the face and a right-hand twill on the back; sections B vice versa.

The construction of the fabric under consideration is 42 ends and 62 (31 face and 31 back) picks per inch finished. The warp is 15s and the filling 7½s. The latter contains very little twist. The warp is all white. The filling is two brown and two white for

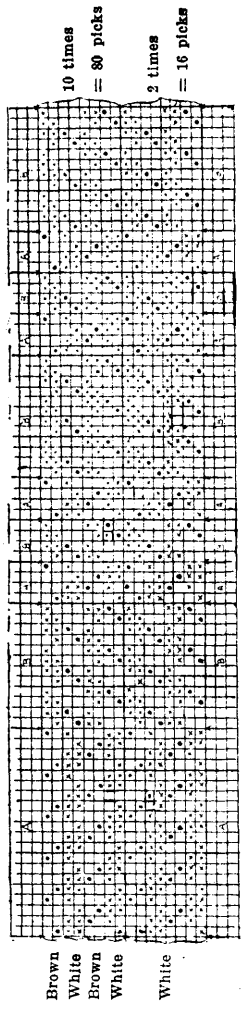


Fig. 2.

80 picks, 16 white; total, 96 picks per pattern. The width is 27 inches finished. The harness draft requires eight harnesses, four for sections A and four for sections B, in addition to two for selvedges. Reed 2 or 4 ends per dent. The chain draft is shown in Fig. 3. The box chain would be required to be built for 96 picks, and a loom with a repeater or multiplier motion would be the best to use.

LOOM REQUIRED.

The simpler types of filling reversibles can be woven readily on any ordinary dobby loom arranged with a two by one box motion. As the warp is hidden entirely after finishing, one warp only is required. On account of the coarseness of the filling, large shuttles are necessary. For rugs a jacquard head is usually used.

FINISHING.

Practically all the finishing these goods receive is in raising the fibre to form a nap. This nap entirely obliterates the weave effect. The soft-twisted filling is readily raised by the card wire of the cotton raising machines.

Carding and Spinning Particulars.

The mills that make the yarns of which filling reversibles are made, will be found in the first and second division of mills as given in a previous article. The filling yarn is slack twisted and for the fabric to be described is a number 7½ yarn. This is made from various stocks; sometimes only straight cotton is used, but more generally it is composed of a

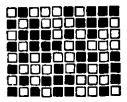


Fig. 3.

certain percentage of waste, sometimes as high as 60 per cent waste being used.

THE WASTE

used also differs, some using card waste, some comber and some both. It is generally safe to say if waste is used that it will be card waste, for the mills making this class of goods are not generally equipped with combers. The stock with which the waste is mixed is of from ¾ to 1 inch staple, according to the quality of the fabric required. A fine average staple to take is one of ⅞-inch length. The mixing would be done by hand and it is almost needless to state that large mixings should always be made for various reasons that have been given previously. The stock of which the warp yarn is made is ⅞ to 1 inch in length, generally the former length being used. While the stock for this yarn is sometimes mixed with waste,

THE PERCENTAGE

of waste does not run as high as that used for the filling stock. The stock

is put through three processes of picking, before which it passes through an opener. Keep the hopper of this opener well filled with cotton so that the fitting or spiked apron will always have a full load. The beaters generally used for the pickers for this class of goods are of the two-bladed rigid type and the speed of that in the breaker picker should be about 1,550 revolutions per minute. The weight of the lap at the front should be 40 pounds or a 16-ounce lap. These laps are doubled four into one at the intermediate picker. The speed of this beater for both warp and filling yarns is 1,500 revolutions per minute. The

WEIGHT OF THE LAP

at the front of this picker is 38 pounds or a 14-ounce lap. These laps are doubled at the back of the finisher picker four into one. The speed of this beater is 1,500 revolutions per minute, which gives the cotton passing through about 43 beats per inch. The total weight of the lap at the front of this machine is 39 pounds or a 14½-ounce lap. A variation of one-half pound either side of standard weight for lap is allowed. Those having more of a variation than this are put at the back of the finisher picker and run over again, although care should be taken not to run two of these laps at the same time, for this would be more than apt to throw the weight of the lap being made out. Look out for the direction of the air currents and see that an

