shipment.

Carding and Spinning Particulars.

The machinery required to make the yarns for madras ginghams will be found in mills of the second division, although mills of the third division (as given in a previous lesson) also make this grade of yarn.

THE COUNT OF YARN

which we will consider in making this class of goods is 1-50s and 3-50s for the warp yarns and 1-60s for the filling. This stock is made out of a good grade of cotton, the staple of which is about 1½ inches to 1⅝ inches in length. The cotton is brought to the picker room and sampled and graded by the overseer in charge of the card room, although in large mills when a cotton sampler is employed he also is present at mixing time.

The bales of cotton are sampled and all those of the same length are placed together. After the lot is sampled, a few (four or five) bales are placed around the bale breaker and fed to this machine, a small lot being taken from each bale alternately, until all the cotton is gone. The bagging which comes around the cotton is then placed in a pile, where later it will be picked clean of all cotton and then it is placed with other bagging, which is sold. The ties which bind the bales are also sold.

THE BALE BREAKER.

The draft of a bale breaker is quite large, but as the cotton is in large lumps it only acts on it by pulling it apart so that a good deal of the draft is lost. The production of a bale breaker is from 80,000 to 90,000 pounds per week.

The cotton is conveyed by endless lattices from the bale breaker to the bins; sometimes a blower and trunks are used in connection with the lattices. Where one is used it has been found that the cotton is in better shape to work and does not have to be dried out as long in the bins. Large mixings should always be used for the reasons given in previous articles.

At the bins the sliver waste of the same length and grade of cotton is mixed into the raw stock. As this is generally done by the man that collects the waste, it is always a good plan to watch him to see that he puts the waste that he has collected in its

proper bin. The raw stock for this class of goods is put through a porcupine opener and

TWO PROCESSES OF PICKING.

Keep the hopper of the opener more than half full of raw stock, because by so doing a more even feed will be obtained and this will help to make an even yarn. The speed of the beater of the opener should be about 1,050 revolutions per minute. The cotton is passed up to the feed rolls of the breaker picker. There are two of these rolls, top and bottom, and they present a sheet of cotton to the beater, which is generally of the two-bladed variety. This beater has a speed of about 1,500 revolutions per minute, and the fan a speed of 1,400 revolutions per minute. The total weight of the lap at the front end of the breaker picker is about 40 pounds, or what is called a 16-ounce lap, meaning that each yard of lap weighs 16 ounces.

The laps are taken from the breaker picker and put up at the finisher picker, the doubling (or number of laps put up) being 4 into 1. It is at this point that the cut roving, of the same length and grade, is mixed in, it having first been put through a special process, which takes out the twist, and also a picker, which forms into a lap. The proportion of cut waste used is one lap of cut waste to three laps of raw stock. The beater of the finisher picker makes 1,450 revolutions per minute. The total weight of the lap at the front of the finisher picker is about 35, or a 12½-ounce lap for both warp and filling yarn. The lap is put up at

THE CARD.

The draft of this machine for this class of goods should not be less than 110; the wire fillet used on the cylinder should be No. 34 wire or No. 110 English count, and on the doffer and top flats No. 35 or No. 20 English count wire should be used. The cards should be ground once every three weeks and stripped (doffer and cylinder) three times a day. The cards should be thoroughly cleaned twice a day and wiped down twice more.

The speed of the cylinder should be 165 revolutions per minute, the licker-in speed 290 revolutions per minute. The top flats should make one revolution every 34 minutes. The weight of the sliver at the front end should be 65 grains, and the production 600 pounds per week of 60 hours. Use a larger diameter doffer, either 26 or 27 inches. On some grades of madras ginghams the filling yarn is combed, but as we have put the cotton in this article through what is called fine carding we will consider that both the warp and filling yarns are to be only carded. The sliver is taken from the card and put through

THREE PROCESSES OF DRAWING FRAMES.

The doublings of these machines are six into one. The weight of the sliver at the finisher drawing frame is 70 grains. Look out to see that the top rolls are all properly varnished and in good repair, or are thoroughly cleaned if metallic rolls are used; see that all stop motions are in proper working order and that the help keep the machine running. The drawing sliver is put through the slubber and made into .50 hank roving. From here it is put through three processes of fly frames and made into 10 hank for 50s count yarn and 12 hank for 60s yarn. In 10-hank roving the hanks made at the different processes are as follows: 2 at first intermediate, 4 hank at second intermediate and 10 hank at the jack frame. For 12 hank it is 2 hank at first intermediate, 4 hank at second intermediate and 12 hank at the jack frame. The roving for warp yarn is carried to

THE RING SPINNING ROOM

and spun into 50s yarn on a frame having the following particulars: 2¾ inches gauge of frame; diameter of ring 1½ inches; length of traverse, 6 inches; speed of spindle, 10,000 revolutions per minute. This yarn is then spooled and the yarn for the plain weave is then warped and then put through a slasher. The following mixing may be used for heavy counts: Water, 100 gallons; potato starch, 65 pounds; tallow, 6 pounds; Yorkshire gum, 3 pounds; white soap, 2 pounds; boil 1¾ hours. The 50s count yarn for cords and leno whip threads after being spooled is twisted into 3-ply 50s yarn on the twister machine.

The 12-hank roving for filling yarn may either be ring spun or mule spun. If ring spun, use a frame having the following particulars: for 60s gauge of frame, 2¾ inches; diameter of ring, 1¼ inches; length of traverse, 5 inches; speed of spindle, 8,000 revolutions per minute.

Dyeing Particulars.

YELLOW.

1 per cent tetrazo chlorine yellow GG, 30 per cent Glauber's, 3 per cent sal

soda; aftertreat with ½ per cent bluestone, ½ per cent chrome.

LIGHT ORANGE.

1 per cent tetrazo chlorine orange R, 30 per cent Glauber's, 2 per cent sal soda; aftertreat with ½ per cent bluestone, ½ per cent chrome.

OLD ROSE.

½ per cent tetrazo chlorine rose, 25 per cent Glauber's, 2 per cent sal soda; aftertreat with ½ per cent bluestone, ½ per cent chrome.

LIGHT OLIVE.

4 per cent pyrogene olive N, 4 per cent sulphide soda, 30 per cent Glauber's, 3 per cent soda ash; aftertreat with 1 per cent bluestone, 1 per cent chrome.

LIGHT TAN.

4 per cent pyrogene cutch 2G, 4 per cent sulphide soda, 30 per cent Glauber's, 3 per cent soda ash; aftertreat with 1 per cent bluestone, 1 per cent chrome.

SKY BLUE.

½ per cent diamine sky blue FF, 25 per cent Glauber's, 3 per cent sal soda; aftertreat with ½ per cent sulphate of copper.

LILAC.

½ per cent diamine brilliant blue G, 25 per cent Glauber's, 3 per cent sal soda; aftertreat: ½ per cent sulphate of copper.

PEARL.

4 ounces diamine dark blue B, 4 ounces diamine brilliant blue G, 25 per cent Glauber's, 3 per cent sal soda; aftertreat: ½ per cent sulphate of copper.

BUFF.

2 ounces diamine catechine 3 G, 2 ounces diamine catechine B, 25 per cent Glauber's, 3 per cent sal soda; aftertreat: ½ per cent sulphate of copper, ½ per cent chrome.

LIGHT BROWN.

10 per cent katigen yellow brown GG, 2 per cent katigen brown V, 10 per cent sulphide sodium, 3 per cent soda ash, 30 per cent salt; aftertreat: 4 per cent bluestone, 4 per cent chrome, 3 per cent acetic acid.

DARK BROWN.

5 per cent diamine catechine B, 4 per cent diamine catechine G, 30 per cent salt, 3 per cent sal soda; aftertreat: 3 per cent bluestone, 3 per chrome.

RED BROWN.

5 per cent diamine brown M, 30 per cent Glauber's, 3 per cent sal soda; aftertreat: 2 per cent bluestone, 2 per cent chrome.

PINK.

½ per cent benzo fast pink, 2 B L, 20 per cent Glauber's, 2 per cent sal soda.

RED.

6 per cent primuline, 30 per cent Glauber's, 3 per cent sal soda; diazotize and develop with beta naphthol.

WINE.

As red. Diazotize and develop with Bordeaux developer.

SLATE.

2 per cent diamine jet black SS, 30 per cent Glauber's, 3 per cent sal soda, aftertreat with 3 per cent chrome.

BLACK.

6 per cent diamine black B, 30 per cent Glauber's, 3 per cent sal soda; diazotize and develop with phenylene diamine.

SULPHUR BLACK.

10 per cent immedial black V, 10 per cent sulphide sodium, 30 per cent Glauber's, 3 per cent soda ash; aftertreat: 3 per cent chrome, 3 per cent bluestone, 3 per cent acetic acid.

LIGHT GREEN.

On tannine and tartar emetic mordant. Dye: 1 per cent new methylene blue GG, 1 per cent thioflavine T.

BLUE.

On tannine and tartar emetic mordant. Dye: 2 per cent new methylene blue GG.

INDIGO BLUE.

10 per cent immedial indone 3 B, 10 per cent sulphide soda, 30 per cent Glauber's, 3 per cent soda ash; aftertreat: 3 per cent sulphate of copper.

ETAMINE.

An etamine is a thin, slightly glossy fabric used principally for women's dress goods. Being a very popular material for summer wear, it is usually made in what is commonly known as a piece dyed fabric, that is, woven with undyed yarn. A good reason for making it a piece dyed fabric is that it is much cheaper than if the yarn is dyed previous to the weaving. Etamines are dyed in almost any color. Blue, black, red and various shades of drabs seem to be very popular. The interlacing of the warp and weft is on the one and one order, or plain weave.

See design, Fig. 1. The openness or transparency of the fabric is due partly to the smooth, hard-twisted yarn and partly to the weave.

Etamines were originally made with worsted yarns, which, of course, are much more expensive; however, if a good quality of cotton is used there is little difference in appearance between worsted and cotton etamines. The difference would be chiefly in the wearing quality, worsted of course being more durable.

The principal feature of an etamine is to have it a crisp,glossy and an open fabric.

ANALYSIS OF FABRIC.

Width of warp in reed, 27½ inches; width of fabric finished, 26 inches. Reeed, 500—2 ends per dent.

Total ends in warp 740, including selvedge. Take-up of warp during weaving, 12 per cent. Weight of fabric from loom, 3 ounces per yard; weight of fabric, finished, 3 ounces per yard.

No shrinkage during the finishing process.

WARPING PLAN.

1-10s carded peeler cotton, hard twist, 20 turns per inch, a left-hand twist.

FILLING PLAN.

28 picks per inch finished; 28 picks per inch in loom; 1-10s carded peeler cotton, hard twist, 15 turns per inch, a left-hand twist.

Notice that warp and weft are both the same twist, that is, both are a left twist. This is an important factor which cannot be ignored in making an open or transparent fabric.

The warp is drawn in straight, that is, 1, 2, 3, 4 (see Fig. 3.), until all the harnesses are used; four harnesses would be quite enough for a fabric of this character; there being but 26 ends per inch would cause no overcrowding of heddles. Fig. 3 is the reeding plan. Fig. 4 shows the chain draft for a dobby loom.

LOOM REQUIRED.

This character of fabric could be woven on any roller or dobby loom, a roller loom being preferable, principally on account of the comparatively low rate of expense the latter could be operated at.

FINISH.

Etamines, as before mentioned, are usually woven with undyed yarns, or in the gray. The cloth, after reaching the dyehouse, is first subjected to a scouring process, then dyed, after which it is given a medium sizing; then it is calendered, which in a great measure accentuates the gloss upon the fabric and also imparts to it the crisp feeling which characterizes an etamine.

It is then measured,rolled and papered, after which it is ready for the merchant. Cotton etamine sells from 12 cents to 20 cents per yard.

Carding and Spinning Particulars.

The cloth of which the weaving particulars have been given is sometimes made of all cotton yarn or a combination of cotton and wool or cotton and linen, or a combination of wool, silk linen and cotton fibres. For the carding and spinning particulars of this lesson we will consider that the fabric is made up of cotton yarns in both the warp and filling.

The count of the yarn we will consider to be 10s.

THE YARNS

for this class of cloth may be made in either the first or second division

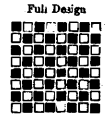


Fig. 1.

Fig. 2.

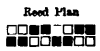


Fig. 3.

Fig. 4.

of mills, as given in a previous article. Generally, however, the mill of the second division is used. The cotton used would be peeler of about 1¼ inches length of staple. A number of bales (enough for a mixing) should be brought from the cotton shed and placed in the picker room. The overseer should sample each of the bales and those not up to staple should be placed to one side. Several of the other bales should be placed around the bale breaker and a little fed to the breaker from each bale alternately This will help to produce a

MORE EVEN MIXING,

which will help to give a more evenly finished yarn. The bales that have been laid aside should either be used in a cheaper mixture or should be shown to the cotton broker and either returned or have an allowance made for them. The bale breaker should be kept on this cotton until it is all put through. The cotton is conveyed from

the bale breaker to the mixing bin by endless lattices, which is the old method, or by having a blower and trunking and an endless lattice as is the newer and more modern method.

When a blower is used in conjunction with the bale breaker the cotton is in a more dried out condition when it reaches the bin and consequently it does not have to stand as long to dry out before using. A blower will pay for its first cost many times over. At the mixing bin the good waste from all machines up to the slubber is mixed in as it is collected. The cotton is next fed to the opener and

WHEN A BLOWER IS USED,

passed through two processes of picking when the cotton is mixed by hand. These processes of picking are generally used. A three-process picking and an opener are given, but when two processes are used all that is necessary to do is to drop the second or intermediate process and use the particulars of the breaker and finisher picker. A porcupine beater is generally used in connection with the opener and this has a speed of about 975 revolutions per minute.

The cotton passes from the opener to the breaker picker and after passing the feed rolls it comes in contact with the beater, which is generally of a rigid two-bladed type, the speed of which is about 1,500 revolutions per minute. The total

WEIGHT OF THE LAPS

at the front of the breaker picker is about 40 pounds or a 16-ounce lap. These laps are doubled four into one at the intermediate picker, the beater of this picker making 1,450 revolutions per minute and the total weight of the lap being 37 pounds or about a 12-ounce lap. The doublings at the finisher picker are four into one, the speed of the beater 1,450 revolutions per minute, which gives the cotton passing through it 42 beats per minute.

It is at this point that the cut roving of peeler stock of the same length is mixed in, in the proportion of one lap of roving waste to three laps of good cotton. The total weight of the cotton lap at the front for this class of goods is 35 pounds or a 12½-ounce lap. The next machine through which the cotton passes is

THE CARD.

This machine for this class of goods has a draft of about 90. The cards should be stripped three times a day and should be ground at least once a month. The flats make one complete revolution every 35 minutes. The production should be about 750 pounds for a week of 60 hours. The weight of the sliver at the front should be about 65 grains. Use as large a doffer as possible, either of a 26 or 27 inch diameter. The carded sliver is then put through three processes of drawing, the weight of the sliver at each process being as follows: 77 grains at breaker drawing, 76 grains at intermediate and 72 grains at finisher drawing, the doubling at each process being six into one. On this class of goods metallic top rolls may be used to good advantage. The sliver is next put through the slubber and made into .50 hank roving. The settings of the rolls at the slubber for this length of staple should be as follows: Front roll to middle, 1½ inches; middle roll to back, 2 inches. The cotton is then passed through

ONE PROCESS OF FLY FRAMES

and made into 2 hank roving. The roving for warp yarn is taken to the spinning room and made into 10s yarn. The following particulars are used on the warp frame: Gauge of spindle, 3 in.; diameter of ring, 2 inches; length of traverse, 7 inches; speed of spindles, 8,600 revolutions per minute. The roving for the filling yarn may be either mule spun or, as is generally the case, ring spun.

When ring spun, use the following particulars for filling frame spinning: 10s yarn, gauge of spindle, 2¾ inches; diameter of ring, 1⅝ inches; length of traverse, 7 inches (because the filling yarn for this fabric has sufficient twist put in to stand this length of traverse), speed of spindles, 6,400 revolutions per minute. The warp yarn is then spooled, warped and run through a slasher.

Dyeing Particulars.

The fabric is dyed on the jig machine.

BLACK.

15 per cent immedial black N N, 15 per cent sulphide sodium, 3 per cent soda ash, 30 per cent Glauber's salt; rinse well, and give a soap bath.

BLUE.

5 per cent immedial indone B, 5 per cent sulphide sodium, 2 per cent soda ash, 25 per cent Glauber's salt; rinse and top with 8 ounces methylene blue B, 1 pint acetic acid.

BROWN.

6 per cent immedial brown B, 4 per

cent immedial yellow D, 10 per cent sulphide sodium, 3 per cent soda ash, 30 per cent Glauber's salt; rinse and give a soap bath.

GREEN.

4 per cent immedial yellow D, 3 per cent immedial indone B, 7 per cent sulphide sodium, 3 per cent soda ash, 30 per cent Glauber's salt; rinse and give a soap bath.

BATISTE.

Batiste as the name implies, is of French origin, commercially understood to mean a light translucent cloth, made from a fine quality of combed cotton yarn, ranging in width from 32 inches to 45 inches.

There is likewise a gradual variation in qualities, ranging from a comparatively coarse to a very fine fabric.

The variations of the different qualities will be more apparent when we consider their commercial value. It may be of interest to our readers to note the retail prices.

Cotton batiste retails at from 12½ cents in 32-inch widths to 50 cents in 45-inch width per yard.

The variety of qualities will suggest some idea of the utility of the fabric. Its uses are even more varied than are the qualities.

The finer grades of batiste are used for dress goods, all kinds of lingerie for summer wear, pillow shams, etc., while the cheaper grades are extensively used for linings in washable and unwashable shirtwaists.

In this article we are confining ourselves to bleached cotton batiste, reserving the linen and colored for some future discussion.

Batiste is woven in the gray, that is, with yarn direct from the spinning frame, with the exception that the warp yarn is well sized, in order to better stand the strain to which the yarn is subjected during the weaving process.

We will consider, first, a very fine bleached cotton batiste, of a quality made 45 inches in width, and then a very cheap grade of bleached cotton batiste, made 32 inches in width.

The analysis will readily show the vast difference in these two qualities.

FINE BLEACHED COTTON BATISTE

Width of warp in reed, 47.8 inches; finish at 45 inches; ends per inch in the cloth from loom, 94; ends per inch finished, 100; ends in warp, 4,500.

Take-up of warp during weaving, 10 per cent; weight of fabric per yard from loom, 1.15 ounces; finished weight, 1.4 ounces.

The difference in weight between fabric from loom and finished fabric is about 20 per cent, the finished goods having taken on 20 per cent of sizing material.

For adding weight to cloth, China clay is used. The proportions to use depend on the character of finish desired. China clay produces a gritty feel, which, however, may be overcome by the use of chloride of magnesium, which is a very powerful softener as well as a weighting material.

Warping plan: body of warp, 1-120s combed Sea Island cotton, selvage 2-100s cotton.

Filling plan: 98 picks of 1-200s combed Sea Island cotton.

CHEAP-GRADE COTTON BATISTE.

Width of warp in reed, 34 inches. Finish at 32 inches; ends per inch in cloth in the loom, 54; ends per inch finished, 58; ends in warp, 1,860; 54x1 reed.

Take-up of warp during weaving, 8 per cent; weight of fabric per yard from loom, .84 ounce; finished weight per yard, 1 ounce; 19 per cent increase in weight.

Warping plan: all 1-60s combed Sea Island cotton

Filling: 50 picks per inch 1-100s combed Sea Island cotton.

LOOM REQUIRED.

Batiste could be very profitably woven on a Northrop magazine loom. The fabric is a plain weave, no dobby being required. The fineness of the yarn, however, requires the use of string heddles. Wire heddles would cause too many warp breakages. The high running speed of the Northrop loom, together with the number of looms a weaver can tend,10 to 20 looms, brings the weaving cost to a minimum. The warp should be drawn in on four harnesses, skip draw as follows: 1, 3, 2, 4 instead of straight, as 1, 2, 3, 4. Skip draws give less strain to the warp.

FINISH.

Batistes are given a Swiss finish; after the cloth comes from the loom it is bleached. After the bleaching process it is sized, then sprinkled or dampened, and then calendered, after which it is folded; then it is ready for the market.

Carding and Spinning Particulars.

The division of mills which make "batiste" is the third of those mills which are equipped with machinery for making fine count yarns. Batiste is made up of extra fine counts of yarn, although these counts vary a great deal according to the grade of fabric wanted. In order to do this cloth justice it will be better to first describe the processes of a coarse yarn batiste and then a batiste made up of fine yarns. We will consider the coarse fabric to be made up of 1-60s warp yarn and 1-100s filling yarn. The finer grade we will consider made up of 1-120s warp yarn and 1-200s filling yarn.

THE RAW STOCK

used for both grades should be Sea Island cotton of from 1¾ to 2 inches staple, although 1¾ inches staple is the length generally used. The selection of the cotton is one of the first and by many considered the most important points to look out for. The lot should be sampled bale by bale and all those bales having a staple not up to standard should be thrown out of the mixing. Those bales that are selected as O. K., should be placed around the mixing bin and thrown into it alternately from each bale until all the bales for the mixing are in. At this point the

GOOD SLIVER AND PICKER WASTE

are mixed in. Care should be taken to see that the sliver waste is pulled apart into short lengths and that no other waste is thrown into the bins by mistake, because a small lot of short staple waste can cause a great deal of trouble later on. Some overseers use only an opener and one process of picking, others use two processes of picking with the opener. It is the general custom to use only an opener and one process of picking for these fine counts. The general instructions that have been given in regard to openers should be followed. The speed of the beater (rigid type) should be reduced so that the cotton should only receive 29 beats per minute. The weight of the lap at the front end of the picker (when one picker is used) should not exceed 30 pounds and from this range to 25 pounds.

A GOOD WEIGHT

per yard for the grade of fabric under description is 9 ounces. The machines should be carefully looked into to see that they are all kept clean and properly set. The laps are taken to the cards. At this point, as at a great many others, overseers differ as to the best means of procedure. Some use a large draft at the card and only one process of combing, and others use lower drafts and two processes of combing. In this lesson we will assume a large card draft and one process of combing for all counts of yarn in both grades of batiste. The speed of the licker should be reduced from about 350 revolutions per minute to 275 or 280 revolutions per minute. This is done by lagging the licker-in pulley. The wire fillet used on the cylinder should be No. 34 wire (American count, or 110s English count), and on the doffer and top flats No. 36 wire, or 130s English count.

THE FLATS

should be speeded up to take out as much waste as possible. The cards should be stripped three times a day and ground so as to keep the wire sharp. The settings used should be very close and care should be taken to see that the cotton is not broken in staple at the card. A great many times, if the cotton is sampled at the front of the card, it will be found to be shorter than when entering. This may be and is generally caused by an improper setting of the feed plate to the licker-in. While this applies directly to long staple cotton, still all cottons should be looked into carefully to avoid shortening the length of the staple. It is very important to keep the cards clean so that as little dust and dirt will go into the sliver as possible, because, if this dirt gets past the combers, it will show up in the cloth, as the thread or yarn is so small. The

PRODUCTION FOR A CARD

making this class of goods should not exceed 275 pounds per week, the weight of the sliver being about 30 to 35 grains per yard. The draft for this class of goods should not be less than 150. The card sliver is taken to the comber room and doubled 14 into 1 at the sliver lap, and the laps from this machine are taken to the ribbon lap machine and doubled 5 into 1. The weight of a yard of lap at the front of the ribbon lap machine should be about 160 grains. These laps are put up at the comber and doubled 6 into 1. The speed of the comber for this stock should not exceed 180 nips per minute. For this weight of web a double row of teeth in the top comb would give

THE BEST RESULTS.

Care should be taken to see that all needles in the top are straight and that the comber is absolutely free from dirt at all times. The table of

the comber should be gone over twice a day with whitening so that the sliver being drawn over it will not stick. The percentage of waste taken out should be about 25. These processes will answer for all the counts except for the 200s, which should be double combed, i. e., after being put through the combers once should be run through the sliver lap machine and then through the combers again. After passing through the combers the sliver passes through two processes of drawing. At these machines the sliver is doubled six into one, the speed of the front rolls at each frame being 320 revolutions per minute. Be sure the settings are proper for the staple so as not to "break" the staple, or too far apart so that uneven drawing will result.

THE TOP ROLLS

should be of a little larger diameter than for shorter length of staple; the grade of skin used for the top rolls should be finer than that used for the shorter and lower grades of cotton. Not only is this true in regard to the drawing frames, but also on all machines on which leather top rolls are used. Always keep these rolls in the best of shape and clean machines more often than with the lower grades of raw stock. The weight of sliver at the front is 60 grains per yard. The drawing sliver is put through the slubber, which makes it into .80 hank. This machine also uses a larger diameter top roll than is used on the lower grades. The slubber roving for 60s yarn is put through three processes of fly frames, the hank roving at the 1st intermediate being 2.25; at the second, 5 hank, and at the fine frames 15 hank. From here it is taken to the ring spinning room and made into 60s warp yarn on a frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1 5-16 inches; length of traverse, 5 inches.

TO MAKE 100s YARN

the slubber roving is the same, also the hank roving at the first and second intermediates. The hank roving at the fine frame is 20. This yarn for filling is taken to the mule spinning room; for warp yarn used in the finer grade of batiste is sometimes spun in the mule room and sometimes in the ring spinning room. When spun on the ring frame, use the following particulars for a warp frame: Gauge of frame, 2¾ inches; diameter of ring, 1¼ inches; length of traverse, 5 inches. For making 200s yarn the final yarn is spun single at the mule; if spun double, the frames and hank roving at each would be as follows: Slubber, .80; first intermediate, 2.25; second intermediate, 5; roving, 20, and jack 30 hank. This would be taken to the mule room and spun into 200s yarn. The warp yarn for both grades of fabric would be spooled and warped and run through a slasher.

A GOOD MIXING

for 60s yarn is as follows: Water, 100 gallons; potato starch, 54 pounds; Yorkshire gum, 2 pounds; soap, 1½ pounds. A good sizing mixture for the 100s would be as follows: Water, 100 gallons; potato starch, 70 pounds; tallow, 7 pounds; Yorkshire gum, 3 pounds; soap, 2 pounds. Boil two hours and let stand 10 hours before using; keep agitator running and keep size almost at boiling point. For selvedge, the 100s yarn would have to be doubled into 2-ply 100s in addition to the other processes.

Bleaching, Dyeing and Finishing Particulars.

These goods are bleached in the ordinary way, great care being taken to keep the goods from damage.

The pieces are boiled in caustic soda at 4 degrees Tw. for ten hours, rinsed well in water, and boiled again with 4 degrees Tw. caustic soda, rinsed, and soured with ¼ degree Tw. of oil of vitriol, rinsed and passed through a solution of chloride of lime at ½ degree Tw. soured with ½ degree Tw. oil of vitriol, and well rinsed, until all acid is washed out.

The goods are then dried, and starched through a mangle with 8-12 ounces best white German dextrine to one gallon of water, starch to be well boiled one hour before using.

The pieces are dried on a tenter frame at full width, care being taken to keep the warp and filling straight.

COLORS.

If colors are required they are light blues, pinks and other light tints dyed in the mangle or on the jig.

LIGHT PINK.

For 10 50-yard pieces, 12 gallons water; ½ ounce to 2 ounces Erika pink; 20 pounds Glauber's; 3 pounds sal soda.

LIGHT BLUE.

Dye as pink with ½ to 1 ounce tetrazo brilliant blue 6B.

LIGHT SLATE.

2 ounces diamine black B H, dye as pink.

RED.

1-2 pounds benzo fast red 4B, dye as pink.

YELLOW.

Dye as pink. 8 ounces chrysophenine.

ORANGE.

Dye as pink. 1 pound Mikado orange B.

SCARLET.

Dye as pink. 1 pound diamine scarlet B.

LIGHT WINE.

Dye as pink. 1 pound diamine Bordeaux B.

LIGHT AMBER BROWN.

4 ounces diamine catechine G; 4 ounces diamine fast yellow B, dye as pink.

TOBACCO BROWN.

½ pound diamine brown B; 2 ounces diamine fast yellow B, dye as pink.

LIGHT TAN.

Dye as pink. 4 ounces diamine bronze G; 2 ounces diamine fast yellow B.

LIGHT GREEN.

Dye as pink. 10 ounces diamine green G; 5 ounces diamine fast yellow B. Top with fresh bath; 6 ounces brilliant green G.

BLACK.

Dye on jig. 15 per cent immedial black N N; 15 per cent sulphide soda; 3 per cent soda ash; 30 per cent Glauber's salt.

ITALIAN CLOTH.

Italian cloth is a light, glossy fabric made from cotton and worsted, cotton and wool, cotton and mohair and all cotton.

We will here consider the all-cotton fabric. Italian cloth is very commonly understood to mean a satin fabric, by some known as Farmer's satin.

ITS CHIEF USE.

It is used chiefly for linings for the heavier styles of ladies' dresses, also for underskirts, or for the garment itself, instead of merely as a lining; when used for such, it is usually in solid black. It is also used for shirtwaistings, fancy pillow backs and so forth, for these purposes usually in fancy colors.

The cloth is woven "in the gray" —undyed yarns. In the finer grades the warp is sized so as to facilitate the

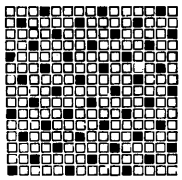


Fig. 1.

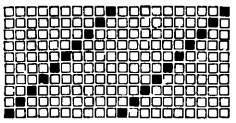


Fig. 2.

Fig. 3.

weaving process. The fabric under consideration is a five-harness satin weave. The satin weave, technically called "satin," is one of the three foundation weaves. The object of a satin weave is to get a smooth-face fabric.

In plain twill weaves every pick interlaces with the warp in the same manner, but each successive pick commences as it were one end farther to the right or left, according to the direction of the twill. This will bind the cloth in a regular order.

In satin weaves

THE INTERLACING

is arranged differently; the intersections of warp and weft are distributed as evenly as possible over the surface of the fabric.

The smallest and most common form of satin is the five-harness satin. The order of intersections is 1, 3, 5, 2, 4. (See Fig. 1.)

ANALYSIS OF FABRIC.

Width of warp in reed, 38 inches; width of fabric, finished, 36 inches; ends per inch in reed, 96; ends per inch, finished, 102; ends in warp, 3,700; 32 dent reed per inch—3 ends per dent. Take-up of warp during weaving is 5 per cent; weight of fabric, per yard, from loom, is four ounces.

Owing to the pressure the fabric is subjected to in the finishing, it stretches slightly in length; consequently the cloth should be lighter per yard, finished, than the cloth from

loom. The difference, however, is made up by the sizing materials, although it is given but a very light sizing.

The cloth per yard finished is practically of the same weight as the cloth per yard from loom.

Warp: All 1-40s cotton, left twist.

Filling: All 1-45s cotton, left twist.

130 picks per inch.

Fig. 1 shows three repeats of the design; the weave as mentioned above is a five-harness satin, weft face, with the direction of the twill running to the right.

The fabric in question has a very smooth face, which is due in a great measure to the direction of the twill being opposite to the direction of twist of yarn.

Fig. 2 shows drawing-in draft. The warp is drawn on ten harnesses, straight draw—five harnesses would be enough; ten harnesses are used so as not to overcrowd the heddles.

Fig. 3 shows reeding plan.

The warp is reeded 3 ends in one dent.

LOOM REQUIRED.

This character of fabric could be woven on any loom where ten harnesses could be operated without difficulty. The loom should have a fairly high running speed.

FINISH.

This fabric, as before mentioned, is woven with undyed yarns. After it comes from the loom it is boiled off, then dyed,after which it is subjected to a light sizing. For a light sizing it is not necessary to use anything but wheat flour, farina and a small quantity of softening material, usually tallow or wax.

After the cloth is sized it is run through the calender with the rolls well heated, the glossy face of the fabric being obtained by the heated rolls. The cloth, after the calendering,is folded, after which it is ready for the market.

Carding and Spinning Particulars.

Italian cloth is made in mills of the second division as given in a previous lesson. The class of cloth may be made up of several grades and lengths of raw stock, but for this article we will consider that the cotton is of a fair grade, the staple being about 1⅝ inches in length. The cotton is all sampled before being put through this bale breaker, several bales being placed around this machine, the cotton being fed alternately from each bale until all the cotton is gone. The bagging which covers these bales is thrown into a pile and is again picked over in order to clean all the fibre from the bagging. This is generally done by the yard hands on rainy days.

THE BEST METHOD

of conveying the cotton to the mixing bins is by a blower and endless lattices. When a blower is used, the cotton arrives at the mixing bins in a more open state and works up much better. At the mixing bin the good waste cotton from all the machines up to the slubber is mixed in. The cotton is fed to the hopper of the opener which should always be kept half full and from here is passed on to the feed rolls of the breaker picker. For this class of goods some overseers use two and some use three processes of picking. It is the general plan of up-to-date mills to use two processes with an opener. After passing the feed rolls of the breaker picker the cotton comes under the

ACTION OF THE BEATER.

If this is of a rigid two-bladed type (which is the one most generally used) the speed should be about 1,500 revolutions per minute. The total weight of the lap at the front of the breaker picker is 40 pounds or about 16 ounces to the yard. These laps are taken and put up at the finisher picker and doubled four into one. The roving waste is mixed in at this point in the proportion of three laps of good cotton to one lap of bobbin or roving waste. The roving waste is put through a special picker that takes out the twist and delivers it in a light, fluffy state. This is taken and spread evenly on the apron of a picker and made into a lap, the weight of which corresponds to the weight of the laps of the same kind being put up at the back of the finisher picker. The speed of the beater (two-bladed rigid type) for this class of work is about 1,400 revolutions per minute. This gives the cotton passing through 42 beats per inch. The total

WEIGHT OF THE LAP

at the front of the finisher should be about 35 pounds, a variation of ½ pound being allowed from standard. If the weight is more than ½ pound, the laps should be run over again, i. e., placed at the back of the finisher and run through with three other laps. If there is a great variation in the laps, the machine should be looked into to see what is the cause. For slight va-

riations in weight there are adjustments to quickly remedy the defects. The lap at the front for this class of goods should weigh 12½ ounces to the yard. The laps are put up at the card and the draft of this machine should not be less than 100. Medium card fillet wire should be used on both the cylinder, doffer and flats, the wire on the doffer and flats being one point finer than that used on the cylinder. The speed of the cylinder should be about 165 revolutions per minute; speed of licker-in, about 350 revolutions per minute; the speed of the top flats, 1 complete revolution every 50 minutes.

THE CARDS

should be stripped 3 times a day and ground surely once a month. At the time of grinding, the card wires should be all straightened out and all reset properly. Light grinding should always be used. The weight of the sliver at the front should be about 65 grains per yard. The production for a week of 60 hours (allowing 10 per cent of time for cleaning, stoppage, etc.) is about 700 pounds. The cotton sliver is then passed on to the drawing frames and through three processes of these machines. The drawing frames may be either equipped with metallic or leather covered top rolls, the speed of the front roll at each process being about 400 revolutions per minute. See that the drawing frame bottom rolls are properly set, a good setting for this stock being as follows: From centre of front roll to centre of second roll, 1½ inches; second roll to third roll, 1⅝ inches; third roll to back roll, 1⅞ inches.

The weight of sliver at the front of the finisher drawing frame should be 72 grains, the doubling at each process being six into one.

AT THE SLUBBER

the sliver is drawn into .50 hank roving. From here it passes through three processes of flyframes, the hank roving being as follows: First intermediate, 1.50 hank; second intermediate, 4.00, and fine frame 10.00 hank. At the fly frame look out for the top leather covered rolls. These should always be in the best of shape. Put just enough twist into the roving so that it will not break back at the succeeding process. Remember, every extra turn of twist given the roving lessens the production. On the other hand, do not get the roving too slack twisted, for then loss of production, as well as poor work, will result in consequence of the roving breaking back. The warp roving is then taken to

THE SPINNING ROOM

and spun into 40s yarn on a frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1⅝ inches; length of traverse, 6½ inches; speed of spindle, 10,000 revolutions per minute. The roving for the filling yarn may be taken to either the ring spinning or the mule room, where it is spun into 45s yarn. If taken to the ring spinning room, use a frame of following particulars: Gauge of rame, 2¾ inches; diameter of ring, 1⅜ inches; length of traverse, 5½ inches; speed of spindles, 8,800 revolutions per minute. The warp yarn is then spooled and warped and run through a slasher.

Dyeing Particulars.

The pieces are boiled out for dark shades, and bleached white for light shades and tints.

The dyeing is done on a jig machine.

PINK.

8 ounces diamine rose G D, 20 pounds Glauber's, 1 pound sal soda. All the dyeings are for 10-12 gallons water and 10 pieces, 50 yards.

SALMON.

4 ounces diamine orange B, 1 ounce diamine scarlet B, 15 pounds Glauber's, 1 pound sal soda.

LIGHT BUFF.

4 ounces diamine catechine G, 1 ounce diamine fast yellow B, 15 pounds Glauber's, 1 pound sal soda.

LIGHT SLATE.

4 ounces diamine black B H, 15 pounds Glauber's, 1 pound sal soda.

LIGHT GRAY.

One-half pound diamine gray G, 15 pounds Glauber's, 1 pound sal soda.

LIGHT BROWN.

One-half pound diamine catechine G, ½ pound diamine brown B, 2 ounces diamine fast yellow A, 20 pounds Glauber's, 1 pound sal soda.

RED.

3 pounds diamine fast red F, 30 pounds Glauber's, 2 pounds sal soda.

SKY BLUE.

2 pounds diamine sky blue F F, 30 pounds Glauber's, 2 pounds sal soda.

SLATE.

1 pound immedial black N B, 4 ounces immedial olive B, 1 pound sulphide of sodium, 20 pounds Glauber's, ½ pound soda ash.

PEARL.

2 ounces immedial black N R T, ½ pound sulphide sodium, 10 pounds Glauber's, 6 ounces soda ash.

BLACK.

15 pounds immedial black N N, 15 pounds sulphide sodium, 30 pounds Glauber's, 3 pounds sal soda.

NAVY BLUE.

2 pounds immedial indone 3B, 2 pounds immedial indone R, 5 pounds sulphide sodium, 30 pounds Glauber's, 3 pounds sal soda.

NIGHT GREEN.

3 pounds brilliant benzo green B, 30 pounds Glauber's, 3 pounds sal soda.

HELIOTROPE.

1 pound heliotrope B B, 25 pounds Glauber's, 2 pounds sal soda.

WINE.

3 pounds tetrazo corinth G, 30 pounds Glauber's, 3 pounds sal soda.

OLD GOLD.

2 pounds diamine fast yellow A, 1¼ pounds diamine brown 3G, 30 pounds Glauber's, 3 pounds sal soda.

FINISHING.

Cotton Italians are finished with a calender finish, passed through a cotton rolled calender, to get a good finish, and then softened down, with a light beetling on a beetling machine, or finished altogether on a beetling machine.

They are also given a hot press finish on the hydraulic press with hot press plates and papers, to imitate the worsted Italians.

Beetling Process for Finishing.

The beetling process for finishing cotton and linen piece goods is one of the oldest finishes in the bleaching and dyeing trades.

It was first invented in the linen bleacheries of the north of Ireland in the Belfast district. The first beetling machines were very crude affairs compared with the machines now in service.

The beam on which the cloth was wound was a large tree trunk turned down and smoothed, which was set in motion with a handle. The part of the machine which lifted the fallers was also turned by hand. The principle of a finish by a beetling machine is simply an improvement on the old mangle, to smooth the cloth, and fill in the spaces between the threads, making the cloth more opaque, and showing the ordinary linen finish. A good beetle finish is also a permanent finish and will stand sponging and ironing.

THE NEW BEETLES

are made entirely of iron, except the fallers, which are wooden. The cloth is wound on the iron cylinder or beam, which revolves about 40 times a minute; the fallers are lifted by cams and fall of their own weight, about 16 inches on the cloth, from 40 to 50 times a minute. The cloth receives by this process a tremendous hammering, and where 10 or more machines are together the noise is simply deafening.

Goods made of half linen and half cotton can be finished to look like all linen goods, and in some goods made of all cotton the finish makes the pieces exactly like a piece of linen, and even

AN EXPERT MAY BE DECEIVED

thereby. Some goods are heavily starched and dryed, then sprinkled, put on the beetles, and hammered for four or five days, being sprinkled and turned occasionally. The beetles are run night and day with two crews. In Ireland, where labor is cheap and water power is used, the finish is not very expensive, although the process is very long, as the goods are often on the beetles for six days. Where steam power only is used, the finish is almost prohibitory and as a very large and expensive plant is required to turn out a large amount of goods, not many plants of any great capacity have been erected in this country.

The largest beetling works are those of the Macnab Co., Hurlet, Paisley, Scotland. There are about 100 sections of beetles there, and some very fine work is turned out.

A GOOD FINISH

is obtained on silesias by first passing the goods through a calender and then giving a few hours on the beetle. Mather and Platt, of Manchester, have a patent beetle with spring hammers instead of fallers. This machine is said to be good for some finishes, but many prefer the old wooden faller machine. Any width of cloth can be finished on the beetle. Holland shades of over 100 inches in width are handled with ease, and the width of the cloth is always increased during the process of beetle finish.

CHEESECLOTH.

This is a thin cotton fabric of light weight and low counts of yarn, which for cheapness ranks among the first in cotton fabrics.

The fact that it is a cheap fabric has much to do with its popularity, in so far that it is used for innumerable purposes; chief among which we may mention that it is used for wrapping cheeses and butter after they are pressed, for these purposes only the bleached fabric being used. It is also much in demand for bunting for festal occasions, for light curtains, masquerade dresses, etc. When used for buntings, draperies and the like, it is usually in colors. Red, blue, cream and yellow bunting seem to have the greatest demand.

In the sample which will now be considered, the cheesecloth is of a fair quality; the weave is a one and one, or plain weave; there is very little variety in the designing.

THE CHIEF OBJECT

of the designer in constructing a fabric of this character is to find the least number of ends and picks per inch required, so that the fabric will not slip too easily; that is, if the cloth is taken between the thumb and first finger of each hand, and the thumbs drawn away from each other over the surface of the fabric and first fingers, the ends, if pulling in the direction of the filling, will not leave their proper places too easily, or, if pulling in the direction of the warp, the picks or filling will not give too easily.

This tendency to slip is entirely due to the lack of material necessary to produce a perfect or firm cloth.

A PERFECT CLOTH

may be defined as a cloth in which the warp or weft yarns are equal in diameter and the spaces between the threads are equal to the diameter of the yarn.

For instance, let us construct a perfect cloth with 1-36s cotton yarn for both warp and filling. By squaring tne counts we find the diameter of yarn to be 1-165th part of an inch; that is, 165 threads of 1-36s will lie side by side in one inch, and by subtracting one-half of the 165 to allow for the space required for the interlacing with the weft we have 82 ends and 82 picks necessary for one inch of cloth.

In the sample in question there is only about half the number necessary to make perfect or firm cloth.

ANALYSIS OF FABRIC.

Width of warp in reed, 38 inches; width of fabric finished, 36 inches.

Ends per inch in reed, 42; ends per inch in finished cloth, 45.

Picks per inch in loom, 42; picks per inch, finished, 42; ends in warp, 1,620.

Reed, 750x2.

Take-up of warp during weaving, 6 per cent; weight of cloth, per yard, from loom, 1.7 ounces; finished weight per yard, practically the same.

Warp, all 1-36s cotton carded peeler; filling, all 1-36s cotton carded peeler.

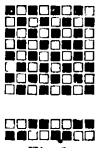


Fig 1.

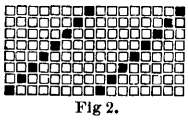


Fig 2.

Fig. 1, design.

Fig. 2, drawing-in draft.

LOOM REQUIRED.

The retail price of cheesecloth, 5c. to 8c. per yard, requires that it be woven on a high running speed loom. The Northrop loom would be about the best, running at about 200 picks per minute. If the warps are properly sized a weaver can take care of 10 to 16 looms.

FINISH.

Cheesecloth is given very little finish. After it comes from the loom, it passes to the dyehouse, where it is bleached or dyed as the case may be; the cloth is dyed in a gig dyeing machine. After the dyeing it is passed through a rotary press with cylinder slightly heated, after which it is folded and is then ready for the market.

Carding and Spinning Particulars.

The yarns of which cheesecloth are made up would be made in mills having an equipment of machinery for making coarse or medium grade yarns. There are several kinds and grades of cotton used for the manufacture of this cloth and the count of yarn varies, but not to such a variation as has been the case with the cloths that have been described in late articles. For this article it will be considered that the cotton is made up of a medium grade of cotton of 1¼ inches length of staple and that the count of the yarn for both warp and filling is 36s. The cotton is fed

to the bale breaker (if the mill contains one) or the bales are placed around the mixing bin and mixed by hand.

THE HAND MIXING

does not give as uniform a mixing as the bale breaker, and when the mixing is done by hand it ought to stand longer before being used, so that it will dry out thoroughly. For this class of goods three processes of picking and an opener are used. The good waste cotton is mixed direct into the bin with the raw stock as it is collected. The cotton is then fed to the opener, which is generally supplied with a porcupine opener, and this should revolve at about 1,050 revolutions per minute. From the opener the cotton is conveyed by an endless apron to feed rolls of the breaker picker, which condense the fluffy mass into a sheet and offer it to the beater. The beater of this machine and also of the intermediate and finisher pickers is generally of the rigid, two-bladed type. The breaker picker makes 1,500 revolutions per minute, the total weight of the lap at the front being 40 pounds, or 16 ounces per yard. These laps are put up at the intermediate picker and

DOUBLED FOUR INTO ONE.

The beater of this machine should make about 1,450 revolutions per minute, the total weight of a lap at the front being 37 pounds, or 12 ounces to the yard. The laps are put up at the finisher picker and doubled four into one, the beater making 1,450 revolutions per minute, and the total weight of the lap at the front end being 35 pounds or 12½ ounces to yard of lap. Keep the draught of the pickers on the top cage as this will help to prevent splitting of laps; also see that the fly is not allowed to accumulate to any great extent under the machines. There should always be a supply of laps ahead, in case of a breakdown. Always use old laps first and not the newly made ones. The laps are carried to the card. The draught of this machine for this class of work should not exceed 100. The top flats should make one complete revolution every 50 minutes. Cards should be set for coarse work, using No. 33 wire on cylinder fillet, and No. 34 wire on doffer and top flats. Use a 26 or 27 inch diameter doffer.

THE SLIVER

should weigh 65 grains per yard, and the production for a week of 60 hours should be 750 pounds. The sliver is put through three processes of drawing. It would be of great advantage to use metallic rolls. The doublings at each process are six into one. The drawing sliver is put through the slubber and made into .50 hank roving. This roving passes through two processes of fly frames. At the first intermediate the hank roving is 1.56, at the second intermediate this is made into 3.75 hank, and at the fly frame 7.50. At the fly frame watch the leather top rolls. The bottom steel rolls should be taken out and scoured at least once a year. The hank roving is then taken to the ring spinning room or the roving for the filling may be taken to the mule room and made into 36s yarn. If taken to

THE SPINNING ROOM,

use a frame having the following particulars (for 36s filling): Gauge of frame, 2¾ inches; diameter of ring, 1⅝ inches; length of traverse, 6½ inches; speed of spindles, 10,200 revolutions per minute. For warp yarns (36s), use 2¾ inches gauge of frame; 1⅝ inches diameter of ring, and 5½ inches length of traverse, with spindles running at 8,900 revolutions per minute. The warp yarn is then spooled, warped and run through a slasher.

Dyeing Particulars.

Cheesecloth is dyed on the gig machine, or in the starch mangle during the starching process.

PINK.

For 10 gallons liquor, 3 pounds 8 ounces cornstarch or dextrine, 4-6 ounces Erika pink, 2 pounds Glauber's, 1 pound sal soda.

YELLOW.

As pink; 1 pound chrysophenine.

ROYAL BLUE.

As pink; 2 pounds alum, no sal soda, 1 pound Victoria blue B.

SCARLET.

As pink; 2 pounds diamine scarlet B.

RED.

As pink; 3 pounds benzo purpurine 4B.

LIGHT SLATE.

As pink; 8 ounces diamine black B H, 1 ounce diamine fast yellow B.

BROWN.

As pink; 2 pounds benzo fast orange S, 2 pounds chrysophenine, ½ pound benzo fast black.

HELIOTROPE.

As pink; 1 pound benzo fast violet R, 4 ounces benzo fast blue B N.

VELVETEEN.

Velveteens, also termed fustians and velverets, are heavy cotton fabrics in which the distinguishing effect is formed by the points of the fibres in the filling yarns, termed the pile, being presented to the vision, and not

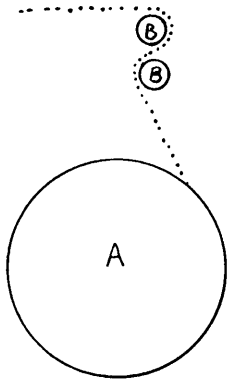


FIG. 1.

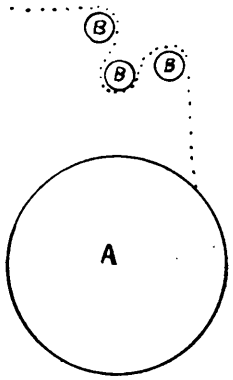


FIG. 2

the sides of the yarns as in the majority of fabrics.

They are principally used for dress and hat trimmings, suitings, and upholstery, having exceptional wearing qualities and showing a full, deep color.

Corduroys are sometimes termed velveteens, the same principle of construction being adopted in both fabrics, but a corduroy is distinguished by having a corded stripe effect running lengthways of the piece, the dividing line between each stripe showing both warp and filling.

In the simplest type of velveteens the pile filling, after being cut, hides the warp entirely from the face. To accomplish this the goods are made with a comparatively small number of ends and large number of picks per inch, ranging from 50 to 76 ends and 150 to 600 picks. One warp only is used.

A fairly heavy loom is necessary.

Figures 1 and 2 illustrate two methods of arranging the whip rolls and yarn when weaving some of the heavier picked goods. In each figure A represents the warp beam and B the whip rolls. The dotted line indicates the direction of the yarn.

Standard widths for velveteens are 19 inches, 22½ inches, 24½ inches and 27½ inches or 28 inches. For the latter width the warp is spread about 33½ inches in the loom. The weights for 28-inch goods vary from one to three and one-half yards per pound.

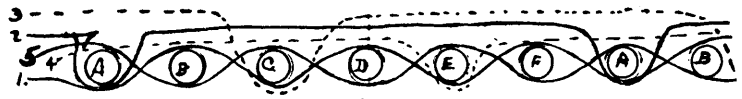


FIG.4.

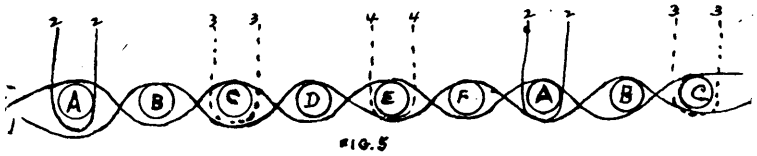


FIG.5

The goods are usually woven two or more widths in the loom, with split selvedges.

In order that the fabric may remain firm after the pile picks are cut, ground or binder picks are inserted regularly, working either plain or twill as may be desired. The filling for

these picks is similar to that used for the pile, only one shuttle being used.

Figure 3 is a design for a velveteen, arranged one ground and three pile picks, the ground weave being plain. The drawing-in draft is straight on 6 harnesses, 1 to 6. The selvedges are woven with a selvedge motion.

The ends are reeded 2 in each dent.

The chain draft is similar to the weave, Fig. 3.

Six ends and eight picks repeat.

Figure 4 shows a sectional view of the cloth before being cut. Figure 5 shows the same with the pile cut. Lettered circles in these figures correspond to ends, and numbered lines to picks, in Figure 3.

An analysis of two fabrics woven with design, Figure 3, shows the following:

Sample No. 1: 76 ends and 192 picks per inch; 28s warp and 40s filling; width 23 inches; weight 4.35 yards per pound.

This is a velveteen of poor quality.

Sample No. 2 is of a good quality. It contains 76 ends and 375 picks per

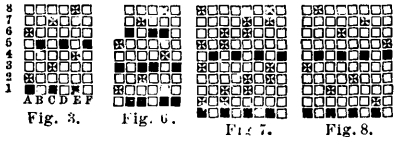


Fig. 3. Fig. 6. Fig. 7. Fig. 8.

inch, 2-ply 60s warp and 55s filling, and the weight is 3.35 yards per pound.

Some velveteens are sold by weight, similar to men's wear fabrics, so many ounces per yard.

Another standard fabric woven with design Figure 3 is as follows: 74 ends, 260 picks, 2-ply 70s warp, 60s filling.

Figure 6 shows a design with a 3-end twill ground, arranged one ground and three pile picks. The drawing-in draft is straight, reed draft, 2 ends per dent, chain draft same as weave, repeated to 18 picks. Selvedges extra.

Figure 7 shows a design for what is termed a fast back velveteen, arranged one ground and four pile picks. When each pile pick is tied under two ends, as in this example, the effect is not so good as when tied only once, but the wearing qualities are improved.

In the preceding examples it will be seen that the pile filling is bound only on every other end.

Figure 8 illustrates a design in which the pile is bound in on every end. This type makes a firm texture but does not admit of a large number of picks, therefore the pile cannot be made very full.

PURPOSES.

For dress and trimming purposes velveteens are usually of a solid color, being piece dyed.

For upholstery purposes the goods are dyed, printed, embossed or stamped. Panel and stripe patterns are also made by cutting a raised figure on an uncut ground, or vice versa, by painting or by the pyrogravure process, burning.

When

STAMPING

velveteens the goods are passed between two cylinders. The upper cylinder is of iron and is heated from the inside. The pattern is engraved or sunk into this. The lower cylinder is of hard wood. The pile is compressed by the projecting part of the upper cylinder, causing the pattern to stand out in relief from a dull ground, or vice versa.

PAINTING ON VELVETEENS

is essentially a hand process. The colors have to be free from oil that they may not spread beyond the limits intended.

In the pyrogravure process of making patterns on velveteens, the sketch is first made and placed in a pantograph machine. With a platinum stylus heated to redness the operator then burns out the pile along the lines traced, leaving a very clear pattern.

From the time a velveteen leaves the loom to the time it is ready for cutting, it has to be passed through several processes. It is first put through a

BACK STARCHING AND DRYING MACHINE.

After drying, the better grades are raised on the under side to make a softer feeling cloth. The lower qualities are not raised on account of the tendency for the process to weaken the cloth.

The goods are then, while under tension, saturated with a weak milk of lime, the solution being brushed into them on the face side.

The next process is drying. This is done by a device in which rods are automatically inserted below the fabric, so that the latter hangs down in loops.

After drying, the cloth is folded and passed to the brushing machine. This machine removes the lime and loosens the filling floats so that the knife can readily enter beneath them.

The cutting process proper now

takes place, being done either by machinery or by hand.

Carding and Spinning Particulars.

The fabric for which the carding and spinning particulars are given below is made up in several grades. For this article only two grades will be considered, a coarse one having a warp of 1-28s and 1-40s filling; and a fine grade, the warp yarn of which is 2-70s and with a filling of 2-60s yarn. This fabric, all grades, would be made either in the second or third division of mills as given in a previous lesson. We will consider

THE COARSER GRADE

first. This would be made from a medium grade 1 5-16 inch staple cotton and run through the bale breaker with blower and endless lattice connections, so that it will reach the mixing bins in a dry, open state. When feeding the bale breaker do not feed one entire lap before starting on another, but open several laps around the bale breaker and feed from each bale alternately. The mixing should be

AS LARGE AS POSSIBLE,

so that there will be less variation in the yarn than when small mixings are used. The good waste from the machines up to the slubber is mixed into the bin as it is collected. The cotton is next put through an opener and either 2 or 3 processes of pickers. It is the general custom nowadays to use 2 processes, but the particulars for three processes will be given. If one process is left out, use particulars given for breaker and finisher pickers. Feed the hopper of the opener so that it is always more than half full, because the more cotton there is in the hopper the more cotton will be taken up by the spiked apron and thus a more even sheet will be presented to the beater, which is generally of a porcupine type and is speeded up to 1,000 revolutions per minute. The speed of the beater at the breaker picker is 1,500 revolutions per minute. The total weight of laps at the front of this machine is 40 pounds or a 16-ounce lap. These laps are

DOUBLED FOUR INTO ONE

at the intermediate. At this machine the speed of the beater is 1,450 revolutions per minute. The total weight of the lap at the front is 37 pounds or a 10-ounce lap. These laps are doubled four into one at the finisher picker, the total weight of a lap at the front being 39 pounds or 14½ ounce lap. The speed of this beater is 1,450 revolutions per minute, which gives the cotton passing through it 42 blows or beats per inch. Each lap, as it is taken from the front of the finisher picker, should be weighed and all those laps ranging over a half a pound from the standard, either way (light or heavy), should be run over again. The

CUT ROVING WASTE

is mixed in at the back of the finisher picker in proportion of one lap of roving waste to three laps of raw stock. The cut roving waste has to go through a special process to take out twist and from here it is put through a picker which forms it into a lap, then it is mixed with the raw stock as above. From the picker the laps are taken to the card. The draft of this machine should be about 110. The settings should be medium and the wire fillet used would be No. 35 for doffer and flats and No. 34 for cylinder. The speed of the top flats should be one complete revolution every 40 minutes. The sliver at the front should weigh 65 grains per yard and the production for a week of 60 hours should be about 800 pounds. The sliver is then put through

THREE PROCESSES OF DRAWING,

the doublings at each process being six into one.

The speed of the front roll is 400 revolutions per minute at each process. The sliver should weigh about 70 grains per yard. This is then put through the slubber and made into .50 hank roving. The roving to be used for 28s yarn is put through two processes of fly frames, the hank roving at the first intermediate being 2 and at the second being 6. This is then taken to the ring spinning room and made into 28s yarn on a warp frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1¾ inches; length of traverse, 6½ inches; speed of spindles, 9,700 revolutions per minute. From here it is passed through the spooler, which takes the yarn from the cop and winds it onto a spool. From here it is wound onto a beam and several of these beams are put up at the ends and run through the slasher and wound on to a beam at the front, which has the required number of ends required for the warp of the fabric.

THE SLUBBER ROVING

for filling yarn is put through three processes of fly frames, the hank roving 1.50 at the first intermediate. 4

hank at the second and 8 hank at the last frame. This roving for filling may be taken to either the mule room or the ring spinning room to be made into 40s. We will consider it to be taken to the ring spinning room and spun on a frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1⅜ inches; length of traverse, 5½ inches.

FOR THE FINER GRADES

of velveteen the foregoing general particulars may be used, but substituting the following for 60s and 70s yarn: Use 1½ inches staple cotton; at the pickers the total weight of lap at the front is 40 pounds or 16-ounce lap at the beater and 35 pounds or 12-ounce lap at finisher, no intermediate picker being used. At the card the top flats should make one complete revolution every 40 minutes, the weight of sliver at front being 65 grains and production about 500 pounds per week.

THE DRAFT

should not be less than 120. Sometimes the filling yarn is combed, but we will consider this yarn to be carded and so it will be put through three processes of drawing. At the slubber the sliver is drawn into .55 hank roving and for both warp and filling is put through three processes of fly frames, the hank roving being as follows: To make 70s yarn: first intermediate, 1.50 hank; second, 4 hank; and jack frames, 14 hank. To make 60s yarn: first intermediate, 1.50; second, 4 hank; and fine, 12 hank. The 14 hank roving is taken and spun into 70s yarn on a

WARP SPINNING FRAME

fitted up as follows: Gauge of frame 2¾ inches; diameter of ring, 1⅜ inches; speed of spindles, 10,000 revolutions per minute; length of traverse 5½ inches. From here it is spooled, then twisted into 2-ply and spooled again, warped and put through the slasher. The 12 roving to be made into 60s yarn may be taken either to the mule room or the ring spinning room. If taken to the ring frame, use a frame having the following: Gauge of frame 2¾ inches; diameter of ring, 1¼ inches; length of traverse, 5 inches. The yarn is then twisted into 2-60s.

Dyeing Particulars.

Velveteen is dyed on the jigger machine in 15 gallons of liquor at 175 degrees F.; for 30 pounds of goods, one-half pound soda ash, one-quarter pound sulphide sodium, 1 pound salt; boil up the liquor, add the soda, sodium sulphide and salt before adding the dyestuff, strain through a piece of calico into the jigger.

The goods are run for 30 to 60 minutes; rinse well in water after dyeing.

ECRU.

4 ounces immedial bronze A, aftertreat with ½ per cent bichrome, ½ per cent sulphate copper.

LIGHT SLATE.

4 ounces immedial black V, aftertreat ½ per cent bichrome, ½ per cent sulphate copper.

PEARL.

1½ ounces immedial black V, 1½ ounces immedial brown B, aftertreat as slate.

FAWN DRAB.

12 ounces immedial bronze A, 2 ounces immedial brown B.

LIGHT BROWN.

1 pound immedial brown B, 4 ounces immedial cutch O, 1 pound sulphide sodium.

MEDIUM BROWN.

½ pound immedial yellow D, 1 pound immedial brown B, ½ pound immedial cutch O, 1½ pounds sulphide sodium.

DARK BROWN.

20 pounds salt, ½ pound soda ash, 5 pounds sulphide, ½ pound immedial black N R T sodium, 8 pounds immedial brown B.

NAVY BLUE.

Dye as ecru with 2 pounds immedial blue C, 2 pounds sodium sulphide, ½ pound soda ash, 10 pounds salt; rinse and top with methylene blue N, and shade with methyl violet B.

BLACK.

2 pounds immedial black V, 2 pounds sodium sulphide, ½ pound soda ash, 10 pounds salt; rinse and top with a one-dip black, or paint with Prussian blue.

INDIGO BLUE.

For 30 pounds goods in jigger, 1 to 5 pounds pyrogene indigo, 1 to 5 pounds sodium sulphide, 1 to 2 pounds soda ash, 5 to 15 pounds salt, ½ to 1 pint mineral oil; rinse and soap, top with methylene blue.

A large number of one dip colors are also dyed on velveteens, from light to dark shades. Although the colors are not so fast as sulphur colors, they are sufficiently fast for some trades.

After dyeing, the goods are topped with basic colors, as methyl violet with methylene blue, Bismarck brown and other bright colors.

For 30 pounds of goods, 3 pounds di-

amine green, 20 pounds salt, 1 pound sal soda; top with Malachite green.

SULPHUR GREEN,

2 pounds immedial indone B B, 1 pound immedial yellow D, 2 pounds sulphide soda, 1 pound soda ash, 10 pounds salt. Rinse and top with brilliant green or Malachite green.

VELVETEEN CUTTING.

Velveteen cutting is one of the processes incident to making cloth that is still, to a considerable extent, done by hand for practical purposes, although machines are now in constant use for accomplishing the same results.

The object of cutting is to present to the vision the points, instead of the sides, of the fibres in the filling.

Fig. 1 illustrates the type of knife used when the cutting is done by hand. The guide A is inserted in a race of the cloth, and raises the filling to the cutting edge B as it is forced along.

The cutting is generally done with the blade of the knife held in a vertical position, so as to cut the filling in the centre of the float.

A STRIPE EFFECT

is obtained, either intentionally or unintentionally, by varying the position of the knife to the left, centre or right, if two or three positions are held while cutting the same piece. Instead of cutting with the knife inclined first one way and then the other, to right and left, when making stripes with an ordinary weave, knives with two blades are sometimes used to make both cuts at once, one blade being a little shorter than the other.

There are

TWO METHODS

of cutting velveteens by hand: (a) the long-frame method; (b) the short-frame method. In both these the cloth is first stretched over rollers to a suitable tension.

In long-frame cutting, two pieces are generally arranged parallel to each other, about 10 or 12 yards long, with room enough for the cutter to pass between. The cutter cuts one race in one piece when walking in one direction and a race in the other piece when returning. Assuming that a

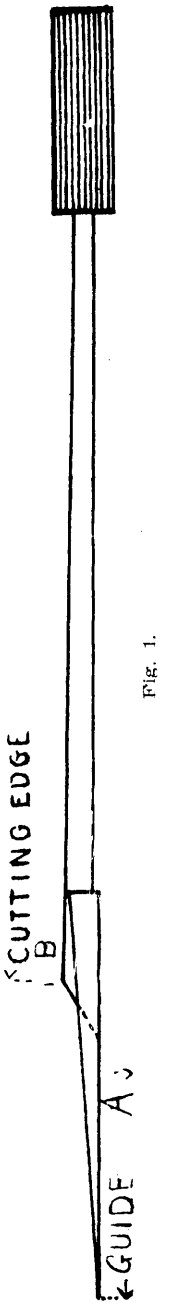


Fig. 1.

24-inch velvet with 900 races is required to be cut, the cutter will have to walk 900x10, which equals 9,000 yds.,

or over 5 miles to cut 10 yards. This illustrates how laborious the hand cutting process is.

IN SHORT-FRAME CUTTING,

about two yards of cloth are cut before a change is made. Here the cutter, with a peculiar swing of the body, forces the knife to the end of the two yards.

Considerable skill is required in a good cutter, as a wrong movement is liable to damage the piece, either by running the knife through it or by cutting at the side instead of the centre of the race.

The amount of seconds in velveteens is very large, there being many of them made after they leave the loom, as well as during the process of weaving. The least imperfection in weaving will cause trouble in cutting.

TWO KINDS OF MACHINES.

Machines for cutting velveteens are of two kinds, blade cutters, and disc or circular cutters. The blade cutters most nearly approach the results attained by hand cutting, the blades being inserted below the filling so as to force the points of the filling upwards as they are cut. The disc cutters cut the filling from the top of the cloth downwards, the resulting pile being inferior to that cut by the blades.

BLADE CUTTERS

are of two kinds, single and multiple. The former have so far given the most satisfactory results on account of the difficulty of keeping the several blades in a multiple machine in perfect alignment with each other.

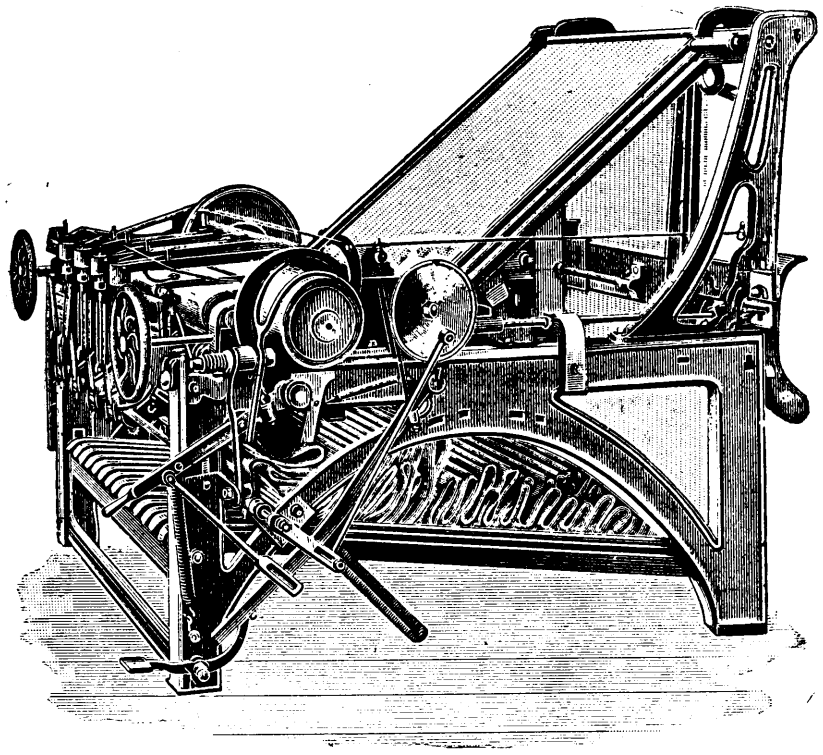


Fig. 2.

The blades are similar to those used when cutting by hand, except that they are smaller.

With a single blade one race is cut at a time, either in lengths of 12 yards or the entire piece, and it is necessary to repeat the operation for each race in the cloth. The

BLADE MACHINES PROPER

are of two kinds, those in which the knives are stationary, the full length of cloth being passed through in an

endless form, and those in which the cloth is stationary, stretched on a long table, and the knives have a horizontal movement.

Both of these types of machines are fitted with either mechanical or electrical stop motions, which cause them to stop immediately a knife jumps out or meets with an obstruction when cutting, or when the end of the race is reached.

Machine cutters require the

CONSTANT ATTENTION

of a skilled mechanic to keep them in proper condition. If they are are not kept sharp and exactly to gauge, the pile will appear stripey, due to uneven cutting.

Figs. 2 and 3 illustrate a continuous cutting machine with four knives.

Cloth cut by a machine of this type is claimed to be of a superior quality, because there is no necessity to take the knives out every few yards, as is the case in hand cutting.

In addition to tne regular tension de-

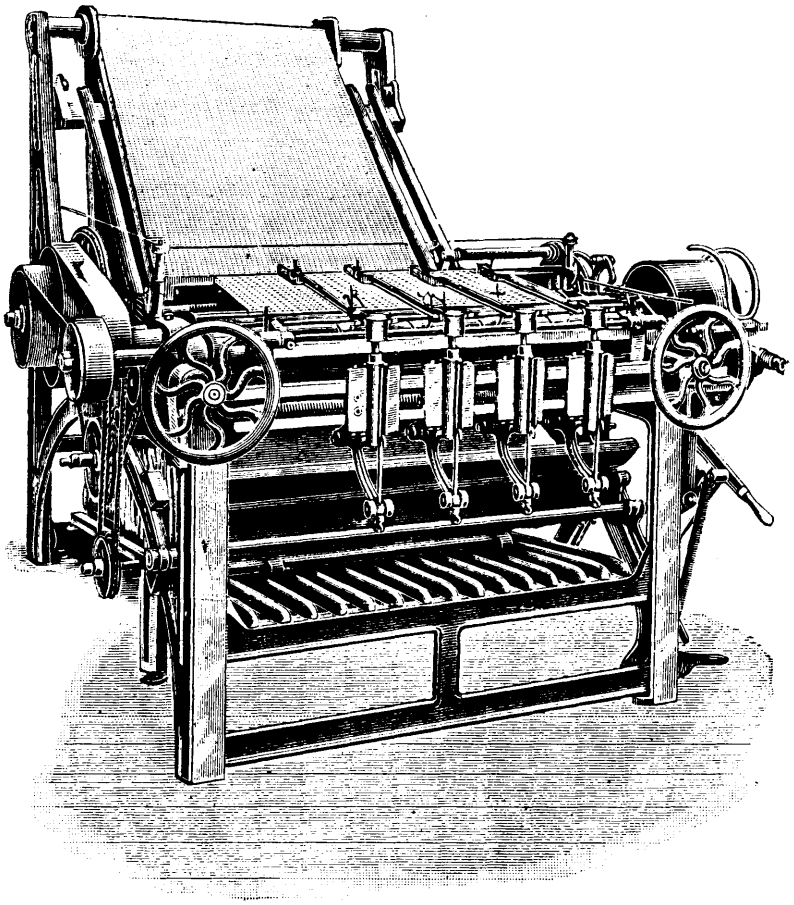


Fig. 3.

vices for holding the piece tight, there are special plates arranged for holding and supporting the fabric immediately under the race being cut. The mechanism is so arranged that the knives, plates, etc., are all moved simultaneously, after each cut.

THE KNIVES

are mounted on hinged arms in such a manner that they lie upon the fab-

ric as it is fed forward, and so continuously cut it. The mounting of the knives is of such a character that in the event of an accident, the worst that can happen is the puncture of the fabric, but the hole so made is only a small one, as the knife is instantly released and the machine stopped.

When the end of a race is reached the knives are readjusted and another set of races cut.

The

DISC CUTTING MACHINES

are fitted with cutting discs of steel plate, accurately gauged and well-sharpened, mounted on a shaft, running at a speed of about 3,000 revolutions per minute. They are sharpened automatically, while the machine is in motion. The number of these cutters depends on the number of races to be cut.

The discs run inside small iron triangles, which serve as guides. These guides are placed in the races of the cloth by hand, and the piece is cut as it is drawn forward by the machine.

The

PRODUCTION OF A DISC CUTTER

is much greater than that of a blade cutter.

The disc machine effects quite a saving in cutting corduroys, these fabrics not having as many races as velveteens.

Devices for cutting the pile filling during the process of weaving have been tried, but have not met with success. One objection to this method is that the goods cannot be finished satisfactorily, the pile pulling out, if handled too severely.

BRILLIANTINE.

Brilliantine is a dress fabric, resembling alpaca, but of superior quality and sometimes finished on both sides. Brilliantines are made with a cotton warp and lustre worsted filling. Lustre wool is grown in Indiana and Kentucky and is commonly known in the trade as braid wool.

Lustre wools are more extensively grown in England. The best qualities are grown in Lincolnshire. The fibres of Lincolnshire lustre range from 8 to 12 inches and are about 1-800th of an inch in diameter.

The wool after it comes from the sheep is sorted both for quality and

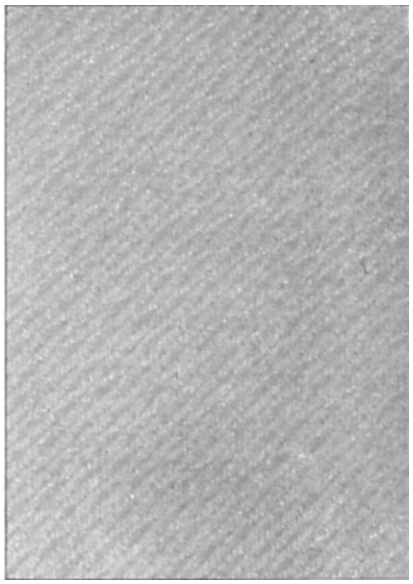


Fig. 1.

lustre and the higher the degree of lustre the more adaptable it is for fancy shades, while the dull or semi-lustre is only used for dark colors.

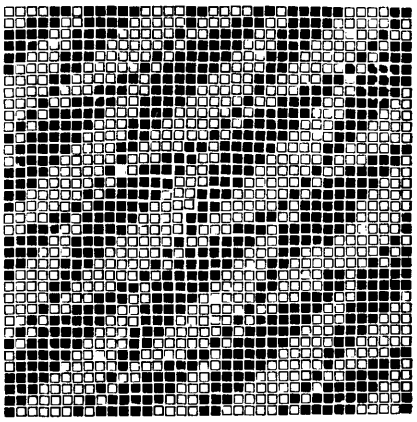


Fig. 2.

Brilliantines are sometimes woven with undyed weft yarn and very rarely if ever with undyed warp yarn. They

are commonly made with both warp and weft yarns dyed previous to weaving. The warp yarn may be the same color as weft or it may be entirely different. If, however, a one-colored fabric is desired and it is to be made with undyed weft yarn, the warp yarn must be dyed, previous to weaving, the same color as the weft will be dyed after the fabric is woven. The warp being cotton will not take color in a wool dye bath.

Fig. 1 shows sample in which both warp and weft are dyed previous to weaving. The warp is light brown and the weft is a medium shade of green. This contrast of colors in connection with the weave gives the fabric

A VERY PRETTY EFFECT.

Any combination of colors may be used. A very important factor to consider in making brilliantines is the weave. The object is to have as much weft floating on the face of fabric as warp, and in figured brilliantines the

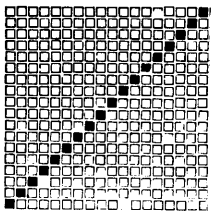


Fig. 3.

figure must in all cases be a weft floating figure. The reason for this is obvious when a lustrous fabric is desired.

The design in Fig. 2, of which two repeats are shown, both warp way and filling way, shows the filling to float on the face of the fabric in exact proportions to the float of warp.

Very pretty effects are obtained with a plain ground weave with a small jacquard figure, and when a very lustrous fabric is wanted, the warp yarn is of finer counts than weft yarn.

ANALYSIS OF FABRIC.

Width of warp in reed (without selvedge), 42½ inches; width of fabric finished, 40 inches; ends per inch in reed, 60; ends per inch finished, 64; ends in warp, 2,535—light brown; 60 ends selvedge, white (30 ends each side), equals 2,595.

Reed 30x2 equals 60 ends.

Take-up of warp during weaving 6 per cent. Weight of fabric per yard from loom 5 ounces; weight of fabric finished practically the same.

Body of warp 2-40s cotton dyed; selvedge 2-40s cotton undyed.

Brilliantines, mohairs and alpacas are usually made with different colored selvedge yarn than the body of warp.

Filling all 1-30s lustre worsted, of about a ¼ blood stock.

Fig. 3 shows drawing-in draft—drawn in on 18 harnesses straight draw, pattern repeats on 18 ends and 18 picks.

LOOM REQUIRED.

For small figured brilliantine a Knowles dobby loom would be about the best. Large figures require a jacquard loom; brilliantines usually require only one kind of filling, consequently a box loom is not necessary, but in order to keep the shade of weft as even as possible when using dyed yarn, two shuttles are sometimes used weaving "pick and pick."

FINISH.

Brilliantines made with undyed weft, after they come from the loom, are first scoured, then dyed; after which they are run through a rotary press, of which the cylinder has from 50 to 60 pounds of steam heat. Brilliantines shrink a little after they come from the loom. The pressure to which they are subjected during the finishing process stretches them out to their original length. Those made with dyed yarns are given usually a dry finish, that is, they are simply run through the press, cylinder heated, after which they are rolled, then packed.

Carding and Spinning Particulars.

In a previous article, under the heading "Carding and Spinning Particulars," the mills were subdivided into three divisions. For the benefit of readers, we will repeat how they were divided for use in these articles. Mills making low count yarns, say from 1s to 30s, were included in the first division, those making medium count yarns, or from 30 to 70s, were included in the second, and the third division comprised mills making yarns from 70s up. This does not mean that only the yarns between the counts given are made in one division, but that the greater portion of the counts of yarn made in the divisions referred to are between the counts given. The

COUNT OF COTTON YARN

used for brilliantine for this article is

2-40s. The filling yarn is lustre worsted yarn and therefore we will only deal with the cotton warp yarn. This class of yarns is made in the second division of mills, the cotton used being of a medium grade and having a staple of about 1 3-16 inches. The equipment for the second division of mills may call for a bale breaker or not. We will consider that one is included. The bales of cotton are stapled and several placed around and fed to the bale breaker alternately from each bale until all are gone. The bale breaker has a capacity of about 80,000 pounds per week of 60 hours. The cotton is carried by endless moving aprons so arranged that they may be moved so as to allow the cotton to be dropped into its proper bin. The bins should be as large as possible so as to allow

A LARGE MIXING.

At this point the sliver waste from the machines up to the slubber is mixed with the raw stock. The cut roving waste of the same length and grade of staple is not mixed at this place, but has to go through a special picking machine, which takes out the twist, then it is put through a picker and made into a lap, after which it is mixed with the raw stock, as will be shown later. The equipment for this division may include two or three processes of pickers. We will consider that it contains an opener and three processes of picking.

THE BEATER

used is generally of the porcupine pattern and the speed should be about 1,000 revolutions per minute for this class of work. The opener is generally attached to the breaker picker and after passing the beater of the opener the cotton is passed to the feed rolls by a moving endless apron. At this point the cotton is in an open, fluffy state. The feed rolls condense the cotton, as it passes between the rolls, into a sheet, and in this state it is presented to the beater of the breaker picker. This beater is generally of a rigid, two-bladed type and for the cotton in question has a speed of 1,500 revolutions per minute. The cotton is then blown on to a set of cages and compressed into a sheet, after which it passes through several sets of calender rolls between which it is further pressed. The total weight of the lap at the front is 40 pounds or about 16 ounces to the yard. These laps are put up at the back of the intermediate picker and

DOUBLED FOUR INTO ONE.

The speed of this beater is about 1,450 revolutions per minute. The total weight of the lap at the front is 37 pounds or a 10-ounce lap. These laps are put up at the finisher picker and doubled four into one. It is at this point that the cut roving waste before spoken of is mixed in the proportion of three laps of raw stock to one lap of roving or bobbin waste. The speed of this beater is about 1,450 revolutions per minute, which gives the cotton passing it about 42 beats or blows per minute. The total weight of the lap at the front of this picker is 39 pounds or about a 14-ounce lap. These laps are then taken to the card, the draft of which for this class of work should not exceed 110. The fillet on the cylinder should be of No. 34 American wire or 110s English count and on the doffer and top flats should be No. 35 wire or 120s English count. The top flats should make one complete revolution every 45 minutes.

THE CARDS

should be stripped (both cylinder and doffer) three times a day and ground at least once a month. The cards should be reset after every grinding in all parts, except the top flats to the cylinder, which should be reset at least four times a year. The weight of sliver at the delivery end of the card should be about 65 grains per yard. The cotton is next put through three processes of drawing frames. Metallic rolls may be used to good advantage on work of this description, the speed of the front roll at each process being 400 revolutions per minute. The weight of the sliver at the finisher drawing frame should be about 70 grains. The cotton is next put through the slubber and made into .55 hank roving.

The roving is then put through

THREE PROCESSES

of fly frames. At the first intermediate it is made into 1.50 hank roving, at the second intermediate into 3 hank and at the jack frame into 9. This roving is then taken to the ring spinning room and spun into 40s yarn on a frame with the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1⅜ inches; length of traverse, 6½ inches; twist per inch, 28.46; revolutions per minute of spindles, 10,000. From here it is passed to the spooler and then to the twister, where it is twisted into 2-40s, and then back to

the spooler. From here it goes to the warper and from the warper the beams are put up at the slasher, where it is sized, and then it is ready for the weave room.

Dyeing Particulars.

These goods are dyed in the piece if solid shades are wanted, but if two-colored fancies are made, the warp and the worsted yarn are dyed in the yarn, woven and finished. For piece dyes union colors are used, or the wool is dyed in an acid bath, rinsed and the pieces are cotton dyed cold.

For union black, 5 per cent union black A, 30 per cent Glauber's salt. Boil till wool is dyed, and run without steam till cotton is dyed up to shade; if cotton is not dark enough add some cotton black.

The union fancy colors are dyed in the same way.

Wool yarn dyeing. For 100 pounds yarn, 10 pounds Glauber's salt, 3 pounds sulphuric acid. Enter pieces at 150 degrees, bring to boil and boil 40 minutes.

LIGHT SAGE GREEN.

1¼ ounces orange I I; 1¼ ounces cyanole B B; ¼ ounce fast yellow S.

MEDIUM SAGE GREEN.

6 ounces orange I I; 2 ounces fast yellow S; 1 pound cyanole B B.

DARK SAGE GREEN.

10 ounces orange I I; 3 ounces fast yellow S; 1¼ pounds cyanole B B.

MEDIUM OLIVE GREEN.

1½ pounds fast yellow S; 6 ounces orange I I; 1 pound cyanole B B.

OLIVE GREEN.

2½ pounds fast yellow S; ½ pound orange I I; 1½ pounds cyanole B B.

BOTTLE GREEN.

3 pounds fast green bluish; ½ pound fast yellow S; ½ pound formyl violet S 4B.

NAVY BLUE.

2 pounds indigo blue S G N; 2 ounces formyl violet S 4B.

DARK NAVY BLUE.

4 pounds indigo blue S G N; ½ pound orange I I; ½ pound formyl violet S 4B.

SLATE.

6 ounces alizarine blue S A P; ½ ounce orange I I; ½ ounce fast yellow G.

RED.

4 pounds fast red N S; 6 ounces orange I I.

ROSE.

3 pounds rhodamine B; 1 pound rhodamine 5G.

SCARLET.

3 pounds brilliant scarlet 1R.

BROWN.

2½ pounds orange I I; ½ pound fast green bluish; 3 ounces fast acid violet 10B; ½ pound fast yellow G.

The warps are dyed in the chain dyeing machine with fast sulphur colors if possible. For 100 pounds warp:

BLUE.

8 pounds immedial indone 3B; 16 pounds sodium sulphide; 8 pounds glucose; 3 pounds soda ash; 15 pounds Glauber's.

SLATE.

3 pounds thion black G; 3 pounds sodium sulphide; 2 pounds soda ash; 20 pounds Glauber's.

FAWN DRAB.

6 pounds immedial cutch O; 6 pounds sodium sulphide; 2 pounds soda ash; 20 pounds Glauber's.

GREEN.

4 pounds immedial yellow D; 4 pounds immedial indone 3B; 8 pounds sodium sulphide; 2 pounds soda ash; 30 pounds Glauber's salt.

OLIVE.

7 pounds immedial olive 3G; 2 pounds immedial dark green B; 10 pounds sodium sulphide; 30 pounds Glauber's salt; 3 pounds soda ash.

NAVY BLUE.

10 pounds immedial dark blue B; 10 pounds sodium sulphide; 30 pounds Glauber's salt; 3 pounds soda ash.

The fancy shades can also be dyed with one dip salt solors and tannine basic colors.

CALICO.

A calico may be defined as a cotton cloth with a figured design printed on one side; generally speaking, any printed cloth coarser than muslin, used principally for inexpensive dresses, such as shirtwaists, wrappers, and so on.

The majority of inexpensive cotton fabrics are constructed on the one-up, one-down system, or plain weave. Calico is no exception to the rule. Its ornamentation, however, is given it after the cloth comes from the loom.

As mentioned above, calico is a printed cloth,

THE PRINTING

being effected by means of a printing machine, which may be described as an elaborate machine with a rotating impression cylinder, on which the design has been stamped, or cut. The cloth, in passing through the machine, comes in contact with the impression cylinder. The cylinder, revolving in a color trough, takes up the color and leaves the impression of the design on the cloth. Calicoes may be seen in almost any color. The printing machine is capable of printing several

COLORS

in one design. Calicoes, however, are usually in but two colors, that is, one color for ground and one for the figure.

The ground color in most cases is effected by dyeing the cloth in some

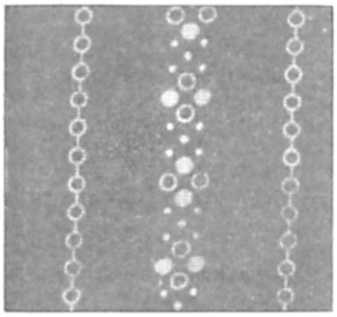


Fig. 1.

solid color. After the cloth is dyed, the design is printed on to the cloth.

The printed designs on calicoes may be somewhat elaborate or they may be some simple geometrical figures. In order, however, to comply with the true principles of art, such fabrics as calicoes should have but simple geometrical figures for their ornamental features.

Fig. 1 shows a sample of calico, with a printed geometrical figure, the simplicity of which is in harmony with the structure of the fabric.

We may here mention that with all machine repeating designs the figures must be laid out in conformity with the dimensions of the printing roll. For instance, say, the printing roll measures six inches in circumference, and the design which we wish to print is but two inches in its vertical repeat, in order to have perfect repetition we must have three repeats of the design stamped on the impression roll.

The circumference of the printing roll will, therefore, control the size and proportion of the design. The design must be so adjusted that the repeat will occur with the utmost accuracy.

Calicoes are made in comparatively narrow widths. The one under discussion is but 23½ inches, finished.

ANALYSIS OF FABRIC.

Width of warp in reed, 25½ inches; width of fabric finished, 24 inches; ends in finished cloth per inch, 72; ends in warp, 1,700; ends per inch in reed 66 2-3; 1,200x2 reed.

Take-up of warp during weaving, 7 per cent; weight of fabric, per yard, from loom, 2 ounces; weight of fabric finished, 2 ounces; warp all 1-30s carded peeler.

Filling: 52 picks per inch in loom; 52 picks per inch finished.

Design.

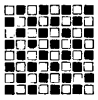


Fig. 2.

Drawing-in-draft.

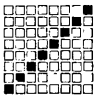


Fig. 3.

Counts 1-30s carded peeler.

LOOM REQUIRED.

The Northrop loom would be the most economical loom to use for calicoes and similar fabrics. The warp is usually sized, in order to strengthen the yarn. In the sizing process about 10 or 15 per cent of weight of sizing material is added to the yarn, which consists chiefly of wheat flour or potato starch.

FINISHING.

The cloth, after it comes from the loom, is sent to the dyehouse. The first process is to boil it off, after which it is immersed in the dye tub. Calicoes are given what may be termed a "cheap cotton dye." By "cheap cotton dye" is meant that the colors are not fast, but will run or fade when subjected to water.

After the fabric is dyed, it is then given to the printer, who ornaments the face of the cloth with some geo-

metrical design; after which it is practically ready for the merchant.

Carding and Spinning Particulars.

The yarns that make up calico may be made in either the first or second division of mills, as given in a previous lesson. The counts of the yarns used for the particular fabric for this article are 1-30s, both warp and filling, and these are made out of 1⅜ inches staple peeler cotton. After being sampled, several bales are placed around the bale breaker, and fed to this machine, a little from each bale. By doing this a

MORE EVEN YARN

is apt to be obtained. After passing through the bale breaker the cotton is conveyed either by endless lattices or blower and trunking to the cotton bins. As large a mixing as possible should be made at one time. The raw stock for this fabric is put through an opener and three processes of picking. The opener is never allowed to become less than half full when machine is running, for reasons given in previous articles. The beater of this machine runs at a speed of about 900 revolutions per minute. After passing through this machine, which is generally connected directly with the breaker picker, either by trunking or by an endless lattice, the cotton comes under the action of the feed rolls of the breaker picker, which compress it into a sheet, and it is in this form that it is presented to the beater. For this class of work a

TWO-BLADED BEATER

is used and the speed of the beater at this machine is 1,400 revolutions per minute. The total weight of a lap at the front end is 40 pounds, or about a 16-ounce lap. These laps are put up at the intermediate picker and doubled four into one. The speed of the beater for this machine is about 1,350 revolutions per minute. The total weight of lap at the front is 37 pounds or 12 ounces to the yard. These laps are put up at the finisher picker, and doubled four into one. It is at this point that the cut-roving waste is mixed in with the raw stock in the proportion of three laps of raw stock to one lap of roving waste. It is understood that the bobbin waste has to go through a special process before being mixed with the raw stock. The speed of the beater for this machine is about the same as that of the intermediate picker, 1,350 revolutions per minute. This gives the cotton passing under its action about 42 beats per inch. The total weight of a lap at the front is 35 pounds or a 13-ounce lap. These laps are then taken to the card room, as needed, and put up at

THE CARD.

This card should have a draft not exceeding 100. The cylinder fillet for this class of work should be composed of No. 33 or 100s English count wire, and the doffer fillet and that of the top combs of No. 34 wire or 110s English count. The speed of the licker-in is 300 revolutions per minute, and the top flats make one complete revolution every 50 minutes. The cards should be stripped three times a day, and ground at least once every month, and set at the time of grinding. Keep parts at the front of card cleaned of all fly and collect the fly from the flats before it accumulates and falls over the doffer or goes up under the flat comb and gets onto the flats. The weight of the sliver at the front should be 65 grains per yard, the production about 750 pounds per week of 60 hours. From the card the sliver is put through

THREE PROCESSES OF DRAWING.

At these machines the doubling is six into one. The draft at the different processes is as follows: Breaker, 4.50; intermediate, 7; finisher, 7.20. The setting of the rolls is as follows: Distance between front and second, 1½; between second and third, 1⅝, third and back, 1⅞ inches. The front roll makes 400 revolutions per minute. The weight of sliver at the finisher drawing is 72 grains per yard. The drawing sliver is put through the slubber where it is drawn into .60 hank roving. Set rolls as follows: front to second, 1½ inches; second to back, 1¾ inches.

The slubber roving is put through two processes of fly frames at the first intermediate. The hank roving is 2.25 hank and at the next process it is drawn into 6. hank. The lays per inch of the roving on the bobbin at this machine are 33. Look out for the top rolls to see that they are always in the best of condition. From the jack frame the roving is taken to

THE SPINNING ROOM

where it is spun into 30s yarn. The particulars for a warp frame are as follows: Gauge of frame, 2¾ inches;

diameter of ring, 1⅝ inches; length of traverse, 6½; speed of spindle, 9,800 revolutions per minute; twist per inch 26.02. The yarn is then taken to the spooler and then to the warper. From the warper the beams are put through the slasher. A good sizing to be used for this fabric is as follows: Water, 100 gallons; cornstarch, 50 pounds; tallow, three pounds; turpentine, one gill. Boil 30 minutes if the cloth is woven on a common loom. If woven on a Draper loom use of water, 100 gallons; potato starch, 50 pounds; tallow, three pounds; turpentine, one gill. Boil 30 minutes.

The filling yarn (30s) is made on a frame fitted as follows: Gauge of frame, 2¾ inches; diameter of ring, 1⅜ inches; length of traverse, 6 inches; speed of spindles, 8,300 revolutions per minute; twist per inch, 19.16.

Printing Particulars.

Most of the designs for calicoes and cotton cloth printing are made in Paris, which has been the headquarters for many years of new styles and fashions.

The design is taken by the sketch maker,and drawn to scale, so that the engraver can apply it to the copper roller. Formerly all the printing was by hand (block) printing. Now machines are made to print from one to 24 colors.

A 12-color machine is the largest generally used, but there are a few 24-color printing machines in Europe. Each color has a separate roller and the engraver has to make the pattern fit on every roller, so that when the piece is printed the design is not spoilt and the colors mixed up.

ENGRAVING THE ROLLERS

is done by hand or machine, by the pentograph or the die machine.

The printing machine turns out about 400 to 800 50-yard pieces a day. There have been times where 1,000 50-yard pieces have been run in 12 hours, a one-color pattern, but for some designs and cloths only 250 pieces are run in a day.

The pieces are singed and bleached, then sheared and brushed to take away all lint from the face of the piece.

The pieces arc printed, dried, and steamed to fix the color, afterwards soaped and washed, then finished and folded, and made up, ready for the market, being generally packed in 20-piece lots, to be shipped to any point of the compass. There are

MANY STYLES

of calico printing. At present the steam styles are most prominent. The colors are the fastest and brightest to be obtained. The most important styles will now be considered. First in the list are alizarine colors, of almost every hue and shade, reds, pinks, purples, browns, blues, yellows, oranges, etc. Alizarines are fixed on the fibre by chrome mordants.

BLUE.

Three pounds alizarine blue S paste, 20 per cent; one gallon starch thickening; three pounds acetate chrome, 20 degrees Tw. After printing,the pieces are steamed for one hour, four pounds steam pressure, then soaped and washed.

BASIC COLORS

are good bright, fast colors fixed with tannine: 10 ounces auramine, 1½ pints of water, 1⅛ pints of acetic acid, 10 degrees Tw.; 6 pints gum water, 1x1; 2¼ pints acetic acid tannic acid solution, 1x1. Steam and run through a bath of tartar emetic; wash and dry. The basis colors are very bright, and consist of every shade in the rainbow.

Extracts of various dyewoods are still used for some styles, fixed with chrome or alumina.

PIGMENT STYLES

are fixed with albumen as vermillion red, chrome green, ultramarine blue, etc. Indigo blue is dyed, then discharged white, yellow, orange and other colors are printed on the dyed pieces. Aniline black is an important style with many resist colors printed first, the black padded afterwards and oxidized. This is extensively used.

Patterns are printed on the cloth with mordants of iron and alum. The cloth is then aged and dunged, dyed with alizarine, and the old madder styles produced, which were in such demand 50 years ago. Then there are turkey-red styles, with discharge white, yellow, blue, green, black on red ground; discharge white and colors on blues, browns, wines, etc. Indigo blues are dyed in the vat with a large proportion of synthetic indigo and discharges printed on. There is also direct indigo printing with the glucose process.

New styles and combination of colors are produced every month and faster and brighter colors printed each season.

PERCALE.

Percale may be defined as a closely woven fabric, made with a good quality of cotton yarn. Percale is of French origin and was originally made with linen yarn, hence the name, as it is sometimes called French cambric.

The finer qualities of percale are used for handkerchiefs, aprons, etc. When used for these purposes they are not printed, but bleached, after the fabric comes from the loom.

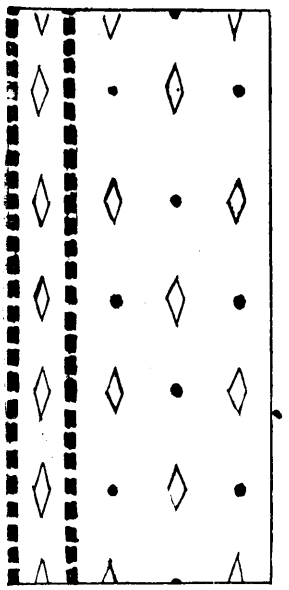


Fig. 1.

Percale, however, is chiefly used for dress fabrics, such as shirt-waist suits for spring and summer wear, and as such, is quite common.

Percale, when intended for dress fabrics, is usually printed on one side with some neat geometrical figure. The printed figure is usually in black, although some may be seen in red or blue. The fabric is bleached before it is subjected to the printing operation.

A CHARACTERISTIC FEATURE of percale is the lack of gloss, or its dull finish, due to the fact that it is not subjected to any pressure during the finishing process. Percales may also be described as plain woven fabrics with a printed design on one side.

The color used for the printed figures is quite durable, in so far that it will not readily fade and will wear almost as long and well as the fabric.

The printed designs on percales are usually plain but neat geometrical figures. The polka dot pattern is quite common. It produces a very neat effect, especially when dots are in black. Striped designs are also very common. Some very neat effects may be obtained when using a stripe in connection with some simple geometrical figure.

Fig. 1 shows on an enlarged scale a design for a stripe percale. The stripes as a rule run in the direction of the warp. Stripes running vertically tend to increase the appearance of height, while stripes running horizontally tend to decrease the impression of height; for this reason short persons are advised to select dress goods with the stripe running vertically.

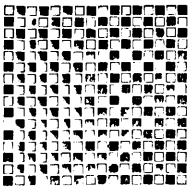
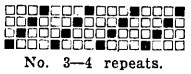


Fig. 2. Weave.



No. 3—4 repeats.

Percale, like most cotton fabrics, is made in several qualities, as regards counts of yarn used, and the number of ends and picks per inch. We will here give an analysis of a good grade:

ANALYSIS.

Width of warp in reed, 38½ inches; width of fabric finished, 36 inches; ends per inch, finished, 85; ends in body of warp, 3,080; 20 ends for selvedge; total ends, 3,100.

Take-up of warp during weaving 6 per cent; weight of fabric per yard from loom, 3½ ounces.

Finished weight, 3½ ounces per yard; warp, all 1-30s carded peeler; reed, 1,400x2.

Filling, all 1-36s combed peeler, 74 picks per inch in loom; 74 picks per inch, finished.

LOOM REQUIRED.

Percale, like most cotton fabrics, is

woven on looms with high running speed. Percales are plain woven fabrics, consequently no dobby is required. The Northrop loom would be the most economical loom to use in the manufacture of percale, or if a Northrop loom is not available use any plain weaving loom and draw warp straight on 8 harness. Considerable care should be exercised in the weaving. No broken picks should be allowed to pass, as they will show quite distinctly in the finished fabric.