EVEN AND UNIFORM LAP

is being made at the front. Do not fool with the lap weight adjustments too much, for too much is worse than not enough, for the former will keep the weight of the lap jumping all around, whereas the latter is more apt to get the same weight of laps. These laps are put up at the card where the draft should not be more than 90. The settings of the card used should be the same as those given in connection with the article on indigo prints, except that of the feed plate to the licker-in, which should be set just a trifle farther, longer than the length of the staple. The flats and doffer should be covered with No. 34s wire and the cylinder No. 32s wire fillet. The speed of the licker should be 350 revolutions per minute, while the flats should make one complete revolution every 55 minutes. The cards should be stripped at least

THREE TIMES A DAY

and an extra stripping would greatly improve the yarn, but is not generally done. The weight of the sliver is 65 grains per yard and the production is 975 to 1,050 pounds per week of 60 hours. This sliver is next put through two processes of drawing where the doublings are 6 into 1. The speed of the front roll is 400 revolutions per minute for each stock, the draft of the breaker frame is 5.25, the weight of the sliver being 72 grains. The draft at the finisher is 5.60, the weight of the drawing being 72 grains per yard. For this class of work either leather covered or metallic top rolls may be used. But the metallic top rolls are considered by many to have a great many advantages, one of the principal ones being that more production is turned out with the same speed of roll. No matter which top roll is used, they should be watched carefully to see that they are in perfect condition

FOR MAKING GOOD WORK.

It is also a good policy to watch the stop-motions, for it is these, if they are not in proper working order, that cause single to be made. The sliver for the filling yarn is made into .40 hank slubber roving, while that for the warp yarn is made into .50 hank roving. The filling yarn is put through one more process of fly frames and made into 1 hank roving, which is taken to the mule room and spun into 7½s, having a 2.80 twist per inch. The slubber yarn for the warp yarn is put through two processes of fly frames, at the first being made into 1 hank and at the second into 3½ hank. This yarn is then taken to the ring spinning room and spun into 15s on a frame having a 3-inch gauge; 2⅛-inch diameter ring; 7-inch traverse, 18 turns per twist and a spindle speed of 9,200 revolutions per minute. This yarn is then spooled, warped and then put through a slasher.

Dyeing Particulars.

HAVANNA BROWN.

Three per cent immedial brown R R; 3 per cent immedial cutch O; 6 per cent sulphide sodium; 30 per cent Glauber's salt; 3 per cent soda ash.

NAVY BLUE.

Eight per cent pyrol navy blue; 8 per cent sodium sulphide; 3 per cent soda ash; 25 per cent salt.

BOTTLE GREEN.

Ten per cent pyrol green B; 10 per cent sodium sulphide; 3 per cent soda ash; 25 per cent salt.

PEARL.

One-half per cent immedial black

N R T; 5 per cent salt; 1 per cent sodium sulphide; 2 per cent soda ash; 10 per cent salt.

SKY BLUE.

One per cent tetrazo brilliant blue 6 B; 2 per cent sal soda; 20 per cent Glauber's salt.

RED.

Five per cent primuline Y; 2 per cent sal soda; 20 per cent Glauber's.

Diazotize: 2½ per cent nitrite soda; 5 per cent spirits salt.

Develop: 2 per cent beta naphthol; 2 per cent soda ash.

SLATE.

One per cent immedial black N B; ¼ per cent immedial direct blue B; 20 per cent salt; 2 per cent soda ash; 2 per cent sulphide soda.

ECRU.

One-half per cent immedial yellow D; ½ per cent immedial cutch G; 1 per cent sulphide sodium; 1 per cent soda ash; 10 per cent salt.

BROWN.

Eight per cent katigen brown V; 2 per cent katigen yellow G G; 10 per cent sodium sulphide; 2 per cent soda ash; 30 per cent Glauber's salt.

HELIOTROPE.

Eight per cent thiogene violet B; 8 per cent sulphide sodium; 2 per cent soda ash; 30 per cent Glauber's salt.

BLACK.

Ten per cent immedial black N N; 10 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt.

PINK.

One per cent erika pink; 3 per cent sal soda; 20 per cent salt.

DHOOTIES.

Dhootie cloths are a class of fabrics used very extensively in Zanzibar, Africa, Egypt and India, for scarfs, turbans, and girdle or body cloths.