FINISHING.

After the fabric comes from the loom it is sent to the bleach house, where it is first boiled off. Then it is bleached. After the bleaching process the fabric is ready for the printer. After the printing operation the fabric is slightly stiffened, by being passed through a size trough. The size used for stiffening is usually corn, wheat, rice, barley, potato or farina. Any of these will give the desired effect.

The fabric passes from the sizing trough on to the drying cylinders, after which it is folded; then it is ready for shipment.

Carding and Spinning Particulars.

The counts of yarn of which percale is composed are made in mills of the second division. The counts of yarn vary according to the quality of the cloth. In this lesson we will consider the count of the filling yarn to be 36s and the warp yarn to be 30s. The filling yarn is combed and the warp yarn is carded peeler of 1 5-16ths inches staple. The cotton is brought from the storehouse and sampled, and all bales of the same length and grade of staple are placed around the bale breaker. The cotton is fed from each bale alternately to the breaker. From the breaker it is conveyed automatically to the so-called mixing bins, either by endless lattices or a blower and trunking, or a combination of both. The latter method is the better one because it

HELPS TO DRY OUT

the cotton better. At the mixing bins the sliver waste from all the machines up to the slubber is mixed in. The sliver waste should not be thrown in in long lengths, but should be broken into short lengths, so that it will not become wound around the pin roller of the hopper. The raw stock is next put through a hopper and either two or three processes of pickers. The hopper should be kept well filled so as to insure a uniform amount of cotton always being delivered to the pin roller. This machine is generally provided with a porcupine beater. The cotton is delivered on to an endless lattice, which carries it to the feed rolls of the picker. These feed rolls compress it and present it to the beater. This beater is generally of the rigid type, having two or three arms, generally two.

SPEED OF BEATER.

This beater has a speed of 1,500 revolutions per minute, if of a 2-bladed type, or 1,000 revolutions per minute if it has three arms. The total weight of the lap at the front of the breaker picker is 40 pounds or a 16-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. The speed of this beater is about 1,450 revolutions per minute for a 2-bladed, or 975 revolutions per minute for a 3-bladed beater. The total weight of a lap at the front is 37 pounds or a 12-ounce (per yard) lap. These laps are put up at the finisher picker and doubled 4 into 1. At this picker the cut roving waste of the same length of staple and cotton is mixed in in the proportion of 3 laps of raw stock to 1 lap of cut waste. The speed of the beater for the machine is 1,200 revolutions per minute for a 2-bladed, or 800 revolutions per minute for a 3-bladed beater of a rigid type. The total weight of a lap at the front is 35 pounds or a 12½-ounce lap. A variation of one-half pound from standard total weight of lap is allowed at this picker. All laps weigning over 35½ pounds or under 34½ pounds should be run over again. The laps are taken to

THE CARDS,

where the draft should not exceed 100 for this class of goods. The speed of the various parts is as follows: Licker-in, 300 revolutions per minute; cylinder, 160 revolutions per minute; doffer (24 inch), 9¼ revolutions per minute. The top flats have one revolution every 45 minutes. The weight of the sliver at the front should be about 65 grains, and the production about 600 pounds per week of 60 hours. At this point the sliver for the filling yarn and that for the warp yarn separate, that for filling yarn being taken to the comber. Before being put through the combers the sliver has to go through one or more processes. These vary according to the different ideas of the ones in charge; sometimes the sliver is put through a drawing frame and sliver lap, and sometimes through a sliver lap alone. The

GENERAL METHOD USED

is to put it through a sliver lap machine and then a ribbon lap machine. It is the general custom of late day

to use 8 head combers running a 10½-inch lap. The following calculations are made on this basis. At the sliver lap machine the carded sliver is doubled 20 into 1. The draft of this machine is about 2. The laps are put up at the ribbon lap machine and doubled 6 into 1. These laps are put up at the comber and doubled 8 into 1. The production of this machine is about 600 lbs. per week of 60 hours. The sliver is then put up and run through two processes of drawing frame and doubled 6 into 1. The weight of the sliver at the front of the finisher drawing frame is 65 grains per yard. The speed of the front roll is 350 revolutions per minute. This sliver is next put through the slubber and made into .50 hank roving. This is next put through three processes of

FLY FRAMES,

the hanks at the different processes being as follows: 1st, 1.40; 2d,3, and jack, 9 hank. From here the roving is taken to either the mule room or the ring spinning room. We will consider that it is taken to the ring spinning room, where the frame for spinning 36s would be as follows: Gauge of frame, 2¾ in.; diameter of ring, 1¼; length of traverse, 5; twist per inch, 27.96; revolutions per minute of spindles,7,400. After the spinning frame the yarn is carried to the weave room.

The sliver for warp yarn after leaving the card is put through

THREE PROCESSES OF DRAWING

the weight of the sliver at the finisher drawing being 70 grains per yard, the revolutions per minute of the front roll being 350. This is put up at the slubber and made into .50 hank roving, after which the roving is put through two processes of fly frames, the hank roving at each being as follows: 1st, 2, and jack,7 hank. The roving is taken to the spinning room and spun into 30s yarn on a frame having the following particulars: Gauge of frame, 2¾ in.; diameter of ring, 1¾ in.; length of traverse, 6½ in.; twist per inch, 26.02; revolutions per minute of spindles, 9,800. The yarn is next taken to the spooler, then to the warper, and from here to the slasher.

Bleaching and Finishing Particulars.

Percales are very carefully handled in the finishing process.

The goods are bleached in a kier with 4 degrees caustic soda, washed and boiled with another process of 4 degrees caustic soda, washed and chemicked at ½ degree Tw. for six to eight hours, being laid in bins. Then they are soured with ½ degree sulphuric acid, and well washed and dried. Some finishers place each piece in the kiers separately, and also in chemic tubs and souring bins, as, if sewed in long lengths, and run through the machinery in the rope form, the pieces are dragged and the threads are not straight across the piece. Spots and small figures are printed on the goods in navy blue, brown, black, green and other colors.

DARK NAVY.

Eight ounces new fast blue F; 2 ounces methyl violet 3 R; 1¼ pints water; 1½ pints acetic acid 10 degrees Tw.; 7 pints thickening; 8 noggins acetic acid and tannic acid (1-1).

DARK ROSE.

Four and one-half ounces rhodamine 5 G; 3 pints acetic acid 10 degrees Tw.; 5 pints water; 3½ pints mucilage tragacanth (70-1,000); 4 noggins acetic tannic solution (1-1).

IMPERIAL PURPLE.

Four ounces methyl violet 4 R; 3 pints acetic acid 10 degrees Tw.; 3 pints mucilage of tragacanth (70-1,000); 5 pints water; 2 noggins acetic tannic solution (1-1).

GREEN.

Four ounces malachite green; 1¼ pints acetic acid 10 degrees Tw.; 5 pints gum water (1-1); 4 noggins acetic tannic acid (1-1); 2 pints water.

GRAY.

Two ounces new fast gray; 5 pints mucilage of tragacanth (70-1,000); 3 pints albumen water (1-1); 3 pints water.

The above colors are steamed for one hour with five pounds steam. They are run through a solution of tartar emetic, 2 ounces to gallon, soaped and rinsed, then dried.

STARCHING.

Six to eight ounces white German dextrine, 1 gallon water. Mix cold and boil for 20 minutes. After starching, dry on a tenter frame.

PERCALINE.

Percaline, like percale, is a plain woven fabric made with a good quality of single cotton yarn for both warp and filling. The similarity extends no further; the difference between the two fabrics lies chiefly in the weight and finish.

Percaline is a lighter fabric and

has a very glossy finish, or, more properly speaking, a moory finish percaline is usually dyed in solid colors. Percale, on the other hand, is a bleached cloth with a dull finish and usually with a printed design on one side.

Percaline is used chiefly for feminine wearing apparel, principally for linings, petticoats, etc. These purposes require that the cloth shall be of solid color, the darker colors being preferred, such as dark blues, dark green and black,which have the greatest sale. It may, however, also be seen in lighter shades, such as a medium blue, a light shade of brown and various shades of tan.

Percaline, as mentioned above, is a plain woven, single-yarn fabric. The

WARP YARN IS SIZED

in order to facilitate the weaving. A fabric like percaline requires very little detail work, as far as the designing is concerned. The most attention is given to the finishing process. In order to get a good glossy finish a certain number of ends and picks per inch are required.

It is important, in laying out the ends and picks per inch, that the designer bear in mind that unless sufficient yarn is used, the fabric will not acquire the desired effect in the finishing.

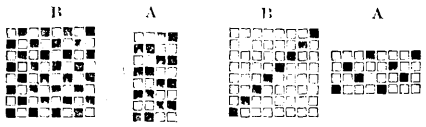


Fig. 1. Fig. 1. Fig. 2. Fig. 2.
Chain Drafts. Drawing-in Drafts.

This glossy or moory finish is quite a characteristic feature in a percaline. The more ends and picks per inch used, the more gloss the fabric will possess when finished.

ANALYSIS.

Width of warp in reed, 37.5; width of fabric finished, 36; ends per inch, 84; ends in warp, 3,050; 1,400x2, reed.

Take-up of warp during weaving, 7 per cent; weight of cloth per yard from loom, 2.5 ounces; weight of cloth per yard finished, 3 ounces; warp yarn, 1-30s combed peeler.

Filling,1-40s, 84 picks per inch from loom.

Picks per inch finished, 84.

LOOM REQUIRED.

Percaline is woven in the gray on high running speed looms, with four or eight harnesses. When four harnesses are used, the warp is generally drawn in the following order: 1, 3, 2, 4. (See Fig. 2A.) When eight harnesses are used, it is drawn straight. (See Fig. 2 B.) Fig. 1 A: design for skip draw four harnesses. Fig. 1B: design for eight harnesses straight draw.

The Northrop loom would be about the best loom to use, principally on account of production obtained with these looms.

FINISHING.

The finishing process will include from the time the cloth comes from the loom until the cloth is ready for use.

The first process to which the cloth is subjected is to boil it off, that is, by soaking it in boiling water; this process partially relieves it from any foreign matter that it may have gathered during the weaving and at the same time prepares it for the dye tub.

After the fabric is dyed, it is sized in order to stiffen it and also heighten the gloss on the cloth.

After the sizing, it is ready for the calender. In order to still more add to the gloss on the face of the fabric, the cloth is usually doubled lengthwise, or sometimes two pieces are placed together, back to back, and run through the calender at the same time. Before the cloth reaches the calender rolls it passes between two perforated steam pipes, which wet the cloth considerably, then between the rolls of the calender, which are well heated and tightly set together. The above-mentioned processes produce what is termed a moory finish.

The cloth after it comes from the calender is lapped on small boards, after which it is ready for the market.

Carding and Spinning Particulars.

The carding and spinning particulars applicable to the manufacture of percale, given in the last article, may be followed also with reference to percaline, with a few minor changes: Thus the count of the filling yarn is to be 40s, instead of 36s. The filling and warp yarns are both carded peeler, and the cut roving is put through a special process that takes out the twist and delivers it in a fluffy state. This is then put through a picker, which forms it into a lap, and these laps are dealt with as before described. All laps weighing over 35½ pounds or under 34½ pounds should be run through the finisher picker

again, being mixed in with the other laps in the proportion of one re-run lap to three regular laps. This is done so that the weight will not vary from the standard. At the cards a 26 or 27 inch doffer should be used if possible, the larger the better, and the production should be 650 pounds per week of 60 hours. The sliver for both the warp and filling yarn is put through three processes of drawing, and the roving to make the warp yarn through two processes of fly frames. The following size mixing may be used at the slasher: Water, 100 gallons; cornstarch, 50 pounds; tallow, three pounds; turpentine, one gill; boil three minutes. The slubber roving for filling yarn is put through three processes of fly frames. We will consider that it is taken to the ring spinning worm, where the frame for spinning 40s would be as follows:

Gauge of frame, 2¾ inches; diameter of ring, 1⅜ inches; length of traverse, 5½ inches; speed of spindles, 8,800: twist per inch, 23.72.

After being spun, the filling yarn is treated so that it is delivered to the weave room in a moist state. This is accomplished by different methods in different mills, some using a steam chest, while others simply immerse the filling in water just before it is carried to the weave room.

Dyeing Particulars.

PEARL.

One-quarter per cent diamine dark blue B; 10 per cent Glauber's; 2 per cent sal soda.

LIGHT TAN.

One-quarter per cent diamine fast yellow B; ⅛ per cent diamine brown G; 1-16 per cent diamine black B H; 10 per cent Glauber's; 2 per cent sal soda.

LIGHT BROWN.

One-quarter per cent tetrazo brown R; ¼ per cent tetrazo yellow M; ⅛ per cent tetrazo black N; 10 per cent Glauber's; 2 per cent sal soda.

LIGHT BLUE.

One-eighth per cent diamine sky blue F F; 20 per cent Glauber's; 1 per cent sal soda.

LILAC.

One-quarter per cent tetrazo chlorine lilac B; 10 per cent Glauber's; 2 per cent sal soda.

ROSE.

One-quarter per cent tetrazo chlorine rose; 10 per cent Glauber's; 1 per cent sal soda.

MEDIUM BROWN.

One per cent diamine fast yellow B; 1 per cent diamine brown B; ¼ per cent diamine black B H; 20 per cent Glauber's; 2 per cent sal soda.

ROYAL BLUE.

Three per cent tetrazo brilliant blue B B; 30 per cent Glauber's; 2 per cent sal soda.

PINK.

One-quarter per cent tetrazo pink G G N; 20 per cent Glauber's; 1 per cent sal soda.

NAVY BLUE.

Two per cent diamine blue B; 3 per cent diamine black B H; 30 per cent Glauber's; 2 per cent sal soda.

DARK GREEN.

Five per cent diamine green B; 1 per cent diamine black H W; 30 per cent Glauber's; 2 per cent sal soda.

DARK BROWN.

Two per cent diamine fast yellow B; 3 per cent diamine brown B; ½ per cent diamine black B H; 30 per cent Glauber's; 3 per cent sal soda.

WINE.

Three per cent diamine Bordeaux B; 30 per cent Glauber's; 3 per cent sal soda.

SCARLET.

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

BLACK.

Fifteen per cent immedial brilliant black; 15 per cent sulphide sodium; 3 per cent soda ash; 30 per cent Glauber's.

BEDFORD CORD.

Bedford cord is a name given to one of the most popular types of fabrics, the distinguishing effect of which is a line stripe and raised cord effect running lengthwise of the cloth, the cords being of more or less prominence.

Figs. 1, 3 and 6 show examples.

They are a standard type and are made in a large variety of weights. The cords vary in width from about 1-20th to ¼ inch. Although usually made with cotton, the name refers to the weave rather than to a combination of weave and material. Sample

for Fig. 3 is a worsted bedford cord.

The face effect of bedford cords is generally plain, although twill face cords are occasionally made.

Fig. 1 illustrates a plain faced bed-

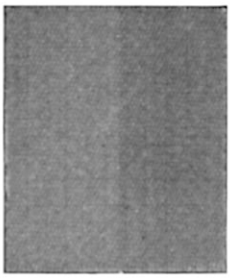


Fig. 1.

ford cord, made with weave Fig. 2. This is the simplest type of bedford cord weave, but is not used to any extent on account of some of the picks, A and B, bringing widely differing proportions of warp and filling on the face from picks C and D, making it hard on a loom.

Fig. 2.

Fig. 4.

Fig. 5.

Fig. 3 illustrates a sample made with Fig. 4. This shows practically the same effect as Fig. 1, but has been made with an easier weave.

Figs. 4 and 5 will serve to show the two principal forms of construction of bedford cords.

Fig. 4 is complete on 24 ends and 4

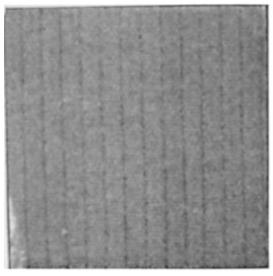


Fig. 3.

picks. One repeat of this weave makes two ribs or cords in Fig. 3. The line or cut effect is formed by ends 1 and 2, and 13 and 14, shown in type ■ These ends weave plain throughout and have twice as many interlacings as the other ends in each repeat.

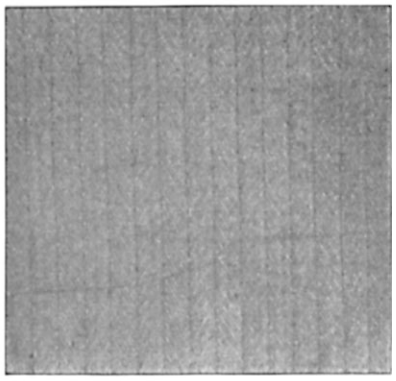


Fig. 6.

The remainder of the ends weave plain on one-half of the picks only, and are then raised out of the way and the filling allowed to float under them for the other two picks, the cords alternating so that when one rib is weaving plain, the same pick of filling is floating under the next one. The plain picks of the succeeding repeat slide over and cover these long floats of filling, making the face effect plain and yet striped.

The advisability of using this type of weave in preference to that shown in Fig. 2 is in the fact that it allows the ends of one cord to be raised out

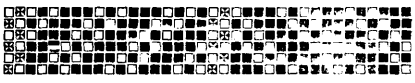


Fig. 7.

of the way, while the other is weaving plain, and the loom is allowed to raise the same number of ends on each pick.

As every two picks of filling interlace only with the ends of every alternate rib, and float at the back of the next one, solid lines of color lengthwise of the piece may be made by arranging the warp yarns of one rib of one color and those of the other rib of

a different color, and picking the filling 2 and 2 so that each color interlaces only with the same color of warp. A variety of colored stripes may be made by combining the types Figs. 2 and 4, varying the number and sizes of sections as desired.

To get extra weight without altering the appearance of the face, extra warp yarns, termed wadding ends, are inserted between the face weave and the filling floating at the back of the rib. When these wadding ends are coarse, they give a pronounced rounded appearance to the cord, more so than if several ends of finer yarns are used. Wadding ends are generally coarser than the face ends.

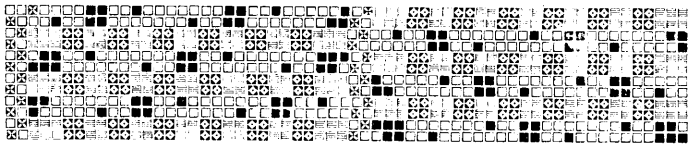


Fig. 8.

Fig. 5 illustrates the type of weave used when a bedford cord is required with a fine face and a heavy weight, or where a well-rounded cord is desired. Ends shown with type ▫ are wadding ends. These are always raised when the filling is floating at the back of the cord and depressed when the filling is interweaving with the face ends.

Fig. 6 illustrates a bedford cord with a twill weave on the face. The twill runs to the right in one rib and to the left in the next one, making a herringbone effect. Fig. 7 shows the face weave for Fig. 6, ends 1 and 2 and 19 and 20 being the cutting ends.

The weave for this particular sample has been made on the principle shown in Fig. 2, but weave Fig. 8 would be preferable. In this figure type ▪ indicate cutting ends; ▫ wadding ends; ▪ and solid black type face cord ends; solid type and ▪ show the face weave. The wadding ends would be drawn 2 in each heddle. There are 12 of these in each rib.

The cutting ends in Fig. 6 might have been arranged to work 2 and 2, instead of plain, because of the large number of picks per inch and the relative amount of interlacing of the other ends. When the face weave is plain, two plain ends should separate the ribs.

Bedford cords are firm fabrics, somewhat heavy on account of the large number of ends and picks required per inch. They are usually woven with a coarse reed in a fairly heavy single box loom. One warp only is required unless the counts of the wadding and face yarns differ.

The question of dividing the two cutting ends with the reed or of putting them in the same dent depends upon the effect desired and the quality of the fabric. The stripes may be varied in width as desired, or the sizes of the different ribs in one pattern may vary within certain limits.

The construction of samples for Figs. 1, 3 and 6 are as follows:

For Fig. 1, 96 sley, 88 pick; for Fig. 3, 116 sley, 108 pick; for Fig. 6, 220 sley, 156 pick.

No. 6 contains 132 face ends and 88 wadding ends per inch, making a total of 220.

Carding and Spinning Particulars.

The machinery for the manufacture of bedford cord will be found in the second and third division of mills, as given in a previous lesson. There are generally three counts of yarn used for each piece of cloth, one for filling, one for the warp, and one for the cords. These counts vary according to the quality of the fabric being made, generally several different qualities being made under one management. The counts of yarn which will be considered in this article as composing the cloth will be number 40s for warp, number 60s for filling and number 20s for the cord or wadding ends. These counts are made up of a good quality of cotton of about 1⅜ to 1⅝ inch staple. At the mixing bins the waste sliver up to the slubber is mixed in as collected, which should be done at regular intervals during the day. The one in charge of the picker room should see that too much waste is not being made and also that the sliver is well torn to pieces before being put into the mixing. A good way to check how much waste is being made is to have the picker man weigh it as it comes in and at the end of every week give his list to the overseer. In this way the overseer may be sure that he is getting a correct list of the amount of waste be-

ing made and can act accordingly. The raw stock is put through either two or three processes of picking,

TWO PROCESSES OF PICKING

being generally used, although the particulars for three processes will be given here. The raw stock is fed to the hopper and from here passes under a beater, the speed of which is 1,050 revolutions per minute. From here it is conveyed to the feed rolls of the breaker picker, in a fluffy state, by an endless lattice. The feed rolls condense it and present the sheet of cotton to the action of the beater, which is generally of the rigid type, having either two or three arms. If a two-armed beater is used, the speed should be about 1,500 revolutions per minute, and if a three-bladed beater, the speed should be proportionately less. The total weight of the lap at the front should be about 40 pounds or a 16-ounce lap. These are put up at the intermediate picker and doubled 4 into 1. The speed of this beater should be about 1,400 revolutions per minute, the total weight of the lap at the front being 35 pounds or a 14½-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. It is at this point that the

CUT ROVING WASTE

is mixed in, it having first been made into a lap after passing through a special process, in the proportion of one lap roving waste to three laps raw stock. The speed of this beater, if of a two-bladed rigid type, should be about 1,350 revolutions per minute, which gives the cotton passing through it about 40 beats per inch. The total weight of the laps at the front should be about 35 pounds or a 12½-ounce lap. A variation of half a pound either side of standard is allowed. Laps with a variation of more than the above should be treated as given in a previous article. The laps are put up at the card, the draft of which should not be less than 100. The speed of the top flats should be one complete revolution every 45 minutes. The wire fillet used should be of medium fineness, about number 110 for cylinder and number 120 for the doffer and top flats.

THE WEIGHT OF SLIVER

at the front should weigh 65 grains per yard, the production for the 40s and 60s yarn being 650 pounds per week of 60 hours, and for the 20s yarn 750 pounds per week. This sliver is put through three processes of drawing, six ends up, the revolutions per minute of the front roll being 400 at the finisher drawing. The weight at the finisher drawing should be 70 grains per yard. The drawing should be sized three times a day, and if the variation is more than one grain per yard, the draft gear should be changed to keep the drawing at standard weight. The drawing sliver is put through the slubber and made into .50 hank roving.

FLY FRAMES.

The roving for 40s and 60s yarn is run through three processes of fly frames and for 20s is run through two processes. For 60s yarn the different hanks at each process are as follows: First intermediate, 1.50; second, 4; jack, 12 hank. For 40s yarn the details are as follows: First, 1.40; second, 3.40; jack, 10. For 20s yarn: First, 1.50; second, 4.50. The warp yarns are frame spun and for 40s use a frame the same as given in a previous lesson. For 20s use a frame having a gauge of 2¾ inches, diameter of ring 2 inches, length of traverse 7 inches.

The filling yarn may be either mule or ring spun; if the latter, use a frame having a gauge of 2¾ inches; diameter of ring, 1¾ inches; length of traverse, 5½ inches; revolutions per minute of spindles, 8,000. The warp yarn is put through the spooler, warper and slashing machines and then is ready for the loom.

A great many mills comb their filling for weaving bedford cords.

Dyeing Particulars.

SLATE.

Two per cent immedial black N B; 2 per cent sodium sulphide: 2 per cent soda ash; 20 per cent Glauber's salt.

PEARL.

One-half per cent immedial direct blue B; ¼ per cent immedial black N B; 1 per cent sodium sulphide; 2 per cent soda ash; 20 per cent Glauber's salt.

BROWN.

Three per cent immedial cutch O; 5 per cent immedial brown R R; ¼ per cent immedial black N B; 9 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's salt.

BLACK.

Fifteen per cent immedial black N

N; 15 per cent sodium sulphide: 3 per cent soda ash; 30 per cent Glauber's salt.

BOTTLE GREEN.

Eight per cent immedial dark green B; 1 per cent immedial yellow D; 9 per cent sodium sulphide; 30 per cent Glauber's; 3 per cent soda ash.

NAVY BLUE.

Four per cent immedial indone B; 4 per cent immedial indone R; 8 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's.

RED.

Six per cent benzo fast red 4 B; 30 per cent Glauber's salt; 3 per cent sal soda.

PINK.

One per cent erika pink; 2 per cent sal soda; 20 per cent Glauber's salt.

SKY BLUE.

Four per cent tetrazo sky blue F; 2 per cent sal soda; 30 per cent Glauber's salt.

IMPERIAL PURPLE.

On a tannine and tartar emetic mordant. Dye 2 per cent methyl violet 2 R.

CHINTZ.

Chintz is a fine, soft, cotton fabric, printed with elaborate designs of flowers and foliage in several colors. The fabric is used principally for household purposes, such as lambrequins, coverings, etc. It is also utilized for such purposes as masquerade dresses and the like.

Chintz is but a plain woven fabric, elaborately ornamented with designs by means of the printing machine, several different colors being employed. From this point of view we will consider the fabric.

COLORINGS FOR CHINTZ.

There is practically no combination of colors that may not be used for the ornamentation of a fabric of this description. However, the high-colored designs are most popular. Following are

POINTS TO CONSIDER

in planning a design for chintz, also colors to use. In the first place it is necessary to have a clear idea of what the main characteristics of the design are to be, before the work of arrangement is begun. The character of the design should be influenced largely by the purposes the fabric is intended for; this brings in the question of fitness, which is the application of a certain class of design to certain materials. It is evident that the style of design that would be suitable for a floor covering would be entirely unsuitable for a printed cotton fabric. The consideration of style is a subject that the designer is bound to be governed by, simply because the designs are for a commercial purpose; consequently in planning a design, the style, scale and character of the design, the material it is to be applied to, and its purposes should be understood by the designer. Chintz is

A PURELY ORNAMENTAL FABRIC.

The designs, therfore, may be rich, both in colors and design. In Figure 1 we give an idea of the character of design used for fabrics of this description. The ground may be a light shade of blue, the leaves and stems in two shades of green, while the flowers may have three shades of red graduating from pink to dark red; a happy blending of color is essential to the well-being of a design.

ANALYSIS.

	Inches.
Width of warp in reed	36½
Width of fabric finished	35½
Ends per inch finished	72
Ends in warp	2556
Selvedge	24
Total ends in warp	2580

Reed 1250x2

Take-up of warp during weaving, 5 per cent; weight of fabric finished, 1½ ounces per yard.

Warp yarn 1-44 cotton.

Filling 56 picks—1-80 cotton.

LOOM REQUIRED.

Chintz is usually woven on high running speed looms, such as a Northrop loom. The warp is drawn in on eight harnesses, straight drafting. The warp yarn is well sized so as to avoid breakages of the warp in the weaving.

FINISHING.

The fabric, after it comes from loom, is sent to the printing house, where it is boiled off, preparatory to the printing operation; chintz is not dyed; all the colors are applied by means of the color rolls in the printing machine. Several rolls are required, each roll having a separate

portion of the design and likewise a separate color.

After the printing, the fabric is

passed through a calender press, the rolls of which are well heated and tightly set, which gives the glazed finish which the fabric possesses.

Carding and Spinning Particulars.

The yarns of which chintz is composed are made in mills having the second division of equipment of machinery. The yarns which make up the sample under description are as follows: filling yarn No. 80s and warp

yarn 44s. The filling yarn is made of good cotton of 1½ inches staple. This is put through a bale breaker, as has been previously described. Either two or three processes of picking may be used, many overseers claiming the two-process method to be the better.

The raw stock, after being allowed to stand in the mixing bin as long as possible to dry out, is put into the hopper of the opener, and after being lifted up by the spiked apron comes in time under the action of the beater. This beater is provided with four arms, the blades of which are composed of leather. The speed of this beater for this kind of stock is 1,000 revolutions per minute.

THE RAW STOCK

is then passed to the breaker picker by an endless lattice. This lattice should be varnished frequently so as to make it smooth. This not only applies to this lattice, but to all lattices in the picker room. The feed rolls of this machine compress the cotton into a condensed sheet and it is struck from these rolls by a beater. This is generally of a rigid type, having either two or three arms; if of two-blade type it makes about 1,500 revolutions per minute. The laps at the head end weigh 40 pounds or a 16-ounce lap. These laps are put up at the intermediate and doubled 4 into 1. The speed of this beater is about 1,400 revolutions per minute, the total weight of the lap being 37 pounds or a 12-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. It is at this point that the cut roving is mixed in, as has been described in a previous article. The speed of this beater is 1,350 revolutions per minute if of a rigid two-bladed type; if the beater has three blades it rotates proportionately slower. The total weight of a lap at the front is 39 pounds or a 12-ounce lap.

THE EVENNESS OF WORK.

Look out to see that the eveners on all the pickers are in proper working order, for remember the greater part of the evenness of a lap depends upon this part of the picker. See that the drafts are properly directed and of the right strength to do the most good. Keep the fly well cleaned out from under the machines and don't be afraid of oil, but get it in the proper place. Be sure and have everything neat and clean. The laps are put up at the card. It has always been a bone of contention whether it is proper to use a heavy lap and slow speed or light carding and higher speed. Heavy carding means low drafts, and light carding, so called, high drafts. For this lesson light-weight carding will be used. The draft of the card should be 115, which gives a 45-grain sliver. The speed of the flats should be one complete revolution every 40 minutes. The speed of the licker is 350 revolutions per minute. Strip three times daily and clean thoroughly twice a day. Keep front of card free from fly waste all the time. The production of the card for a week of 60 hours is 550 pounds. This is put through

THREE PROCESSES OF DRAWING,

the weight of the sliver at the finisher being 60 grains per yard. The speed of the front roll is 400 revolutions per minute. The top rolls of a drawing frame should always be kept well varnished, the leather being free from flutes, ridges, nicks; in fact, they should be in perfect shape. The drawing sliver is next put up at the slubber and made into .55 hank roving. This is put through three processes of fly frames, the hank roving at each process being as follows: First, 1.50 hank; second, 4.80 hank; fine or jack, 16 hank. This roving may be taken to either the mule or ring spinning room. If to the latter, use a frame having the following particulars for spinning 80s yarn: Gauge of frame, 2¾ inches; diameter of ring, 1¼; length of traverse, 5 inches; revolutions per minute of spindles, 7,400; twist per inch, 29.07. The

YARN AFTER BEING TREATED

in some manner to make it damp, is carried to the weave room. What has been said of the cotton for the filling yarn may also apply to the warp yarn with the following exceptions: In the picker room, length of staple, 1⅜ inches; weight of lap at finisher picker, 40 pounds. In card room at the cards, draft not over 105; speed of flats, one revolution in 50 minutes. Production 675 to 700 pounds, at drawing frame, weight of sliver, 70 grains per yard; at slubber a .50 hank roving, which is put through three processes of fly frames, the hank at each being as follows: First, 1.50 hank; second, 4 hank; fine, 10 hank. This is carried to the ring spinning room and made into 44s yarn on a frame with the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 6 inches; revolutions per minute of

spindles, 10,000; twist per inch, 29.65. The yarn is then spooled, beam warped, and these are run through the slasher, where the requisite number of ends is run on a warp beam at the head end. A good size mixing is as follows: Water, 100 gallons; potato starch, 54 pounds; Yorkshire gum, 2 pounds; soap (white), 1½ pounds; parafine wax about 1 pound.

Printing Particulars.

The colors for this style of goods are mostly light bright shades.

LIGHT BLUE.

Two ounces methyl blue B; 1 pint acetic acid, 10 degrees Tw.; 2 pints water; 6 pints gum water, 1 : 1; ¼ pint acetic acid tannic acid solution, 1:1.

LIGHT GREEN.

One and one-half ounces brilliant green crystals; 1 pint acetic acid, 10 degrees Tw.; 2 pints water; 5 pints gum water, 1 : 1; ¼ pint acetic acid tannic acid solution, 1 : 1.

LIGHT PINK.

One and one-half ounces rhodamine 5 G; 3 pints water; 1½ pints acetic acid, 6 degrees Tw.; 3 pints tragacanth solution, 70—1,000; ½ pint acetic acid tannine solution, 1 : 1.

RED.

Six ounces rhoduline red B; 2 pints water; 1½ pints acetic acid, 10 degrees Tw.; 6 pints gum water, 1 : 1; 1½ pints acetic acid tannine solution, 1 : 1.

LIGHT MAUVE.

One-half ounce methyl violet 6 B; 2 pints water; 1½ pints acetic acid, 10 degrees Tw.; 6 pints gum water, 1 : 1; ¼ pint acetic acid tannine solution, 1 : 1.

ROYAL BLUE.

Six and one-half ounces Victoria blue B; 1½ pints acetic acid,10 degrees Tw.; 2½ pints water; 6 pints gum water, 1 : 1; 1½ pints acetic acid tannine solution, 1 : 1.

LIGHT YELLOW.

Five ounces duramine I I; 1⅛ pints acetic acid, 10 degrees Tw.; 1¼ pints water; 6 pints gum water, 1: 1; 1¼ pints acetic and tannine solution, 1 : 1.

ROSE.

Four ounces rhodamine 6G; 4½ pints water; 3 pints acetic acid, 9 degrees Tw.; 3½ pints tragacanth solution, 70—1,000; 1 pint acetic acid tannine solution, 1 : 1.

LIGHT BROWN.

Six ounces Bismarck brown G; 2 pints acetic acid, 10 degrees Tw.; ¼ pint glycerine, 45 degrees Tw.; 2½ pints water; 6 pints gum water, 1 : 1; 1 pint acetic acid tannine solution, 1 : 1.

LIGHT OLIVE.

One pint of the light yellow color; 1 pint of light brown color; ¼ pint light green color; well mixed and strained through a cloth. With different proportions of these colors any shade can be obtained.

These colors are well mixed in a tub or copper pan, strained through a cloth, and printed in a printing machine. The pieces are dried, steamed one hour, without pressure, passed through a bath of tartar emetic, soaped at 90 degrees F., washed and dried.

The pieces are then run through a starch mangle and starched, then calendered to finish required.

ORGANDIE (Plain and Figured).

An organdie may be defined as a very fine translucent muslin, used exclusively for dress goods.

The fabric is made in a variety of qualities as regards the counts of yarns used. This naturally influences the number of ends and picks per inch in the fabric. The fabric is also made in a variety of widths, ranging from 18 to 60 inches.

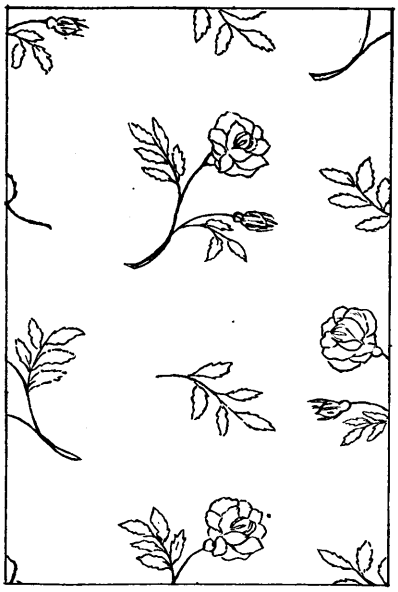
The fabric, as already mentioned, is used exclusively for dress goods. The plain organdie is very popular in pure white or bleached, although considerable quantities are dyed in solid colors of light shades, such as pale blue and various pinks, while the figured organdie is usually bleached, then printed with small floral designs. The printed design is usually in from two to four colors and in delicate shades in conformity with the material.

The design itself is also quite delicate.

In a design for a fabric of this character, the scale of the pattern should not be too large. It should not exceed 4½ inches in the repeating of it as the folds of the dress and the numerous seams would destroy the effect

of the repeat if it were much larger.

The accompanying sketch shows a design for the fabric in question; the design shows a rose spray rendered in a natural manner. A color scheme for the same would be to have the flowers pink or yellow, while the leaves and stems may be in green; this against a white ground should give a pleasing effect. A delicate design and color scheme are essential for this kind of fabric. Organdie, considered in relation to cost, as a wearing material is



quite an expensive fabric; however, the retail price apparently seems to disprove this fact. Our reason for the statement that the fabric is not an inexpensive material is that it has a finish peculiar to itself, so that when subjected to soap and water it will not have the same appearance as before. It loses its crisp feeling entirely; consequently an organdie is worn by many until soiled, then discarded.

ANALYSIS.

Width of warp in reed, 32 inches; width of fabric finished, 30½ inches; ends per inch in reed, 76; ends in warp, 2,440; ends per inch finished, 80.

Reed, 1,400x2.

Take-up of warp during weaving, 7 per cent; weight of fabric, about 15 yards to one pound.

Warp yarn, 1-80 combed Sea Island. Filling, 1-20s combed Sea Island; 88 picks per inch.

LOOM REQUIRED.

Organdie is but a plain woven fabric. The ornamentation of the figured fabric is effected by means of the printing press; consequently any smooth running high speed loom may be used in the weaving of this cloth. However, as the Northrop loom with warp stop motion would answer best, the warp may be drawn in straight on eight harnesses; in using a considerable number of ends per inch, it is safe to use at least eight harnesses, so as to avoid heddle chafing.

The warp preparatory to weaving is given a fair sizing with white gum in order to give it strength.

FINISHING.

The fabric is stiffened by sizing it with such ingredients as dextrine, dulcine, albumen, casein, etc., after which it is run through the calender, which slightly glazes the surface of the fabric, thus completing the finishing process.

Carding and Spinning Particulars.

The yarns of which organdies are composed require the equipment of machinery found in the second or third division of mills, as given in a previous lesson. This class of goods requires a very fine grade of cotton, and generally both warp and filling yarns are made of combed stock. The counts of yarn vary, according to the grade of goods to be made. In this article it will be considered that the make-up of the cloth is as follows: 80s warp and 120s filling yarn. These are made from Sea Island stock of 1⅝ to 1¾ inch staple. Sea Island cotton as a whole requires just as little picking as possible and still get the dirt out. Sea Island cotton is generally put through an opener and one process of picking, although some overseers use two processes. This stock is not put through the bale breaker, but is

GENERALLY MIXED BY HAND.

If any bales are found which are not up in grade and staple they should be placed one side and not put into the mixing. The mixing should be made from several bales at once, so as to get the mixing as even as possible. At this point the sliver waste from the machines up to the slubber is mixed in. The sliver should be pulled into short lengths so that it will not be so apt to become wound around the pin beater of the opener. The hopper should be kept more than half full. The cotton is passed from this machine

directly to the finisher picker; the apron of this picker is divided up into yard lengths and the loose cotton is spread evenly over it. About 10 ounces to the yard is the weight used. The beater for this class of goods is generally of a rigid two-bladed type, the speed of it being less than those that have been previously given. The speed of the beater is about 1,200 revolutions per minute, which gives the cotton of this length passing through the picker about 29 beats per minute. The total weight of the lap at the front of picker is 30 pounds, or a 10-ounce lap. The usual points that have been previously given should be looked out for and in addition the

SPEED OF THE BEATER

should be watched to see that it is not putting neps into the cotton. These laps are put up at the card, the draft of which should be high, not less than 125, and on some Sea Island stock the draft runs as high as 180. The card wire fillet used on the cylinder should be No. 120s (English count) and for the doffer and flats 130s. The flats should be speeded up to take out more flat waste or, in other words, the card with 110 flats should make one revolution every 35 minutes. The flats are speeded up by lagging the flat pulley on the main cylinder shaft. Close settings should be used and these should be gone over every time the card is ground, which should be once every month. Grind lightly. Strip three times a day and keep the cards clean, especially the fronts. The weight of the sliver at the front should be about 45 grains per yard and the production about 225 to 300 pounds per week of 60 hours. Be sure that the feed plate is set at the proper distance from the licker-in, so that the staple will not be broken. On most makes of cards the licker-in is speeded too high for this class of cotton, and better results will be obtained if the speed is dropped to 275 and not more than 300 revolutions per minute. It is claimed that a high speed of the licker-in tends to put neps into the cotton of long staple.

THE LICKER-IN

should be speeded so as to tear the sheet or lap apart and take out the seed, etc., left by the picker. The cotton is next taken to the sliver lap machines and made into a lap. The weight of the lap should be about 300 grains per yard. The doublings at the sliver lap are 14 into 1 when 6-head 9-inch lap combers are used, or 20 into 1 when 8-head 10½-inch laps are used. The laps from the sliver lap machine are doubled 6 into 1 at the ribbon lap machine, the weight of laps per yard being 280 grains. These laps are put up at the comber. The doublings at the comber depend on how many heads it has. For the past two or three years the comber builders have sold practically nothing but 8-head combers, so we will consider that the mill is equipped in this manner. The doublings would then be 8 into 1. For this class of goods from 22 to 25 per cent waste is taken out and the weight of the sliver at the front is 48 grains. This is put through

TWO PROCESSES OF DRAWING

the weight at the front of the finisher drawing being about 60 grains per yard.

Be sure to keep the top leather rolls well varnished and in good condition. See that all parts of the machine are working properly.

The sliver is next put up to the slubber and made into .80 hank roving. In some mills the top leathers are varnished and in addition to this, on long-stapled stock, larger top rolls are used

This roving is put through three processes of fly frames for 120s filling yarn, the hank roving at each process being as follows: At the first intermediate 2.25 hank, at the second intermediate 6.50 hank and at the fine frame 24 hank. On this hank roving it is a good plan to either have self-weighted rolls on second intermediate and fine frames or run them without weights, all the weight being on the back top roll. The roving is then spun on a mule into 120s.

The slubber roving for the warp yarn is put through three processes of fly frames, the hank roving being as follows: At the first, 2.25; at the second, 5 hank, and at the jack, 16 hank. Keep the top leather rolls in good condition and watch the traverse motion. Look out for twist and don't get too much tension, so as to pull the roving when it is between the boss of the front roll and the flyer, as this tends to cause uneven roving. Don't let the hands cut the roving from the bobbin, and weigh the cut roving. This roving is taken to the ring spinning room and spun into 80s yarn on a frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1⅜ inches; length of traverse, 5¼ inches; twist per inch, 39.08; speed of spindles, 9,600. From here it passes through the spooler and warper, and the beams for this machine are put up

at the slasher, and after passing through this machine the required number of ends are run on to a warp at the front end.

A GOOD-SIZED MIXING

for 80s yarn, if sley and pick are high, is as follows: Water,100 gallons; potato starch, 70 to 75 pounds; tallow, 7 pounds; Yorkshire gum, 3 pounds; soap (white), 2 pounds. Boil 2 hours and let stand 10 hours before using. Keep agitator running and keep size mixing almost at boiling point.

Dyeing Particulars.

Following are dyeing particulars for organdie:

PINK.

Two ounces rhodamine pink 6 G; 1 qt. water; 1½ pints acetic acid 90 degrees Tw.; 3 pints tragacanth solution 70 : 1,000; ¾ pints acetic acid tannine solution .1 : 1.

LIGHT YELLOW.

Four ounces thioflavine T; 2 qt. water; 1½ pints acetic acid, 6 degrees Tw.; 3 pints tragacanth solution .70: 1,000; 1 pint acetic acid tannine solution 1 : 1.

PEACOCK BLUE.

Four ounces turquoise blue G; 2 qt. water; 2 pints acetic acid, 9 degrees Tw.; 3 pints tragacanth solution 70 : 1,000; 1¼ pints acetic acid tannine solution 1 : 1.

ROSE.

Four ounces brilliant rhoduline red B; 2 qt. water; 1½ pints acetic acid, 6 degrees Tw.; 3 pints tragacanth solution 70 : 1,000; 1¼ pints acetic acid tannine solution 1 : 1.

BLUE.

Four ounces methylene blue B B; 2 qt. water; 2 pints acetic acid, 9 degrees Tw.; 2 pints tragacanth solution; 1½ pints acetic acid tannine solution 1 : 1.

GREEN.

Four ounces emerald green crystals; 2½ pints water; 2 pints acetic acid, 6 degrees Tw.; 3 pints tragacanth solution 70 : 1,000; 1½ pints acetic acid, tannic acid solution 1 : 1.

LIGHT BROWN.

Four ounces Bismarck brown B; 1 qt. water; 2 pints acetic acid, 9 degrees Tw.; 3 pints tragacanth solution 70 : 1,000; 1½ pints acetic acid tannic acid solution 1:1.

SAGE GREEN.

Mix together one gallon green color; ¼ gallon light yellow; ½ gallon light brown.

VIOLET.

One ounce methyl violet 4 B; 1 qt. water; 1½ pints acetic acid, 6 degrees Tw.; 6 pints gum water 1 : 1; ½ pint acetic acid tannine solution 1 : 1.

SLATE.

One gallon blue color; 1 pint light yellow; well mixed with ½ gallon tragacanth solution 70 : 1,000.

The color is then strained through a cloth, and is ready to print. All the colors are well boiled in a copper pan. and strained through a cloth. After the printing process, they are dried, steamed one hour without pressure, passed through a bath of tartar emetic, and soaped at 90 degrees F., rinsed and dried. The goods are starched and finished on a tenter frame.

ALBATROSS CLOTH.

Cotton albatross cloth is a plain fabric made in imitation of a worsted fabric of the same name. It is light in weight, and is used principally for dress goods. It is sometimes used instead of bunting for railroad flags. The ends and picks per inch are few and the width of the cloth is narrow.

The items of construction for a cotton albatross are as follows: Warp. 1,024 ends of No. 28s cotton; 16 ends have been allowed for selvedges.

Filling, 48 picks per inch of No. 36s cotton; 48 sley reed.

Width in reed, 23 inches.

Width finished, 21 inches.

This fabric can be made very readily on an automatic loom, or on any of the light, fast running, single box cotton looms, four wire heddle harnesses, or the regular twine harnesses, on the plain cotton loom only being required. If wire harnesses are used on a cam loom, the ends should be drawn through the heddles, 1, 3, 2, 4.

Being considered a fair quality of cloth, it is necessary to match the pick when weaving it.

The goods are finished by being burled, sheared, washed, singed, dyed, rinsed, dried and pressed; care being

taken not to press them too hard.

The singeing process is sometimes omitted.

Albatross cloth is generally sold in white, black, or solid colors, being piece dyed. It is not used to any extent for printing purposes.

Carding and Spinning Particulars.

The yarns for albatross cloth are made in mills having the equipment of machinery found in the second division of mills, as given in a previous lesson. For this article we will consider the filling yarn to be number 36s. This would be made of 1⅜-inch staple American cotton. The warp yarn is 28s count and may be made from the same state and grade of cotton. The mixing is done either by hand or by a bale breaker. The cotton, if mixed in the former manner, should be allowed to stand longer than if mixed by the latter method. This is to allow the cotton

TO DRY OUT.

At this point the good sliver waste from machines up to the slubber is mixed in, care being taken that the sliver is broken up into short lengths. The cotton is next put through an opener and either two or three processes of picking (generally three). The opener hopper should be kept at least half full in order to always have an even amount of cotton fed to the breaker picker. This picker is generally provided with a two-bladed, rigid beater, which rotates at a speed of 1,400 revolutions per minute. The

TOTAL WEIGHT OF LAP

at the front end of this picker is about 40 pounds or a 16-ounce lap. These are put up at the intermediate picker and doubled four into one. This is also provided with a two-bladed, rigid type of beater, the speed being 1,500 revolutions per minute. This style of beater is not always used, as will be noted later. The total weight of lap at the front is about 38 pounds or a 12-ounce lap. These laps are put up at the finisher picker and doubled four into one. At this point the laps of cut roving waste are mixed in in the proportion of one lap of cut roving to three laps of raw stock. The cut roving is treated as before stated.

THE FINISHER PICKER

is equipped with either a rigid or what is called a pin beater. A great many mills are putting in this pin beater on stock up to 1 9-16-inch, claiming that the stock is more thoroughly cleaned. The speed of the pin beater (which has three arms) is higher than that of the rigid type, being 1,500 revolutions per minute, whereas a two-armed rigid type would be run about 1,450 revolutions per minute. The pin beater can be run at a greater speed because it does not strike the cotton a blow but rather tears it apart. If a two-bladed, rigid type of beater is used, it should be speeded up so as to give about 42 beats to each inch of cotton passing through. The total weight of lap at the front should be about 38 pounds. Laps varying more than one-half a pound either side of this standard should be run over again. Observe the general points about the picker room that have been given before. The laps are put up at the card. For this grade of goods

THE DRAFT

should not be less than 100. Use medium wire filled, i. e., No. 120s, for cylinder and No. 130s for doffer and flats. Speed of licker-in, 320, flats one revolution every 45 minutes; use 26-inch or large diameter doffer. Strip three times a day and grind cards all over once a month. Groove setting points frequently and watch the dead roller grinding wheel to see that it is straight.

The weight of the sliver at the front should be about 65 grains, the production being 700 pounds per week of 60 hours. The card sliver is put through three processes of drawing, the weight at the front being 70 grains per yard.

WATCH THE CLEARERS

to see that they are in proper condition. Metallic rolls may be used on this class of work to great advantage. If leather top rolls are used, keep them up in good shape. The drawing sliver is run through the slubber and made into .55 hank roving. This is put through three processes of fly frames for the filling yarn, the hank roving at each process being as follows: 1st, 1.50; 2d, 3.50, and jack, 8.25 hank.

We will consider that the filling yarn is taken to the ring spinning room, where it would be spun in 36s yarn on a frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1⅝ inches; length of traverse, 5½ inches; speed of spindles, 8,900 revolutions per minute. After being treated to make it damp, the filling is taken to the weave room and woven as given above. The roving for the warp yarn is put through two processes of fly frames, the hank roving at the first

intermediate being 1.75 and at the jack 5.50 hank. This yarn is spun into 28s yarn on a ring frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1¾ inches; length of traverse, 6½ inches; speed of spindles, 9,700 revolutions per minute. The warp yarn is then taken to the spoolers; from here to the warpers, and the warps are put up at the slasher, the required number of ends being run upon a beam at the head end.

Dyeing Particulars.

LIGHT PINK.

One-half pound Erika pink; 20 pounds Glauber's; 2 pounds sal soda.

SKY BLUE.

One pound diamine sky blue F F; 20 pounds Glauber's; 2 pounds sal soda.

LIGHT SLATE.

One per cent katigen blue black B; 3 per cent soda ash; 20 per cent Glauber's; 1 per cent sodium sulphide.

OLD GOLD.

Two per cent diamine catechine 3 G; 2 per cent diamine fast yellow B; ⅛ per cent diamine black B H; 30 per cent Glauber's; 2 per cent sal soda.

LIGHT SAGE GREEN.

One-half per cent chloramine yellow M; 116 per cent benzo fast orange, S; ⅛ per cent benzo fast blue B N; 30 per cent Glauber's; 2 per cent sal soda.

LIGHT BROWN.

One-half per cent diamine brown B; ½ per cent diamine fast yellow B; ¼ per cent diamine catechine 3 G; 20 per cent Glauber's; 2 per cent sal soda.

LIGHT GREEN.

One per cent diamine sky blue F F; 1 per cent diamine fast yellow F F; 30 per cent Glauber's; 2 per cent sal soda.

PEARL.

One-quarter per cent immedial direct blue B; ¼ per cent immedial black N G; ¾ per cent sodium sulphide; 20 per cent Glauber's; 2 per cent soda ash.

BLACK.

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

NAVY BLUE.

Twelve per cent thiogene blue B; 22 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's.

DARK BROWN.

Ten per cent thiogene brown G; 6 per cent sodium sulphide; 30 per cent Glauber's; 3 per cent soda ash.

BOTTLE GREEN.

Ten per cent pyrogene green B; 12 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's.

ROSE.

Mordant for 200 gallons water; 3½ pounds tannic acid; run through, on jig machine, for one hour. Pass through a clean bath of two pounds tartar emetic for 200 gallons water half hour; wash and dye. Two pounds rhodamine 5 G.

ROYAL BLUE.

Mordant as rose. Dye, 1½ per cent Victoria blue B.

ROYAL PURPLE.

Mordant as rose. Dye, ¾ per cent methyl violet R.

TARLTON.

Tarlton is a fine, open, transparent muslin, somewhat similar to an organdie in the feel and finish, though a much coarser fabric. The cheaper grade of tarlton resembles a mosquito netting. Mosquito netting, however, is in a leno weave, while tarlton is but a plain woven fabric. The goods are piece dyed and may be seen in any color; some are finished in pure white or

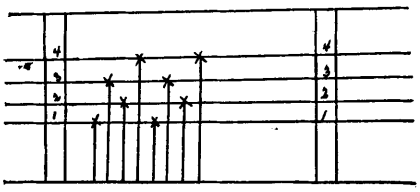


Fig 1. Drawing-in Draft.
(2 repeats.)

bleached. The fabric is used for various purposes, the finer qualities for women's wear. The fabric is principally used for draping and decorating purposes, for foundations for ladies' hats, for bunting around bird cages, for a twofold purpose—first to prevent the birdseed from being scattered to the floor, and second, as a decorative feature. Briefly we may say that the fabric is intended chiefly for draping and decorating purposes, especially the cheaper grades, the meshes of

which are so open that hardly any lady would care to wear a dress made of it, unless she were anxious to exhibit the garments which she would be obliged to wear under it. The grade of tarlton under consideration, of which an analysis will follow, is entirely too flimsy for a dress fabric. If the goods are taken between the thumb and forefinger with any degree of firmness and the surface of the fabric is drawn between them, the threads will readily

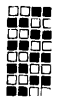


Fig. 2.

give, or leave their original place. This would certainly be a poor feature in a fabric intended for dress goods. The fabric is woven in comparatively wide widths; the coarser qualities are commonly 58 inches in reed, including selvedge. The selvedge is about ⅜ of an inch, two ends in one heddle, while the body of goods is drawn one end in one heddle, and each end into a separate dent in the reed.

harnesses, in the following order: 1, 3, 2, 4, the chain being built accordingly so as to give a plain weave. The warp is sized before it is put on the warp beam.

ANALYSIS.

Width of warp in reed, 58 inches. Finished width, 52½ inches; ends per inch finished, 20; picks per inch finished, 18.

Reed, 650x1.

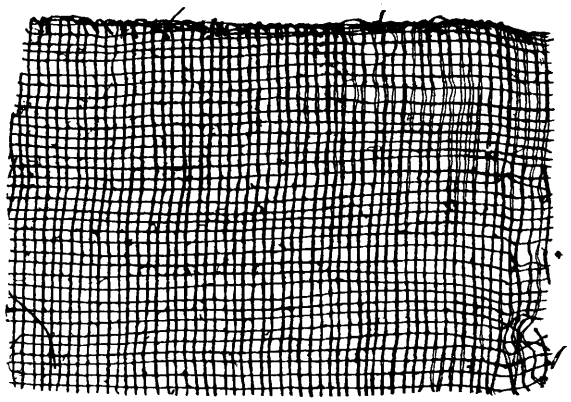
Ends in warp, 1,010; 80 ends selvedge, two ends in one heddle; total, 1,090 ends.

The take-up during the weaving is very little; the take-up in the finished goods, about 1 per cent. After the fabric is finished the threads lie practically straight; this is due to the openness of the mesh. This readily illustrates that the closer the weave, the more take-up of warp yarn.

Warp yarn, 1-50s cotton. Filling, 1-30s cotton. Finished weight, 10 yards equal 7 ounces. The finished fabric carries about 12 per cent of sizing.

FINISHING.

After the fabric is taken from the loom, it is sent to the dyehouse. The



TARLTON.

The goods in weaving have a tendency to roll up, that is, the selvedges roll toward the middle of the fabric; this is overcome by holding out the selvedges by means of the temple. The temple also prevents the chafing of the warp during weaving.

LOOM REQUIRED.

Any light-built loom with a comparatively high running speed will answer for weaving tarltons, providing it is wide enough in the reed space. The warp is usually drawn in on four

first process is to boil it off, in order to rid it of all foreign matter possible; then it is dyed or bleached as required. After this process and after the fabric is dried, it is then immersed in size. Sizing the fabric is usually done in front of the drying cylinders. The goods pass from the size trough on to the drying cylinder, which practically completes the finishing process.

The goods are then doubled and put on to boards in the form of rolls, after which they are ready for the market.

Carding and Spinning Particulars.

The machinery required to make the counts of yarn of which tarlton is made will be found in the second division of mills, as given in a previous article. The counts used for this class of goods differ slightly, but for this article we will consider the counts to be 1-50s for the warp yarn and 1-80s for the filling yarn. These yarns are made of American cotton of about 1⅜-inch staple. This cotton is first mixed by hand, as large a quantity being mixed at one time as possible. In fact, two large mixings should be made so that one batch may be drying out while the other is being used. At this point the good sliver from all the machines up to the slubber is mixed in, it being collected at regular intervals from the machines. An eye should be kept on this

WASTE

by the one in charge to see that too much waste is not being made at any one machine and also to see that it is broken up into short lengths before being put into the mixings. Long lengths of sliver waste are apt to wind around the various rotating parts of the opener and cause a "bung up," which requires time to remove and also is apt to cause a fire.

If trunking is used to connect the opener to the breaker picker, be sure that no scraps of iron or other metal are around where they can work into the cotton, as this is also apt to cause a fire by coming in contact with the metallic parts of the machine and striking a spark,which ignites the other cotton very quickly and often causes a fire on account of the currents of air which fan it into a flame. Keep the hopper full of cotton for reasons previously given. The

SPEED OF THE BEATER

(two-bladed rigid type) of the opener is 1,500 revolutions per minute; the total weight of lap at the front is 40 pounds. These are doubled four times at the intermediate picker. The beater of this machine may be either of a rigid type or a pin beater. If of a rigid type it makes 1,400 revolutions per minute; if a pin beater, 1,450 revolutions per minute. The total weight of lap at the front of this machine is 38 pounds or a 12-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. At this machine the cut-roving waste is mixed in with the raw stock in the proportion of one lap of cut waste to three laps of raw stock. The cut-roving is first put through a process to take out the twist and then run through a picker to form it into a lap. The beater of this machine may be either a rigid or a pin type. If the former, its speed should be 1,450 revolutions per minute; if the latter, 1,500 revolutions per minute. The

TOTAL WEIGHT OF LAP

at the front of this machine should be 38 pounds or a 14½-ounce lap. At this machine all laps are weighed, and if they vary one-half pound from the standard weight they should be put up at the back and run over again. Always keep a supply of laps ahead in case of breakdowns, etc. The laps are then put up at the cards. The speed of the licker-in should be about 325 revolutions per minute; flats should make one complete revolution every 55 minutes. The card clothing should be 110s for cylinder and 120s for doffer and flats. Use a large doffer (either 26 or 27 inch diameter). Strip cards three times a day and see that they are ground all over once a month a whole day (twice a month grinding half a day is better).

ALWAYS GRIND LIGHTLY.

The card clothing should be looked after at intervals to see that it is not faced or hooked. Before grinding, all jams should be taken and flats should be kept free from cotton embedded in the wire fillet. After grinding, the parts should be set in proper relation to each other. The sliver at the front for the class of goods under description should weigh 65 grains per yard and the production should be about 700 pounds per week of 60 hours. The cotton should be run through three processes of drawing frames. It will be found

A GREAT ADVANTAGE

to run metallic top rolls for this grade of goods. The weight of the sliver at the finisher drawing should be about 65 grains,the doublings at each process of drawing being 6 into 1. The hank roving at the slubber should be about .55. The slubber roving for both the warp and filling roving should be put through three processes of fly frames, the hank roving being as follows: for warp, first, 1.50 hank; second, 3.50 hank; jack, 10 hank; for filling yarn, first, 1.50; second, 4 hank; jack, 16 hank.

The roving for warp yarn should be taken to the ring spinning room and spun into 50s count on a frame having the following particulars: Gauge of frame,2¾ inches; diameter of ring, 1½ inches; length of traverse, 6 inches; revolutions per minute of spindle, 10,-

000. The yarn is then spooled and warped and several warps put up at the slasher and the required number of ends run on to a beam at the front. The filling yarn is spun into 80s on a frame having the following particulars: Gauge of frame, 2¾inches; diameter of ring, 1¼ inches; length of traverse, 5 inches; revolutions per minute of spindle, 7,400.

Dyeing Particulars.

Tarltons are dyed on the jig machine, or the color is boiled up in the starching process with the starch. The dyed colors, being faster, are mostly used. The following color is an example of a starched dyeing:

ORANGE.

One gallon of water; 6 ounces dextrine; 2 ounces tetrazo orange C R. Mix cold. Boil for 30 minutes. Pass the pieces through a starch mangle, and dry on tenter frame. All one-dip colors can be dyed after this formula and any shade produced by varying the amount of color.

RED.

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

PINK.

Four ounces benzo fast pink 2 B L; 10 per cent Glauber's; 1 per cent sal soda.

LEMON YELLOW.

One-half per cent chrysophenine; 10 per cent Glauber's; 1 per cent sal soda.

GREEN.

Three per cent brilliant benzo green B; 20 per cent Glauber's; 2 per cent sal soda.

WINE.

Two per cent diamine Bordeaux B; 20 per cent Glauber's; 2 per cent sal soda.

SCARLET.

Two per cent diamine scarlet B; 25 per cent Glauber's; 2 per cent sal soda.

LIGHT BROWN.

One-half per cent diamine catechine G; ½ per cent diamine brown B; 20 per cent Glauber's; 2 per cent sal soda.

SLATE.

One per cent diamine black B H; 20 per cent Glauber's; 2 per cent sal soda.

SKY BLUE.

One per cent diamine sky blue F F; 20 per cent Glauber's; 2 per cent sal soda.

NAVY BLUE.

Three per cent diamine blue R W; 20 per cent Glauber's; 2 per cent sal soda.

BLACK.

Five per cent diamine jet black O O; 20 per cent Glauber's; 2 per cent sal soda.

MAUVE.

One-half per cent diamine violet N; 20 per cent Glauber's; 2 per cent sal soda.

GRAY.

One per cent diamine gray G; 20 per cent Glauber's; 2 per cent sal soda.

ROSE.

One-half per cent diamine rose B D; 15 per cent Glauber's; 1 per cent sal soda. The pieces are starched and dried on a tenter frame.

BROCATELLE.

Brocatelle is a coarse brocaded or figured fabric of cotton and wool or silk and linen or cotton, used for tapestry and upholstery and sometimes used for dresses. The brocatelle used for dresses is much finer and necessarily lighter in weight than the fabric used for upholstery purposes.

We will here consider the fabrics used for upholstery purposes only. This may be classed as a double cloth fabric, with two warps and two fillings, a face warp and weft and a back warp and weft. These warps and fillings, however, interweave with one another, thereby binding together the two sets of warp and filling threads, with this peculiarity, that the face warp threads do not show on the back of the fabric nor does the back filling show on the face of the fabric, while, on the contrary, the face filling shows on the back and the back warp threads show on the face.

The face warp threads give body to and also form the ornamental feature of the fabric, which is the raised or brocaded figure in the cloth.

These threads, when not forming the figure, lie buried between the face and back filling picks. The figure thus formed is usually of an eight harness sateen weave, the ends floating over seven back filling picks and under one, while the back filling is used principally to give weight to the fabric and accentuate the raised figure.

Brocatelle, as already mentioned, is made with silk and wool, linen or cotton; the face is of silk, while the back has wool, linen or cotton, depending on the quality of fabric desired, as does

also the quality of silk used in the fabric.

The yarns in all instances are

DYED BEFORE WEAVING.

The colors and number used depend upon the prevailing fashion. Some brocatelles are made up of several colors on the face of the goods, while again others have but two—the figure and ground colors. The figure color is usually darker than the ground. For example, a dark olive may be used for figure color, that is, the face warp threads, while the ground color, face filling picks, may be a light salmon. The back warp is usually the same as the face filling, while the back filling usually blends off to a lighter shade of olive. The object is to have the colors blend well together and at the same time form a harmonious contrast.

The ornamental feature of brocatelles is elaborate conventionalized floral figures which cover the greater portion of the surface of the fabric, about 75 per cent. The figures are bold and rich, repeating about 4½ times across the width of the fabric. Fig. 1 gives an idea of the character of design used. This is about one-half the size it would be in the fabric.

Fig. 1.

THE CONSTRUCTION

is as follows:

7,904 ends 50-2 silk face warp.
1,976 ends 2-110s cotton back warp.
16 ends 4-20s white cotton selvedge.

9,896 ends in warp.

Dressing, 4 ends olive 50-2 silk; 1 end salmon 2-110s cotton; total, 5 ends per warp pattern.

190 ends per inch in reed; reeded 8 ends 50-2 silk and 2 ends 2-110s cotton in one dent; 19x10 dent reed.

Ends per inch finished 200; finished width of fabric, 49.4 inches.

Filling: 116 picks per inch; 58, 21s silk salmon; 58, 28s linen light olive; total 116.

Linen 300 yards per pound; 10s cotton.

Filling arrangement: 1 pick 21s silk face; 1 pick 28s linen back; total, 2 picks, repeat.

Weight per yard of finished fabric, 14.83 ounces.

Weight of various yarns used:
6.04 ounces face warp.
2.60 ounces face filling.
.70 ounce back warp.
5.46 ounces back filling.
.03 ounce selvedge.

14.83 ounces.

LOOM REQUIRED.

Brocatelle requires a heavy jacquard loom. A Crompton & Knowles combined broad loom, slow speed, would be a good one. The patterns require from 400 to 1,200 ends and over, in order to repeat. Consequently, a machine that can operate the required number of ends is essential for the production of these fabrics. When a great number of ends are required for the repeat of the pattern, two ma-

chines are combined; for example,2-600 machines will operate a 1,200 end pattern, but usually a French or fine index machine is used that will operate the required number of ends.

The pattern to be woven is first stamped on cards by means of a card cutting machine. This machine consists of a punch box, containing 13 punches; if a 600 machine, 25; if a 1,-200 machine, 24 for cutting the smaller holes and one for the peg holes. These cards, when placed on the jacquard machine over the loom, bear a direct relation to the warp threads, raising and dropping them according to the pattern. The warp threads in the drawing in are kept separate from each other; that is, the face warp threads are drawn through certain mails as likewise are the back warp threads, although both sets of threads are represented on the one card.

FINISHING.

These fabrics require no finishing. They are smoothed and folded and then are ready for the upholsterer.

Carding and Spinning Particulars.

The mills which make the cotton yarns for brocatelle will be found in the second and sometimes the first division of mills, as given in a previous lesson. Brocatelle is a fabric made up in many different fibres, but the fabric under description is composed of silk and cotton, the back warp and selvedge being composed of cotton yarns. It is these yarns that we will describe. The cotton back warp yarns are 2-110s cotton yarns,while theselvedge is composed of 4-20s cotton yarns. The cotton used for the back warp of this count would be of a good American cotton of about 1 9-16 inch staple. This yarn should be put through a bale breaker and carried to the bins by means of a blower and trunking. This will insure the cotton at this point being dry, and in a more "picked out" state than when hand mixing is done. The cotton is mixed at the bale breaker in the usual manner,each bale being first stapled to make sure that the cotton is all up to standard.

COTTON MUST BE DRY.

If the mixing is done by hand it should be allowed to stand as long as possible before using, so that it will be thoroughly dry. Too much care cannot be taken at this point as all carders know what trouble damp cotton makes. The good sliver waste from the machines up to the slubber is mixed in at this point, care being taken to see that only the cotton of the same grade and length of staple is thrown into the bin. This waste should not be put all in one place, but should be distributed all over the top and front or back of the mixing. The cotton is next run through an opener and

THREE PROCESSES OF PICKING.

At the opener the hopper should be kept well filled so as to feed the breaker picker an even sheet. The breaker picker beater is generally of the rigid type, either two or three blades being used.

If two blades are used, the speed should be about 1,500 revolutions per minute; if three blades, the speed should be proportionately slower. The total weight of the lap at the front is 37½ pounds or a 14-ounce lap. These laps are doubled four times at the intermediate. This picker is generally provided with a two-bladed beater, the speed of which for this class of cotton should not exceed 1,450 revolutions per minute. Some overseers

PREFER A PIN BEATER

at the machine and a rigid beater at the finisher and some just the reverse. If a bin beater is used, the fan does not have to be run at such a high rate of speed, as this beater creates considerable draught itself. The total weight of the lap at this picker is 36 pounds or a 13-ounce lap. These are put up at the finisher picker and doubled 4 into 1. The speed of this beater, two-bladed rigid type, is 1,400 revolutions per minute. The total weight of the lap is 35 pounds or a 12½-ounce lap. The cotton at this picker receives 42 beats per minute. The laps are put up at the card. The licker-in speed should be about 350 revolutions per minute. The top flats make one complete revolution in 40 minutes. The cards should be ground and set once a month, stripped three times a day and cleaned and oiled twice a day; keep the front of the cards always clean from fly, etc. Collect flat strips at regular intervals, not too long apart, so that they will fall over the doffer and not get into the good work. The sliver at the front should weigh 60 grains per yard, and the production should be 550 pounds per week of 60 hours. This sliver is put through

THREE PROCESSES OF DRAWING.

The top rolls used may be either metallic or leather top rolls. These should be looked out for at all times, but especially so in hot weather to see that they are in perfect condition. Keep

sweaty hands off of the varnish on the rolls. Varnish rolls frequently. A small piece of borax in the mixture will help harden the varnish. The weight of the sliver at the finisher drawing is 60 grains per yard. When the weight is kept at the drawings, they should be sized at least three times a day. This is then put through the slubber and made into .55 hank. The roving is then put through three processes of fly frames, the hank roving at each process being as follows: First, 2.25; second, 6.50, and jack. 18.50. The roving is next spun into 110s on a frame having the following particulars: Diameter of ring, 1⅜ inches; length of traverse, 5 inches; speed of spindle, 9,400 revolutions per minute. This is then spooled, and twisted into 2-ply yarn and then run on a warper and through a slasher.

COTTON USED FOR SELVEDGE.

The cotton to make the selvedge yarn is 1¼-inch staple. At the pickers the changes from the above are as follows: Speed of beater, breaker, 1,500 revolutions per minute; intermediate, 1,450 revolutions per minute and finisher, 1,450 revolutions per minute.

The weights of the laps are as follows: Breaker, 40 pounds or a 16-ounce lap; intermediate, 37 pounds or a 12-ounce lap; finisher,35 pounds or a 12½-ounce lap. At the cards note the following changes from the back warp yarn: Speed of top flats. 1 revolution every 50 minutes; weight of sliver, 65 grains per yard; production per week of 60 hours, 750 pounds.

Draft of card should not be over 100. At the finisher drawing the weight of sliver at the finisher is 70 grains per yard. It is

AN ADVANTAGE

to use metallic top rolls on this stock at the drawing frame. Slubber roving should be .55 hank. There should be two processes of fly frames, the hank roving at each process being as follows: First intermediate, 1.75 hank; second, 5 hank. The moving is then taken to the spinning room and spun into 20s yarn on a frame, the particulars of which have been given before. The yarn is then spooled and twisted into 4-ply 20s.

Dyeing Particulars.

The colors are dyed on the silk, wool, or cotton, in the yarn. The colors used depend on the prevailing fashion.

The following wool colors are dyed in the acid bath of 20 per cent Glauber's salt and 3 per cent sulphuric acid.

For 100 pounds wool yarn:

LIGHT SLATE.

Four ounces patent blue B; ¼ ounce orange I I.

OLIVE BROWN.

One per cent orange I I; ½ ounce lanafuchsine S B; 4 ounces fast yellow S; 1 ounce indigo blue N.

LIGHT BROWN.

Two per cent orange I I, 1½ per cent fast yellow extra; 4 ounces azo crimson L; 6 ounces fast green B.

OLIVE GREEN.

One and three-quarters per cent indigo blue N; 1 per cent tropaeoline O O.

GREEN.

Two and one-half per cent indigo blue N; ½ per cent fast yellow S; 1½ tropaeoline O O.

BLACK.

Five per cent palatine black 4 B.

VIOLET.

Two per cent acid violet 4 B N.

SCARLET.

Two per cent palatine scarlet 4 R.

SALMON.

One and one-half ounces rhodamine 5 G; 20 grains eosine yellowish.

ROSE.

Five per cent rhodamine G.

LAVENDER.

One ounce acid violet 4 B N; 30 grains orange I I; 100 grains fast acid violet 10 B.

SILK COLORS.

Silk yarn is dyed in the soap bath with the addition of acetic acid.

SALMON.

One ounce rhodamine 5 G.

LIGHT LAVENDER.

One-quarter acid violet 4 B N; 100 grains rhodamine G.

OLIVE GREEN.

One per cent fast green B; 1 per cent fast yellow Ex.; 4 ounces orange I I.

ROSE.

One per cent rhodamine 5 G.

NAVY BLUE.

Two per cent indigo blue N; 4 ounces acid violet 2 B N.

RED.

One per cent fast red R.

LIGHT GREEN.

One per cent acid Victoria green S N.

LIGHT YELLOW.

Four ounces tartarzine S.

COTTON COLORS.

BLUE.

Four per cent brilliant benzo blue 6 B: 20 per cent Glauber's; 2 per cent sal soda.

LIGHT BROWN.

Two per cent diamine brown B; 1 per cent diamine fast yellow B; 20 per cent Glauber's; 2 per cent sal soda.

OLIVE BROWN.

Three per cent chloramine yellow M; ½ per cent benzo dark green B; ½ per cent benzo brown B.

TAN.

One-half per cent benzo fast orange S; 2 per cent chrysophenine; 2 ounces benzo fast black.

GREEN.

Eight per cent immedial green G G; 8 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's salt.

NAVY BLUE.

Ten per cent immedial indone 3 B; 10 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's salt.

OLIVE.

Five per cent pyrogene olive G; 5 per cent sodium sulphide; 2 per cent soda ash: 20 per cent Glauber's salt.

RED.

Five per cent benzo fast red 4 B S; 30 per cent Glauber's; 2 per cent sal soda.

TERRY PILE FABRICS.

Terry is a fabric in which the distinguishing effect is small loops of warp yarn, uncut pile, projecting from one or both sides of the cloth, these loops being tied to the ground cloth in regular or irregular order as desired.

The terry principle of construction, which has been developed with the power loom, is used extensively in the manufacture of cotton terry toweling, known generally as Turkish toweling.

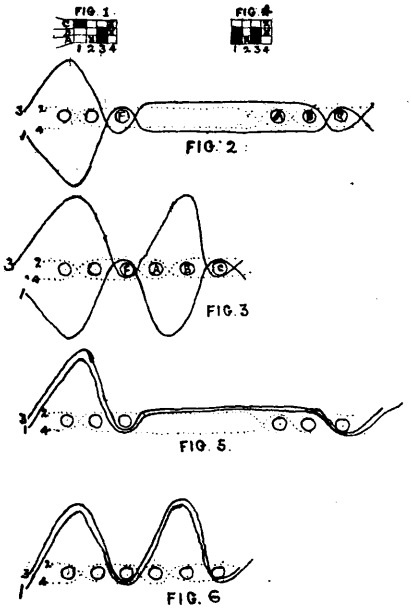
These towels are made in various sizes and grades from the cheap fabrics made almost entirely from waste yarns to those made of the best quality of cotton obtainable.

Terry pile is the simplest of the many types of warp pile goods, the effect being obtained without the use of wires.

Two warps are required: (a) the ground warp; (b) the pile warp.

The ground warp contains the selvedge and ground ends, and is wound on the regular loom beam. This beam is heavily weighted in the loom. The pile warp is usually wound on a light beam and is allowed to let off the warp very easily.

The reason for the difference in tension on the warps is to allow the ground warp to remain tight and the



pile warp to go forward easily when it is required to loop.

Figs. 1, 2 and 3 will serve to illustrate the relation of a terry design to the cloth. Circles indicate picks; dotted lines, ground ends; continuous lines, pile ends. The numbered ends in each figure correspond.

Assuming F to represent the fell of the cloth, and the last pick of a repeat, Fig. 2 shows how the three succeeding picks A, B and C would appear when about to be driven to the fell of the cloth, and Fig. 3 a section of the cloth with the loop completed.

Figs. 4, 5 and 6 illustrate a design and sectional view of a terry cloth in which the pile is distributed on one side of the cloth only. Cloth of this type is used for furniture coverings and as a ground for embroidered effects.

Figured terry goods are made by combining colored yarns and terry

effects, the terry being thrown on either side when the other is weaving a ground weave. The face and back are reversible.

LOOM REQUIRED.

In order to weave terry toweling a dobby loom differing from the ordinary loom is required. The principal point of difference is in its having mechanism to allow two (in three-pick terry) out of three picks to be beaten up to within a certain distance of the fell of the cloth, this distance depending upon the length of pile desired, then forcing these two picks, along with every third pick, to the fell of the cloth.

The object of this is to allow the first two picks to fasten themselves into the pile ends, say one-half inch from the cloth, so that when the three picks are driven home together the pile ends will go along with them, making a loop slightly less than ¼ inch. At the same time the three picks will slide over the ground ends, these interlacing with the filling as in an ordinary cloth.

To accomplish the three-pick movement to form the loop one of two methods is adopted: (a) By a rocking or oscillating reed, which is held back or forced to the fell of the cloth as desired; (b) by a rocking whip roll and back roll terry motion. With this device the reed is held firm, the cloth being moved back toward the rear of the loom every third pick. A backward and forward movement, similar to that of the cloth, is imparted to the temples. The length of pile can be varied as desired, or the weave can be changed from terry to regular, or from regular to terry as required.

A loom for weaving terry towels, besides having mechanism for making the pile, contains mechanism for one or more of the following: (a) A box motion, for inserting different colors or kinds of filling; (b) a fringe motion, for making fringe at the end of each towel; (c) a motion for changing the weave from terry to regular construction or vice versa at the beginning and end of each towel. This is usually accomplished with a multiplier or repeater, or with a measuring device which automatically brings into play the pattern chain required.

Terry looms are usually heavily built and contain stands for at least two warp beams.

FINISHING.

Some toweling is sold in the gray, but most of it is bleached. First process: Boiled with 4 per cent caustic soda, boil for 12 hours, rinsed through water; second, again boiled with 4 per cent caustic soda, boil for 10 hours; third, passed through acid bath, ½ degree Tw. sulphuric acid, rinsed with water; fourth, passed through chlorine water at ½ degree Tw. and laid down in bin until white; fifth, passed through acid bath of ½ degree Tw. sulphuric acid and rinsed well with water, dried and cut up into towels.

Carding and Spinning Particulars.

The yarns of which terry cloth are made vary from those made of waste stock to those made of long staple combed stock and it would be hard to describe one particular grade to make it cover all terry cloth. For this article we will suppose the average count of the yarn is 1-45s and will give the carding and spinning particulars for this count of yarn in both warp and filling yarns. We will also consider that the stock is carded.

THE MACHINERY USED

would be found in the equipment found in the second division of mills, as given in a previous article. The cotton would be brought from the cotton shed and sampled by the one in charge of this job; sometimes it is the overseer, sometimes the "super," and sometimes, in large mills, a cotton sampler is employed. All bales containing cotton not up to grade or length of staple should be placed at one side and not put into the mixing. The mixing should be as large as possible and may be done either by hand or, as is more generally the custom, by a bale breaker. One bale breaker is able to take care of a great many bales of cotton per week. The cotton is fed to the bale breaker from several bales of cotton, a little being taken from each. This is so that the cotton from all the bales will be intermixed, and in this manner a more even yarn is apt to result. After passing the bale breaker the cotton is conveyed to the mixing bins by an arrangement of endless lattices, which may be moved when it is desired to drop the cotton into another bin.

THE MIXING

should be allowed to stand as long as possible, especially if the mixing is done by hand. The cotton is then put through a bale breaker and three processes of picking. The hopper of the opener or feeder should always be kept more than half full so that the

spiked lifting apron will always be carrying a load to the pin beater. In this manner an even amount of cotton is fed to the feed rolls of the breaker picker. The breaker picker is provided with either a two or three armed rigid type of beater. If two bladed, the speed should not exceed 1,500 revolutions per minute for this grade and staple of cotton (1⅜-inch peeler). The total weight of the lap at the front end of the breaker picker is 40 pounds or a 16-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. This picker may be provided either with a rigid or pin type of beater. They both have a great many favorites among the trade. The speed of a rigid two-bladed type should be about 1,450 revolutions per minute.

THE FAN SPEED

should be about 1,050 revolutions per minute. If a pin beater is used, the speed of the fan may be reduced. This is on account of the amount of draft that this beater creates itself. The total weight of the lap at the head end of this machine is 37 pounds or a 12-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. What has been said of the beater at the intermediate picker applies here, except that the speed of a two-bladed rigid type should be 1,400 revolutions per minute. This gives the cotton passing through it about 42 beats or blows per inch. The cut roving is brought to the picker room and put through a special picker (to take out the twist) and then is run through a breaker picker to form it into a lap, and these laps are mixed with the raw stock at the finisher picker in the proportion of three laps raw stock to one lap cut waste. The total

WEIGHT OF THE LAP

at the front of the finisher picker should be about 35 pounds or a 12½-ounce lap. These laps are put up at the card; the draft of which should not exceed 110. The card clothing used should be for carding medium counts. This should be ground at least once a month all over, after which the card should be reset. Use gauges that are straight and not bent all out of shape. The cards should be stripped three times a day and kept clean. The speed of the licker-in should be about 300 revolutions per minute and the flats should make one complete revolution every 50 minutes. The weight of the sliver should be 65 grains per yard, with a production of 700 pounds for a week of 60 hours. Use as large a doffer as possible. This sliver is put up at the drawing frame and doubled 6 into 1. The sliver should be run through

THREE PROCESSES OF DRAWING.

Either metallic or leather-covered top rolls may be used to good advantage. Whichever top roll is used, it should be kept in the best of shape. The weight of the sliver at the front of the finisher drawing should be about 70 grains per yard. This is put up at the slubber and made into .55 hank roving. This is put through three processes of fly frames and made into 9 hank, the hank roving at each process being as follows: 1st, 1.25 hank; 2d, 3.50 hank, and fine, 9 hank. This is then taken to the ring spinning room and made into 45s warp yarn on a frame with the following particulars: Gauge offrame, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 6 inches; speed of spindles, 10,000 revolutions per minute; twist per inch, 30.19. This is then spooled and warped and the required number of warps put up at the slasher to give the required number of ends at the front warp. For making 45s filling yarn use a frame having the following particulars: Diameter of ring, 1¼ inches; length of traverse, 5½ inches; twist per inch, 25; speed of spindles, 8,500 revolutions per minute.

SATINE, or SATEEN.

Satine, or sateen, is a cotton fabric with a smooth, lustrous surface resembling satin. The latter is made of silk. The weaves for satins and satines are similar.

Satines, which are of two kinds, warp satines and filling satines, are made in a great variety of weights and qualities, and are used for many purposes.

The bulk of the goods are made on the filling satin principle and are used for linings, corset covers, dress goods, etc. These are usually woven white and are bleached, or piece dyed in varying colors.

Warp satines are used for mattress and furniture coverings.

Stripe effects are made by using a warp containing different colors and a warp satine weave. Warp and filling satines are also printed, to a considerable extent, the smooth face lend-

ing itself very readily to this process.

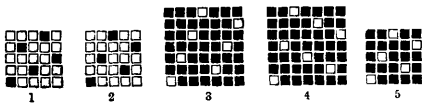
COLORED EFFECTS

made in the loom are confined to stripes made when a warp satine weave is used, because the warp covers the filling almost entirely. In a filling satine the filling practically covers all the warp, and color inserted here would show in barry effect across the cloth.

The smooth, lustrous effect of satines is due in large measure to the weave used. Briefly stated, satine weaves are made on from five ends upwards; they are complete on the same number of ends as picks; each end and each pick interlaces only twice in each repeat; the interlacings do not support each other, at least one end or one pick separating them.

In filling satines each end is raised over one pick only in each repeat; warp satines, vice versa.

Figs. 1 and 2 illustrate the only two filling satine weaves that can be made on five ends. Both of these weaves are



used in the trade, some buyers preferring one to the other, according to the effect desired.

Figs. 3 and 4 show warp satine weaves on seven ends each.

The constructions of filling satine fabrics vary from about 64 to over 100 sley and 120 to 300 or more picks.

The following, which show results of the analyses of five different satine fabrics, will serve to show that the satine principle of construction is used in fabrics of widely differing qualities.

Sample No. 1. Colored warp satine stripe cloth for upholstery; 96 ends and 52 picks per inch; 7s cotton yarn for warp and 14s for filling. Woven with weave Fig. 5, a 5-end warp satine weave.

The filling in this particular sample is twisted harder than the warp.

Sample No. 2. A fine warp satine of good quality, made with a 7-end weave; 152 sley and 80 picks; 2-50s warp and 30s filling.

Samples 1 and 2, as well as almost all warp satines, on account of the large proportion of warp on the face, would be woven face down in the loom.

Sample No. 3. A filling satine of fair quality; 72 sley and 150 picks; 45s warp and 70s filling. Weave Fig. 1.

Sample No. 4. 96 sley and 280 picks; 45s warp and 97s filling. Weave Fig. 1.

Sample No. 5. 104 sley and 210 picks; 60s warp and 75s filling. Weave Fig. 1.

Samples 4 and 5 are of good quality.

KIND OF LOOM REQUIRED.

Satines, whether warp or filling, are usually woven on single box cam looms of heavier build than plain sheeting looms. The selvedges are actuated by a selvedge motion. If woven on dobby looms, the selvedge motion is dispensed with.

One warp only is required. The ends are drawn through the harnesses in straight order.

In practice it has been found advisable, when weaving heavily picked satines, to use a reed that is no deeper than is necessary. For warp satine, on account of the large number of ends and comparatively few picks per inch, deeper reeds are used, so that the wires will give, to some extent, for knots.

FINISHING SATINES.

Satine tickings are sheared and then calendered with hot steam rollers, the steaming being done in front of the machines; the appearance is improved by gas singeing. A method of finishing ordinary satines is to first saturate them with a mixture of corn or potato starch, China clay or baryta and tallow. To this is added soap or oleine, with wax and glue size. They are then mangled, dried, damped, calendered, folded and pressed.

For printed or dyed satines, starch with a small portion of soda crystals for a stiff finish, and soluble oil with soda for a soft finish are used.

Carding and Spinning Particulars.

Satines are made up of various counts of yarns, the different samples analyzed being only a few of the various grades made, but they illustrate the various grades very well. For the carding and spinning particulars of a satine, sample No. 5 will be taken as an example. This is made up of combed yarns of 60s for warp and 75s for filling. The cotton used would be Egyptian of 1⅜-inch staple. This grade of satine is made in either the second or third division of mills as given in a previous lesson. Of course

THE EQUIPMENT

will have to include combers. The cotton is first sampled and then mixed in a manner that has been described in previous lessons. It is better to use a bale breaker, but cotton may be mixed by hand. If mixed by hand, let the mixing stand a little longer to dry and open out as the cotton is compressed very tightly in the bales.

These bales weigh considerably more than the American bales.

The good waste from the machines up to the slubber should be mixed in at the mixing bin. The cotton is next put through an opener and three processes of picking. The hopper of the opener should always be kept

OVER HALF FULL,

so that an even amount of cotton will be fed to the breaker picker. The breaker picker is provided with either a two or three bladed beater of a rigid type. If the former, the speed should be about 1,350 revolutions per minute. The total weight of the lap at the front should be 40 pounds or a 16-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. The beater of this picker is either a two or three bladed rigid or a pin beater. If the former, the speed of it should be 1,250 revolutions per minute. If a pin beater is used, the fan speed should be reduced for reasons given in a previous article. The total weight of the lap at the front should be 36 pounds or a 12-ounce lap. These laps are doubled 4 into 1 at the finisher picker. At this picker the cut roving waste, which has previously been put through a roving picker, to take out the twist, and a breaker, to form the fluffy mass into a lap, is mixed in in

THE PROPORTION

of three laps of raw stock to one lap of cut roving waste. If the equipment of machinery does not include a roving picker, the cut roving is mixed in at the mixing bin, care being taken to spread it over the entire mixing. The speed of the finisher picker beater of a rigid two-bladed type is 1,200 revolutions per minute. The total weight of the lap at the front is 35 pounds or a 12½-ounce lap. These laps are put up at the card. The wire fillet used should be 120s for cylinder and 130s for doffer and flats. Use a 26 or 27 inch diameter doffer. The speed of the cylinder should be 160 revolutions per minute; licker-in, 300 revolutions per minute. Top flats should make one complete revolution in 35 minutes. The draft of the card on this stock should not be less than 125.

THE CARDS

should be stripped three times a day and ground at least once a month, at which time the various settings should be gone over. Set doffer to cylinder with a 5 gauge. The sliver at the front weighs 55 grains per yard and the production is about 475 pounds per week of 60 hours. This sliver is taken to the sliver lap machine and doubled 14 into 1 for an 8¾-inch lap (wide) or 20 into 1 for a 10½-inch lap. These laps are generally put through a ribbon lap machine, the weight of them being 330 grains per yard for an 8¾-inch lap or 380 grains for a 10½-inch lap. The laps are doubled 6 into 1 at the ribbon lap, the weight at the front being 265 for an 8¾-inch lap and 320 grains for a 10½-inch lap. These laps are put up at the comber and doubled either 6 or 8 into 1, according to whether the comber is a six or eight head comber.

THE EIGHT-HEAD COMBER

is the one that is being put in nowadays, very few of the six-head being sold. The speed of the comber should be at least 90 nips per minute, and may run up as high as 105. The percentage taken out should be about 20. The weight of the sliver at the front is 40 grains per yard. The combed sliver is next put through two processes of drawing, the speed of the front roll being 400 revolutions per minute. Either metallic or leather-covered top rolls may be used, generally the latter. These should be varnished frequently and those that are damaged, fluted, loose or not true should not be run. If the latter, they may be buffed, as may also the leather rolls at the comber. See that the stop motions are all in working order, and that the traverse motion is set and working so that the whole surface of the leather rolls is used.

THE SETTING

or spread of the rolls for this stock should be 1⅞ inches front roll to second; 1½ inches second roll to third, and 1⅝ or 1¾ inches third to back roll according to bulk of cotton being fed. The doublings at the drawing frames are 6 into 1. The weight of the sliver at the front is 60 grains per yard. This sliver is put through the slubber and made into .70 hank roving, after which it is put through three processes of fly frames and made into the following hank roving at each frame: First intermediate, 1.75; second intermediate, 4.50; and fine, 15; at the fine frame the lays per inch on the bobbin being 48.

The standard for twist for this kind of cotton is 1.2 multiplied by the square root of the count. For example, the count or hank is 15. The square root of 15 is 3.87, which, multiplied by 12, equals 4.64. If the standard for twist on this frame was 94.9, the twist gear used would be 20. The method by which this is found is by dividing the constant for twist by the standard for twist (American frames). Look out for the leather top rolls, traverse and clearers to see that each

is performing its duty properly. Of course the

SPEED OF THE ROLLS

is very important, the general method being to gain 1-16 of an inch over stock at each roll. The production should be about 33 hank per spindle per week of 60 hours. The 15-hank roving is taken to the ring spinning room and made into 60s warp yarn on a frame having a gauge of 2¾ inches; ring diameter of 1½ inches, and length of traverse,6 inches; with spindle speed of 10,000 revolutions per minute. The yarn is then put through a spooler and warper and then a slasher. The filling yarn is made from the 15-hank roving on a frame having a 1¼-inch diameter ring, 5-inch traverse and spindle speed of 7,400 revolutions per minute. The roving for the filling yarn may be taken to the mule room, but for this class of goods is generally taken to the ring frame spinning room.

Dyeing and Finishing Particulars.

PINK.

One-half per cent Erika pink; 20 per cent Glauber's; 2 per cent sal soda.

HELIOTROPE.

One per cent tetrazo chlorine lilac B; 20 per cent Glauber's; 2 per cent sal soda.

NAVY BLUE.

Three per cent tetrazo blue Rx; 25 per cent Glauber's; 2 per cent sal soda.

GRAY.

One-half per cent thio gray B; 10 per cent Glauber's; 2 per cent sal soda.

LIGHT SLATE.

One-half per cent direct black S; 20 per cent Glauber's; 2 per cent sal soda.

PEACOCK BLUE.

Two per cent Eboli blue B; 20 per cent Glauber's; 2 per cent sal soda.

RED.

Three per cent direct red B; 20 per cent Glauber's; 2 per cent sal soda.

SLATE.

Two per cent katigen black S W; 2 per cent sodium sulphide; 20 per cent Glauber's; 2 per cent soda ash.

ROYAL BLUE.

Three per cent brilliant benzo blue 6 B; ¼ per cent benzo fast violet R; 25 per cent Glauber's; 2 per cent sal soda.

TAN BROWN.

Three per cent benzo fast orange S; 2 per cent chrysophenine; ½ per cent benzo fast black; 30 per cent Glauber's; 2 per cent sal soda.

SKY BLUE.

One and three-quarters per cent diamine sky blue F F; 25 per cent Glauber's; 2 per cent sal soda.

BROWN.

Three per cent diamine brown B; 30 per cent Glauber's; 2 per cent sal soda.

WINE.

Three per cent diamine Bordeaux B; 30 per cent Glauber's; 2 per cent sal soda.

SCARLET.

Two and one-half per cent diamine scarlet B; 25 per cent Glauber's; 2 per cent sal soda.

Satines are finished by passing through a calender machine to give a fine lustre finish and are sometimes placed on a beetle machine and beetled for two hours. They are starched first with a very light starch, and a little white soluble softening, to give a soft, smooth feel.

MUSLIN---BUTCHER'S MUSLIN.

Muslin is commercially understood to mean a soft cotton fabric, used for various purposes, but principally for dress goods, underwear, sheetings, etc. Some muslins are named from their place of production, as Asoreem, Dacca, India, Madras and Swiss muslin, while some are named from the use to which they are chiefly put, as butcher's muslin, which derives its name from the fact that it is chiefly used by grocery men and butchers in the form of aprons and coverings. It is a strong bleached fabric, well suited for the purposes. Muslin is so called from Mosul, a city on the banks of the Tigris, where was once the chief seat of its manufacture, but to-day large quantities are manufactured in the United States.

The quality of muslin is as varied as are the names by which it is known. Butcher's muslin is but a substitute for butcher's linen. Cotton is cheaper and almost as durable, and because of this it has forced itself to the front. Butcher's muslin is easily distinguished from the others by its coarseness. However, considerable quantities are used for summer outing dresses, for which purposes the bleached fabric only is used. The unbleached is used principally for sheetings and sometimes for pillow-cases. The unbleached fabric is preferred where du-

rability is the chief object. It is a common fact that unbleached fabrics will wear better than bleached.

Muslin is used only in the bleached or unbleached state. The fabric is not dyed.

As previously mentioned, there are various kinds of muslin; in fact, anything in the line of soft cotton fabrics may be termed muslin. The name by which a particular kind is commonly known may vary likewise in quality, as, for example, there are several qualities of butcher's muslin, as an analysis would prove.

Analysis of a fair grade of butcher's muslin, which retails at 15 cents per yard: Width in reed, 37½ inches; finished width, 36 inches; ends in warp, 1,900: 1,844 in body; 28 ends each side equal 56, selvedge; total, 1,900; 900 x 2 reed; 52 ends per inch finished; warp, 1-12s cotton; take-up during weaving, 8 per cent; filling, 40 picks per inch in loom: 42 picks per inch finished; 1-15s cotton; weight per yard in the gray, 5 ounces.

LOOM REQUIRED.

Muslin is a plain woven fabric; consequently any loom may be used in the weaving of these goods. The cost of production is of course reduced in proportion to the speed of the loom and the number of looms a weaver can take care of. The least expense would be incurred by using a Northrop loom.

THE WARP

should be sized so as to withstand the chafing during weaving. As a rule all single yarns are sized before they are beamed. The warp is drawn in on eight harnesses, straight drafting. Fig. 1 shows design.

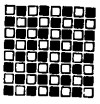


Fig. 1.

FINISHING.

The unbleached receives little or no finishing. After it comes from the loom, it is simply boiled off, dried, made up into rolls and then shipped.

When the fabric is to be bleached, it is first boiled off, then subjected to the bleaching chemicals, after which it is sometimes subjected to a very light sizing, composed of corn, or wheat, glycerine, bees' or Japan wax, after which it is run through a rotary press, then made up into rolls, and shipped.

Carding and Spinning Particulars.

The yarns of which butcher's muslin is made are of a low count and are made in mills of the first division. The grade of cloth is sometimes made up of raw stock and a certain percentage of waste. The raw stock used very rarely exceeds ⅞ inch in staple and is of a low-grade American cotton. While the same care is not taken of this class cotton at the different processes for this cloth, still care should be taken to see that each machine is working properly to its best advantage for production. In this class of goods production is

THE FIRST CONSIDERATION

and quality the second. This does not mean that quality should be sacrificed wholly for production, but that the machines should be driven to a greater extent and the best possible work turned off of them under these conditions. For example, at the card the top flats should not be set or driven at the same speed as when finer goods are made, and so it is with all the machines. The cotton mixings should always be as large as possible and should be allowed to stand as long as possible before being used. This gives the cotton a chance to dry out. A better plan (if there is room enough) is to have two large mixings and use the cotton from one while the other is drying out. If cotton is very damp, the heat should be turned on to help dry it out. This is generally done at night or over Saturday and Sunday. It is at this point that the good waste from all the machines is mixed in, care being taken to see that the waste is spread as evenly as possible over the mixing. As the cotton is generally quite dirty, it is put through an opener and three processes of picking. The hopper of the opener should always be kept full of cotton. The opener is connected directly with the breaker picker and this machine is provided with either a two or three bladed rigid beater. If of a two-blade type

THE SPEED

should be about 1,550 revolutions per minute. The total weight of the lap at the front should be about 40 pounds, or a 16-ounce lap. These laps are put up and doubled four into one at the intermediate picker. This beater is generally of a two or three bladed rigid type and if the former its speed is 1,500 revolutions per minute. The laps at the front of this machine weigh 38 pounds total weight and 10

ounces per yard. The laps are put up at the finisher picker and doubled four into one. This machine is generally provided with a two-bladed rigid type of beater having a speed of about 1,500 revolutions per minute. The laps at the head end weigh 40 pounds or 14½ ounces to a yard. An allowance of 10 ounces either side of standard is made with this staple cotton. If the lap varies more than this, it should be run over again. These laps are put up at

THE CARD.

This should be set coarse and have No. 100 wire fillet on cylinder and top flat, the doffer fillet being No. 110. The draft of card should not exceed 100. Strip cards at least three times a day. The cards on this stock need more stripping than when long-stapled stock is used, because of the greater bulk passing through and also on account of the short staple, which fills up the wire. The card sliver weighs 65 grains per yard and the production should be about 1,000 pounds per week of 60 hours. This is put through two processes of drawing frames. It is of great advantage to use metallic rolls on this class of goods. The speed of front rolls is 400 revolutions per minute. Keep rolls free from dirt and fly. The sliver is put through the slubber and made into .40 hank roving. This is put through two processes of fly frames, having the following hank roving: 1.30 at the first and 3.25 hank at second. The roving is then taken to the spinning room and made into 15s on the filling frame and 12s on the warp frame. Use a warp frame with 3-inch gauge, 2⅛-inch ring and 7-inch traverse, with a 16.45 twist per inch and spindles revolving at 9,000 revolutions per minute. This yarn is then spooled and wound on a warper. Enough beams are put up at the back of the slasher to give a beam with the required number of ends in front. To make 15s filling yarn, use a frame having 2¾-inch gauge, 1½-inch diameter ring, 6¼-inch traverse, 12.59 twist per inch and spindle speed of 6,900 revolutions per minute.

HENRIETTA CLOTH.

Henrietta cloth is a light-weight fabric for women's wear, made in all colors from single worsted yarn, with silk mixture in the best qualities.

The cheaper qualities are made with cotton and worsted, the cotton yarn being for the warp, while the worsted is used for filling. Henriettas are made in various qualities; for example, the "all worsted" from various grades of fine worsted yarn; the worsted and silk mixture from various grades of each; the "cotton and worsted" made up in various qualities of cotton and worsted yarn.

When the fabric is made with different qualities of yarn, that is, the warp differing from the filling in quality or kind, the cheaper quality or kind is in all instances used for warp. The reason for this is readily understood, when the character of the weave is taken into consideration. The weave for this fabric is a one up, two down twill, the weave repeating on three ends and three picks. Fig. 1 shows

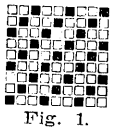


Fig. 1.

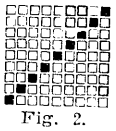


Fig. 2.

nine repeats of the weave; Fig. 2, drawing-in draft. This weave will show but one-third of the warp on the face of the fabric and two-thirds of the filling; the filling is usually of a slightly coarser count than the warp, especially when cotton warp is used, consequently the filling, to a certain extent, covers the warp yarn. The two factors, the weave, viz., $\frac{1}{2}$ twill and the coarser count of filling, give to the face of the fabric a much finer feel than the back. The feel or handle of henriettas is very important, consequently the above-mentioned particulars should be kept in view when constructing a fabric of this character, as its commercial value is largely influenced by the feel of the fabric.

PIECE DYED.

The cloth is dyed after it is woven. Considerable quantities of cotton and worsted henriettas are bleached or finished in the gray; when the cotton and worsted fabric is to be dyed, the cotton yarn is prepared so as to take color in a worsted dye, otherwise two dyeing processes would be necessary—one for the cotton yarn and one for the worsted. The one dip or union dye makes the cost of finishing but

normal. Preparing the cotton yarn for the worsted dye is accomplished before the yarn is warped or beamed.

ANALYSIS.

Width of warp in reed, 38 inches.
Width of fabric finished, 35 inches.
Ends per inch in reed, 70.
Ends per inch finished, 76.
Reed, 35x2.
Ends in warp 2620, plus 40, 20 ends each side selvedge; total ends in warp, 2,660.
Warp yarn, 1-50s cotton.

FILLING.

1-40s worsted.
64 picks per inch in loom.
66 picks per inch finished.
Finished weight per yard, three ounces.

WEAVING.

Henriettas are usually woven on dobby looms, the speed of which is from 120 to 140 picks per minute; it is essential that the warp is well sized, adding about 15 per cent of weight to the yarn; wheat, flour, sago or potato starch may be used; in connection with this, a small quantity of chloride of magnesium should be added to give the yarn the necessary moisture and pliability.

FINISHING.

First process: After the fabric is woven, it is scoured, then bleached, dyed or left in the gray as the case may be, after which the fabric is subjected to a very light singeing in order to slightly stiffen the cloth, after which it is pressed, then made up into rolls.

Carding and Spinning Particulars.

The yarns which make up henrietta cloth are made up of two fibres, worsted for the filling and cotton for the warp yarn. The count of the warp yarn is 1-50 and this count of yarn would be made up in mills of the second division, as given in a previous article. This equipment should include combers, as this yarn in most grades of the cloth under description is combed. The cotton is mixed in the usual method, which has been described several times. It is

OF GREAT ADVANTAGE

to use a bale breaker for this class of yarns. The cotton is put through three processes of picking, the breaker picker being combined with an opener. The breaker picker is provided with a three-bladed beater, the speed of which is 1,200 revolutions per minute. The lap at the front weighs 39 pounds to the lap or 16 ounces to the yard. These are doubled 4 into 1 at the intermediate picker. This picker has a pin beater, the speed of which is 1,300 revolutions per minute, the fan speed being reduced on account of the extra draft caused by the pin beater. The total

WEIGHT OF LAP

at the front end of this picker is 37 pounds or a 12-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. At this point the cut roving waste is also mixed in in the proportion of 1 lap cut waste to 3 laps raw stock. This picker is generally provided with a two-bladed beater, the speed of which is 1,400 revolutions per minute. Keep the beater blades sharp and properly adjusted. This speed of the beater gives the cotton passing through the picker about 40 beats or blows to the inch. The total weight of lap at front is 35 pounds or a 12½-ounce lap. The lap for this class of work is allowed half a pound variation either side of standard weight; if more than this, it should be run over again because, if put up at the card, it would have a tendency to make uneven work.

AT THE CARD

the following particulars should be observed: Draft of card not less than 110; wire fillet for cylinder, 120s; for doffer and top flats, 130s. Use large doffer. Strip three times a day. Grind all fillet once a month, leaving grinding rolls on all day. Grinding twice a month is better, leaving grinding rolls on half a day. The speed of the licker-in is 300 revolutions per minute; flats, 1 revolution in 35 minutes. The weight of the sliver at the front should be about 50 grains per yard; production, 550 pounds per week of 60 hours. This sliver is taken to sliver lap machines and doubled 14 into 1 for 8¾-inch lap or 20 into 1 for 10½-inch lap. The

SPREAD OF ROLLS.

for this stock (peeler 1½-inch staple) should be as follows: Front to middle, 1¾ inches; middle to back, 1¾ inches. The weight per yard of lap at the front is 300 grains for 8¾-inch lap or 350 grains for a 10½-inch lap. These laps are put up at the ribbon lap machine and doubled 6 into 1. The weight per yard of lap at the front is 265 grains for 8¾-inch lap or 315 grains for 10½-inch lap. This gives a draft of about 7 for this machine. These laps are put up at the comber and doubled either 6 or 8 into 1, ac-

cording to the number of heads on the comber. If 8 heads, the laps should be 10½ inches wide and set as follows: Cushion plate to half lap, 18 gauge; top combs to segment, 20 gauge. Feed at 5½, top comb set to 29 degrees angle; a double row of needles is used on top comb; 18 per cent waste should be taken out.

THE SPEED

should be 100 nips per minute; draft about 40; weight of sliver, 50 grains per yard. The speed of rolls in draw box should be as follows: Front to middle, 1⅝ inches; middle to back, 1¾ inches. This sliver is put up at the drawing frames and doubled 6 into 1 and put through two processes, the speed of front roll at each process being 380 revolutions per minute, the spread of the rolls being as follows: Front to second, 1⅝ inches; second to third, 1¾ inches; third to back, 1⅞ inches. Use leather top rolls on this class of drawing and keep them well varnished and in perfect condition. The weight of sliver at the front of the finisher drawing is 65 grains per yard. This is put up at the slubber and made into .50 hank roving.

AT THE SLUBBER

the front rolls for this class of goods are sometimes varnished, but this is not often done, they being varnished when running on Sea Island stock. The slubber roving is put through three processes of fly frames, the hank roving at each process being as follows: First intermediate, 1.50; second intermediate, 3.50, and jack, 10 hank. Look out for the traverse motion and do not lay roving too close to make triangular roving. This roving is then spun into 50s yarn on a ring spinning warp frame with a 2¾-inch gauge of frame, 1½-inch diameter ring and a 6-inch traverse. The speed of the spindles is 10,000 revolutions per minute, the twist per inch, 31.81. This yarn is next put through a spooler, then a warper and from here to a slasher. A good-sized mixture for this class of goods is as follows: Water, 100 gallons; potato starch, 54 pounds; Yorkshire gum, 2 pounds; white soap, 1½ pounds.

Dyeing Particulars.

This cloth is dyed with union colors, the wool and cotton being dyed in the same bath. The goods are entered into the dye kettle; after the color has been boiled up with from 20 to 30 per cent of Glauber's salt, cool off with water to 120 degrees F. Run the goods for 20 minutes; heat to 200 degrees F. Run for 30 minutes. If wool is not dark enough, boil for some minutes more; when wool is only a shade too light, turn off steam and run for 30 minutes or till the cotton is colored to shade. If the goods are boiled too long the wool will be too dark and the cotton thin.

UNION BLACK.

5 per cent union black B F; 25 per cent Glauber's salt; 5 per cent salt.

LIGHT BROWN.

1½ per cent diamine fast yellow B; ½ per cent diamine orange B; ½ per cent diamine brown M; 6 ounces union black B F; 30 per cent Glauber's; 2 per cent salt.

NAVY BLUE.

3 per cent diamine black B H; 1 per cent union black B F; 4 per cent naphthol blue black; ½ per cent formyl violet S 4 B; 30 per cent Glauber's; 5 per cent salt.

RED.

5 per cent benzo fast red S 4 B; 30 per cent Glauber's; 5 per cent salt.

LIGHT TAN.

100 pounds goods: 1 ounce tetrazo orange G; ¼ ounce union tetrazo black B; ¼ ounce tetrazo Bordeaux G; ⅛ ounce tetrazo brown R; 20 per cent Glauber's salt.

SLATE.

1 per cent diamine black B H; ¼ per cent diamine fast yellow B; 20 per cent Glauber's.

PURPLE.

2 per cent diamine violet N; ¼ per cent union black; 1 per cent formyl violet S 4 B; 30 per cent Glauber's.

SCARLET.

3 per cent diamine scarlet B; 30 per cent Glauber's salt; 5 per cent salt.

PEA GREEN.

½ per cent diamine green B; 1 ounce diamine sky blue; 30 per cent Glauber's.

ROYAL BLUE.

3½ per cent diamine brilliant blue G; ½ per cent diamine violet S 4 B; 30 per cent Glauber's; 5 per cent salt.

DARK GREEN.

2½ per cent diamine black H W; 2 per cent diamine green B; 30 per cent Glauber's; 5 per cent salt.

RUBY.

3 per cent diamine fast red F; ½ per cent diamine Bordeaux B; 30 per cent Glauber's; 5 per cent salt.

CAMBRIC.

Cotton cambric is a fabric woven with a plain weave, the distinguishing effect being a heavily glazed, smooth surface. The glossy effect is obtained in the finishing process. The goods are somewhat lighter in weight than French percale.

When finished white or in solid colors they are used very extensively

FOR LINING PURPOSES.

The name cambric, like many other names of dry goods, does not signify any special construction or quality of fabric, being made in both linen and cotton materials.

The name is said to have been originally given to a very fine, thin linen fabric made at Chambrey, or Cambrai, in the department of Nord, French Flanders.

Cambric is known in France as batiste, so called, it is said, from its inventor, a linen weaver named Baptiste, of Chambrey. One authority states that French cambric is the finest linen fabric made.

Cotton imitations of the original cambric are of the muslin type and are sometimes termed cambric-muslin.

The finer grades of cotton cambrics are made from hard twisted cotton yarns, and are of good quality.

LOOM REQUIRED.

Any of the light, single-box, fast-running looms are suitable for weaving cambrics, the goods being woven white, then bleached or piece-dyed as required.

The finest grades, where mispicks tend to make second quality goods, are woven on the regular looms. Devices have been invented and tested which change the filling before it is entirely spent, but they have not been successful on fine filling because, coming in contact with the filling every second pick, in practically the same spot, they wear it out before it can be run off the shuttle.

Little attention is paid to mispicks when weaving the lower qualities of goods, and these can be made most economically on the automatic looms.

ANALYSIS.

An analysis of a black cambric of only fair quality shows the following data: Finished width, 36 inches; finished weight, 4 yards per pound; ends per inch, finished, 70; picks per inch, finished, 54.

The average number of the yarns in the finished sample is 24, but on account of the starch, clay, or other filling substance used in the finishing process, the gray yarns would be finer than 24.

To obtain the fabric just mentioned, the following might be adopted, both as to construction and finish:

Width of warp in reed, 38¾ inches.

Warp yarns, 26s cotton.

Filling yarns, 28s cotton.

Eight double ends on each side for selvedges.

Total ends, 2,536.

Seventy sley reed, 2 ends per dent.

Fifty-six picks per inch.

Weight, 4.3 yards per pound from loom.

The finished and unfinished weights do not bear a direct proportion to the average counts of yarns in each case on account of the increase in length of the cloth during the process of finishing.

FINISHING.

After dyeing, open the goods out to the full width and run through a mangle containing the filling substance; then dry.

After drying, dampen in a damping machine and run through a calender.

For a fine white cambric the goods would be bleached, opened out to the full width, run through a starch mangle, containing a light starch or filling substance, the starch being blued to give the shade required, dried, dampened and run through a 5-bowl calender twice, the same side of the cloth being presented to the surface of the brass or steel roll each time.

Carding and Spinning Particulars.

The yarns of which cambric is made are spun in mills having the equipment of the first and second division of mills as given in a previous article. Cambric is made in mills or sets of mills where only this grade of cloth or perhaps two or three other styles of cloth of the same grade of fabric are made and after the proper gears hank roving are once found they are never changed. In fact, a machine or set of machines may run on this grade of goods its whole lifetime, the only changes made being in case of a breakdown, or parts and gears becoming worn out. Cambric is made from American cotton, the length of the staple used being from ⅞ to 1¼ inches. For this article we will consider the staple to be 1⅛ inches in length and the count of the yarn to be as follows: 26s for warp and 28s for filling.

THE MIXING

is generally done by hand, and the

mixings are always as large as possible. In some mills two large mixings are made so that one can be drying out while the other is being used. Better results are obtained by the latter method. The good sliver waste from machines up to the slubber, as well as the cut roving, is mixed in at the mixing bin. The cotton is then put through an opener and either two or three processes of picking, three processes being the general method. The opener is either directly connected with the breaker picker or is connected by trunking; if by trunking, keep it clear, so as not to cause fire. The

SPEED OF THE BEATER,

which is of either a two or three bladed rigid type, is 1,500 revolutions per minute for the two-bladed, or 1,000 revolutions per minute for the three-bladed type. The total weight of the lap at the front of breaker picker is 40 pounds or a 16-ounce lap. These are doubled four into one at the intermediate picker. The speed of this beater, which is generally of a rigid. two-bladed type, is 1,450 revolutions per minute, the total weight of lap at the front being 38 pounds or a 12-ounce lap. These laps are put up at the finisher picker and doubled four into one.

This picker is equipped with a two-bladed rigid style of beater, and makes 1.450 revolutions per minute, which gives the cotton passing through about 42 blows or beats per inch, the total weight of lap at front being 39 pounds or a 14½-ounce lap. The cotton is next put up at the card.

THE CARDS

on which cambric was formerly made are to some extent now used and are known as the top flat card. These are fast going out of date, so that the particulars given below refer to the so-called English card. The draft for this card, for these goods, should not exceed 90. The wire fillet used should be 100s for cylinder and 110s for doffer and top flats. The speed of the cylinder should be 160 revolutions per minute; licker-in, 400 revolutions per minute, and top flats should make one complete revolution in 50 minutes. Grind once a month. Strip three times a day and if running an extra heavy production, strip once more. Set top flats to cylinder to a 12-1000ths gauge and doffer to cylinder to a 7-1000ths gauge. Use large doffer. The

WEIGHT OF SLIVER

at the front of the card should be 65 grains per yard and the production about 750 pounds for a week of 60 hours. The card sliver is next put through either two or three processes of drawing, generally three. The doublings are generally six into one. The speed of the front roll is 400 revolutions per minute. On this class of goods some overseers prefer the metallic top rolls. In calculating the production of a drawing frame with metallic top rolls, it is the general rule to allow one-third more than that figured for leather rolls. It is found, however, that this is too great, and if the allowance is cut down to ¼ or 25 per cent, it will be found about right. Keep metallic rolls clean and well oiled. In figuring

DRAFT OF FRAME

with metallic top rolls, add 7 per cent when draft does not exceed 3.75, and 9 per cent when draft is between 4.60 to 7. If leather top rolls are used, care should be taken to see that they are properly oiled and free from flutes; they should be level, without breaks in leather, and the leather cot should be tight and last should be varnished frequently. A good recipe for a cooked varnish is given below: One quart vinegar, seven ounces glue, two teaspoons gum tragacanth, borax, size of walnut, one teaspoon brown sugar. Cook about an hour. Thicken with lampblack and Princess metallic. One that does not need cooking is as follows: Three ounces glue, one ounce acetic acid, one-half teaspoon brown sugar, one-half teaspoon oil origanum. Dissolve and add color; add one-half teaspoon of borax in hot weather. The bottom steel rolls should be set as follows: Front roll to second, 1¼ inches; second to third, 1½ inches; third roll to back, 1¾ inches. The weight of sliver at the front of the finisher drawing should be 70 grains per yard. This is put through the slubber and made into .40 hank roving. The

SLUBBER ROVING

is put through two processes of fly frames, the hank roving at each being as follows: First intermediate, 1.75, and second intermediate, 5; the setting of the bottom steel rolls at each process being 1 3-16 inches from front to middle and 1⅜ inches from middle to back. The roving is taken to the ring spinning room and spun into 26s yarn on a warp frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1¾ inches; twist per inch, 24.22; length of traverse, 6½; revolutions per minute of spindles, 9,-200. The yarn is next spooled and then warped, after which it is put through a slasher. On this class of

goods a heavy sizing is used. The roving is spun into 28s yarn on a filling frame with a 2¾-inch gauge of frame; 1⅜-inch diameter ring; 6-inch traverse; 17.20 twist per inch; revolutions per minute of spindle, 7,300. This yarn is then taken to the steam chest or put through some other process which prepares it for weaving.

Dyeing Particulars.

Cambrics are dyed in the jig machine or the continuous machine. The fancy colors are dyed on the jig. After dyeing, the pieces are starched with a light starch and calendered through a heavy calender.

BLACKS.

One dip salt black, 6 per cent oxydiamine black S A T; 30 per cent Glauber's; 3 per cent sal soda.

SULPHUR BLACK.

Ten per cent immedial black N N; 10 per cent sodium sulphide; 5 per cent soda ash; 20 per cent Glauber's.

BOTTLE GREEN.

Ten per cent thionol dark green; 2 per cent thionol yellow; 15 per cent sulphide sodium; 3 per cent soda ash; 30 per cent common salt.

PEA GREEN.

Two per cent immedial green B B; 2 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

NAVY BLUE.

Three per cent direct indigo blue B E M; 15 per cent salt; 2½ per cent frankhansine.

DARK SLATE.

One per cent Pluto black S S; 40 per cent Glauber's salt; 2 per cent soda ash.

BROWN.

Three per cent tetranil brown O; 30 per cent Glauber's; 3 per cent soda ash.

LIGHT BROWN.

One-half per cent tetrazo yellow M; 1 per cent tetranil brown O; 30 per cent Glauber's; 3 per cent soda ash.

OLD GOLD.

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

SLATE.

Two per cent diamine black B H; 2 ounces diamine yellow B; 30 per cent Glauber's; 3 per cent soda ash.

MAROON.

Ten per cent immedial maroon B; 10 per cent sulphide soda; 5 per cent soda ash; 35 per cent salt.

GREEN.

Ten per cent immedial green G G; 10 per cent sulphide sodium; 3 per cent soda ash; 35 per cent salt.

BLUE.

Ten per cent immedial new blue G; 20 per cent sulphide sodium; 5 per cent soda ash; 40 per cent salt.

ECRU.

Three per cent immedial cutch G; 4 per cent sulphide soda; 3 per cent soda ash; 20 per cent salt.

SCARLET.

Five per cent diamine scarlet B; 30 per cent salt.

WINE.

Four per cent benzo fast scarlet 8 B S; 1 per cent benzo fast violet R; 30 per cent Glauber's; 3 per cent sal soda.

PINK.

One-half per cent Erika pink; 20 per cent Glauber's; 2 per cent sal soda.

SKY BLUE.

One per cent diamine sky blue F F; 25 per cent Glauber's; 2 per cent sal soda.

HELIOTROPE.

One per cent diamine violet N; 30 per cent Glauber's; 3 per cent soda.

TIRE FABRICS.

Tire fabrics are, as the name implies, used for automobile, bicycle and other vehicle tires.

They are not actually tires themselves, but form the base or foundation of some kinds of composition and pneumatic rubber tires.

Like other terms denoting the use to which the fabric is to be subjected, as quiltings, bedspreads, shirtings, etc., the term tire fabrics covers a wide range of weights and qualities.

The stock used in the warps for these goods is of good quality, although the single yarns used are not of very high counts.

The weights vary considerably, ranging from about three to 20 ounces per square yard. In one type of goods this excessive variation is due almost exclusively to the ply warp yarns, which vary from 2 to 12 ply, from single yarns varying from about 8s to 40s, according to the weight required. This

type of tire fabric is termed thread fabric.

ANALYSIS.

The analyses of two tire (thread) fabrics of widely varying weights show the following data:

Sample No. 1. Warp ends per inch in reed, 16. Reed, 16; one end in each dent.

Warp yarn, 11-ply 9s cotton.

Filling: One pick per inch of single 40s cotton.

Finished weight per square yard, 13.5 ounces.

The weave is plain. The drawing is in straight order.

One peculiarity of this class of tire fabrics, which will be noticed from the preceding data, is that the filling is used merely to keep the warp yarns in position, not being needed to give strength to the cloth.

Sample No. 2. Warp ends per inch in reed, 68.

Reed, 17; 4 ends in each dent.

Warp yarn, 2-ply 24s cotton.

Filling: One pick of 40s filling every three-quarters of an inch.

Finished weight per square yard, 3.9 ounces.

The ends in Sample No. 2 were drawn 2 as 1 through each heddle eye, in straight order, two picks completing the weave as in an ordinary plain cloth.

For a better quality of fabric with the same construction the yarns would have been drawn in straight order, reeded two ends in each dent, as

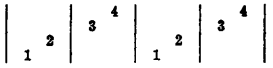


Fig. 1.

shown by the vertical lines in Fig. 1, and actuated as indicated by chain draft Fig. 2.

Fig. 2.

By this arrangement the ends working together would have been split or separated with the reed and prevented from rolling over each other.

If woven on a cam loom working four harnesses, the drawing in and reeding would be as indicated in Fig.

Fig. 3.

3, and the lifting of the harnesses as indicated in Fig. 4.

Fig. 4.

Reed ends at lines in Fig. 3, two ends in each dent.

LOOM REQUIRED.

Tire fabrics may be woven on ordinary one-shuttle cam or dobby looms, there being but one warp and one filling, provided provision is made for the proper regulation of the let-off and take-up motions.

On the heavy grades of goods, it is advisable to fold the woven fabric as it is made, instead of running it on a cloth roller, on account of the large yardage produced in a short time.

The two samples analyzed were woven on a heavy loom running about 90 picks per minute.

Carding and Spinning Particulars.

In a previous article the cotton mills were divided into three divisions, each division having a different equipment of machinery. The yarns that make tire fabrics do not come under the head of any of these divisions, but may be classed among those having a special equipment. This is on account of the extra length of staple used, which is very rarely less than 1¾ inches, and from this up to the longest staple grown, 2¼ inches. The stock is, of course, Sea Island. It will therefore be readily understood that the machines in use in the other divisions of mills, having drawings rolls, such as drawing frames, slubbers, fly frames, etc., could not spread the bottom steel rolls the required distance, so as not to break the staple. In order to do this, specially constructed frames have to be obtained, which allow this spread of rolls.

ANOTHER POINT

is that the one main object sought is strength and this is the chief reason why long staple is used, the counts of yarn being extremely low for the length of the stock, i. e., 2-24s warp and 40s filling, so that the additional points that should be looked out for, besides those that will be given below, are to see that the top clearers cover all the top rolls, that the spread of the rolls is enough so that the staple will not be broken, and that the traverse motion is in perfect shape and working properly.

As it is strength that is sought, the cotton is

GENERALLY COMBED

to get all short staple out, but sometimes the stock is only carded. When carded, the carding should be light or, better still, double carding should be used. In this article we will consider

the yarn to be combed. The mixing should be done by hand, the cotton being first stapled to see that it is up to standard, which for this article will be considered as two inches. The cotton, after being allowed to dry out, is put through an opener and either one or two processes of picking, generally one. If one process is used, the lattice is marked off into sections of one yard each and an equal amount of cotton put on to each section to make the required weight lap in front. If two processes are used, the opener is combined with the breaker picker. The speed of the beater of the breaker picker should be about 850 revolutions per minute for a two-bladed rigid type. The total weight of the lap at the front should be 32 pounds or an 8½-ounce lap. These laps are doubled four into one at the finisher picker; the speed of this beater should be 800 revolutions per minute. The total weight of lap at the front should be 27 pounds or a 9-ounce lap. A variation of not over 6 ounces either side of standard should be allowed. All laps outside this variation should be run over. The picker laps are put up

AT THE CARD.

On this class of work the draft of the card should not be less than 140 and from this up to 180. The wire fillet used should be No. 120s for the cylinder and No. 130s for the doffer and top flats. The speed of the cylinder should be 160 revolutions per minute, licker-in 200 revolutions per minute, and top flats should make one complete revolution every 35 minutes. Cards should be stripped three times a day, although some overseers claim that stripping the cylinder twice and the doffer three times a day is plenty. The cards should be ground once a month or oftener if wire is dull. For this class of goods keep wire fillet as sharp as possible. Use close settings, except that of the feed plate to the licker-in, which should be set so as not to break the staple. Pull the staple at the back and front of card at least once a day to see that the length of staple is the same in both places. The weight of the sliver at the front should be from 35 to 45 grains per yard, 45 grains being a good weight.

THE PRODUCTION

should be about 300 pounds per week of 60 hours. Keep front of card clean, so that the short fly, etc., will not get into the good carded cotton. The cotton is next put through the sliver lap machine, where it is doubled 20 into 1 for a 10½-inch lap, or 14 into 1 for an 8¾-inch lap. We will consider that the lap being made is a 10½-inch lap used on an eight-head comber. Set the bottom steel rolls as follows: Front roll to middle, 2¼ inches; middle roll to back, 2¾ inches. In combing this cotton the instructions given in a previous lesson may be followed with the following exceptions: The weight of the sliver lap per yard is 275 grains; at the ribbon lap 260 grains per yard. The cotton lap is next put through the comber. The

SPEED OF THE COMBER

for this stock should be about 85 nips per minute. The doublings are 8 into 1 (for an eight-head comber). The percentage of waste taken out is from 25 to 30. Use close settings, 18 from half lap to segment and 21 from top comb to segment. The sliver at the cam should weigh 45 grains. After the comber use three processes of drawing, the spread of the rolls being as follows: 2⅛ inches from front to second; 2¼ inches from second to third roll; 2½ inches from third to back roll. Look to the top leather covered rolls to see that they are in perfect shape and properly varnished. The weight of the sliver at the front of the finisher drawing should be 60 grains per yard. The doublings at the drawing should be 6 into 1. At the slubber this drawing should be made into .70 hank roving. At this frame

SEVERAL CHANGES

are made, which are as follows: The top leather rolls are varnished, sometimes all three sets, and sometimes only the front rolls. The size of the front leather roll is sometimes increased to 1½ inches, or even to 2 inches in diameter. This is to help prevent the roving "licking up"; when this is done, top clearers similar to those used on mules are used. The slubber roving is put through two processes of fly frames and made into the following hank roving: 2.25 at the first intermediate and 5 at the second for the 40s cotton, and for the 24s cotton the hank roving at each frame is as follows: 2.25 at the first and 8 at the second intermediate.

The spread of the rolls should be as follows: Front to middle, 2 inches; middle to back, 2⅛ inches. It should be understood that when giving the spread of the rolls, the distance is from centre to centre. The warp yarn is then spun into 24s on a warp frame having a 2-inch diameter ring and a 7-inch traverse. Some overseers give a little more than standard twist to this yarn. The yarn is then put through the spooler and from here to

the twister, where it is made into 2-ply yarn. From here it is put through the warper and the slasher. The filling yarns may be either mule or ring spun; if spun on a ring frame for 40s yarn, use a 1⅜-inch ring and 5½-inch traverse. This yarn is then conditioned, when it is ready to weave.

PLAIN and PLAIDED NAINSOOK

Nainsook is a light cotton fabric, utilized for numerous purposes,such as infants' clothes, women's dress goods, lingerie,half curtains for dining rooms, bathrooms and for various other purposes. The striped or plaided nainsook is used for the same purposes as the plain fabric, depending upon the tastes of the consumer. Where the fabric is required for lingerie and infants' wear, the English finished fabric is selected because of its softness. When intended for curtains or dress fabrics the French finished fabric is chosen; the latter finish consists of slightly stiffening and calendering the fabric.

The name nainsook is derived from the Hindoo Nainsukh and was orginally defined as a stout India muslin, manufactured in India.

The fabric as manufactured to-day may be distinguished from fine lawns, fine grades of batiste and fine cambrics from the fact that it has not as firm construction, or as much body, and the finished fabric is not as smooth nor as stiff, but inclines to softness, principally because it has not the body to retain the finishing materials used in finishing the fabric; consequently it must needs be a cheaper article than the fabrics above mentioned. Nainsook, like most cotton fabrics, is made in several grades, the different grades being affected by the counts of yarns used, which in turn influence the ends and picks per inch in the construction.

ANALYSIS.

Width of warp in reed, 30½ inches; width of fabric finished, 28¼ inches; ends per inch in reed, 82, reeded 2 in 1 dent; ends per inch finished, 86, ends in body, 2,460, plus 40 ends selvedge, equals 2,500, total ends in warp; take-up during weaving, 5 per cent; weight of fabric, 1½ ounces per yard; warp yarn, 1-50s cotton; filling yarn, 1-64s cotton; 66 picks per inch in loom; 68 picks per inch finished. Fig. 1, design; fig. 2, chain draft; fig. 3, drawing-in draft.

LOOM REQUIRED.

Nainsook, like various other one-filling fabrics of the character under discussion, may be woven on any light, single box, high speed loom.

Plaided nainsook seems to imply

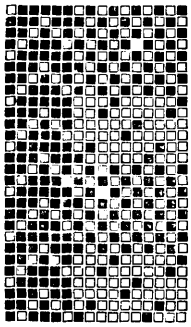


Fig. 1.

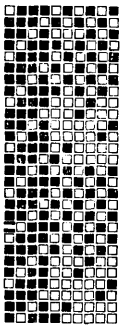


Fig. 2.

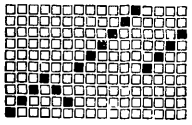


Fig. 3.

the use of more than one filling, the plaid, however, is formed by the weave. See design Fig. 1.

FINISHING.

This fabric is given either what may be termed an English or a French finish. By the former finish the fabric, after it comes from the loom, is boiled off, then bleached, after which it is softened by immersing in a light solution of glycerine, or cocoanut oil, and flour or

farina, after which it is dried by passing over heated cylinders, then run through a rotary press with very light pressure. In the French finish, after the fabric is bleached, it is stiffened by immersing in a solution of size, composed of the following ingredients: flour, wax and gelatine, after which the fabric is dried, then slightly sprinkled with water, then run through the calender, which completes the finishing process.

Carding and Spinning Particulars.

One mill making the above style of fabric makes its warp and filling yarn as described below. This mill is included in the second division as given in a previous article. Its equipment includes both combers and a bale breaker. The stock used is 1½-inch good quality Allen seed cotton. The cotton is put through three processes of picking and an opener. The opener is connected with the breaker picker. This picker is provided with a two-bladed rigid type of beater, which rotates at 1,500 revolutions per minute. The weight of the lap at the front of this beater is 40 pounds or a 16-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. This picker is also provided with a two-bladed, rigid beater, the speed of which is 1,450 revolutions per minute. The total weight of the lap at the front of this picker is 38 pounds or a 12½-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. It is at this point that the cut roving waste is mixed in, it having first been put through a roving picker and a picker to form it into a lap.

THESE ROVING LAPS

are mixed in with the raw stock in proportion of three laps raw stock to one lap cut waste. The beater used on this picker is a two-bladed, rigid type and its speed is 1,400 revolutions per minute. This gives the cotton passing through the picker about 42 beats or blows per inch. The total weight of the lap at the front is 36 pounds or a 12½-ounce lap. The laps are next put up at the card. This card is provided with a 26-inch doffer. The speed of the licker-in is 350 revolutions per minute, flats one revolution every 43 minutes. The draft is 100. Cards are stripped three times a day, ground twice a month, and the wire fillet used is No. 34s for the cylinder and 36s for the doffer and flats. The weight of the sliver at the front of the card is 50 grains and the production is 600 pounds per week of 60 hours. This mill is equipped with 6-head, 8¾-inch lap combers.

THE SLIVER

from the card is doubled 14 into 1 at the sliver lap machine and the weight of the lap is 320 grains. These laps are put up at the ribbon lap and doubled 6 into 1, the weight per yard at the front being 275 grains. These are put up at the comber and doubled 6 into 1, the weight of the lap at the can being 40 grains per yard. The speed of the comber is 90 nips per minute and 18 per cent of waste is taken out. The sliver is then put through two processes of metallic top roll drawing frames, the weight of the sliver at the finisher drawing being 70 grains per yard. The speed of the front roll is 375 revolutions per minute. The drawing is then put up at the slubber and drawn into .55 hank roving. This is then put through three processes of fly frames and made into the following hank roving at each frame: First intermediate 1.50, second 4, and jack frame 12 hank. The bottom steel roll

SETTINGS

are as follows: Front to second, 1⅝ inches; second to back, 1¾ inches. The front top rolls of the slubber are varnished. The roving is next taken up to the ring spinning room and made into 64s for filling and 50s for warp. For spinning 50s warp yarn use a frame having 2¾-inch gauge, 1½-inch diameter ring, 6-inch traverse, and put in 31.71 turns or twists per inch. The spindle speed is 10,000 revolutions per minute. This yarn is then put through a spooler and a warper and then a slasher. The filling frame to spin 64s should have a 2¾-inch gauge, 1¼-inch diameter ring, 5-inch traverse, 27 twists per inch and a spindle speed of 7,700 revolutions per minute. This yarn is taken to the conditioning room and then it is ready to be woven.

SPOT and STRIPES

As Produced by Means of an Extra Warp.

The spot or stripe may be effected by the weave alone or by means of extra warp and filling. The latter method of constructing these fabrics will be considered. Fabrics of this character are made in a variety of qualities

—from an "all cotton" to a very fine woolen or worsted fabric. The elaboration of the spot or stripe is largely influenced by the material used in the body of the fabric. The rule with

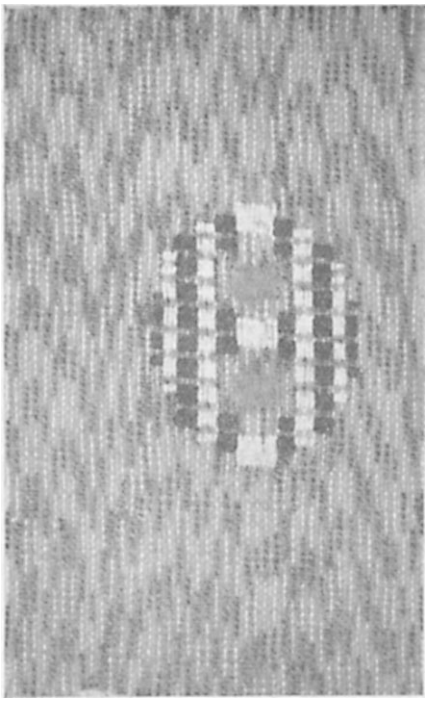


Fig. 1.

few exceptions is, the finer the quality of the material, the more elaborate is the stripe or spot.

THE SPOT PATTERN.

The spot is effected by floating the extra warp or filling yarn on the back of the goods for a given space, then raising the extra yarn to the face of the fabric for a given number of picks. The size of the spot depends on the number of picks or ends which the extra yarn floats over, which may be only one, two or more picks or ends. This, of course, is the simplest form of the spot pattern.

The simplicity of this method of construction lends itself readily to some very neat effects in small spot patterns; for example, by using different colored yarns for the spot, arranged in some order, on a ground composed of a 4x4 herringbone weave, with ground color scheme as follows: 4 ends green, 4 ends black, 4 ends brown, 4 ends black, with the same arrangement in the filling. The spot yarn may be composed of several colors, as, for instance, red, white and yellow.

In making the spot, with extra warp yarn only, the spot yarn is usually directly under the lightest ground color and forms the spot at the junction of light ground colors, referring to ground color scheme given above.

The spot yarn comes to the face of the fabric where green crosses green for two picks, then floats on back until the alternate crossing of green. This form of spot is operated on but two harnesses. The more elaborate spot is formed on the same principle as the small two-pick spot, just mentioned; the elaboration consists of the use of more ends. These ends are woven in, in the form of a figure, which requires the use of from 4 to 12 harnesses and more, in order to form the spot. These large spots are usually woven on a plain ground weave. The pattern would be read: 1 end of ground, 1 end of figure or extra yarn. The figure could be removed without affecting the ground weave, by reason of the fact that the spot is formed entirely by extra yarn. The spots are woven in the cloth in some order; for instance, they may be based on any satin, broken twill, or plain weave order.

Fig. 1 is a sample of spot pattern formed by extra warp yarn.

RAISED STRIPE PLAID.

These fabrics are much in use as a dress fabric for children and are made in all cotton, worsted and cotton, and all worsted, with the exception of the raised stripe, which is usually mercerized cotton or silk.

Fig. 2.

The raised stripe is formed by the use of partially extra yarn in both warp and filling, that is to say, if a stripe is formed with 12 ends, these 12 ends would be reeded so as to take the place of only 8 ground ends; for example, if ground is reeded 2 in 1 dent, the stripe is reeded 3 in 1 dent.

If we use for ground weave $\frac{1}{2}$ twill, the raised stripe must be a weave that is divisible by 3—the number of ends in the repeat of ground weave; in order to produce perfect stitching, a 6-end irregular satin would be required.

In laying out the pattern, or color

arrangement, it should be observed that the pattern is divisible by 6, and that the number of ends between the raised stripes in both warp and filling is divisible by 6, otherwise

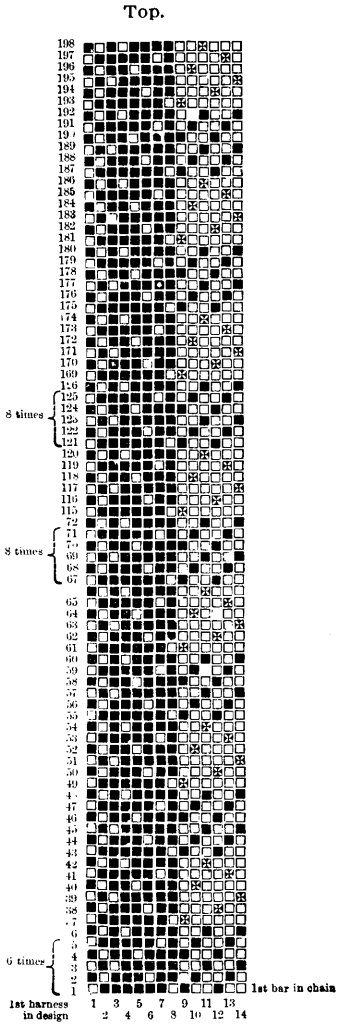


Fig. 3.

imperfect stitching will result when using a $\frac{1}{2}$ twill for ground weave.

These fabrics are made in various widths; the cotton goods are set usually at 38 inches in reed, and finish at 36 inches.

ANALYSIS.

1,000—2 reed; picks 54, with stop take-up.

WARP AND FILLING PATTERN.

36 ends bleach cotton.
4—6 ends blue cotton mercerized.
6 ends bleach.
4—6 ends blue.
6 ends bleach.
4—6 ends blue.
30 ends scarlet.
12 ends green, start 12.
4 ends black.
2 ends bleach.
4—6 ends scarlet.

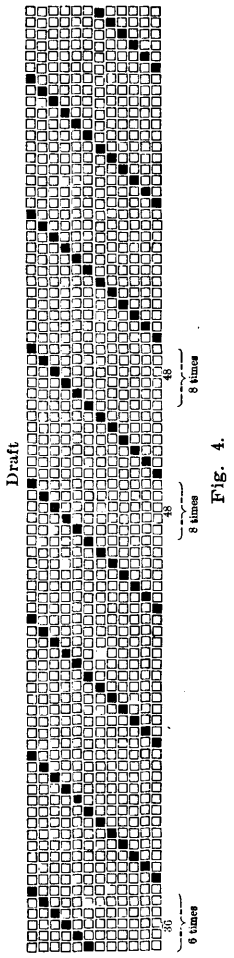


Fig. 4.

2 ends bleach.
4 ends black.
12 ends green, end 12.
30 ends scarlet.
4—6 ends blue.
6 ends bleach.
4—6 ends blue.
6 ends bleach.
4—6 ends blue.

198
14 ends extra yarn for stripe.

184

Fig. 3 required chain draft.
Fig. 4 drawing-in draft.

Ends in warp.	Ends in pattern.
708 bleach	64 2-40 cotton.
660 scarlet	60 2-40 cotton.
288 green	24 2-40 cotton.
396 blue	36 2-40 mercerized cotton.
72 scarlet	6 2-40 mercerized cotton.
144 black	8 2-40 mercerized cotton.
2,268	198 ends in 1 pattern.

2,268 total ends in warp.

The pattern shows that we have 198 ends and picks taking up the space required for 184, or 14 ends and picks of extra yarn in each pattern require average picks per inch in fabric: 54 pick wheel—198 in place of 184; 184 : 198 : : 54 : x equals 58 picks.

To calculate filling material required for 10 yards of cloth:

PATTERN.

64 A
60 B
24 C
36 D
6 E
8 F

198

184

38 inches in reed.
54 pick wheel.

2,052 divided by 184 = 11.15 average yards of yarn of colors in 1 yd.

11.15
10 yds.

111.50
5.58 5% added for waste.

117.08

117.08 / 64		Weight of each color.
7,493.12 yds.	of color A—	7.13 ozs.
7,024.80 yds.	of color B—	6.66 ozs.
2,809.92 yds.	of color C—	2.66 ozs.
4,214.88 yds.	of color D—	4.01 ozs.
702.48 yds.	of color E—	.70 ozs.
936.64 yds.	of color F—	.90 ozs.
		22.06 ozs. of filling for 10 yds. of cloth.

2-40s mercerized filling = 16,800 yards to 1 lb.

LOOM REQUIRED.

These fabrics require the use of box looms; a 4x1 or 6x1, or pick and pick loom, that is, a 4x4 box loom, is much used. If 6 colors are in the warp pattern, a 6x1 box dobby loom should be used. In the cheaper grade of plaids a 6 color warp pattern is sometimes filled with only 4 colors; this necessitates that one filling color covers two warp colors. A little discretion along this line will enable the manufacturer to use a 4x1 box loom where a 6x1 should be used. This, however, is only practiced in the cheaper grade of fabrics.

FINISHING.

These fabrics, if made with worsted are given a light scouring, then pressed. In the large spot patterns the extra yarn that floats on the back, when not forming the spot, is cut off by means of a shearing machine. The cotton fabrics are usually given a dry finish—simply run through a rotary press with slightly heated cylinders, and slightly steamed before passing over the cylinder of the press—after which they are made up into small rolls, then shipped.

Carding and Spinning Particulars.

The mills making the yarn for these fabrics will be found in either the first or second division of mills, as given in a previous article.

The yarns of which this class of goods is made vary a great deal, some of the finer ones being combed. For this article we will consider the warp and filling to be carded 2-40s yarn made from a 1 5-16-inch staple peeler cotton of a good grade. The raw stock is mixed by hand, although, if done by a bale breaker, it is better, as has been before stated; especially is this true in rainy or muggy weather. The mixings should be as large as possible and the hands mixing the cotton should break the bale into as small parts as possible.

IN HAND MIXING

several bales should be opened at once, and the cotton from each mixed together. At this point the sliver waste is mixed in with the raw stock. This should be thoroughly spread over the entire mixing. The cotton is put through an opener and three processes of picking. Always keep hopper of opener more than half filled with cotton, so as to obtain as even a feed as possible.

After passing through the opener the cotton is fed on to an endless lattice, which carries it to the feed rolls of the breaker picker. These condense the cotton and present it to the action of the beater. This beater is generally the two-bladed rigid type of beater and its speed is 1,550 revolutions per minute. Look at the

GRID BARS

to see that they are properly spread and the dirt is going through them and not being drawn into the cotton again after being knocked out by the beater. Do not allow the dirt to collect under picker, especially under the grid bars, as it is liable to be drawn into the cleaned cotton by the draft. The total weight of lap at the front of the breaker is 40 pounds or a 16½-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. This picker is also generally provided with a two-bladed rigid type of beater, whose speed is 1,500 revolu-

tions per minute. The total weight of the lap at the front of this picker is 38 pounds, or a 12½-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. It is at this point that the

CUT ROVING WASTE

is mixed in. If the mill contains a cut roving waste picker the proportion of mixing is as follows: Three laps raw stock to one lap cut roving. If, however, there is no such machine, the two centre laps are taken out and the cut roving spread evenly over the surface of the last lap. This will, of course, bring the waste between two laps of raw stock. The beater of this machine is a rigid two-bladed beater and makes 1,450 revolutions per minute, which gives the cotton passing through the machine 41½ beats per minute. The total weight of this lap at the front is 36½ pounds or a 12-ounce lap. The variation allowed for this kind of work is one-half pound either side of standard. Laps weighing over or under this variation are put back to be run over again. These laps are put up

AT THE CARD.

This card should have a draft of not less than 100. The end is set for medium work and uses the medium count of wire fillet for wiring doffer flats and cylinders. Set the doffer (which should be as large as possible) from the cylinder with a 7-1,000-inch gauge. The flats of the cards should make one complete revolution every 45 minutes. The cards should be cleaned thoroughly twice a day and the front wiped off many times more, to keep fly from falling back into good work. Strips should be collected at regular intervals which should not be so long apart as to allow the fly to accumulate so that it is liable to fall over on the doffer or be drawn up into the flats. This it cannot do if cards are equipped with a Thompson waste roll. The sliver at the front should weight 60 grains per yard and the production should be about 750 pounds for a week of 60 hours. Strip cards three times a day (twice in morning and once in afternoon) and grind all over once every three weeks.

DRAWING.

The cotton is next put through three processes of drawing frames. These frames may be equipped with leather top rolls or metallic top rolls. If the former, be sure to see that the rolls are well covered and in perfect condition and well varnished. The frames should at least receive a set of front top rolls every week. The speed of the front roll should be about 350 revolutions per minute. The frames may be equipped with metallic rolls to good advantage and, if they are, care should be taken to keep the flutes free from dirt of all kinds. The weight of the drawing sliver at the front of the finisher drawing frame should be 75 grains per yard. The cans of sliver are put up to the slubber and spun into .50 hank roving. Varnish the front loose top rolls of the slubber. The other sets of top rolls may also be varnished, but they are not so important. Keep rolls properly covered, oiled and weighted. Look out to see that no cut work is being made. After passing through the slubber the cotton is put through three processes of

FLY FRAMES

and made into the following hank roving: at each first intermediate, 1.50; second intermediate or roving frame, 4, and jack frame 10 hank. Be careful to see that proper twist is being put in, just enough so that the roving will not break back at the succeeding process. The method of finding the standard for twist has been given in a previous article. Another point is to see that the tension is right, because, if it is too much, the roving will be apt to be strained, while, if too slack, a soft bobbin will be made. Keep top leather rolls in good condition, as well as spindles well oiled for good roving. After having passed the fly frames the roving is taken to the

RING SPINNING FRAME

and spun into 40s yarn. If spun on a warp frame, use a frame having a 1⅝-inch diameter ring, 6½ inches traverse, twist per inch of 28.46, and spindle speed of 10,000 revolutions per minute. If spun on a filling frame use a frame having a 1¼-inch diameter ring, 5½-inch traverse, twist of 23.72 and spindle speed of 8,800 revolutions per minute. The yarn is next twisted into 2 ply at the twister and then the warp yarn is run on a chain warper; from here it is taken and dyed, after which it has to be warped again on a beam.

Dyeing Particulars.

Following are the dyeing particulars on cotton yarn and mercerized yarn:

SCARLET.

Four per cent direct scarlet A; 30 per cent common salt.

MAROON.

Three and one-half per cent direct maroon B; 30 per cent common salt.

PINK.

Three-quarters per cent direct pink 7 B; 20 per cent salt.

YELLOW.

Three per cent chromine G; 30 per cent salt.

GREEN.

One and one-half per cent naphtamine green 4 B; 25 per cent salt.

NAVY BLUE.

Four per cent naphtamine blue 2 B; 30 per cent salt.

LIGHT BROWN.

One-half per cent naphtamine brown N conc; ½ per cent naphtamine yellow N N conc; 20 per cent salt.

SKY BLUE.

One per cent diamine sky blue F F; 30 per cent Glauber's salt.

ORANGE.

One per cent naphtamine orange O; 30 per cent Glauber's salt.

LIGHT OLIVE.

Three-quarters per cent direct olive R; ¾ per cent naphtamine yellow N N conc; 30 per cent Glauber's salt.

BROWN.

One per cent naphtamine brown 6 B; 2 per cent naphtamine yellow N N; 30 per cent salt.

SLATE.

One and one-half per cent naphtamine black N; 20 per cent salt.

BOTTLE GREEN.

Five per cent naphtamine black 2 G; 1 per cent naphtamine yellow N N; 30 per cent salt.

BLACK.

Five per cent naphtamine black D; 30 per cent salt.

HELIOTROPE.

One-quarter per cent heliotrope B B; 20 per cent Glauber's salt.

ECRU.

One ounce naphtamine brown N; 2 ounces naphtamine yellow N N; 20 per cent salt.

TARTANS.

Tartans, also termed tartan plaids, or Scotch plaids, are highly colored fabrics, the distinguishing effect being large plaid or check effects formed by two or more colors of warp and filling, more particularly containing such prominent colors as red, yellow, blue, orange, green, purple, primary and secondary colors and other showy colors, to a greater or less degree. Pure blacks and whites are also used.

THE MATERIALS

used are yarn dyed. The weaves used are usually the plain, $\frac{2}{2}$ twill, $\frac{2}{2}$ basket, $\frac{3}{3}$ twill, $\frac{3}{3}$ basket, and rearrangements of or combinations of these weaves, which distribute the warp and filling in equal proportions on both sides while retaining a firm structure of cloth.

The Mayo or Campbell weave, Fig. 1, and the 6-end twill and 6-end bas-

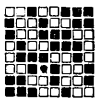


Fig. 1.

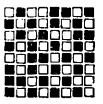


Fig. 2.

ket are used for the finer grades of goods.

Tartans, although sometimes made with cotton yarns, are more extensively made with worsted. They are also made with other fibres.

References to tartans being used for wearing apparel are found in literature, dating back to the 15th century.

At the present time tartans are used, as of old, for ladies' dress goods, and also for a certain type of garment for men, well known where Scotchmen have found their way.

The word tartan is of doubtful origin, some historians claiming one and some another. For several hundred years it has been connected with cloths made and worn principally by people in the Scottish highlands..

The Highlanders were formerly divided into sections, or clans, each of which had its own special tartan, the latter varying in the arrangement of colors, or of the colors themselves, or of both, from those used by the other clans.

The Scottish clans and their tartans have been ably and extensively dealt with in literature, books having been

published on the subject, to which the reader is referred for more detailed information. In some of these publications the illustrations show the principal tartans in their several colors.

A collection of tartans of good quality is one of the best aids in studying pure color combinations that can be obtained.

It is said that the tartan, no matter of what colors or arrangement of colors the plaid may be composed, signifies the brotherhood of the various Scottish clans.

THE SIMPLEST FORM

of tartan is in two colors, arranged so many ends of one color and an equal number of ends of another color in the warp, the arrangement of filling being similar to the warp, making blocks of equal size.

The combinations of colors, or arrangements of yarns, may vary as desired.

From this base an infinite variety of variations can be made; 4, 5 and 6-color tartans are commonly made.

In a tartan made in six colors, red, yellow, blue, green, black and white, with the exception of the yellow and white ends, which work $\frac{7}{1}$, the weave is as shown in Fig. 2.

A tartan with a prominent weave effect, as in this instance, is something unusual. The idea here seems to have been to get a stripe effect.

To produce said tartan, 16 harnesses would be required, 8 for the ground, 6 for the warp float and 2 for the selvedges. The sections working $\frac{7}{1}$ work in 8-end sateen order; the largest contains 6 ends, therefore 6 harnesses only are required.

Being a fabric characterized by color effect, tartans are made to vary in quality, width, weight and finish to a considerable degree, according to requirements. In cotton goods they are usually developed in medium counts of yarn, from say 20s to 40s.

LOOM REQUIRED.

One requisite for weaving tartan fabrics is a loom with two or more shuttle boxes at one end. For almost all of the patterns a single box will answer at the other end.

The harness motion of the loom will differ according to the weave required. For a plain weave tartan, an ordinary 2-cam gingham loom will answer; in fact, about the only difference between a tartan and a gingham is that the colors of the former are brighter than those of the latter, and yarns of only one count are generally used, one warp only being required, whereas in a gingham it is quite common to have yarns of varying counts in both warp and filling.

A tartan plaid is also larger, as a rule, than a gingham check.

A cam box loom would also suffice for weaving 4-harness twill and derivative weaves, although it might be preferable in the case of the latter to use a dobby loom on account of the cross drawing-in that would be necessary.

For fancy weave tartans, which are in the minority, a box loom with a dobby head is required.

LONG CLOTH.

Long cloth is a fine cotton fabric of superior quality, made with a fine grade of cotton yarn of a medium twist. Originally, the fabric was manufactured in England and subsequently imitated in the United States.

The fabric is used exclusively for lingerie and long dresses for infants, from which it has apparently derived its name.

Long cloth to some extent resembles such fabrics as batiste, fine grades of muslin, India linen and cambrics. It is distinguished from these fabrics by the closeness of its weave and when finished, the fabric possesses a whiter appearance, due to the closeness of the weave and the soft twist yarn. The fabric, while possessing fair weaving qualities, is, however, not used as a dress fabric, chiefly because of its finished appearance which is similar in all respects to fabrics which we have been accustomed to see that are used solely for lingerie, night gowns, etc.

Long cloth, like the fabrics enumerated above, is made in a variety of grades or qualities. It is a very common thing in textile manufacturing to vary the grade of a fabric; not simply because the manufacturer loves to do so, but because of necessity, competition, etc.

THE SOLE PURPOSE

of the manufacturer is to produce a fabric that will sell and in order for a fabric to sell, it must be attractive and reasonable in price; the price which a manufacturer can command determines precisely how he must construct any fabric which he may offer to the consumer; if he finds, for instance, that long cloth is more salable at 12½ cents a yard than at 15c.,

it follows that he must make it at the former price. In order to make it profitable at 12½ cents per yard he must either use a cheaper grade of yarn or make a slightly lighter fabric, by using a fine count of yarn, which will produce more yards of cloth per pound of yarn; thus are brought about the various grades and qualities of fabrics.

The public is sometimes badly mistaken when it imagines it buys precisely the same fabric at 12½c. which some other concern is offering at 15c. per yard.

Following is an

ANALYSIS OF A FABRIC

which sells at 15c. per yard.

Width of warp in reed, including selvedges, 37½ inches. Width of fabric finished, 36 inches; ends per inch finished, 100; ends per inch in reed, 96; ends in warp without selvedges, 3,600; ends in selvedges, 40; total ends in warp, 3,640.

Take-up of warp in weaving 8 per cent; weight of finished fabric 2.5 ounces; warp all 1-50s cotton; filling all 1-60s cotton.

Picks per inch finished, 92.

Picks per inch in loom, 90.

LOOM REQUIRED.

A factor of supreme importance in the production of light cotton fabrics is the loom facilities available; such fabrics as long cloth and fabrics closely allied in character are woven most profitably on high-speed looms, such as a self-filling Northrop loom.

Long cloth is but a plain woven fab-

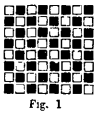


Fig. 1

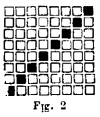


Fig. 2

ric (Fig. 1 design; Fig. 2 drawing-in draft) and is usually woven with eight harnesses, owing to the number of ends per inch, which would overcrowd the heddles and cause the yarn to chafe and break if less harnesses were used. The yarn is sized before the warp is beamed. The sizing is merely to strengthen the yarn. For light sizing it is not necessary to use anything but wheat flour, farina, or sago and a small quantity of softening material, usually tallow or wax.

FINISHING.

After the fabric is woven it is sent to the bleaching house. The first process is to boil it, then it is bleached. After the bleaching process the fabric is subjected to a very light sizing. The most prominent of the sizing ingredients is the softening material used, which may be glycerine, paraffine, cocoa oil, olive oil or bees' or Japan wax.

After the fabric is sized it is run through a rotary press, the cylinders of which are only slightly heated, with equally as little pressure on the fabric. The cloth is then folded, after which it is ready for the market.

Carding and Spinning Particulars.

The yarns for this fabric are made in the second division of mills, as given in a previous article. Long cloth is also sometimes made in the better-equipped mills of the first division. The raw stock used is generally Allen or peeler cotton, the average length of staple of which does not exceed 1⅛ inches in length. In some grades of long cloth the filling yarn is combed, but as it is the more general custom to use a carded yarn, we will work on this basis. Make the mixings as large as possible. After being mixed the cotton is put through three processes of picking and an opener. Keep the opener hopper

WELL FILLED,

so that the pin beater will always have to strike some of it back. A well-filled spiked lifting apron means an even amount of cotton being fed to the breaker picker and therefore a more even breaker lap. For this class of cotton a three-bladed rigid type of beater is best. The speed of this beater should be about 1,050 revolutions per minute, as this class of cotton is generally very dirty and requires an extra amount of beating in the breaker and intermediate pickers so as to get a good, clean lap. The weight of lap at the front of the breaker picker should be 40½ pounds. These laps are put up and doubled 4 into 1 at the intermediate picker. The beater used on this picker, to get good results, should be a two-bladed, rigid, type, the speed of which should be 1,500 revolutions per minute. The weight of the lap at the front should be 38 pounds or a 12-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. It is at this picker that the

CUT ROVING WASTE

is mixed in in the proportion of three laps raw stock to one lap roving waste. If the mills are not provided with a roving picker, the third lap is taken out and the roving fed on top of the sheet that comes from the fourth lap. Do not use too much waste because it tends to make split laps which cause trouble in licking and making single at the card. The beater of the finisher picker is generally a two-bladed rigid type, the speed of which should be about 1,500 revolutions per minute. The total weight of the lap at the front should be 36 pounds or a 13-ounce lap. A variation of one-half pound, either standard, is allowed for this work. The cotton passing through the finisher picker receives 42 beats or blows per inch. Put these laps up

AT THE CARD

which should have wire fillet for spinning medium counts of yarn. The draft of this machine should not exceed 115. The speed of the licker-in is 375 revolutions per minute and the flats make one complete revolution every 50 minutes. The percentage of waste and fly taken out is about 3.75 to 4. Use medium settings and be sure that the feed plate is not set too close so as to break the staple. The cards should be stripped as follows: Three times for cylinders and four for doffers per day. Grind cards all over at least once every three weeks, lightly, and set after having ground. The weight of the sliver at the front should be 60 grains per yard. The production on this class of goods should be 700 to 750 pounds per week of 60 hours. This sliver is put through three processes of drawing frames which may be either equipped with metallic or leather-covered top rolls. If leather top rolls are used a good receipt for

VARNISH,

which differs from those already given, follows: 8 ounces best flake glue, 8 ounces ground or flake gelatine, 3 pints acetic acid, 1 pound burnt or raw sienna, 1 ounce oil of origanum. In many mills trouble is often found with the laps of the leather rolls breaking or splitting apart when varnish is first put on. If the laps are painted with formaldehyde, using a fine brush for the purpose, it will be found to overcome this trouble. This not only applies to drawing frame top leather rolls but to all leather rolls that have to be varnished.

ANOTHER POINT

to look out for is when sending rolls away to be covered, all waste should be removed from the bearings, for, if this is not done, a rust spot will be on them when they are returned from the roll coverer. On the drawing frame on this class of work it will be found advantageous to use metallic top rolls. If used, keep the flutes clean and smooth. The speed of the front roll should be 375 revolutions per minute on all processes. The doublings are 6 into 1 and the weight of sliver at the front is 70 grains per yard. Size the drawing frames at least three times a day. The sliver is next put up at the slubber and made into .55 hank roving. From here it is put through three processes of fly frames and made into 11.50 hank roving at the jack frames. The hank roving at the different processes is as follows: First, 1.50; second, 4 and fine 11.50. From here it is taken to the ring spinning room and spun into 50s yarn on a warp frame having a 2¾-inch gauge, 1½-inch diameter ring, 6-inch traverse, 31.81 twist per inch and a spindle speed of 10,000 revolutions per minute. From here it is spooled and warped and the required number of beams put up at the slasher to give sufficient end for the warp at the front. A good slasher size is as follows: Water, 100 gallons; potato starch, 65 pounds; tallow, 6 pounds; Yorkshire gum, three pounds; soap (white) two pounds. Boil 1¾ hours.

For the filling yarn the roving is spun into 60s on a frame having 2¾-inch gauge, 1¼ diameter ring, 5-inch traverse, 27 twist per inch and spindle speed of 8,000 revolutions per minute. This yarn should be conditioned.

BUCKRAM.

Buckram may be described as a coarse, glue-sized fabric made with cotton, linen, hemp or cotton and hair, the name in most cases being acquired by the finish which the fabric receives after it is woven. Some qualities of buckram are but plain woven cotton fabrics.

Buckram is used principally for stiffening garments, being much in demand by tailors, who use the fabric for stiffening and to give shape or form to a garment. The fabric is inserted between the lining and the surface cloth of the garment in particular parts, such as the lapel, cuff or wherever the

shape of the garment is essential to its appearance. Buckram is manufactured in several kinds; the fabric used for men's wear is usually made with linen, hemp or hair and cotton; the latter combination, namely, hair and cotton, is supposed to be the best, insofar that when bent or twisted it will spring back to its original position; this feature cannot be attributed to hemp or linen. The hair and cotton buckram is a loosely woven fabric, the hair figuring as warp, and the cotton as filling. It is usually woven in plain twills or herring-bone weave. The

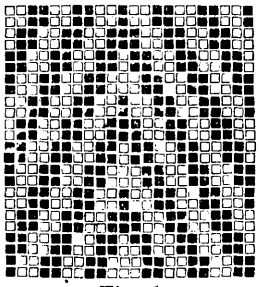


Fig. 1.

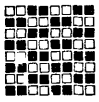


Fig. 2.

filling is usually two picks in one shed. (See Fig. 1, design.)

Buckram also figures largely in the millinery trade, where it is made up into hats. These hats are covered with chenille, plumes, flowers or whatever finery may be desired.

The buckram used for this purpose is a plain woven cotton fabric heavily sized, increasing its weight from 50 per cent to 100 per cent. The odd feature of millinery buckram is that two separate fabrics are made into one during the finishing process by means of gluing or sizing them together; these two fabrics are of different texture. The top or face fabric closely resembles a fine cotton voile, while the back or bottom fabric might be termed a coarse tarlton.

Millinery buckram is a piece-dyed fabric, usually in sombre colors, such as dark red, garnet, dark green and black. In the hair and cotton fabric, which is principally used for men's wear, the cotton is dyed before it is woven.

COTTON BUCKRAM ANALYSIS.

Face or top fabric: Width of warp in reed, 38 inches; width of fabric finished, 36 inches; ends per inch finished, 40; ends per inch in reed, 38; ends in warp, 1,440; 19x2 reed; take-up of warp during weaving, 8 per cent; warp, 1-22s cotton; filling, 1-26s cotton; 34 picks per inch; weight from loom, 2.22 ounces.

Back or bottom fabric: Width of warp in reed, 41 inches; width of fabric finished, 36 inches; ends per inch finished, 16; ends per inch in reed, 14; ends in warp, 576; ends selvedge, 24; total ends in warp, 600; 14x1 reed; take-up of warp during weaving, 5 per cent; warp, 1-12s cotton; filling, 1-10s cotton; 12 picks per inch; weight of fabric from loom, 1.86 ounces.

Weight of two fabrics after finishing, as one, 6.38 ounces; nearly 60 per cent added by sizing materials.

LOOM REQUIRED.

These fabrics may be woven on any light-built loom, the speed of which should be from 150 to 170 picks per minute. The warp for face fabric is usually drawn on eight harnesses; the back fabric may be drawn in on four harnesses in the order of: 1, 3, 2, 4. The chain, if a dobby loom is used, must be built accordingly. (Fig. 2.) Chain required: 2 repeats.

FINISHING.

These fabrics, as previously mentioned, depend a great deal on the finishing which they receive. The men's wear buckram requires less sizing by reason of the strenuous ordeal to which it is subjected in the fulfillment of its purposes, and also because the warp, which is composed of hair, is in itself quite stiff.

Millinery buckram requires more attention. After the fabrics are woven, they are dyed; the finisher then must observe that the fabrics finish the same width, so that when sized or glued together one fabric will not extend beyond the other. To insure that the fabrics lie evenly, they are stitched at the selvedges by means of a sewing machine.

The fabrics are then subjected to the sizing process, with the back cloth to the roller, which revolves in the size; this allows the size to penetrate more readily, as the meshes of the back cloth are larger than the meshes of face fabric; the fabric is usually subjected two or three times in succession before it is finally dried.

The ingredients used in sizing are glue, flour and China clay. These ingredients are used in various proportions, the following being an example: 40 parts glue, 20 parts clay, 40 parts flour.

Carding and Spinning Particulars.

The yarns which make up buckram vary according to the quality of fabric, but, generally speaking, the yarns are what are called coarse. The yarns of this class of goods would be made in mills of the first division as given in a previous lesson. In coarse yarns quantity is the end sought for rather than quality. Of course, this does not mean that everything is dropped for quantity, but that as great a production as possible is made at each machine and still get the desired quality for the class of goods being made. In fact, the machines are set to produce this result. For this article we will consider the buckram to be what is called "cotton buckram" and made up of all cotton yarn. Other kinds of buckram are made which have only one or both filling and warp back yarns of cotton fibre. The latter are made up of very coarse counts of yarns, generally about 1-10s. Cotton buckram is made up of finer yarns and for this article we will consider the count to be 1-22s for the warp and 1-26s for the filling yarns. Both these yarns are made up of the same staple cotton, generally a low grade of American cotton being used of about three-quarters-inch staple.

MIXINGS.

Waste is sometimes mixed with the raw stock, but we will consider that only good sliver waste is to be mixed with the raw stock. Large mixings are made by hand, generally enough to last a week or longer if the mixing bin is large enough. Mixing is done in the same manner as in the case of finer grades of cotton, making as uniform a mixing as possible, so that all the bales of cotton used will be distributed throughout the mixing. For this class of goods an opener and three processes of picking are used. The speed of the breaker picker, which generally has three blades and is of a rigid type, is 1,550 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. This picker is provided with a two-bladed rigid type of beater, the speed of which is 1,550 revolutions per minute. The total weight of the lap at the front is 39 pounds or a 14-ounce lap. The laps from the intermediate picker are put up at the finisher picker and doubled four into one. This picker is also provided with a two-bladed beater of a rigid type, the speed of which is 1,500 revolutions per minute. Great care should be taken to see that the cotton mixing is free from all foreign substances, for, if the beaters should strike any hard substances while going at this rate of speed, a spark is sure to be struck, which may cause considerable damage. The total weight of the laps at the finisher picker is 38 pounds, or a 14-ounce lap. A variation of 10 ounces either side of the standard weight is allowed for this class of goods; all laps varying more than this are run through the finisher picker again.

THE CARD.

The laps are put up at the card, which is covered with a coarse wire fillet on doffer, flats and cylinder, the wire on the cylinder being gauged coarser than that used for the doffer and top flats. The draft of the card should not exceed 85 and the speed of the flats should be one complete revolution in 60 minutes on a 110 top flat card. The cards should be stripped four times a day and ground once a month. For this class of work look out for the doffer comb to see that it is set right and is making the correct number of vibrations to clean the doffer. The production of the card is 900 pounds or even 975 pounds for a week of 60 hours with a 70-grain sliver. The sliver is put through two processes of drawing frames.

THE DRAWING FRAMES

for this class of work are generally, although not always, equipped with metallic top rolls. Keep the flutes cleaned and the rolls well oiled. If leather top rolls are used, keep them well varnished, using a little heavier varnish than the recipe given in the article on long cloth. The weight of the sliver at the finisher drawing is 75 grains per yard. The doublings at the drawings are 8 into 1. This sliver is put through the slubber and made into .40 hank roving. This is then put through two processes of fly frames. At the first it is made into 1.00 hank roving and at the second 2.50 hank. Look out to see that the full bobbins are properly shaped and that the frames are changing right, so that the roving will not run over or under, as this will make a great deal of unnecessary waste. The roving is taken to the

RING SPINNING ROOM

and spun into 22s warp yarn on a frame with a 2¾-inch traverse, 2-inch

diameter ring, 7-inch traverse, 22.28 twist per inch and spindle speed of 9,500 revolutions per minute. This yarn is spooled and warped and these beams put up behind a slasher and sized and run on a beam at the front on which the required number of ends are run. The filling yarn is spun into 26s on a frame having 2¾-inch gauge, 1⅜-inch diameter ring, 6-inch traverse, 17.84 twist per inch (3.25 x square root of count) and a spindle speed of 8,000 revolutions per minute.

Dyeing Particulars.

The goods are piece dyed on the jigs or padding machines with one-dip colors.

BLACK.

5 per cent oxydiamine black A K; 30 per cent Glauber's salt; 3 per cent sal soda.

Navy blues are also dyed in the same manner. The goods are very heavily starched with dextrine or animal glues of various kinds. The goods are run through a starch mangle, or starched by hand in a tub, and dried on a tenter frame. The starching process is repeated until a sufficient stiffness is obtained.

STARCH SOLUTION.

1 gallon water, 10 ounces dextrine, mixed cold and boiled for one hour. The addition of a little color, to color the starch, is sometimes required.

INDIGO PRINTS.

Indigo print cloth is one of the standard types of cotton fabrics that are run with more or less success all the time, no matter what the trend of fashion or style may be.

An indigo print is distinguished from a regular print by having a printed figure, of any desirable type or design, on a solid indigo blue ground, the latter varying in depth of shade, according to requirements, whereas the ground of an ordinary print cloth pattern is white or a light color.

An indigo print pattern is obtained by one of

THREE METHODS:

indigo blotch printing, indigo discharge printing or indigo resist printing.

The basis of an indigo print may be any of the many types of plain cotton fabrics, according to weight and fineness desired, although what is known as a standard print cloth is generally used.

A "STANDARD PRINT"

is supposed to be constructed as follows: 28s warp, 36s filling, 28 inches wide, 64 ends and 64 picks per inch, 7 yards per pound.

28 inches x 64 ends per inch equals 1,792 ends in the warp, not allowing extras for selvedges.

As a matter of fact, a great many so-called standard prints made in Fall River, the centre of the print cloth industry, contain only 1,720 ends in the warp and 62 picks per inch in the filling.

IN NEW BEDFORD

print cloths are made from yarns two numbers finer than the above, being made of 30s warp and 38s filling. There are 1,790 ends in the warp and 62 or 63 picks per inch in the filling.

Another print cloth made in Fall River is 28 inches wide and contains 28s warp, 32s filling, 64x64 (shy). The weight is 6.44 yards per pound.

Although 28 inches is the usual width of these goods, they are also made in

OTHER WIDTHS,

generally wider. A certain wide Fall River print is constructed as follows: 34s warp, 36s filling, 46 inches wide, 56 ends and 52 picks per inch, 5.4 yards per pound.

On account of the large number of standard print fabrics used, by far the largest quantity of any type of cotton fabric made, many mills are run on these goods entirely.

THE LOOM REQUIRED

for weaving print cloths is of the ordinary plain 2-harness cam type. From a general consideration of the subject it would appear that the automatic looms would be the most economical to use.

With a plain loom the drawing-in and reeding plans are similar to those previously explained when considering other plain weave goods—skip shaft, draw on two twine harnesses, which is equal to 4 wire heddle harnesses, reed 2 ends per dent; selvedge end, double.

In consequence of the colors or design of a print cloth being the principal salable features of the cloth, and those that appear to the eye the most readily, more attention is paid to quantity than quality when weaving them, the idea being that the printing and

finishing processes will obliterate, or at least reduce,any cloth structural defects that may be made in the loom. Cloth defects are allowed to pass for prints that would not be allowed, only as second quality goods, to be finished by any of the other cotton finishing processes.

Carding and Spinning Particulars.

The mills which make yarn used for print cloth comprise the larger percentage of all the mills and would belong to the first division of mills, as given in a previous article. While the equipment of machinery is about the same in all mills making yarns for print cloth, still they differ in a great many cases as to the number of processes used. For example, one mill uses two processes of drawing and an extra process of fly frames; another may use a railway head and cut out one process of drawing, some mills using this machine before the drawing frame and some after. Some mills may only use two processes of pickers and an opener, whereas other mills use three processes.

ANOTHER FEATURE

about mills making print cloth yarns is that there is very little if any changing, according to the usual custom; as one overseer puts it, one set of gears is nailed on when the machine is started and left on until worn out,when another set of the same number of teeth is substituted for the old ones. In this article it will be the general machines and number of processes which will be given, for carding and spinning the standard print yarns, 28s warp and 36s filling. First comes the mixing, which may be done either by hand or by machine (bale breaker). The usual methods that have been explained in previous articles may be followed. Next the sliver waste from the different processes up to the slubber is mixed in at the bins or is sometimes placed in the hopper of the feeder and fed to it a little at a time along with the raw stock.

PICKERS.

After passing the opener the cotton is put through three processes of pickers, the beaters used on all three being generally the two-bladed rigid type. The speed of these beaters at the different processes is as follows: Breaker. 1,500 revolutions per minute, intermediate and finishers,1,450 revolutions per minute. The beats per inch at the finisher picker should be 40 to 43 for this staple cotton. The total weight of the laps is as follows: Breaker, 40 pounds or a 16-ounce lap; intermediate, 38 pounds or a 10-ounce lap; finisher, 39 pounds or a 14½-ounce lap.

A variation from the total standard weight of the lap of half a pound either side is allowed. All laps weighing more or less are run through the finisher picker again. The doublings at the last two processes are 4 into 1. Mix cut roving waste at finisher process.

THE CARDS

are set for coarse work and while there are still many of the old-style American cards in use, for this article the newer card or the English card is much used, particulars of which will be given. The speed of the cylinder is 160 to 165 revolutions per minute; the licker-in, 350 revolutions per minute. The feed plate should be set to the licker-in one-eighth inch longer than the staple of the cotton, i.e., from bite of feed roll to licker-in teeth, and the feed plate should have a fairly pointed nose. The licker-in should be set with a 10-1,000ths inch gauge from cylinder wire. The back side of cylinder screen should be set 1-32d of an inch away from cylinder wire, directly underneath (in centre), with a 28-1,000ths inch gauge and at the front one-quarter inch away from cylinder wire. The doffer should be set to the cylinder loose to a 5-1,000ths inch gauge; the doffer comb set with a 12-1,000ths inch gauge from doffer wire; the top flats to cylinder wire with a 10-1,000ths inch gauge and the back and front knife plates should be set the same as for leno cotton fabrics. The top flats make one complete revolution every 45 minutes. Strip three times a day and grind as before stated. The production for a week of 60 hours is 750 to 850 pounds. The weight of the sliver is 65 grains per yard. This sliver is next put through three processes of

DRAWING FRAMES,

the speed of the front roll being 400 revolutions per minute. Use either metallic or leather-covered top rolls. The advantages of both kinds have been given previously. The weight per yard of the drawing is 70 grains. The doublings at each process are 6 into 1. At the slubber the drawing sliver is made into .55 hank roving. The top rolls for this staple of cotton are not generally varnished. The slubber roving is next put through two processes of fly frames. At the different processes the hank roving is as follows: First, 2 hank; and second 7

hank for the warp yarn. The different processes up to the last fly frame for making 36s filling yarn are the same. Here the roving is spun into 8.50 hank. The yarn is then taken to

THE SPINNING ROOM

and made into 28s warp yarn on a frame with a 6½-inch traverse, 2¾-inch gauge, 1¾-inch diameter ring, 25.-13 twist per inch, and 9,700 revolutions per minute of spindle. This yarn is spooled and warped and then put through a slasher. A

GOOD SLASHER MIXING

to use, if prints are to be woven on a common loom, is as follows: Water, 100 gallons; cornstarch, 50 pounds; tallow, 3 pounds; turpentine, 1 gill; boil 30 minutes. If woven on a Draper loom, use the following size: Water, 100 gallons; potato starch, 50 pounds; tallow, 3 pounds; turpentine, 1 gill; and boil 30 minutes. The roving for filling yarn may be either mule or frame spun. It is the general custom to have it ring spun in mills built lately. For this count of yarn use a frame with a 5½-inch traverse, 1⅜-inch diameter ring, 22.50 twist per inch, 8,900 revolutions per minute of spindle. This yarn, after being conditioned, is ready for use.

Dyeing Particulars.

The pieces are first bleached to get a good white, and then dyed in the continuous vat.

THE HYDROSULPHITE VAT.

The water is corrected by the addition of one quart of hydrosulphite to every 250 gallons of water. A stock liquor is made up in a barrel:

Fifty pounds synthetic indigo paste; 2½ gallons warm water; 3¾ gallons caustic soda, 76 degrees Tw., and stirred; temperature is raised to 105 degrees F., and 8 gallons of hydrosulphite added. The temperature is kept at about 105 degrees F. for two hours. If the solution is not clear yellow, a further addition of one gallon of hydrosulphite is made. The vat is made up from the stock liquor and the pieces are passed through a sufficient number of times till the required shade is obtained.

The pieces are washed and dried and printed with a discharge paste.

WHITE DISCHARGE.

Four and one-half pounds bichromate of potash; 9 pints hot water; 1½ pounds soda calc, then 6½ pounds No. 11 gum; 5 pints water; heated to 140 degrees F., cooled and strained.

COLORED DISCHARGE.

Eight pounds discharge pigment; 10 pounds discharge thickening; 7½ pounds tragacanth, 8 ounces to gallon.

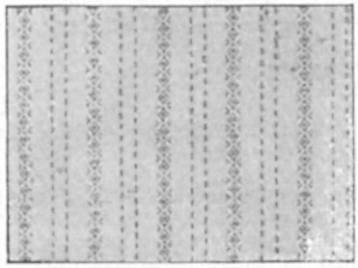
DISCHARGE THICKENING.

Eight pounds tragacenth, 8 ounces to gallon; 2½ pounds bichromate potash; 3¼ pints hot water; after dissolving add 20 ounces ammonia, 25 per cent; when cold add 1 gallon blood albumen, 8 pounds to gallon; after printing and drying, the material is passed through the following acid bath at 140 degrees F.; 4 pounds sulphuric acid,168 degrees Tw.; 4 pounds oxalic acid; 10 gallons water. The goods should be immediately well washed and dried.

LENO COTTON FABRICS.

Leno fabrics constitute a division of textile fabrics characterized by particular warp threads crossing over one or more warp threads, instead of lying parallel to one another as in ordinary or plain weaving.

These fabrics possess two distinct sets of warp threads, the regular or



ground warp and the douping warp or warp that crosses over the ground warp and forms the ornamental feature that characterizes the fabric.

Leno fabrics are woven upon a system quite apart from ordinary or plain weaving.

THE DIFFERENCE

lies chiefly in the fact that two sets of harnesses are required to operate the warp, the ground harness and the doup harness set.

The ground harness is the same as in ordinary weaving; the doup harness set consists of two harness frames, if string doup is used, known as the

standard and skeleton harness. When wire douping heddles are used, it requires three harness frames. We will for convenience deal with the string doup; this douping heddle is but a half heddle, so to speak. This half heddle is usually fastened at the bot-

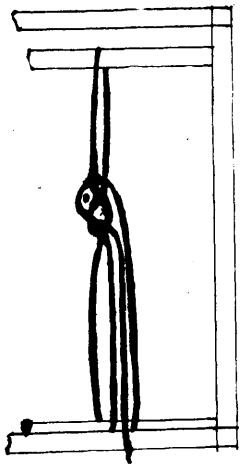
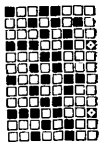


Fig. 1.

tom of the skeleton harness frame and connected with the stand and harness heddle by passing through the upper opening of the standard heddle, then through the eye of the standard heddle, then fastened at the bottom of the skeleton harness frame.

side of the ground warp threads, that is, it will cross under the ground threads; if, however, only the doup heddles are raised, the douping thread will remain in its normal position; that is, it will not cross under the ground threads. We must, however, bear in mind that in no case can the standard heddle be raised without also raising the doup heddle; when the standard and doup are raised together, we must also slacken or ease up on the doup warp threads in order to allow them to cross under the ground warp threads. This is done by means of a

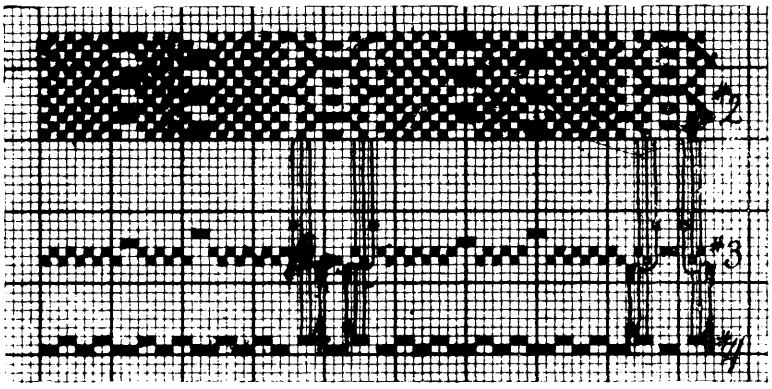


Slackener

Fig. 5.

slackener or easing rod. This rod is similar to what is known as the whip roller in ordinary weaving. The doup threads pass under this rod into the eye of the doup; this rod is so arranged that it will let up or relieve all tension from doup threads by moving toward the loom. When doup threads are required to cross under ground warp threads the easing up of the doup threads must be indicated on chain draft. (See Fig. 5.)

Fig. 3 shows drawing-in plan. Fig. 4 reeding plan. All leno fabrics have



(See Fig. 1.) The secret of leno weaving will be readily understood if it is borne in mind that it consists of but two movements of the standard and douping heddles; these two movements are that if the standard and doup heddles are raised at the same time, the douping thread will be on one

special reeding plans; the reed is sometimes plucked, that is, a wire taken out of reed, so as not to overcrowd the threads. This is usually done when doup threads cross under six or more ground threads; the doup thread must be in same dent with the ground threads under which it crosses.

ANALYSIS.

1,400 reed special denting; 70 picks per inch; 38 inches in reed. Finished 36 inches.

WARP.

9 white.
2 medium blue.
6 white.
2 medium blue.
9 white.
2 dark blue.
1 white—2-ply.
2 dark blue.
1 white—2-ply.
2 dark blue.

36

As the warp lay out is on 36 ends the cloth contains two repeats of the same to one repeat of the weave.

Draw the 2-ply yarn from the top beam.

FILLING.

20 white 1-50s.

Pins.	Ends.
559 Black	48 1-40s.
233 Dark blue	20 1-40s.
56 Black	4 2-40s.
848 Pins, including selvedges.	Selvedges 2-40s black.

Take-up during weaving ground warp 10 per cent.

Take-up during weaving doup warp 65 per cent.

LOOM REQUIRED.

These fabrics are usually woven on a dobby loom, the speed of which is from 120 to 130 picks per minute; a higher speeded loom usually causes considerable trouble with the doup warp.

The loom must necessarily carry two warp beams, ground warp and doup warp beams. Great care should be given to the setting of the harnesses as they should be perfectly even and form a perfect shed when in operation.

FINISHING.

These fabrics are principally used for shirts and shirtwaistings. This requires that the patterns be not too large and that the warp stripe be more prominent than the filling stripe when fabric is made with filling stripe; leno fabrics are principally yarn dyed fabrics. After the fabric leaves the loom it is boiled off, then given a light sizing, pressed, then made up into rolls, after which it is ready for the merchant.

Carding and Spinning Particulars.

Leno fabrics, like all fabrics having a trade name covering a certain class of goods, are made up of various counts of yarn and of course the methods used in making the different counts vary as to the processes used, also the kind and staple of cotton and the speed and setting of the different parts of the machines. A great many times changing the speed or setting of one part of a machine may improve the unevenness of the yarn or roving, or, if made at the picker, stop licking, so that it is very hard or almost impossible to give a hard and fast rule of speed or settings for the machines that will cover the whole of leno fabrics. The particulars which are given may be taken

AS A FOUNDATION

from which to work and a little variation one way or the other only will be needed. For an example of leno yarns, we will consider the fabric to be made up of 1-40s and 2-40s warp and 1-50s filling yarns. For these counts of yarn the equipment of the second division of mills will be needed. The cotton generally used is Allen seed or peeler (American cotton) of 1⅜-inch staple. Some mills comb both warp and filling yarns, while other mills comb only the filling yarns. In this article we will consider that only the filling yarn is to be combed, although, if both are combed, the particulars given below may be used. The mixing is made as has been previously described, it being pointed out that the use of a bale breaker in connection with a blower will help the cotton to a great extent. An opener and

TWO PROCESSES OF PICKING

are used. The sliver waste from all the machines up to the slubber is mixed in at the bins. At the opener use the particulars that have been given in previous articles. The breaker picker has a two-bladed rigid type of beater, and the speed of the beater is 1,450 revolutions per minute. Care should be taken to clean all seeds, etc., from under the bars at regular and frequent intervals. The total weight of the lap at the front of this picker is 38 pounds, or a 13-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. The speed of the beater of this machine is 1,450 revolutions per minute; the fan speed being 1,100 revolutions per minute; the driving shaft of the picker making 375 revolutions per minute. Cut roving waste is mixed in at the finisher picker in the proportion of 1 lap cut waste to 3 laps raw stock, the cut roving having been treated as described in previous articles. The total weight of the lap at the front end of the finisher picker should be 35 pounds or a 12½-ounce lap. The laps are put up

AT THE CARD,

the draft of which should not be less

than 100. The wire fillet generally used for this class of goods is 34s on cylinder and 35s on doffer and top flats. Set feed plate from licker-in with 20-1,000ths of an inch gauge; licker knives from licker-in 12-1,000ths of an inch; cylinder under screen from cylinder 22-1,000ths inch in centre and one-quarter of an inch at each end of screen; top flats from cylinder, with a 12-1,000ths inch gauge, licker-in from cylinder with a 1-1,000th of an inch gauge, doffer from cylinder with 7-1,000ths of an inch gauge. Always set to high places. Set the back edge of the back plate knife 17-1,000ths of an inch from the cylinder. The front plate knife has its upper edge adjustable in order that the amount of stripping to be taken from the flats may be regulated. Setting this plate closer to cylinder

MAKES LIGHTER STRIPPING,

and the farther away it is set, the heavier stripping it produces. The lower edge of this plate is set to a 17-1,000ths of an inch gauge. Grind and strip card as previously described. The top flats should make one complete revolution every 45 minutes. The percentage of waste taken out at the card for this class of goods should be about 4½ to 4¾. The production for a week of 60 hours is 700 pounds with a 65 grain sliver. Use a large diameter doffer. The sliver for the filling yarn is taken to the sliver lap machine and doubled 14 into 1 for an 8¾-inch lap or 20 into 1 for a 10-inch lap. The weight of the lap at the front is 300 grains. These laps are put up at the ribbon lap machine and doubled 6 into 1. The weight of a lap at the front end of a ribbon lap machine is 260 grains per yard for an 8¾-inch lap. Get weight for a 10-inch lap by proportion. Size both ribbon and sliver lap machines once a day.

THE DOUBLINGS

at the comber depend on the number of heads of the machine; recent machines are generally provided with eight heads with a 10-inch lap. The speed of the comber for this class of stock is 85 nips per minute for old machines and 100 nips for those of recent construction. Varnish rolls once a week, using one of the recipes given in previous articles; in sticky or dog-day weather use a little ground charcoal and gum arabic dissolved in a teaspoonful of vinegar. This swells to five times its bulk. Take out 18 per cent waste. After passing the combers, the sliver is put through two processes of drawing, being doubled 6 into 1. The speed of the front roll at each process is 350 revolutions per minute. The weight of the sliver at the finisher drawing is 70 grains per yard. The card sliver for the warp yarn is put through three processes of drawing, the speed of the front roll being 380 revolutions per minute. The weight of this sliver is also 70 grains per yard. The sliver is next put up at the slubber and made into .55 hank roving. From here it is put through three processes of

FLY FRAMES,

the hank roving at each process being as follows: First intermediate, 1.50; second, 4, and jack, 12. Keep your leather rolls in good condition and see that all parts of machine are well oiled and that top and bottom rolls are properly set, which for this length of staple should be for fly frames as follows: Front roll to middle, 1½ inches; middle roll to back, 1⅝ inches. From here the roving is taken to the spinning room, although some prefer mule spun yarn. There is a great difference in the opinion of mill men as to the advantages and disadvantages of both systems, one mill building with no mules and another including them in its equipment. We will consider both yarns to be

FRAME SPUN.

For a warp frame spinning 40s use a frame having a 2¾-inch gauge, 1⅝-inch diameter ring, 6½-inch traverse, 28.46 twist per inch, 10,000 revolutions per minute of spindles. The 1-40s warp yarn is spooled, warped and put through the slasher, a good mixing for which has been previously given. The 2-40s yarn is put through a twisting frame and spooled. Enough spools are put up at the warper and the ends, after which run on to a specially constructed beam.

For the filling yarn 1-50s, use a ring frame having a 2¾-inch gauge, 1¼-inch diameter ring, 5½-inch traverse, 26.52 twist and spindle speed of 8,200 revolutions per minute. This yarn is conditioned and then is ready to be woven.

Dyeing Particulars for Yarn.

BLACK.

Ten per cent immedial black N N; 10 per cent sulphide sodium; 3 per cent soda ash; 30 per cent Glauber's.

LIGHT BLUE.

Three per cent diamine sky blue F F; 3 per cent sal soda; 30 per cent Glauber's salt.

LIGHT SLATE.

One per cent diamine black; B. H; 1

ounce diamine fast yellow A; 1 per cent sal soda; 20 per cent Glauber's.

LIGHT BROWN.

One-half per cent naphtamine brown 6 B; 1 per cent naphtamine yellow N N; 1 per cent sal soda; 30 per cent Glauber's.

MEDIUM GREEN.

Six per cent thion green G; 2 per cent thion yellow G; 8 per cent sulphide sodium; 3 per cent soda ash; 30 per cent Glauber's.

MEDIUM BROWN.

Three per cent tetrazo dark brown; 1 per cent sal soda; 20 per cent salt.

MEDIUM SLATE.

One per cent tetrazo black G; 1 per cent sal soda; 25 per cent salt.

WINE.

Three per cent tetrazo Corinth; 1 per cent sal soda; 25 per cent salt.

RED.

Three per cent benzo fast red 4 B; 1 per cent sal soda; 25 per cent Glauber's.

DARK GREEN.

Seven per cent thion green B; 8 per cent sulphide soda; 3 per cent soda ash; 30 per cent Glauber's salt.

ECRU.

One per cent thion brown G; 1 per cent sulphide soda; 2 per cent soda ash; 20 per cent Glauber's salt.

FAWN BROWN.

One per cent diamine fast yellow A; 2 per cent diamine brown M; 1 per cent sal soda; 20 per cent salt.

NAVY BLUE.

Five per cent diamine dark blue B; 2 per cent sal soda; 30 per cent Glauber's salt.

BEDSPREADS---Crochet Quilts.

Bedspreads, also termed bed quilts, coverlets and counterpanes, are, as the names imply, used as coverings for bed clothing.

Being primarily decorative fabrics, most of them show elaborate jacquard designs of a type peculiar to this class of fabric, the use to which they are subjected necessitating a design of a large, bold character that is complete in itself in each quilt.

Quilts are of various sizes, ranging from crib quilts. 28x63 inches, to large quilts, 92x108 inches.

For metal beds the quilts are sometimes cut at the four corners so they will hang better and make a neater appearance.

Being a type of fabric of universal use in civilized countries, for all classes of people, quilts are necessarily made in widely varying qualities. They are also made in varying single and compound structures of cloth, and in varying types of designs.

THREE PRINCIPAL TYPES.

Three of the principal types of structures are seen in quilts known as crochet, Marseilles and satin. The first is a single fabric, where all yarns used show on one side or the other.

The second is a compound fabric, in

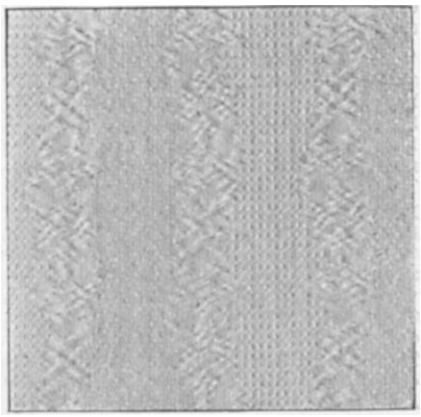


Fig. 1.

which the extra yarns are generally used for the purpose of adding weight and at the same time producing an embossed pattern on the face.

The third is a double cloth, reversible, with some types of designs in which each of the single cloths alternate from one side of the quilt to the other, according to the pattern required.

These three types will be considered in the above order.

It may be mentioned here that there are other names of quilts, as Toilet, Albany, Mitcheline, Duree, Grecian, Embroidery, Tapestry, Kensington, Alhambra and Honeycomb, but these may be included in one or other of the three principal types mentioned.

CROCHET QUILTS.

The term crochet quilt does not mean that said fabric is crocheted with needles, but refers to the simplest type of woven single cloth quilt made

with medium or fine counts of yarns. Honeycomb and Alhambra quilts are of the same class, differing principally in the type of design used.

This class of quilt, for full size quilts, shows variations in size from about 68x82 inches to 80x90 inches, and in weight from about one pound 12 ounces to three pounds 9 ounces, per quilt.

THE ANALYSIS

of an unbleached crochet crib quilt shows the following data: Width, 31 inches; 84 ends and 72 picks per inch; 24s warp, 12s soft twisted filling. The warp contains 2,600 ends and is reeded three ends per dent in a 26-dent reed. The cloth will finish about 28 inches wide.

By reference to Fig. 1, it may be seen that the pattern is a stripe composed of four sections in each repeat, as follows: First, a section of honeycomb effect, formed by weave Fig. 2,

Fig. 2.

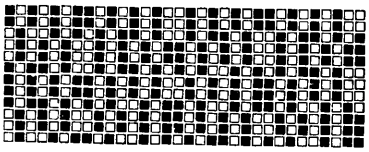


Fig. 3.

on 6x6; second, a continuous floral effect, filling flush weaves; third, a crepe effect, formed by weave Fig. 3 on 32x12; fourth, like the second section, but dropped 78 picks, one-half the number in each repeat.

There are a little more than 12 repeats in the entire width. The selvedges are each one-half inch wide, reeded the same as the ground, and show an angled twill weave effect.

The length of the pattern filling way is 2 3-16ths inches and requires 156 picks for a repeat.

As there are 200 ends in a repeat of the design, a 400-hook jacquard might be used, each pick of the pattern being read twice on each card.

THE LOOM REQUIRED

for this type of fabric is of medium weight. The pattern being small, a small jacquard head of the ordinary rise and drop type, or, if the weave is not required to be changed to form the headings of the quilt, a double action head may be used.

For the sample shown, if required to have headings at both ends to complete the quilt, differing in weave from the ground, what is termed a double or single acting automatic auxiliary cylinder jacquard would be the most economical to use.

If the ground weave was required to be repeated 25 times between headings, an ordinary jacquard attachment would require 25x156 picks in repeat, equalling 3,900 cards for the ground, whereas with the auxiliary cylinder machine 156 cards only would be required for this same section.

For larger patterns, the capacity of the jacquard would be required to correspond, i. e., with more than 400 ends in a repeat.

FINISHING.

The goods are generally woven white from unbleached yarn, and are bleached and finished after they leave the loom. A quilt will shrink in width about 10 per cent from the gray to the finished state, and increase about 1 per cent in length.

After bleaching, starching and bluing, they are cut, hemmed or fringed as desired, inspected, rolled or folded, tagged and papered.

It is not advisable to leave finished quilts unpapered for any length of time if in the same building as the bleach house, because the fumes from the bleaching liquors take out the bluing in a short time. If this is done after the quilt is folded, the bluing is taken from the outer layers only, and uneven, poor-looking quilts result.

Carding and Spinning Particulars.

The yarns of which bedspreads are composed are made in mills of the second division. There is one feature about the filling yarn which is not common to all fabrics, and that is, it is what is called soft twisted. The counts of yarn which make up the fabric to be described in this article are 24s warp and 12s filling.

THE WARP YARN

is made from 1⅛-inch staple American cotton, while the filling yarn is made from a good grade of 1-inch staple American stock. The mixing is done in the usual manner, which has been described many times before, separate bins being used for the two staples. The good sliver waste from all machines up to the slubber is mixed in at the bins. This sliver should be spread over the entire mixture and not bunched in one place; it should also be broken into short lengths so

that it will not be so apt to become tangled around the spikes of the hopper. This hopper should be kept full so as to feed an even amount of cotton to be struck off by the pin roller at the top of the lifting apron.

The raw stock for both warp and filling yarns is put through three processes of picking, the breaker picker being generally connected directly to the opener. Many different kinds of

BEATERS

are used by different mills, each claiming certain advantages over the other, but the style of beater in most general use throughout the mills is what is known as the two-bladed or armed rigid type of beater, although many mills use a three-bladed beater of the same style for the breaker picker. To sharpen the edge of this beater its side is planed. The speed of the beater used for the same stock and weight lap varies greatly in different mills and the speeds given below are the ones used in a mill making this class of goods. For the breaker picker the speed of the beater (two bladed) is 1,500 revolutions per minute, for the intermediate, 1,450 revolutions per minute, and for the finisher 1,350 revolutions per minute. The total weight of

THE LAP

at the breaker is 40 pounds or a 16-ounce lap, at the intermediate 37 pounds, or a 10-ounce lap, and at the finisher 39 pounds or a 14½-ounce lap. At the intermediate and finisher pickers the laps are doubled four into one. The draft of the finisher picker does not exceed three. At this picker it is customary to mix in the roving waste both cut and uncut. The roving waste that has not been cut from the bobbin consists of that which is made by the speeder tenders when they are putting in new sets of roving and taking off single and double. Speeder tenders should never be allowed to cut off roving; all bad work being sorted out, charged and given to them to fix. All marks should be made small and near the bobbin.

The laps from the picker are next put up

AT THE CARD,

the draft of which for this fabric should not exceed 100. The wire fillet used should be No. 33s for cylinder and 35s for doffer and top flats. The settings of the card should be the same as given for leno cotton fabrics, although some overseers use a little wider settings for this class of stock. The speed of the licker-in should be 375 revolutions per minute, cylinder 165 revolutions per minute, and the flats should make one complete revolution every 50 minutes. The card should be stripped, ground and cleaned. The weight per yard of the sliver at the front should be about 65 grains per yard, the production for a week of 60 hours being 750 pounds. This sliver is next put through three processes of

DRAWING FRAMES,

the doublings at each process being 6 into 1. For this class of goods metallic rolls may be used to great advantage. If leather top rolls are used, they should be varnished frequently and kept in good repair. See that all parts are working properly, especially those parts which coil the sliver into the cans, because if these are not working properly, the sliver cannot be run out at the next process without a great deal of breaking back of the sliver. Imperfect coiling of the sliver is a great many times caused by the cans themselves, they being out of true or having broken parts sticking out and coming in contact with part of the machine and stopping the can from turning. The only remedy for imperfect coiling is to run it over again.

The spread of the front roll of the drawing frame at each process is 375 to 400 revolutions per minute. The

WEIGHT OF THE SLIVER

for warp yarn is 70 grains and for the filling yarn, 80 grains per yard. These slivers are put up to the slubber and made into .40 hank for the 1-inch stock and .60 hank for the 1⅛-inch stock. The process of fly frames for the 1⅛-inch stock and the hank roving made at each process are as follows: First, 2 hank, and second, 6. From here it is taken to the ring spinning room and made into 24s yarn on a frame having a 2¾-inch gauge of frame, 2-inch diameter ring, a 7-inch traverse, 23.27 twist per inch and a spindle speed of 9,600 revolutions per minute. The yarn is then spooled and put through a warper and these warps put up at the slasher, the required number of ends being run on a beam at the front.

The slubber roving for the filling yarn is put on the first intermediate fly frame and made into 1 and then into 2.5 hank at the next process, after which it is taken to the mule room and spun into 12s yarn with a twist per inch of 2.75.

After leaving the loom, quilts are first boiled for 10 hours with a

CAUSTIC SODA SOLUTION

at 4 degrees Tw., rinsed well with

water and boiled again with a 4 degree Tw. caustic soda, 10 hours; rinsed well with water, soured with one-half degree Tw. oil vitriol, rinsed with water, chemicked with one-half degree Tw. chloride of lime solution, soured with 1 degree Tw. oil of vitriol and rinsed two or three times with water. The goods are placed in the kiers, each piece separate, and handled very carefully throughout the whole operation.

BEDSPREADS--Marseilles Quilts

Marseilles quilts are characterized by large embossed effects, usually of elaborate floral or geometrical design, each pattern occupying an entire quilt. The general effect is similar to what would be formed by stitching a pattern on a fine plain cloth, which effect is made more prominent in the better grades of goods by weaving a coarse plain cloth at the back and inserting wadding between the face and back cloths. When wadding is used the stitching points form deep furrows, which indicate the pattern.

One of the principal types of designs used reverses from the centre in both directions, warp way and filling way, as in Fig. 1.

When designing for this type it is necessary to make only one-quarter of the figuring design, the same occupying only one-sixth of the total number of ends in the warp, or one-half of the stitching ends. The jacquard

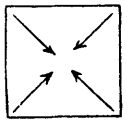


Fig 1

tie-up is on the point or centre draft principle, ∧ , which doubles the capacity of the machine as compared to a straight tie-up, and there is an attachment on the loom by which the cards are reversed when the centre of the quilt is reached filling way.

When considering the plan for the card cutter only one-half of the stitching ends and one-half the back picks in each quilt are considered, i. e., when there are two face picks to one back pick.

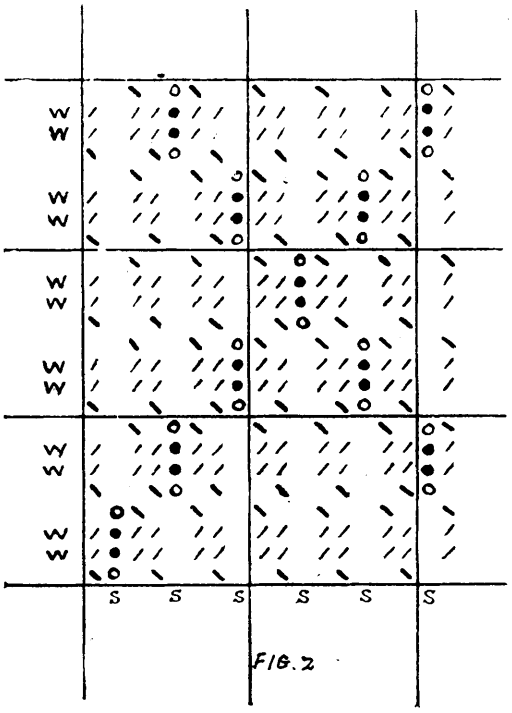


FIG. 2

There are two types of Marseilles weaves, known as ordinary Marseilles and fast-back Marseilles. The latter

type is used for almost all but the lowest qualities of goods.

Design Fig. 2 illustrates the principle upon which an ordinary Marseilles weave is constructed, in which the wadding lies between the face cloth

Fig. 3.

and the stitching, also termed binder, figuring, or black, ends. These ends when not required to be raised to form the pattern, remain at the back of the cloth and are not interlaced with the filling. On this account the distance, filling way, between the stitching points is necessarily limited.

In Fig. 2 the ends marked S are stitching ends, raised over the face cloth at O on the face picks and at ● on the wadding picks.

The picks marked W, shown in type /, indicate wadding, inserted for the purpose of adding weight and of forcing the face cloth up, or embossing it. When these picks are inserted, all the face ends are raised.

Fig. 3 shows the motif or order of stitching in Fig 2.

FAST-BACK WEAVES.

A fast-back differs from an ordinary Marseilles weave in having the fine filling; besides interlacing with the face ends, it also interlaces with the stitching ends when the latter are at the back between stitching points. In this way a double plain cloth is formed, either of which could be taken away and still leave a perfect single cloth.

In fast-back Marseilles quilts, both face and back weaves are plain, the

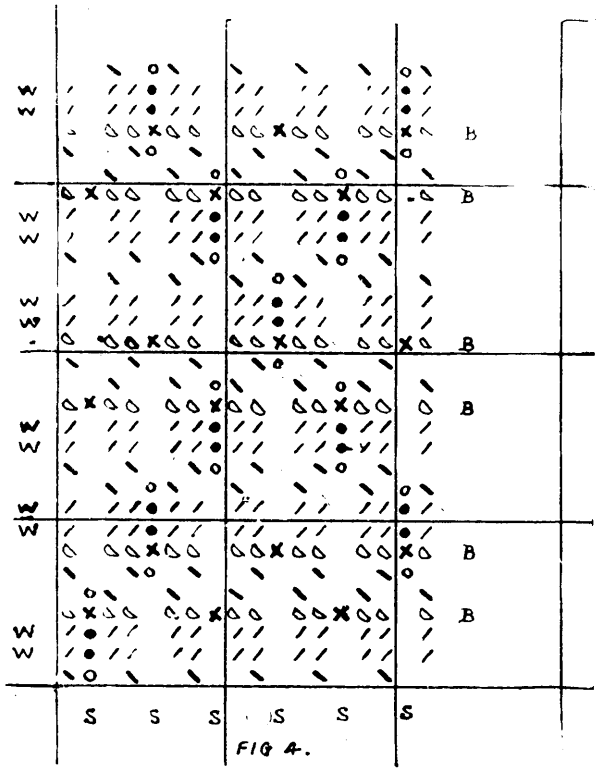


FIG 4.

pattern being formed by the stitching points.

In Fig. 4, which shows a fast-back weave completed to form the motif Fig. 3, ends S indicate stitching ends; W indicate wadding picks, and B indicate back picks.

Marks / show all face ends raised when wadding picks are inserted; stitching ends are all down on these

same picks except where they are required to be brought through the face cloth to form a stitching point.

When the back picks are inserted, all face ends are raised, as indicated at O , and one-half of the stitching ends, as at x, forming a plain weave at the back.

The ends and picks not marked S, W or B form a plain weave on the face.

Marks O show where stitching ends are brought over the face cloth, each stitching point covering two face picks, to define the pattern.

A standard make of cloth made with suitable designs on the principle shown in Fig. 4 is as follows: Warp, 40s yarn for face, 20s for stitching, arranged 1 end of 40s, 1 of 20s and 1 of 40s; 80 face and 40 back ends per inch, 120 average sley.

Filling 60s yarn for face and back, 12s yarn for wadding, picked 1 pick of 60s, 2 of 12s, 4 of 60s, 2 of 12s, 1 of 60s, repeated; 200 picks per inch.

The reason why the picks are arranged as here shown in preference to arranging them 2 face, 2 wadding, 1 back, is to enable an even number of picks of one count of filling to be inserted before the shuttles are changed. This can be done on a loom having a single box at one end and a multiple box at the other.

When a pick and pick loom is used, which is in the majority of cases, 4 picks instead of 5 complete the round of filling, one pick of 6s taking the place of 2 of 12s for the wadding.

The yarns in both warp and filling are usually arranged 2 face to 1 back, making a fine effect on the face and a coarse one on the back; this in addition to the wadding picks.

Two warp beams are required, one of which, that containing the stitching yarn, is more heavily weighted than the other in order to pull down the stitching points and make the embossed effect as prominent as possible. This warp may be of equal or of different counts from the face warp. It is usually of lower counts.

LOOM REQUIRED.

The patterns being large and elaborate, a jacquard head is of necessity used, although not of such a large capacity as would at first appear.

The cards for this head control the action of the stitching ends only.

An examination of Fig. 4 will show that only 2 ends are necessary to complete the face weave, every alternate face end working similarly.

The face ends, two-thirds of the entire number, are worked most economically by harness shafts, generally placed at the rear of the comber board.

These shafts are worked from the head in a positive manner, independently of the pattern cards.

To weave a quilt like the one under consideration, say 90 inches wide, an 1,800 hook head would be required, tied up point draft.

The 20s warp would contain 3,600 ends, and the 40s warp 7,200 ends,

Fig. 5.

making a total of 10,800 ends in the quilt.

The Crompton-Knowles Loom Co. builds pick and pick box looms, with rise and drop jacquard heads, with figuring capacities up to 1,800 hooks, containing features or attachments specially designed for weaving these goods.

On this type of loom Fig. 4 could be woven with 8 instead of 10 picks in a repeat, the action being as follows: First pick, jacquard rises, carrying the hooks selected for stitching by pattern card; all face warp raised; wadding filling. Second pick, jacquard up; one-half of face warp up and the other

half down; fine filling; face pick. Third pick, jacquard up; face ends reverse positions; fine filling; face pick. Fourth pick, jacquard drops and then rises again, carrying with it one-half every alternate one, of the stitching ends; all face warp raised; fine filling; back pick.

The fifth, sixth and seventh picks are a repetition of the first, second and third, with perhaps the exception that a fresh selection of stitching ends have been raised.

Eighth pick, jacquard drops, then raises the half of the stitching ends not raised, and leaves down the ends that were raised on the fourth pick; face ends all raised; fine filling; back pick.

The principal advantage claimed for this machine over others is that the attachment for raising the stitching ends, one-half every fourth pick, dispenses with one-half of the number of cards ordinarily required.

Two other methods are used for actuating the stitching ends when back picks are inserted. First, by bringing jacquard cards, called plain cards, into play to work them; this method requires double the number of cards required for the same pattern on the Crompton-Knowles loom.

Second, by using 2 comber boards, drawing the odd numbered ends through one and the even numbered ends through the other, and raising each board alternately every fourth pick.

When this plan is adopted knots are put on the harness cords immediately above the comber boards so that when the boards rise the cords and ends are also raised.

Light-weight Marseilles quilts are known as Toilet quilts. They vary in weight from about 2.5 pounds to 4 pounds per quilt.

Heavy-weight quilts vary from 3.5 pounds in narrow quilts to 6 pounds for wide goods.

In the lightest and cheapest grades of fabrics wadding picks are omitted, but when made on the fast-back principle the back filling is considerably coarser than the face filling.

The processes of finishing are somewhat similar to those explained in the article dealing with crochet quilts.

Carding and Spinning Particulars.

Marseilles quilts are of a better quality than the quilts described in the preceding article, but are made in the same division of mills. The quilts under description require four different sizes of yarn, which are as follows: 40s and 20s for warp and 60s and 12s for the filling. For 12s yarn use cotton of from ⅞ to 1 inch in staple; for the 20s and 40s use 1⅛ inch stock and for 60s 1¼ to 1⅜ inch stock, all American cotton. For the filling yarn a soft twist is used and it is generally mule spun. Mix raw stock by usual method, of course the different staples being mixed in separate bins. Hand mixing is generally used on this class of goods, but it would be

OF GREAT ADVANTAGE

to use a bale breaker or willow to prepare the cotton before it is fed to openers. All stocks are put through an opener and three processes of picking. The speed of the beater (rigid two-bladed style) for all stocks except the ⅞-inch is 1,500 revolutions per minute. For the short stock the speed should be increased so as to take out the extra amount of dirt which is always in short staple cotton. The total weight of the laps at the front for all staples should be 40 pounds or a 16-ounce lap. At the intermediate the speed of the beater is 1,450 revolutions per minute for all stocks, except the short stock, where speed should be increased. The total weight of lap at the front is 37 pounds or a 12-ounce lap for the finer yarns and a 10-ounce lap for the stocks for 12s and 20s yarn. These are put up at

THE FINISHER PICKER

and doubled 4 into 1. At this picker the cut roving is mixed in in proportions that have been described in previous articles. The speed of this beater varies from 1,400 to 1,500 revolutions per minute, according to the yarn being put through, the higher speed being used for the stock for the 12s yarn. This gives the stock for 20s, 40s and 60s about 42 beats or blows per inch. The total weight of the lap at the front is as follows: 35 pounds for the 60s and 40s yarns and 39 pounds for the 12s and 20s yarns, or a 12½-ounce lap for 1⅜-inch stock, and 14-ounce lap for the other stocks. A variation of one-half pound either side of standard is allowed for all the stock, except the ⅞-inch staple, for which a variation of 10 ounces either side of staple is allowed. Follow instructions about oiling, cleaning, etc., that have been given in previous articles.

THE CARDS

should be fitted up with 34s wire fillet for cylinder and 36s for top flats and doffer. The draft of the card should be as follows: 110 for 60s and 40s yarns and not over 100 for the shorter

staples. Speed of licker-in is about 325 for long staple and 375 for ⅞-inch stock. The speed of the flats for the different stocks is as follows: 1 complete revolution in 40 minutes for 60s yarn, 50 minutes for 40s yarn, 55 minutes for 20s yarn and 60 minutes for 12s yarn. Strip cards three times a day, except for the ⅞-in. stock, when an extra stripping of both cylinder and doffer should be made, although some overseers strip only three times, while others strip the doffer only an extra time. Use same

SETTINGS

for card as were given in the last article except for the ⅞-inch stock, when those for indigo prints should be used. The production for a week of 60 hours should be as follows: 1,000 pounds for ⅞-inch stock, 800 pounds for the 20s yarn, 750 for 40s yarn and 700 pounds for 60s yarns. The weight of the sliver is 65 grains for all staples.

The cotton for 60s is combed and the instructions, weights, etc., given in the last article may be used for the 40s and 20s. The card sliver is put through three processes of picking and for the 12s only two processes are used. Either metallic or leather top rolls may be used. We should recommend metallic rolls for the coarser work.

The weight per yard at the finisher drawing should be 70 grains for all staples except the ⅞-inch, which should be 80 grains per yard. The speed of the front roll should be about 400 pounds for coarse work and 350 for finer staples.

THE DRAWING

is put up at the slubber and made into .60 hank for 20s, 40s and 60s yarns and .40 hank for 12s yarn. The roving for 60s and 40s yarns is put through three processes of fly frames and for 20s and 12s yarns two processes are used. The hank roving for each yarn and the hank roving at each process is as follows: For 60s yarn, first intermediate, 1.50; second, 4.50; and fine, 12.50 hank. For 40s yarn first intermediate, 1; second, 3; and fine, 8 hank. For 20s yarn, first intermediate, 1.50; second, 4. For 12s yarn, first intermediate 1, and second, 3 hank.

THE ROVING

for the filling yarns is generally mule spun, because a soft twist is put in, about 2.75 x square root of yarn being used. For the warp yarn a ring frame is used. Of course if this fabric is made in a mill having only ring frames both yarns will have to be ring spun. The yarns for filling after being spun at the mule are all ready to be woven after being conditioned. For spinning 40s on a ring frame use a frame with 2¾-inch gauge, 1⅝-inch diameter of ring, 6½-inch length of traverse, 28.46 twist per inch and spindle speed of 10,000 revolutions per minute; for 20s use a frame with 2¾-inch gauge, 2 inches diameter of ring; 7 inches length of traverse, 21.24 twist per inch and spindle speed of 9,400 revolutions per minute. After passing the ring frame the yarn is spooled and warped and the 40s yarn is put through the slasher.

BEDSPREADS---Satin Quilts.

Satin quilts, so called, are distinguished by having a fine, smooth ground, from which the pattern appears to stand up. This pattern is made with coarse filling interlaced with a comparatively fine warp. The latter is almost lost to view in the coarse filling, unless examined closely.

The coarse filling floats over the ground yarns to form the pattern, and under them when not required to form the pattern, being bound with binding yarns, so called, generally in plain cloth order. The binding warp is all down when the ground filling is inserted.

The ground yarns, warp and filling, are of medium counts.

Fig. 1 illustrates the effect.

The term satin is probably used on account of the fine appearance of the ground, and not from any reference to the weave, as both ground and figuring weaves are generally plain.

MINOR VARIATIONS

in weave have been made from time to time, and patents granted for them, with the result that these goods are now sold in the market under different names. In 1868 a patent was granted for this type of quilt, known then and now as Mitcheline, in which a bold figure is generally woven on a plain ground, the figure being plain, twill or satin as desired.

Other names now used for practically the same type of quilt are Duree, patent satin, embroidery and Kensington.

Although generally woven white, some

VERY GOOD EFFECTS

are obtained in satin quilts by using colored ends in stripe form for the ground, as in Fig. 2.

An analysis of the sample illustrated in Fig. 2 shows the following data: Ground warp, 30s; binding warp, 20s; ground filling, 30s; coarse filling, 3s.

All binding ends are white ends.

The ground warp yarns are arranged 3 white, 3 blue, alternately.

There are 69 ends per inch, 46 of 30s and 23 of 20s, arranged 2 of 30s and 1 of 20s alternately.

The warp yarns are usually arranged 2 ground, 1 binder, although other arrangements are used. The filling is arranged 2 of ground and 2 of coarse, or 1 pick of each alternately.

The principle of construction of satin quilt weaves is illustrated in Figs. 2, 3, and 4.

The effect seen in Fig. 2 is like the motive Fig. 3, each end of which represents 18 ends in the cloth; each pick in Fig. 3 corresponds to 8 picks in the cloth.

The complete weave is illustrated in Fig. 4, where ends B, every third end, are binding ends; picks C are coarse picks. Solid squares show where these ends and picks interlace to form a plain weave. Marks x show where the ground ends and ground picks weave plain.

Marks . (dots) show where the ground warp is raised when coarse filling is inserted, leaving the latter at the back as not being required to form the pattern.

On the same picks in which these marks occur it may be noticed that some of the ground ends, indicated by = =, are down, allowing the coarse filling to float over them. It is at these places that the latter forms the figure. In Fig. 4 these marks indicate filling. All other marks indicate warp.

Two beams are required. The ground beam is more heavily weighted than the other, the idea being to allow the coarse filling to show as prominently as possible, and this filling passing first to one side of the cloth and then the other, and lying practically flat, not being bent out of a

Fig. 1.

straight line by the warp, necessitates the binder warp being held somewhat slack.

The goods vary in weight from about 3 to 5 pounds.

LOOM REQUIRED.

Satin quilts, although containing fewer ends than Marseilles quilts, require a much larger number of hooks, usually from 2,400 to 3,600.

Sometimes it is necessary to use two jacquard heads over one loom. The loom part itself is somewhat similar for both types of quilts. Two

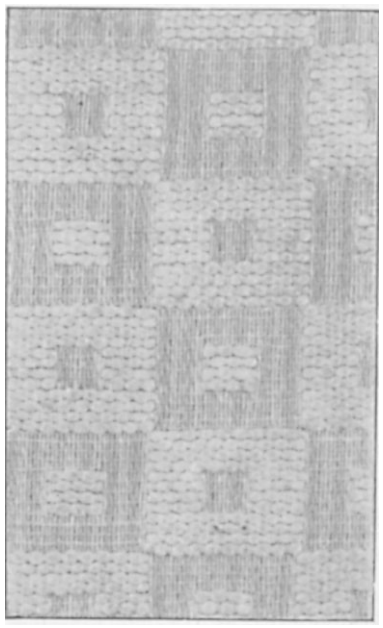


Fig. 2.

shuttles are used, one for each count of filling, picking 1 and 1 or 2 and 2 alternately as required.

The Crompton-Knowles Loom Co. build a jacquard head designed especially for weaving satin quilts. It is built straight-lift, or rise-and-drop as desired.

With this machine the ground picks are woven plain, satin, or twill as desired, without the action of the cards or cylinder. This saves labor in making the design and cutting the cards because in making a design the figure only need be dealt with. The binder ends, working plain all the time with the coarse picks, may be drawn through harness shafts and worked from the head, irrespective of the cards, as in Marseilles weaving.

The cards actually need actuate only the ground ends on the coarse picks, the remainder of the ends and picks being actuated in a positive manner by the head.

FINISHING.

The finishing of white quilts is about the same for all types, with the exception that some need more blue and starch than others. Briefly, they are bleached, washed to remove the acid, run through blue mangle, starched, dried, cut, hemmed, or fringed, inspected, folded, ticketed, bundled and packed.

In some mills it is the custom to weave the number of the loom on each quilt as it is being woven, so that if any defect shows up in any of the subsequent processes it can be readily traced to its source.

Carding and Spinning Particulars.

Satin quilts are made in the same division of mills as the fabric de-

Fig. 3.

scribed in the last article. The cotton used is similar. The make-up of satin quilts differs in different mills and even in the same mill different grades of this fabric are made. The quilt that has been analyzed for this article is made up of the following counts of yarns: 30s and 20s warp yarn and 3s and 30s filling yarn. As stated above, all the yarns except the 3s would be made up of cotton of 1⅛ to 1 5-16 inch staple. The 3s would be made from a shorter staple, say ¾ to ⅞ inch, and mixed with waste, as will be shown later.

THE MIXING.

The cotton for the warp and filling, except the 3s, is mixed in the usual manner and after being allowed to stand as long as possible (in order that it may dry out), the good waste from the machines up to the slubber, which is collected at regular intervals, is mixed in at this point, care being used to break up sliver waste into small lengths and to spread the sliver throughout the entire mixing, so that it will not all be fed to the feeder at once. In some mills a very small percentage of comber waste is mixed in

at this point, but it is not the general custom to use a mixture of this kind. For the 3s yarn the mixing is made up of a certain per cent of waste, the exact percentage depending upon the mill making the quilts; it may be from 25 to 60 per cent. Generally speaking, card and comber waste is used.

PICKING.

The finer mixture is put through an opener and three processes of picking, the speeds and other particulars being the same as given in our last article for the number yarn. For the coarser yarn only two processes of picking are used, the speed of the beater at the breaker being 1,500 revolutions per minute, and at the finisher being 1,400 revolutions per minute. The total weight of the lap at the breaker is 40 pounds and at the finisher 39 pounds, or a 16-ounce lap at breaker and a 15-ounce lap at finisher. A variation of 12 ounces either side of standard weight is allowed for these laps. Look out to keep your drafts so regulated that they will not cause the laps to split and lick. These laps are next put up

AT THE CARD

and as it is the custom to use but one count of wire fillet in a mill, the count used for this style of quilts would be the same as that used for bedspreads as given in the last article.

The other particulars given in that article may also be used. Care should be taken to see that the wire fillet on the top flats does not become choked up with the fly. In cards that have been in use for some time it is the rule rather than the exception to find fly at this point. Sometimes an adjustment of the brush up may entirely remedy the defect, but if not the fly has to be picked out by hand; or a better way is to put the stripping brush on the grinding brackets and drive it at a slow rate of speed until the flats have made either two or three complete revolutions.

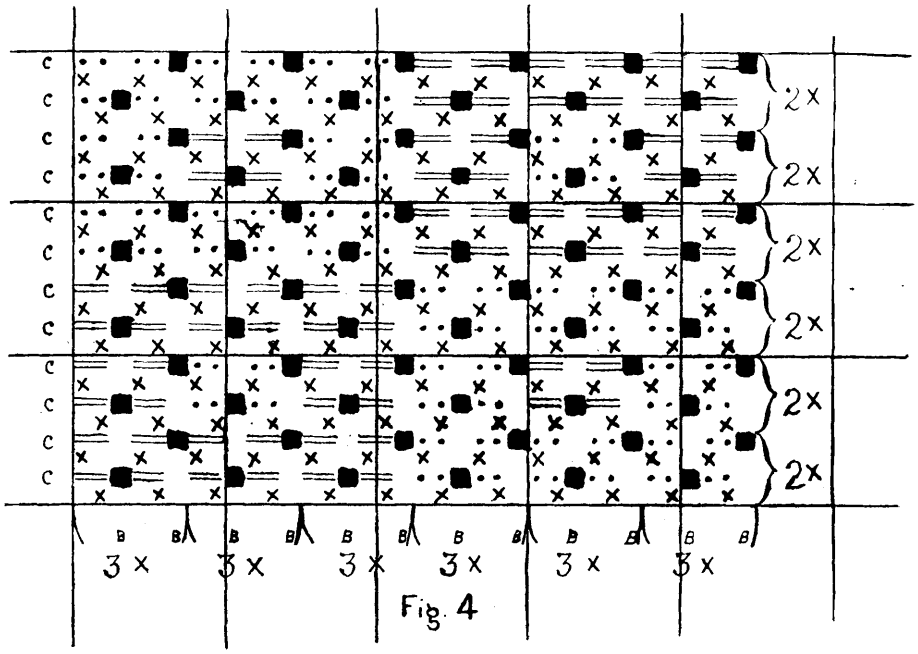


Fig. 4

ANOTHER POINT

to look out for is to see that the top flats are ground perfectly even. A great many overseers, if they look at the flats sharply, will be surprised to see that they are grinding more off of the back of the flat than at the front. This may not be the grinder's fault, but may be due to a defective grinding device, the main point being that they are not grinding in the same manner as they are working. It is just as well to grind the flats at least once a year on a flat grinding machine, the flats having to be taken

off to do this; which of course means the loss of production for that card for a certain length of time, but it will mean a better quality of sliver, which will more than offset the former, as a great deal closer settings may be used.

THE PRODUCTION

for a week of 60 hours for all counts of yarn (in this article) except the 3s should be 825 pounds and for the coarse yarn 950 pounds. The weight of the card sliver is 65 grains for all stocks. The yarn is next put through three processes of drawing for the finer counts and two processes for the coarse yarn. The top rolls used may be either leather covered or metallic. The advantages of both have been previously stated. The speed of the front rolls for the longer staple cotton is 400 revolutions per minute, and for the short staple 425, if convenient; or it may be run on the same line of machines as the longer staple cotton, when the speed of the front roll would have to be the same. The weight of the sliver for the 30s and 20s yarn should be 70 grains per yard and for the 3s, 80 or 85 grains per yard. The sliver is put through the slubber and made into .60 hank roving for fine counts and .40 hank roving for the coarser count. The roving for the 30s is put through two processes of

FLY FRAME,

the hank roving being as follows: Two hank for first intermediate and 6.25 hank for the next process; for the 20s the hank roving would be just the same at the first intermediate, but 4.50 at the last process. For the 3s the roving would be put through only one more process, where it would be made into 1 hank roving. It is the general custom to spin the yarn for this class of fabric on mules on account of the soft twist being put into it, but in some cases the yarn is spun on the ring frame. The particulars given in previous articles for 20s and 30s yarn may be used, with the exception of the twist, which should be less than that given. If mule spun, the standard for twist used should be 2.75 times the square root of the count. If the 3s are spun on a ring frame, a frame should be used with a 2¾-inch gauge, 1⅝ inch diameter ring, 6½-inch traverse. After passing through the ring frame the warp yarn is put through the spooler and warper and then through the slasher, and finally run upon a beam which has the required number of ends to make the quilt.

Dyeing Particulars.

SKY BLUE FOR STRIPES.

One per cent diamine sky blue F F; 2 per cent sal soda; 20 per cent Glauber's salt.

PINK.

One-half per cent diamine rose B D; 2 per cent sal soda; 20 per cent Glauber's salt.

LIGHT YELLOW.

One per cent chromine yellow G; 2 per cent sal soda; 20 per cent Glauber's salt.

LIGHT BROWN.

One-half per cent naphtamine brown N; ¾ per cent naphtamine yellow N N; 2 per cent sal soda; 20 per cent Glauber's salt.

RED.

Four per cent benzo fast red 4 B; 30 per cent Glauber's; 2 per cent sal soda.

LIGHT SLATE.

One per cent diamine black B H; 2 ounces diamine fast yellow B; 2 per cent sal soda; 20 per cent Glauber's salt.

LIGHT GREEN.

One per cent diamine sky blue F F; 1¼ per cent diamine fast yellow F F; 2 per cent sal soda, 20 per cent Glauber's salt; aftertreat with 2 per cent sulphate of copper.

PEARL.

One-quarter per cent diamine dark blue B; ¼ ounce diamine fast yellow B; 2 per cent sal soda; 15 per cent Glauber's salt; aftertreat with ½ per cent bichrome; ½ per cent sulphate of copper.

RAINCLOTH.

Raincloth, commonly so-called, has no particular style of construction or character of weave, the name being acquired from the fact that the fabric is waterproofed during the finishing process.

The most popular and best grades of raincloth may be defined as closely woven, smooth-face fabrics, made with twist warp, that is, cotton and wool, of cotton and worsted twisted together, and with all worsted or wool filling. The weave used for this fabric is what may be termed a five-harness satin $\frac{3}{2}$, see Fig. 1. This fabric, as the name implies, is exclusively

made up into raincoats or Cravenettes, worn principally as a covering in damp or rainy weather. The fabric, after it is finished, is impervious to water.

Raincloth is a piece dyed fabric. Such shades as drabs, fawns, light and dark browns and black are the prevailing colors. The warp yarn, as already mentioned, is a two-ply thread, composed of a very fine cotton thread and coarser count of worsted or woolen thread. The fabric is given a wool dye. The cotton does not take on color. The finished fabric presents what is termed a powdered effect, that is, little specks of white show over the entire surface of the fabric.

The fabric may be elaborated by means of mercerized cotton threads being inserted at regular intervals in

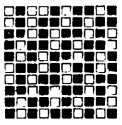


Fig. 1.

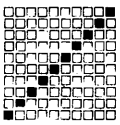


Fig. 2.

Drawing-in Draft.

both warp and filling, producing check or plaid effects, or by using a given number of solid worsted threads and a given number of twist threads arranged in some order producing a stripe effect. The fabric is also varied as regards quality, in so far that it is made with coarser counts of yarn, and less ends and picks per inch; in the cheaper qualities the plain weave and $\frac{2}{2}$ twill are much in evidence.

Analysis follows of a first-class fabric:

Width of warp in reed, 60 inches; width of fabric finished, 56 inches; ends per inch in reed, 84; ends in warp, 5,040.

21x4 reed.

Take-up of warp during weaving, 8 per cent.

Weight per yard finished, 10 ounces.

Warp yarn 2-50s worsted counts, composed 1 end of 1-30s worsted, 1 end 1-100s cotton.

Filling, 80 picks per inch in loom, 1-35s worsted yarn.

LOOM REQUIRED.

For plain raincloth, that is, a one-filling fabric, a broad Knowles dobby loom, speed from 140 to 150 picks per minute, may be used; for the five-harness satin weave the warp is usually drawn in on 10 harnesses straight draw, so as not to overcrowd the heddles and prevent chafing of the warp; for fancy raincloth the Knowles box, pick and pick loom is the one best suited for these fabrics.

FINISHING.

The better quality of raincloth requires considerable attention in the finishing process. After the fabric comes from the loom, it is dyed, the wool or worsted only taking color, the cotton in the warp yarn remaining white. Twist yarn is more or less irregular, that is, the cotton may be more prominent in some places than in others; this requires the fabric to be examined and where the cotton is found to be too prominent, it is darkened or inked in conformity with the ground color, after which follows the waterproofing process. This consists of immersing the fabric in a combination of ingredients, such as greasy matters of all natures, resin, paraffin, tannic acid, drying oils, salts of alumina, alums and carbonate of magnesia. After it is waterproofed, the fabric is pressed, made up into rolls, then made up into garments.

Carding and Spinning Particulars.

As has been stated in the analysis of raincloth given above, the material used in the construction of the yarns is wool and cotton. As in the carding and spinning particulars only the construction of the cotton yarn has been described we will follow the usual custom and give the processes, with the particulars at each stage, through which the cotton passes to produce the finished yarn. The count of the cotton yarn described for this fabric is 100s. This may be made from either a fine, long-stapled Egyptian cotton or from a Sea Island cotton of a staple of 1⅝ to 1¾ inches, the latter being the one most generally used. The bales of cotton are first stapled and graded and all those not up to standard length and quality are put one side, while the rest are mixed by hand.

A LARGE MIXING

is made so that there will be as few changes as possible in the yarn made from the different batches. It will be understood that it is often necessary to change certain parts of different machines for almost every mixing so as to suit some peculiarity of the mixing being made. These changes are generally slight and many times only

mean the changes of certain speeds or settings, but when running the different mixings the first lot run through should be carefully watched to see that it compares exactly with the foregoing mixture.

SEA ISLAND COTTON

of a long staple is put through only two processes of picking and an opener. Some overseers put the cotton through only one process. The beater used is generally of a two-bladed rigid type and if two processes are used the speed of the breaker is 1,300 revolutions per minute and the speed of the second, 1,100 revolutions per minute. As will be seen, this speed is reduced considerably from that of the other cottons that have been previously described and the reason is that a greater speed of the beater puts in neps, which, as every one knows, is the one thing to be most feared, because dirt can be taken out, but it is almost impossible to take out neps. To be sure, a greater portion of them are taken out, but it means much extra work and care to do it, so it is always best to see that none are put in. The beats per inch given to the cotton as it is passing through the finisher picker are 29. The total weight of the finished lap is 28 pounds or a 9½-ounce lap.

These laps are put up

AT THE CARD.

The settings used for this card should be close, a 12-1,000ths-inch gauge being used to set the flats from the cylinder and a 5-1,000ths-inch gauge to set the doffer from the cylinder. The wire fillet used should be No. 34s for cylinder and 36s for doffer and flats. The card should have as many working as possible and the speed should be one complete revolution every 35 minutes. The draft of the card should never be less than 130 and some overseers increase this to 175 or 180 on this class of work. The stripping should be done three times a day and grinding as usual. The card should be kept unusually free from fly and dirt and should produce from 250 to 300 pounds per week of 60 hours. The weight of the sliver should be 40 grains per yard. Another part of the machine that is changed differently from all other stock is the speed of the licker-in. This should be a great deal less than that used for other stocks for the same reason as given for the low speed of the beater. The speed of the licker-in should be dropped from 350 to 400 revolutions per minute (the usual speed) to about 275 revolutions per minute. The card sliver is next combed. The different

COMBING PROCESSES

vary, but those in most general use are as follows: sliver lap machine, ribbon lap machine and comber. The width of the lap is another part that has also been changed so that now it is 10½ inches, whereas formerly an 8¾-inch lap was almost universal. The following particulars will be given for an 8¾-inch lap; when a 10½-inch lap is used the proper weights may be calculated by proportion: The doublings at the sliver lap are 14 for an 8¾-inch lap and 20 for a 10½-inch lap.

The weight of a yard of lap at the front is 280 grains. These are put up at the ribbon lap machine and doubled 6 into 1. The weight of a yard of lap at the front of this machine is 265 grains. The laps are put up at the comber and doubled according to the number of heads that the comber contains; formerly it was the custom to have six heads, but within the last few years a comber of eight heads is used. The

PERCENTAGE OF WASTE

taken out should be not less than 20 for this class of stock and the trimmings and settings should be as follows: Combing starts at 5. Nippers open at 3½, close at 9¼. Lifters down at 6¾ and up at 8¾ to 9¼. Top combs down at 5. Feed roll commences to move forward at 5½. The start of the feed roll to a certain degree controls the percentage of waste taken out and is the part that is changed after the settings of the comber have been made. A later feeding means an increased amount of waste. The detaching roll moves forward at 5¾. There is a great deal of difference in settings, of the top combs to segment and cushion plate to needles or cylinder, among comber men, but good settings even for this grade of stock are with an 18 gauge from cushion plate to half lap and a 21 gauge from top comb to segment. Either a double or single row of needles in top comb may be used, both having their advantages and disadvantages. The weight of the sliver should be about 35 grains per yard. The sliver is next put through two processes of

DRAWING FRAMES,

the weight of the drawing at the finisher drawing being 60 grains per yard. Leather covered top rolls are generally used for this stock and should be kept in perfect shape and frequently varnished, as should the leather detaching rolls of the comber

and the top rolls of the sliver lap and ribbon lap machines. Several good recipes for varnish have been given in previous articles, one of which may be used. The sliver is put through the slubber and made into .80 hank roving. The front top rolls of this machine are generally varnished and some mills use rolls of a larger diameter, claiming less licking. The twist put in is the square root of hank being made. The slubber roving is next put through three processes of fly frames, the hank roving at each process being as follows: First intermediate, 2.25; at the second intermediate, 5, and at the jack frames, 20 hank. The standard twist per inch is the square root of hank times 1.10 at first and second intermediates and 1.20 at fine or jack frames. Care should be taken to see that the roving is properly laid on the bobbin and that the bobbin, when full, is properly built; also that the settings of the rolls and traverse are correct. This yarn is either mule or ring spun. If ring spun the particulars for a frame making 100s yarn are as follows: Gauge of frame, 2¾ inches; diameter of ring, 1⅝ inches; length of traverse, 5 inches; speed of spindles, 9,400 revolutions per minute. This yarn is then spooled and then is in shape to be twisted with the worsted yarn.

Dyeing Particulars—Piece Dyeing.

LIGHT OLIVE BROWN.

One-half per cent anthracene acid brown G; 6 ounces anthracene blue C; 2 per cent sulphuric acid; aftertreated with 1 per cent chrome.

MEDIUM BROWN.

One and one-half per cent anthracene chrome brown D; ½ per cent anthracene yellow B N; ½ per cent anthracene acid blue D; 2½ per cent sulphuric acid; aftertreat with 2 per cent chrome.

NAVY BLUE.

Four per cent anthracene acid blue D; ¾ per cent anthracene chrome violet B; 3 per cent sulphuric acid; aftertreat with ½ per cent chrome.

SLATE.

One-half per cent anthracene blue C; ¼ per cent anthracene chrome brown D; 1 per cent sulphuric acid; aftertreat with ½ per cent chrome.

OLIVE.

One and one-half per cent anthracene acid brown G; ¾ per cent anthracene brown; ½ per cent anthracene yellow B N; 1 per cent sulphuric acid; aftertreat with 1 per cent chrome.

DRAB.

Six ounces anthracene blue C; ½ per cent anthracene chrome brown D; 1 per cent sulphuric acid; aftertreat with 1 per cent chrome.

BLACK.

Six per cent anthracene chrome black F E; 4 per cent acetic acid; 2 per cent sulphuric acid; aftertreat with 2 per cent chrome.

DARK BROWN.

One per cent anthracene yellow B N; 3 per cent anthracene chrome brown D; 1½ per cent anthracene acid blue D; 3 per cent sulphuric acid; 2½ per cent chrome.

DARK GREEN

Three per cent anthracene yellow B N; 1 per cent anthracene chrome brown D; 3 per cent anthracene blue C; 3 per cent sulphuric acid; aftertreat with 3 per cent chrome.

COTTON CASSIMERE.

Cassimere was originally understood to mean a woolen cloth used for men's wear. This fabric differs from cashmere in so far as the latter is finer and used principally for ladies' dress goods. Cashmeres are usually in solid colors only, and were originally made in Cashmere and near-by regions from yarn hand-spun from the flossy wool of the Cashmere goat.

"About the year 1816, a small herd was imported into France with the view to acclimatize them and breed them for the sake of their wool, but the enterprise failed." The foregoing facts will suggest that this fabric is quite costly, consequently cheaper grades, cotton and wool imitations, have a liberal demand.

In varying the quality of a fabric, the manufacturers have two objects in view: first, to reduce the cost; second, to retain the same general appearance. It then follows that the change effected is of degree, not of kind, consequently the variations usually consist in changing the number of ends and picks per inch, or substituting a high-

er or lower grade of yarn as the case may be.

ANALYSIS.

— x x x
25 1—1—1

FACE WARP.

3 ends Black.
7 — 1 Black and drab.
— 1 Black and white.
2 — Black.
1 — Black and white.
1 — Black.
1 — Black and white.
2 — Black.
7 — 1 Black and drab.
— 1 Black and white.
1 — Black.
x2 — Black.
x1 — Bleach.
—
28

BACK WARP.

1 Green x.
2 Black.
1 Drab.
1 Black.
1 Drab.
3 Black.
1 Drab.
2 Black.
1 Drab.
1 Black.
1 Drab.
2 Black.
1 Drab.
3 Black.
1 Drab.
1 Black.
1 Drab.
4 Black.
—
28

x Alternate garnet.

FACE WARP.

11 ends Black 2/30.
8 ends Black and drab 2/30.
8 ends Black and white 20/60.
1 end Bleach 2/40.
—
28

BACK WARP.

19 ends Black 2/30.
8 ends Drab 2/30.
1 end Green 2/30.
—
28

ENDS IN FACE WARP.

726 ends Black.
528 ends Black and drab.
528 ends Black and white.
66 ends Bleach.
—
1,848
40 ends selvedge.
—
1,888

ENDS IN BACK WARP.

1,254 ends Black.
528 ends Drab.
33 ends Green.
33 ends Garnet.
—
1,848
40 ends selvedge.
—
1,888

Filling 60 picks per inch, 2/26s black cotton.

Width of warp in reed, 34 inches. Width of fabric finished, 31 inches; outside ends per inch, 111; 500x8 reed; ends in face warp, 1,848; 20 ends 2-30s white selvedge; total ends in face warp, 1,888; ends in back warp, 1,848; 20 ends 2-30s white selvedge; total ends in back warp, 1,888; total ends in face and back warp, 3,776; take-up of face warp during weaving, 10 per cent; take-up of warp during weaving, 6 per cent.

Weight of fabric per yard from loom, 7.85 ounces. Weight of fabric per yard finished, 7 ounces.

When both warp and filling are changed from wool to cotton, as with the cassimere under consideration, the general appearance may be retained, but the feel or handle of the fabric will be entirely different—so much so that it will be apparent to the buyer.

When such radical changes are made in fabrics as to substitute cotton for wool, it can no longer be sold under the same name; it therefore follows that the fabric be designated, as, for instance, cotton cassimere.

In making these cheaper grade fabrics the methods of manufacturing are

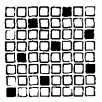


Fig. 1.

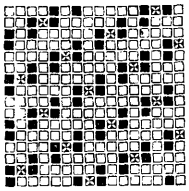


Fig. 3.

simplified as much as possible, chiefly because the profit will not admit of any unnecessary expense. No intricate weaves are used; such weaves as $\frac{2}{2}$ twill, $\frac{2}{2}$ basket weave and common rib weave are principally used for operating face warp. These fabrics are generally made with two warps. The back warp interlaces with filling on the 8-harness satin order. (See Fig. 1.) These fabrics are confined to 16 harness, 8 harness for face warp and 8 for back warp; the warp is drawn in one end face, and one end back, the first end of face warp on the first harness, the first end of back warp on second harness. (See draft, Fig. 2; Fig. 3, chain draft.)

The back warp for these fabrics is usually plain yarn, twist yarn being too expensive and the pattern of the back warp usually differs from the face warp in regard to the color arrangement, but the number of ends must be the same, if one end face warp and one end back warp fabric is required.

LOOM REQUIRED.

These fabrics may be woven on any box, harness loom. The Crompton and Knowles would probably be the most economical. The loom should

have stands for two warp beams, one for face warp and one for back warp; in some instances both warps are beamed on one beam, the back warp beamed tight because of less take-up.

FINISHING.

After the fabric comes from the loom, it is burled, examined and mended if necessary. The face of the fabric is sheared, after which it is run through a rotary press. The fabric, in passing through the press, runs over a perforated steam pipe, which partially saturates the fabric, then it is pressed by passing through heated cylinders, after which it is made up into rolls, then shipped.

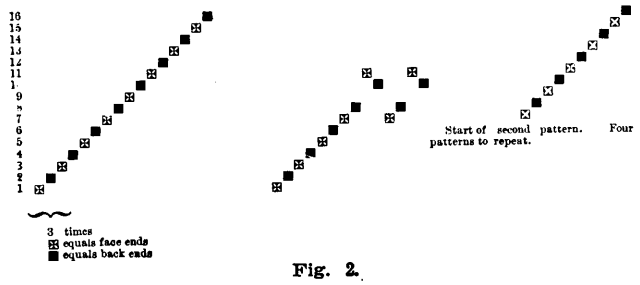


Fig. 2.

Carding and Spinning Particulars.

Different mills make cotton cassimere out of different counts of yarn, but the fabric under description is composed of 2-30s warp and 2-26s filling. These yarns would be made in a mill belonging to the second division as given in a previous article. The yarn would be made from American cotton of a fair grade, having a staple of about 1⅛ inches. The mixing should be done by one of the various methods that have been given in previous articles. The only point to be looked out for is to see that the cotton is thoroughly dry and aired out before being put through the opener. For this class of fabric the raw stock is put through three processes of picking and an opener. The good waste from all machines up to the slubber is mixed in before the cotton is fed to the opener. This waste should be picked up at regular and frequent intervals and spread throughout the entire mixing, and snould not be allowed to accumulate in large lots, but should be run up as fast as collected. The

LIFTING APRON

should always be carrying up a load of cotton for the pin beater to strike off. This beater should be so adjusted that the proper amount of cotton is passed to the breaker picker, which is generally either directly connected or is connected by trunking or lattice work to the opener. The beater of the breaker picker for this kind of stock is generally of a two-bladed rigid type and its speed is 1,550 revolutions per minute. The total weight of the lap at the front is 40 pounds or a 16-ounce lap. These laps are put up at the intermediate picker and doubled four into one. The beater of this machine is also generally of a two-bladed rigid type, the speed of which is 1,500 revolutions per minute. The total weight of the lap at the front of this picker is 37 pounds or a 10-ounce lap. These laps are put up at

THE FINISHER PICKER

and doubled four into one. It is at this point that the cut roving waste is mixed in with the raw stock. This is done by two methods, both of which have been described in a previous article. If done by hand, care should be taken to see that the percentage of cut waste mixed is not too great, because this is apt to cause licking of the laps when they are being run at the card. The beater of this machine may be either a two-bladed rigid or a pin beater, either of which has its advantages. If of the two-bladed rigid type, the speed should be 1,450 revolutions per minute. This gives the cotton passing under its action 42 beats per inch. Care should be taken to see that all the drafts in the pickers are properly directed where they will do the most good. The total weight of a lap for this class of goods should be 39 pounds or a 14½-ounce lap. A variation of the standard of half a pound (either side) is allowed. All laps varying more than this are run through the finisher picker again. The picker laps are put up

AT THE CARD,

the draft of which for this class of

work should not exceed 100. The wire fillet used should be No. 33 for cylinder and 35s for doffer and flats. This is the American count of the wire; the equal English count is No. 100s for cylinder and No. 120s for doffer and top flats. The settings of the card should be the same as given in connection with the article on "Indigo Prints." Strip cylinder and doffer three times a day and grind lightly at least once a month—twice a month is better—and then leave the grinder on half a day. The teeth should always be kept sharp and never allowed to run faced. It is the general rule of grinders to set cards after grinding in large rooms where several grinders are employed. It is better to have one grinder or boss grinder to set all the cards and hold him responsible. Keep cards clean, especially the front end around and over the doffer bonnet. The speed of the licker-in should be 375 revolutions per minute. The flats make one complete revolution every 45 minutes. The sliver at the front weighs 65 grains per yard and the production is 800 pounds per week of 60 hours.

THE SLIVER

at the cards should be sized at least once a week to see how it is comparing with previous sizings. The sliver is next put through three processes of drawing frames, which may have either metallic or leather-covered top rolls. If metallic rolls are used, keep them clean, because if dirt and waste collect in the flutes of either the top or bottom rolls, cut roving is almost sure to result. Keep top and bottom rolls well oiled. If top rolls are not kept oiled and are allowed to become dry, bad work is sure to result. Also see that the calender rolls have enough pressure on them to cause them to condense the sliver properly. Look out to see that the trumpets have the right size hole at the small end. The drawing frame sliver should be sized at least three times a day, and if sized four times it keeps the work a great deal evener. The sliver from at least four heads of each frame is taken and sized separately and then averaged; a variation of not more than 5 grains either side of standard is allowed; if more than this, the draft gear is changed.

THE DOUBLINGS

at the drawing for this kind of work are 6 into 1 at each process. The speed of the front roller is 400 revolutions per minute. The weight of the sliver is 70 grains per yard. The drawing is next put through the slubber and made into .60 hank roving. It is not customary to varnish the slubber top leather rolls for this kind of work. See that the traverse is working properly and that the top rolls are in perfect condition and set properly. Keep slubber as clear as possible and it will make returns many times over in extra production, which is often affected by dirt, fly, etc., getting between the gears and filling up the teeth.

THE SLUBBER ROVING

is put through two more processes of fly frames, the hank roving being made at each as follows: First intermediate, 2.00, and second intermediate, 6.00 hank for the warp yarn and 5.25 hank for the filling yarn. Try to keep the roving a little on the heavy side of the standard and don't put more twist into roving than is actually needed to draw it so that it won't break back at the next process. Remember that every extra tooth of twist put in cuts into the production to that extent. Keep the top rolls in good condition and change them frequently. Keep the chains clean and look out for bunches. Look out for single and double and watch the tension and the taper of the bobbin. Do not let the help fill up the bobbin after the frame has knocked off, but first be sure that the frame will knock off at the proper place. Keep frames well oiled and don't run bare spindles.

ANOTHER THING

to watch is jumping bobbins; set the gear properly to remedy this. Replace all broken bolsters as soon as possible. After changing a frame over, use up all pieces from it as soon as possible. The roving for the warp yarn is spun on a ring frame having the following particulars for 30s yarn: Gauge of frame, 2¾ inches; diameter of ring, 1¾; twist per inch, 26.02, and speed of spindle, 9,800 revolutions per minute. The yarn is then spooled, twisted into 2-ply yarn, spooled, and then warped, after which it is put through the slasher and run on to a beam with the required number of ends. The roving for filling may be either mule or ring spun; if the latter, use a frame with a 2¾-inch gauge, 1⅜-inch diameter ring and spindle speed of 8,000. This yarn is then twisted into 2-ply 26s, after which it is conditioned and then is ready to be used.

Dyeing Particulars.

BLACK.

Ten per cent thion black T B C; 20 per cent sulphide sodium; 2 per cent soda ash; 30 per cent salt.

BROWN.

Ten per cent thion brown R; 2 per cent thion violet black A; 1 per cent thion yellow G; 10 per cent sodium sulphide; 2 per cent soda ash; 25 per cent salt.

DARK GREEN.

Eight per cent thion green B; 8 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

PEARL.

Four ounces thion violet black A; 1 per cent thion black T B C; 1 per cent sodium sulphide; ½ per cent soda ash; 10 per cent salt.

DRAB.

Three per cent thion green G; 3 per cent thion orange N; 6 per cent sodium sulphide; 2 per cent soda ash; 20 per cent salt.

NAVY BLUE.

Six per cent thion navy blue R; 2 per cent thion blue B; 8 per cent sodium sulphide; 3 per cent soda ash; 30 per cent salt.

SLATE.

One and one-quarter per cent thion black T B C; 1½ per cent sodium sulphide; 2 per cent soda ash; 10 per cent salt.

RED.

Twenty per cent thiogene rubine O; 10 per cent sulphide sodium.

BLUE BLACK.

Ten per cent thion blue black B; 10 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt.

ONDULE FABRICS.

Ondule fabrics are characterized by having one or both series of yarns, warp or filling, drawn out of a straight line, while yet remaining in the same relative positions, i. e., the curving of the yarns is not made by certain yarns crossing over others as in leno and similar fabrics.

They may be placed in the novelty class. As such, the production is limited in quantity in cotton goods by several factors, among which may be mentioned: First, costly loom attachments have to be applied in order to weave them to the best advantage; second, the demand is small and uncertain.

Fig. 1 illustrates the effect formed in warp ondules, in which the filling remains in straight lines, as in any ordinary fabric. The warp forms the undulations.

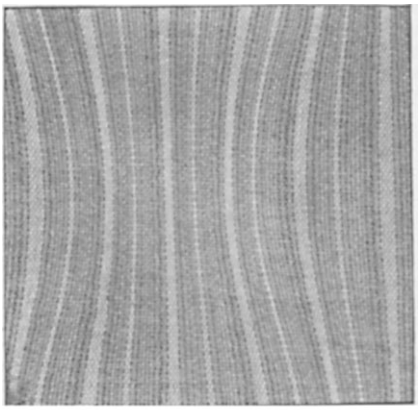


Fig. 1.

This type has not been developed to any extent in cotton goods on account of the reasons mentioned, and for another reason. Some of the ends curve considerably more than others, necessitating the use of several warp beams in order to have the ends at such a tension that some will not be slack in the shed, while others are tight. The sample in question, although containing only two different counts of warp yarns, one fine and one coarse, required five warps.

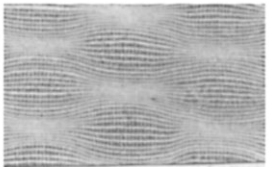


Fig. 2.

It will be understood readily that a greater length of warp will be required for a curved end than for a straight end in a given length of cloth.

The white warp yarn in Fig. 1 is cotton.

When woven in only one color or one count of warp the stripe effect is very faint.

The ondule principle of construction is not of recent origin, similar

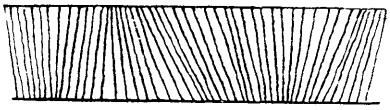
goods having been made to some extent in the early part of the 19th century.

Filling ondules are of more recent origin than warp ondules, and may be made much cheaper, one warp only being required. Fig. 2 illustrates the effect of a good filling ondule, in which the filling yarns form curved or wavy effects, the warp yarns remaining parallel to each other. The filling is considerably coarser than the warp, which accentuates the desired effect.

Fabrics like Figs. 1 and 2, or of combinations of these two effects, may be made with similar loom attachments or devices. The attachment generally used consists of a suitable mechanism, varying in detail with different makers, for imparting to the reed, which is very deep, an up and down movement, so as to bring a different part of it to the fell of the cloth at each pick.

The reeds used are of special construction. In those used for warp ondules the dents are arranged somewhat like Fig. 3.

Fig 3

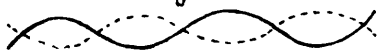


The top, bottom and face of the reeds are straight, as in ordinary reeds.

For weaving filling ondules the same device may be used for actuating the reed. The reed itself is made after the form shown in Fig. 4. The solid line indicates the top, and the dotted line the bottom of the reed. The dents are equal distances apart, both at the top and bottom. When this type of reed is used, a false reed is also used as a guide for the shuttle, as in lappet weaving. Another type of reed used is made fast at one end, and in loose sections at the other. These sections contain, say, three or four dents. An engraved or grooved roller is made to separate and change the positions of the sectional end of the reed as desired.

Fig. 5 illustrates a cotton fabric intended to imitate the high-class filling ondules. To obtain this effect two leno easers or slackeners have been used instead of the reed motion. There are 30 ends in each pattern, 15 of which were placed over the first and 15 over the second easer. The easers were then actuated so that the yarn over one of them wove slack for eight picks while the yarn over the other was held tight, then vice versa for eight picks. The selvedge ends were placed over the regular whip roll. Two warp beams were used, although one would perhaps have answered better. This is a simple meth-

Fig 4.



of obtaining the waves, but the effect obtained is not as good as when a special reed is used; nor can it be depended on, not being a positive motion. The easers have to be adjusted to a nicety and kept in that condition or each alternate section will appear more prominent than the others.

Fabrics showing a much better effect than that shown in Fig. 5 may be produced by the yarn easing method.

The construction data for the sample is as follows:

Ends per inch, 48; picks per inch, 48; width, 27 inches; warp yarn, 50's cotton, combed American; filling yarn, 2-40s cotton, Sea Island, mercerized; 696 ends on number 1 beam—this includes 48 for selvedges; 648 ends on number 2 beam, total, 1,344 ends; weight, 8 yards per pound; reed, 1 end in each dent; the weave is plain on 4 harnesses. The attachments can be

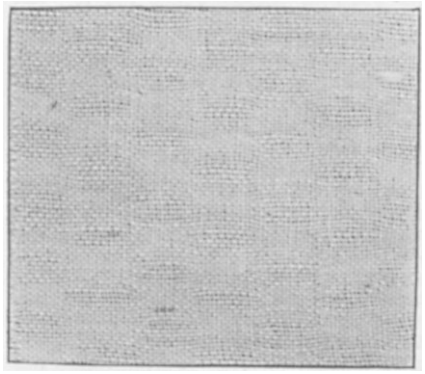


Fig. 5.

applied to and these goods made on any ordinary dobby loom.

Carding and Spinning Particulars.

There are a great many different styles of ondules and these com-

prise many different counts of yarn according to the grade and quality of the fabric being made. This class of fabric is made in mills of the third division, as given in a previous article, or at least those plants whose equipment of machinery includes combers. The fabric that has been selected out of this class of goods is made up as follows: For the warp, 50s yarn is used and is made of an American cotton, generally the kind called peeler, having a staple of 1¼ to 1 5-16 inches, being used, and for this fabric is combed. For the filling yarn a Sea Island cotton of 1½ inches is used. This is also a combed yarn, the count of which is 2-40s. For this article we will take each yarn and treat it separately, starting with the mixing.

MIXING.

First take the American yarn. This is mixed,as has been previously stated, at the mixing bin; the sliver waste from the machine up to the slubber is used. Care should be taken to see that too great an amount of this is not being made at the different machines. It is impossible to avoid making this waste altogether, but a large percentage of it may be saved if watched carefully. This cotton is put through an opener and three processes of picking. Keep the hoppers of the openers well filled so as to obtain as even a feed as possible at the breaker picker. The speed of the beater at this machine is 1,050 revolutions per minute. See that the pin beater is set properly to obtain the required weight per yard of cotton being fed to the breaker picker. This picker is generally provided with a two-bladed rigid type of beater, the speed of which is 1,550 revolutions per minute for this class of work. The total weight of lap at the front is 40 pounds or a 16-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. The beater of this picker is like that of the breaker, and its speed is 1,450 revolutions per minute. The total weight of the laps at the front of this picker is 37 pounds or a 12-ounce lap. The laps are put up at the finisher picker and doubled 4 into 1. The speed of the beater, if a rigid, two-bladed type, is 1,450 revolutions per minute, which gives the cotton passing through it about 42 beats or blows per inch. The total weight of the lap at the front is 37 pounds or a 12½-ounce lap. A variation of one-half a pound is allowed either side of standard; laps over or under this weight are run through the finisher again. At the finisher picker the cut waste from the fly frames is mixed in in the proportion of one lap of cut waste to three laps of raw stock. Be careful not to use too much cut waste, as it is apt to cause the laps to kick; also be careful to see that the drafts of the pickers are properly directed for the same reason. At the card the draft is not less than 100, a good draft being 120. The speed of the cylinder is 160 revolutions per minute; licker-in, 300 revolutions per minute; and the top flats make one complete revolution every 34 minutes.

DOFFER AND CYLINDER.

The doffer should be as large as possible and clothed with a No. 35s wire fillet, as should the top flats; the cylinder is clothed with No. 34 wire fillet, the equivalent English count being 120s for doffer and 110s for cylinder. Keep this wire sharp at all times, as dull wire is apt to cause kinked yarn. Grind at least once a month and reset all points after grinding. It is a good plan, although one not generally used, to brush out cylinder and doffer after grinding and before setting up. See that the grinding brackets for the top flats are set so as to grind the flats evenly across their face, when in their working position. This is

A GREAT FAULT

with most of the grinding devices and should be carefully looked into. See that the doffer stripping comb is set to clean the doffer of the web properly. Strip cards three times a day and keep front free from dirt and fly. The total production for a week of 60 hours, allowing 10 per cent time for stoppages, etc., is 550 pounds and the sliver weighs 45 grains per yard. The sliver is then combed.

BEFORE BEING COMBED

it has to be run through several different processes. The order of these, as well as the machines themselves, differs, but it is most general to have the machines as follows, especially for this class of work: Sliver lap machine, at which the doublings for an 8¾-inch lap are 14 into 1, the draft of this machine being small, less than 2; the weight per yard is 285 grains; for larger width laps the doublings and weight per yard may be found by proportion; this is also true at the ribbon lap machine. At the ribbon lap machine the doubling is 6 into 1, and the weight of the lap is 265 grains per yard. These laps are put up

AT THE COMBER

and doubled according to the number of heads, 6 or 8 being generally used, a

6-head comber generally using an 8¾-inch lap and an 8-head comber a 10½-inch lap. These particulars are given for the Heilmann combers and not the later foreign makes, which have been tried with varying success the last four or five years. For this stock take out 15 per cent waste and set time as given in a previous article. The speed should be about 95 nips per minute. Keep all the leather top rolls of sliver and ribbon lap machines as well as those of the draw box and detaching rolls of the comber in perfect condition and well varnished. It is a good plan to varnish the leather-covered detaching rolls once a week. A little trouble in this direction is well repaid. Look out to keep the percentages of

WASTE

at the different machines uniform.

If two or more ends break down on the table, break end running into the can, and before piecing up again, see that all the ends are running. Combers should be scoured at least once a year, when they should be taken down and all parts reset and timed. Keep table smooth and polished and do not touch with the hands those parts over which the combed sliver is running. The weigh per yard of the combed sliver is 40 grains. This sliver is put through two processes of drawing, being doubled 6 into 1 at each process. Leather-covered top rolls are generally used for this class of stock and they should be looked out for to see that they are well oiled and varnished and in perfect condition. See that all stop-motions are in working order so that single and double may be prevented as far as possible. The weight of the drawing is 70 grains per yard. This is put through the slubber and made into .50 hank roving, after which it is run through three processes of

FLY FRAMES,

the hank roving at each being as follows: First, 1; second, 3, and jack, 10 hank. Watch the leather rolls, also the shape and lay of the roving on the bobbins. Mark all roving small and distinctly near bobbins, and do not allow pieces to accumulate. This roving is taken to the ring spinning room and made into 50s on a frame having a gauge of 2¾ inches, diameter of ring, 1½ inches, length of traverse, 6 inches, and spindle speed of 10,000 revolutions per minute. The yarn is then spooled and warped, after which it is put through the slasher, where in addition to being slashed the required number of ends are run on to one beam, and then it is ready for the weave room.

The Sea Island cotton for

THE FILLING YARN

is put through either one or two processes of picking, generally two. The speed of a two-bladed rigid type of beater at the breaker is 1,350 revolutions per minute, and the total weight of lap is 30 pounds or a 10-ounce lap. These laps are doubled 4 into 1 at the finisher picker. The speed of the two-bladed rigid type is 1,250 revolutions per minute, or about 29 blows or beats per inch of cotton passing through. The total weight of this lap is 28 pounds or a 9½-ounce lap. At the card the draft should not be less than 120, the speed of the licker-in, 275 revolutions per minute. The top flats make one complete revolution every 35 minutes. The production is 300 pounds per week of 60 hours, and the weight of the sliver 40 grains per yard.

THE SETTINGS

for the card should be somewhat closer than when carding peeler cotton; for example, the doffer should be set to the cylinder with a 5 gauge instead of a 7 gauge, and the flats should be set with a 10 gauge instead of a 12 gauge, which is used to set peeler cotton. The other particulars given above may be also used with Sea Island cotton. This sliver is next put through the same machines as given above for combing. The weight of the sliver lap machine is 240 grains per yard and the ribbon lap 220 grains per yard. The settings at the comber should be closer than those used on peeler cotton and the percentage of waste taken out should be 20 per cent. The weight of the sliver is 35 grains per yard.

This sliver is put through two processes of

DRAWING,

being doubled 6 into 1. The speed of the front roll should be 350 revolutions per minute, and the weight of the sliver 60 grains per yard. It is important that extra care be taken with the top rolls, stop-motions, etc., when running this kind of stock, otherwise the particulars given with peeler cotton may be followed. The leather top rolls of the slubber are varnished for this stock and it is better to use rolls of a little larger diameter than those used for peeler cotton. The hank roving made at the slubber is .65, which is put through two processes of fly frames, the hank roving being made at each process being as follows: First intermediate, 2.25; and

second, 8 hank. Use a finer grain leather for the roll covering than that used for peeler cotton and look out for all the particulars given above, except that extra care should be given to the Sea Island stock. This roving is taken to the mule room and spun into 40s yarn, after which it is generally mercerized under tension and twisted into two-ply 40s, when it is ready to be woven.

Dyeing Particulars.

LIGHT SKY BLUE.

Two ounces diamine sky blue F F; 20 per cent Glauber's; aftertreat with ½ per cent sulphate copper.

LIGHT PEA GREEN.

One-quarter per cent diamine sky blue F F; ½ per cent diamine fast yellow F F; 20 per cent Glauber's salt; 1 per cent sal soda; aftertreat with 1 per cent sulphate copper.

PEARL.

Two ounces diamine brilliant blue G; 15 per cent Glauber's salt; aftertreat with ½ per cent sulphate of copper.

PINK.

One-half per cent erika pink; 10 per cent Glauber's; 1 per cent sal soda.

CREAM.

One-thirty-second ounce diamine fast yellow B; 1-64th ounce diamine catechine 3 G; 10 per cent Glauber's; 1 per cent sal soda.

LIGHT BROWN.

One-half per cent diamine brown M; 1 per cent diamine catechine 3 G; 20 per cent Glauber's; 1 per cent sal soda; aftertreat with 1 per cent chrome.

GREEN.

Two per cent diamine green G; 20 per cent Glauber's; 2 per cent sal soda.

LIGHT SLATE.

Two ounces diamine dark blue B; 1-16th ounce diamine fast yellow B; 10 per cent Glauber's; 1 per cent sal soda; aftertreat with ½ per cent chrome and ½ per cent sulphate of copper.

LIGHT SNUFF BROWN.

Six ounces diamine catechine 3 G; 6 ounces diamine catechine B; aftertreat with ½ per cent chrome and ½ per cent sulphate of copper.

SLATE.

One per cent diamine black B H; 2 ounces diamine fast yellow B; 20 per cent Glauber's; 1 per cent sal soda; aftertreat with ½ per cent chrome; ½ per cent sulphate of copper.

UMBRELLA CLOTHS.

The name given to these fabrics indicates the use to which they are subjected. It stands for cloths of widely different qualities, materials and weaves. The weaves, with the exception of those used for umbrella ginghams,are of small repeating types, as plain, three-end twill, and five and six end twills of four interlacings in a repeat.

Being subjected to extremes of weather,the constructions of the cloths are necessarily good.

All-cotton umbrella cloths are usually woven white, then piece dyed in solid colors. For cotton warp and worsted filling goods the warp yarn is usually dyed before being woven. This is especially the case in colors other than black. It is much harder to get a fast color, one of the essential features of a good umbrella cloth, on union piece dyed goods than on yarn-dyed goods. Black is the principal color used.

IN THE BETTER GRADES

of umbrella cloths it is common to find silk or wool in combination with cotton. These materials are sometimes combined in the same yarn, being mixed before being spun. In other cases the yarns on a beam are all of one material, and yarns of different materials, from separate beams, are used in one fabric.

The analysis of a good grade of umbrella cloth shows it to have been made of silk and cotton, the selvedges being of silk and the body of the warp arranged two ends of cotton and one end of silk alternately. The filling is cotton. This is a so-called silk umbrella cloth.

A good cotton umbrella fabric with a twill weave is constructed as follows: Ends per inch, 84; picks per inch, 112; width in reed, 28¾ inches; width of cloth, 27 inches; ends in warp, 2,312; reed, 2 ends per dent; warp, 60s combed American cotton; filling, 40s combed Egyptian cotton; weave $\frac{1\ 1}{2\ 1}$ twill. Plain selvedges. The cloth was woven on 12 harnesses, 2 for selvedges and 10 for ground.

One of the most essential features of a good umbrella cloth is a good selvedge, as upon such depends not only the appearance of the cloth, but its utility. A cloth between two ribs of an umbrella would be worthless if it contained a broken selvedge.

We will consider a plain weave um-

brella cloth, containing a good selvedge, where 2 picks work as one and 2 picks are inserted in each shed. The ground is reeded 2 ends in each dent and the selvedges 4 ends per dent.

The construction of this fabric is 96 ends per inch of 60s warp yarn: 104 picks per inch of 56s filling; American warp and Egyptian filling, combed stock.

An ordinary single box dobby loom is generally used when making these goods, the large number of ends per inch necessitating a greater number of harnesses than are usually run on cam looms.

Care has to be exercised, when weaving, to make the goods as near perfect as possible, because defects made in the loom have to be remedied afterwards, or the goods have to be sold as seconds.

FINISHING.

On account of the combinations of materials found in mixed umbrella fabrics the finishing and dyeing processes are of great importance and have to be done with care in order that each material will look the same when finished, and retain its color under severe usage. Especial care has to be taken with silk selvedge goods because, if the selvedges are damaged, the goods have to be sold for other purposes, with a consequent loss in price.

Cotton umbrella cloths are singed or sheared, crabbed and steamed. If they contain silk selvedges, the latter are moistened slightly just before they reach the singe plates or flames.

When the goods are required to be sheared, they are first thoroughly burled, all knots and other uneven imperfections being removed so that the cloth will present an even surface, free from holes, after shearing. When steaming and drying the goods, it is necessary to have them started and kept straight, that the warp yarns may be straight and the width uniform throughout the piece.

Carding and Spinning Particulars.

The goods considered in this article are made in the same kind of mill and from the same grade of yarns as ondule fabrics, which were dealt with in the previous article. The carding and spinning data of the one will therefore apply equally well to the other, and need not be repeated here.

Dyeing Particulars.

FAST BLACK.

Dyed on the jig machine. First bath, 100 gallons; 8 pounds immedial black N N; 10 pounds sodium sulphide; 3 pounds soda ash; 25 pounds common salt; run the pieces through for one hour, take off to a washing machine, and give a good rinsing with water; aftertreat with 3 per cent chrome; 3 per cent acetic acid for 30 minutes at 180 degrees F.; soap with 10 pounds soap; 2 pounds olive oil; 4 pounds sal soda; 50 gallons water at 180 degrees F., and rinse. Boil the soap, olive oil and sal soda together for one hour before using. For subsequent lots 2 per cent soda ash, 7 per cent immedial black N N, 8 per cent sodium sulphide, 6 per cent common salt will be sufficient for the dyeing process.

A SULPHUR BLACK

is the fastest to light, washing and general wear. Another black can be dyed with sulphur black topped with logwood: Six per cent immedial black N G; 10 per cent sulphide soda; 2 per cent soda ash; 20 per cent salt; rinse well, and aftertreat with 2 per cent chrome; rinse and dye with 5 per cent extract logwood; rinse and soap at 150 degrees F.; ½ ounce soap to 1 gallon water.

And again a good black can be dyed with a one-dip black fixed with chrome which is very fast to light and washing, but not so fast as sulphur black.

A ONE-DIP BLACK.

Ten per cent diamine fast black F; 2 per cent sal soda; 30 per cent Glauber's salt; dye at the boil for one hour; rinse and aftertreat with 2 per cent chrome; 2 per cent sulphate copper at 175 degrees F.; 3 per cent acetic acid; rinse well and soap with weak soap solution at 150 degrees F.

HUCKABACK TOWELS.

Huckaback, or huck, is a name given to a certain type of weave which is extensively utilized in the manufacture of towels, being excellently adapted for that purpose.

Two of the principal features desired in a towel are, first, strength; second, a readiness to absorb moisture.

An examination of huckaback, Figs. 1 and 2, will show that it is composed for the greater part of plain weave; this gives strength to the fabric.

The moisture-absorbing qualities of a huck towel are aided by the long floats of yarn which appear regularly,

as on ends and picks 2, 4, 7 and 9 of Fig 2, as well as in the light twist or small number of turns per inch put in the yarns. The softer twisted the yarns, the better they are adapted for toweling.

The selvedge ends, which are required to bear the greatest amount of friction of any of the yarns in the loom, are usually of 2-ply yarns, whereas the yarns in the body of the cloth are single, twisted not any harder than is necessary to enable them to weave well.

Huckaback toweling is sold to the consumers in various ways, by piece,

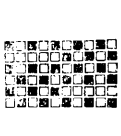


Fig. 1.

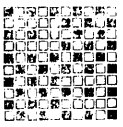


Fig. 2.

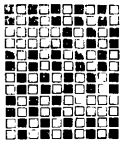


Fig. 3.

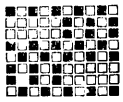


Fig. 4.

yard and towel. The cloth sold by the piece or yard is generally white. Completed towels, which are usually hemmed, hemstitched, or fringed, vary in size from about 17 by 32, to 25 by 45 inches for general use. A favorite size for barbers' use is 14 by 26 inches. These are all white, or are white in the body of the towel and colored on the borders, usually with light red or blue.

Towel borders usually consist of alternate stripes of colored and white filling, varying relatively in size as desired, and of weaves other than those of the huckaback type.

An analysis of a huckaback towel shows the following construction data: Ends per inch, 50; picks per inch, 44; width of cloth, 17½ inches; warp yarn, 14s; filling yarn, 10s; ends in warp, 854 of 14s for the body of the cloth, 40, i. e., 20 on each side, of 2-28s for selvedges; 23 reed, 2 ends of 14s per dent; selvedges, each 20 ends, drawn as 10 in 5 dents; the weave is shown in Fig. 3. The drawing-in draft for reproduction on a dobby loom is straight, with Fig. 1 as a chain draft. Weave Fig. 3 differs from the chain draft Fig. 1 in having two picks in a shed.

To enable a greater length of cloth to be woven in a short time, in fact, in one-half the running time ordinarily required, two strands of filling are wound together as one on a bobbin and run off together in the loom. In reality, although the cloth contains 44 picks per inch, the shuttle traverses the loom lay only 22 times to weave one inch of cloth.

Another method of inserting two picks in a shed at once is by the use of a shuttle containing two bobbins of filling. Objections to this method are that it is necessary to use a shuttle of a greater length than can be run on an ordinary loom, and extra waste is made if the filling from both bobbins does not end at the same time.

Huckaback towels are usually made of linen, cotton, or a combination of linen and cotton. A cloth under consideration of the latter type, of a good quality, is 18 inches wide and contains 58 ends and 37 picks per inch finished. The yarns in both warp and filling, with the exception of the selvedge ends, are single. There are 8 ends of 2-ply yarn for each selvedge.

Fig. 4 is the weave used for this cloth; 12 harnesses are required, 10 for ground and 2 for selvedges.

LOOM REQUIRED.

For plain white huckaback toweling an ordinary dobby loom is used, one warp beam and one shuttle only being required. Coarse cloth is usually woven on 4 harnesses, with a cross draw.

When colored borders are required a dobby box loom containing a repeater or multiplier motion is the best to use. A fringe motion is added to this when both borders and fringe are required. This motion automatically pulls the cloth forward several inches between each two towels, the distance being regulated as desired.

Carding and Spinning Particulars.

Huckaback towels are made up of various counts of yarns which differ according to the mills in which they are made, and also several grades may be made in a single mill, but the division of mills that they are made in is the second. The fabric under description is made up of 14s warp yarn and 10s filling; the selvedge yarns are 2-28s.

THESE YARNS

are all made up of American cotton, the warp and filling yarns being made from a 1¼-inch staple and the selvedge yarn of 1 5-16-staple cotton. The cotton for these mixings is mixed by hand, large mixings being made. They are put through an opener and three processes of picking. Only those openers that have the best means of cleaning the pin beater

should be used, as there are several on the market which do not clean the pins properly. Especially is this the case when running sliver waste, the waste becoming wound around the beater, which will be seen to be a great detriment.

THE BEATERS

of all three of the pickers are generally of the two-bladed rigid type and the particulars given below will be applied to them. The speed of the breaker picker beater for this stock is 1,550 revolutions per minute and 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 and pass to the beater, the speed of which is 1,450 revolutions per minute. The total weight of the lap at the front of this machine is 37½ pounds or a 10-ounce lap. From the intermediate picker the laps are put up at the finisher picker and doubled four into one. The speed of this beater is 1,400 revolutions per minute. The total weight of the laps at the front of this picker is 39 pounds or a 14½-ounce lap. The laps are allowed a variation of one-half a pound either side of the standard weight. When more than this, they are put up at the back and run through the picker again.

WATCH THE EVENER

motion to see that it is working properly. The cotton at the finisher picker receives 42 blows or beats per inch fed. This cotton is generally a very dirty cotton and care should be taken to get all the dirt out possible, so that the cards will not have to do picker work. The laps from the picker are put up at the card, the draft of which is generally not more than 95. The speed of the licker-in is generally 300 revolutions per minute and the top flats make one complete revolution every 50 minutes. The settings of the card should be the same as those given in the article on "Indigo Prints."

THE STRIPPING

should be done three times a day and cards, especially the fronts, should be kept clean. The cards should be ground at least once a month, when the grinding rolls should be allowed to stay on half a day. Always grind lightly and it is a good plan to have traverse grinding rolls send the grinding disk across the surface of the wire fillet as quickly as possible and not in the slow manner in which it is generally done. Look out for the emery on the grinding disk to see that it does not become greasy. The emery should be cleaned frequently with some fluid that will remove the grease. The

WEIGHT OF THE SLIVER

should be 65 grains per yard and the production for a week of 60 hours 750 pounds. As these yarns are carded they are put up at the drawing frame and run through three processes, the doublings being 6 into 1 at each process. The drawing frames may be equipped with metallic or leather top rolls. If the latter are used, keep the flutes clean; and if the former, see that the top rolls are always well covered and varnished. No matter which top rolls are used, it is important to see that the stop motions are all in perfect working order, especially those operating the spoons, for it is here a great deal of trouble is caused by single and double if they are out of order. The speed of

THE FRONT ROLL

should be about 350 revolutions per minute. The weight of the sliver at the front of the finisher should be 75 grains. This sliver is put up at the slubber and made into .60 hank roving. From the slubber it is put through one process of fly frames for the warp and filling yarns and two processes for the selvedge yarn. The hank roving being 2.25 for warp and filling and 1.50 for selvedge at the second intermediate, the hank roving for the latter yarn is 5.50. At these frames be sure that the top rolls are in good condition and that the traverse motion is working properly. The top rolls should be cleaned frequently, at least twice a week, and new rolls put in at regular intervals, these being determined by various conditions which are different in every mill. Never run loose, fluted, bruised or uneven top rolls. Watch to see that all

THE TENDERS

mark their roving correctly and that they do not let single and double go. Do not allow pieces to collect, but use them up as fast as possible. Keep floor of card room clean at all times, as nothing creates so poor an impression on a visitor as an untidy card room floor. From the card room the roving is taken to the ring spinning room and made into 14s warp on a frame having a gauge of three inches, diameter of ring, 2⅛ inches, length of traverse, 7 inches, twist per inch, 17.77, and spindle speed of 9,000 revolutions

per minute. The 10s filling yarn is made on a frame having a 2¾-inch gauge, 1⅝-inch diameter ring, 7-inch traverse, 10.28 twist per inch and spindle speed of 6,400 revolutions per minute. The selvedge yarn is spun on a frame having 2¾-inch gauge, 1¾-inch diameter ring, 6½-inch traverse, 25.13 twist per inch and spindle speed of 9,700 revolutions per minute. The warp yarn is put through a spooler and warper and from here put through a slasher. The selvedge is put through a spooler and then twisted, spooled again, and run on to a selvedge beam after being put through a slasher.

IMITATION GAUZE---Mock Leno.

These weaves are very extensively used in cotton manufacture.

The imitation of leno or gauze fabrics can be made extremely close; in some cases the deception has even imposed on experienced buyers.

These weaves are commonly used

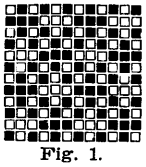


Fig. 1.

for such fabrics as dress goods, curtains, ladies' aprons, men's shirts, canvas cloth, etc. These fabrics are characterized by three or more warp threads and three or more filling picks interlacing with each other very loosely, while the following warp and filling threads form a complete break and so can readily be kept apart for small spaces.

In the warp these breaks are augmented by the reed by leaving one, two, three or more dents empty (if, for example, we use a plain six-harness imitation gauze weave, as shown in Fig. 1, ends one, two and three would be drawn in one dent, while ends four, five and six would fill another dent) and by leaving one, two or more dents empty between the first group of three ends and the second group of three ends. The number of dents to be left empty depends upon the space desired between each group of ends.

Diagram Fig. 2 shows the character of fabric woven with weave shown in Fig. 1.

A four and four, or five and five mock leno is based on the same principle as the three and three described above; in the four and four the ends are reeded four in one dent, while in

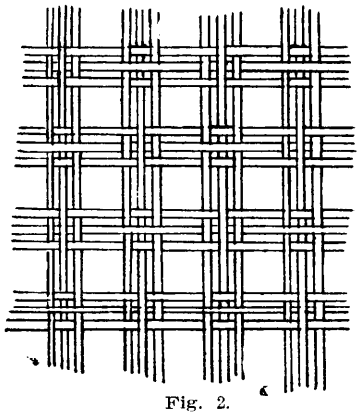


Fig. 2.

the five and five the ends are reeded five in one dent.

The four and four and the five and five end patterns produce a slightly more open effect than the three and three end pattern.

The former is also suitable for a finer make of cloth, as the open effect can be made with a larger number of ends per inch.

In the five and five end or ten-harness weave (see Fig. 3) the second, fourth, seventh and ninth ends serve to pull the picks together in fives and make a decided opening in the cloth between the fifth and sixth picks; in the pattern the same thing takes place with the ends—they are pulled together in fives by the second, fourth and seventh and ninth picks, and if two

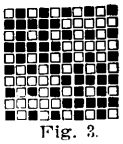


Fig. 3.

dents be skipped between each group of five ends it will produce the effect in fabric shown in Fig. 4. In addition to plain gauze fabrics, as shown in Fig 2, these weaves are used in connection with plain woven fabrics in the form of a pattern (see Fig. 4) and also in the form of checks. The fabric shown in Fig. 4 shows a series of ends working gauze or mock leno throughout the entire pattern, forming a stripe through the entire length of the fabric. In the check effects these ends

are made to weave plain or otherwise as may be desired. Fig. 5 illustrates a mock leno three and three check pattern, showing 18 ends working gauze for 18 picks and the next 18 ends work plain for 18 picks, these two series of ends alternating into a plain weave at the end of the 18 picks. These check pattern fabrics in nearly all in-

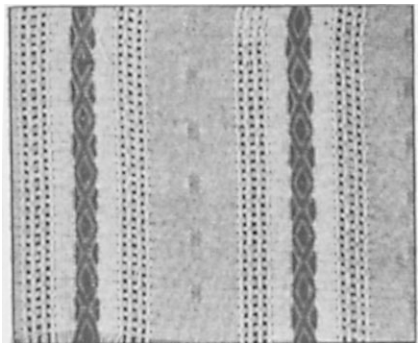


Fig. 4.

stances are given a wet finish. By reason of the fact that the warp is reeded three in one dent, skipping one, two or more dents between each three ends will cause the plain woven part of the fabric to show more or less streaky; that is, it will show each of the three ends lying close together instead of being evenly distributed across the fabric. When subjected to the wet finish these ends will take their proper places. When making a gauze stripe fabric as shown in Fig. 4, the ends operating the gauze weave are on a separate beam because of the difference of take-up in warp during weaving.

Another method of producing a mock leno is to have two ends appear as if they were twisted around several other ends, that is, not resting parallel to one another. This is readily produced by allowing the two ends to come together for two picks, then gradually spreading them for six or eight picks, then allowing them to gradually come together again for two picks. These two ends in the pattern are of coarser counts than the body of warp, usually a three-ply thread, and are on a separate beam from the body of the warp.

Fig. 6 shows design and reeding plan for a fabric of the above description.

ANALYSIS.

Width of warp in reed, 37½ inches; width of fabric finished, 36 inches; ends per inch finished, 68; reed, 1,200; take-up of warp (ground warp) during weaving, 10 per cent; take-up of leno warp during weaving, 20 per cent.

DRESSING.

12 ends white.
8 ends blue.
6 ends white.
4 ends blue.
2 ends white.
2 ends blue.
10 ends white.
8 ends blue.
16 ends white.
1 end dark blue mercerized cotton.
8 ends white.
1 end dark blue mercerized cotton.
16 ends white.
8 ends blue.
10 ends white.
2 ends blue.
2 ends white.
4 ends blue.
6 ends white.
8 ends blue.

134 ends in pattern.

Ends in pattern: 88 ends white 1-40s; 44 ends blue 1-40s; 2 ends dark blue 3-30s; total, 134 ends.

Filling, 70 picks per inch 1-50s bleached cotton.

LOOMS REQUIRED.

These fabrics are mostly woven with but one color filling; consequently any ordinary harness loom would answer for weaving these fabrics. Competition and economy are factors that have caused the discarding of the old roller loom, using instead the Crompton and

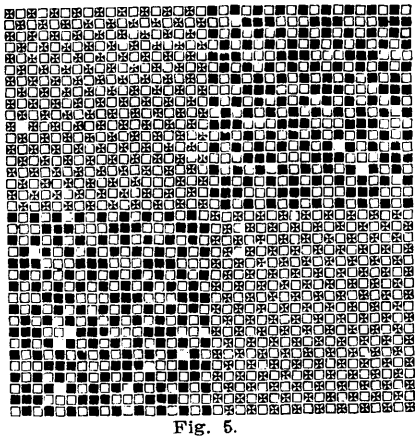


Fig. 5.

Knowles dobby or Ingham patent harness motion loom.

FINISHING.

These fabrics are sometimes given a dry finish, depending chiefly upon the weave and pattern. In some qualities in which only one color warp and filling is used, the fabric is bleached,

hot pressed, then made up into rolls ready for shipment. When two or more colors are used, the fabric in most cases is boiled off, then subjected to a light sizing, pressed, and then made up into rolls.

Carding and Spinning Particulars.

The yarns of which mock lenos are composed are made up in mills of the second division as given in a previous article. These yarns may be either combed or just carded, according to the grade of the fabric to be made. For the fabric under description in this article we will consider the filling yarn to be combed and the warp yarn to be carded. The filling yarn is made from an American cotton of 1 5-16-inch staple, while the warp yarn is made out of cotton of 1¼-inch, the cotton used for both purposes being of a good grade. Both cottons are generally mixed by hand, being kept in separate bins, of course. The mixings should be as large as possible,

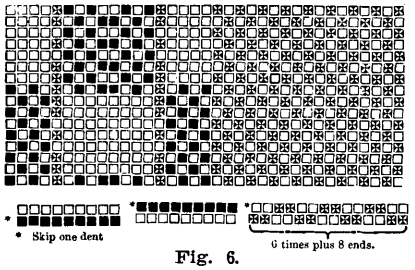


Fig. 6.

each batch being calculated to last at least a week.

A GOOD PLAN

to follow is to have a batch of the same stock always on hand drying out while one is being used. This insures a dry and fluffy cotton being mixed. At the mixing bins the good sliver waste from all machines up to the slubber is mixed in. This waste should be spread throughout the entire mixing and not, as is sometimes done, piled up in one place and fed to the opener all at once. The mixing is put through an opener and three processes of picking. Follow the rules that have been given in previous articles in connection with the opener. At the breaker picker the beater used is generally of a two-bladed, so-called rigid type and for both stocks makes 1,500 revolutions per minute. See that the beater is properly set to the feed rolls and that the grid and grate bars are properly spaced so that they will allow all foreign matter to drop through. Look out for all

THE DRAFTS

to see that they are properly directed to the best advantage to make a good, clean, even lap that does not split. The weight of the lap at the front of the breaker picker is 40 pounds. At the intermediate picker the speed of the beater (two bladed) is 1,450 revolutions per minute, and the total weight of the lap is 37 pounds or a 12-ounce lap for the 1 5-16-inch stock and a 10-ounce lap for the 1¼-inch stock. These laps are doubled four into one at the finisher picker. On this picker the speed of the beater is also 1,456 revolutions per minute. The total weight of the lap at the front is 35 pounds for the 1 5-16-inch stock and 39 pounds for the 1¼-inch stock, or a 13-ounce lap for the longer stock and a 14½-ounce lap for the shorter staple. The laps are put up at the card and the draft of the card for the warp yarn is not more than 95. The speed of the licker-in should be about 300 revolutions per minute. The top flats make one complete revolution every 50 minutes. The sliver weighs 65 grains per yard and the production for a week of 60 hours is 750 pounds. For the filling yarn the draft of the card should not be less than 110. The top flats make one complete revolution every 35 minutes, the speed of the licker-in being 300 revolutions per minute. The weight of the sliver is 55 grains per yard and the production 550 pounds for a week of 60 hours. The counts of the wire filletused for all parts would be similar for carding both staples of cotton or 110s for cylinder and 120s for doffer and top flats. Strip three times a day and grind at least once a month. Always gauge the setting points after grinding and set to high places. Use

THE SETTINGS

given in a previous article on "Bedspreads." The sliver for the warp yarn is put through three processes of drawings, the doublings being 6 into 1, the speed of the front roll being 350 revolutions per minute at each process. A good weight for the sliver at the different processes is as follows: 77 grains at front of breaker, 76 grains at front of middle and 70 grains at front of finisher. Either metallic or leather covered top rolls may be used on this stock. Either one used will give good results if properly cared for. If leather-covered rolls are used, use one of the recipes

given in a previous article and don't use rolls that are not in perfect condition. If the damage is in the covering, send it to be recovered and always examine the returned rolls to see that they are level and have the right grade of sliver covering. Look out for all the knock-off motions to see that they are in perfect working order; for remember, that one of the two duties of a drawing frame is to even the sliver, and if the knock-off motions do not work they will allow single to go through, which is a serious fault that is not corrected while passing through the slubber where the end is put through single. The drawing sliver is put through the slubber and drawn into .60 hank roving. From here it passes through two processes of

FLY FRAMES,

the hank roving at the first intermediate being 2 for the 30s, and 2½ for the 40s yarn; at the second intermediate the hank roving is 6 for the 30s and 8.50 for the 40s yarn. These rovings are then spun on a ring frame into 30s and 40s yarn. For 30s yarn the frame, to get best results, should be fitted as follows: Gauge of frame, 2¾ inches; diameter of spindle, 1¾ inches; length of traverse, 6½ inches; twist per inch, 26.02,and spindle speed, 9,800 revolutions per minute. For 40s yarn use a 2¾-inch gauged frame, a 1⅝-inch diameter ring; 6½-inch traverse, 28.46 twist per inch and spindle speed of 10,000 revolutions per minute. The yarns are spooled and twisted, 3 ends of 30s being twisted together, and then 2 ends of the 3-30s twisted with 1 end of the 40s yarn. The yarns are then warped and slashed.

The card sliver for the filling yarn is generally put through a sliver lap, ribbon lap and then a comber. At the sliver lap the doublings are 14 into 1, the weight of a yard of lap being 280 grains per yard. These are doubled at the ribbon lap machine 6 into 1. The weight of the laps at the front of this machine is 265 grains per yard. These laps are put up at the comber and doubled according to the number of heads on the comber, either six or eight into 1. The particulars given for the sliver and ribbon lap machines are for an 8¾-inch lap.

AT THE COMBER

a percentage of 16 per cent should be taken out of the lap being fed. The settings should be the same as given in a previous article and this is true of the trimmings. As the combers are not equipped with stop-motions, single and double should be looked for, and it is a general rule, if two or more ends break down on the table, to break the sliver entering the can and to remove all single from can before piecing up end again. This rule should be rigidly enforced so as to prevent,as far as possible, single going to the drawing frame. Keep the leather detaching rolls in perfect condition as to covering and varnish. It is a good plan to varnish all detaching rolls at least once a week. Varnish leather covered rolls in draw box as often as necessary. Take percentages of at least six combers a day to see just what they are doing. The comber sliver is put through two processes of drawing. The speed of the front roll at each process is 350 revolutions per minute. A good weight for the sliver is 68 grains per yard at the breaker and 75 grains per yard at the finisher. The sliver is then put through the slubber and made into .50 hank roving. From here it is put through three processes of fly frames, the hank roving at each process being as follows: First intermediate 1; second intermediate 3, and fine 12 hank. This roving may be either mule or ring spun. If the latter, use a frame with the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1¼ inches; length of traverse, 5½ inches; twist per inch, 26.52, and speed of spindle, 8,200 revolutions per minute. The yarn is then taken and conditioned and is ready for weaving.

Dyeing Particulars.

AMBER.

One-half per cent diamine catechine G; 15 per cent Glauber's salt: 1 per cent sal soda; aftertreat with ½ per cent bichromate of potash; ½ per cent sulphate of copper.

SKY BLUE.

One-half per cent diamine sky blue F F; 15 per cent Glauber's salt; 1 per cent sal soda; aftertreat with ½ per cent sulphate of copper.

LIGHT PEA GREEN.

Six ounces diamine sky blue F F; 8 ounces diamine fast yellow F F; 10 pounds Glauber's; 1 pound sal soda; aftertreat with 1 per cent sulphate of copper.

PINK.

One-half per cent erika pink G; 10 per cent Glauber's salt; 1 per cent sal soda.

LIGHT SLATE.

Four ounces benzo fast black; 1-16 ounce chrysophenine; 5 pounds Glauber's salt; ½ pound sal soda.

PEARL.

Four ounces naphthamine black N; 5 pounds Glauber's; 1 pound sal soda; aftertreat with ½ pound bichrome.

NAVY.

Four per cent naphthamine blue 2 B; 20 per cent Glauber's; 2 per cent sal soda; aftertreat with 1 per cent bichrome; 1 per cent sulphate copper.

NAVY BLUE.

Two per cent diaminogene blue B B; 2 per cent diaminogene blue N A; 25 per cent Glauber's salt; 3 per cent sal soda.

Diazotize: Two and one-half per cent nitrite soda; 5 per cent sulphuric acid; turn for 15 minutes and rinse.

Develop: Dissolve 14½ pounds beta naphthol; 18 pounds soda lye at 77 degrees Tw.; 20 gallons boiling water; for 100 pounds yarn add 1½ gallons of developing solution, turn for 15 minutes, rinse and give a good soaping.

RED.

Six per cent primuline; 20 per cent Glauber's; 2 per cent sal soda; diazotize and develop as the navy blue.

LIGHT YELLOW.

Four ounces chromine G; 5 pounds salt; 1 pound sal soda.

GREEN.

Three per cent diamine green G; 3 per cent diamine fast yellow A; aftertreat with 3 per cent bichrome.

BLACK.

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

FILLING REVERSIBLES.

Filling reversibles is a term given to a class of cotton fabrics used extensively in the manufacture of dressing sacques, kimonos, bath robes, etc. In cotton warp and shoddy or woolen filling goods the same principle of construction is adopted for goods for horse blankets, rugs, etc.

THE RESULT DESIRED

is to have a cloth containing two colors, each color being in solid blocks or effects, and to have one side the reverse of the other. In low-price goods this is obtained by a combination of weave, color and finishing.

Fig. 1 illustrates a cloth of this type showing solid blocks of brown and white running warp way. Where brown appears on the face, white appears opposite on the back. In this particular sample the white bar across the cloth shows white on both sides. Brown shows opposite white at all other places.

Fig. 2 illustrates the weave for cloth Fig. 1, being on 80 ends and 96 picks. Sections A correspond to brown sections on the face of the cloth, and sections B, indicated on picks marked White, to the white sections. The weave is really complete on eight picks, the coloring indicating the extent of the pattern.

In Fig. 2 the dots indicate the face weave, i. e., at these places the filling

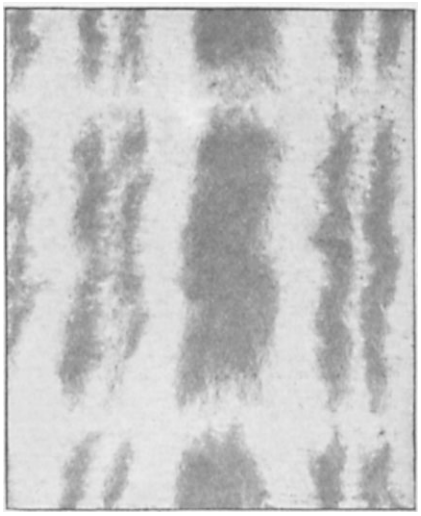


Fig. 1.

which is always considerably coarser than the warp, almost covers the latter. On account of the large number of picks as compared to warp, the relative sizes of the yarns and the peculiarity of the weave, the filling on the picks indicated by the dots comes together, covering the picks indicated by the crosses. The picks marked in crosses come together on the under side of the cloth.

In the section bracketed and indicated as containing 80 picks, the filling is picked two brown and two white alternately, making 40 brown picks on the face and 40 white picks on the back in sections A and the reverse colors in sections B. The fabric is really double in the filling and single in the warp.

Sections A form a left-hand twill on