They vary in width from 18 inches to 50 inches, and in length from two to six yards. The cut lengths vary from 12 to 40 yards.

They are distinguished by gaudy, highly colored borders, running lengthwise, and headings running across the piece between which both warp and filling yarns are of gray, white or other light color. Both sides of the cloth are similar, the fabric being reversible. The borders lengthwise range from about one-half inch to four inches in width.

THE REAL DHOOTIE

is a native eastern hand-woven fabric, in which the colored filling interlaces only with the border warp yarns. To weave such a fabric the services of three persons are required, one to take care of the centre and one for each of the borders.

It is practically the only article of apparel used by many of the poorer classes in the eastern countries.

Referring to these goods an Indian textile journal states that the following are standard sizes: 22 inches to 23 inches wide, 2 yards long; 24 inches to 25 inches wide, 2½ yards long; 26 inches to 28 inches wide, 3 yards long; 29 inches to 32 inches wide, 3½ yards long; 29 inches and upwards wide, 4 to 5 yards long.

THE YARNS

employed vary from 30s to 40s in the warp, and from 36s to 60s in the filling.

A great many of the goods are made with 34s warp and 40s filling in the centre of the goods, the borders being about 2-50s and 2-60s.

Although not usually the case, they are sometimes made with several colored stripes in the width of the piece, in addition to those forming the borders.

The cross borders, or headings, are sometimes very elaborate, varying in length up to about 20 inches. In the longer types these headings are inserted every few inches, whereas in the shorter types they are woven only at the beginning and end of each scarf. The

BORDERS AND HEADINGS

are intended to be made so that the colors of which they are composed will appear as prominent or solid as possible. To accomplish this on the side borders the method usually adopted is to arrange the colors in the warp yarns, and crowd them in the reed so that they will cover the filling as nearly as possible. In this class of dhooties the filling is of the same color as the warp of the centre of the goods. This filling necessarily shows to a greater or less degree in the borders and is regarded as an objectionable feature.

When weaving the better grades of goods, those nearly approaching in appearance the native hand-made goods, another method is adopted to make the prevailing color in the borders, usually red, as bright as possible. They are made on a loom containing three shuttles, one of which is a fly shuttle and carries the filling for

the centres of the cloth; the other two are small shuttles, made to work on one of the positive motion principles, as on narrow ware looms. These two shuttles

WORK ON OPPOSITE SIDES

of the loom and interweave only with the warp yarns constituting the borders. The small shuttles cross the ends at the same time as the fly shuttle, so that the amount of production is not affected either way by them.

Three filling forks are used, one for each shuttle, so that if any of the fillings break, the loom is stopped instantly.

The border shuttles run in a different plane, and move in the opposite direction to the fly shuttle, so that only one pick of filling passes in front of the filling forks on the pick required to actuate the stop-motion. Catch threads are used to connect the borders and centres.

LOOM REQUIRED.

For plain dhooties, in which the borders as well as the centres weave plain, an ordinary single box loom is used,unless cross borders are required, when a box motion becomes necessary. In England, where these goods are extensively manufactured, side cam, revolving box looms are usually used.

For the better grades, where the borders are interlaced with colored and the centres usually with white or gray filling, a loom of a special type, previously referred to as having positively acting and fly shuttles, is used. This contains a dobby or other head motion.

Whether for low or high grades, plain or fancy, the border warp yarns are usually run from small rollers or spools, on account of being reeded differently, and are often of different counts from the centre yarns.

When the goods are required to be made with colored headings, the box motion of the loom is actuated to insert different colors of filling as may be necessary, the loom weaving the cross borders, or headings, and centre automatically. If a fringe is desired, it is made in the usual manner.

The figure ilustrates one border and part of the white centre of a cheap dhootie cloth, in which the white filling interlaces with both centre and border.

The border is 2 5-16 inches wide and contains five colors, red, green, yellow, white and orange. The outer stripe of red is 1 3-16 inches wide. The count of the centre cloth is 52x46, and is reeded two ends per dent. The fancy weave portion is arranged one end of green and one end of red, alternately, and is reeded five ends per dent. The remainder of the border is reeded four ends per dent. With the exception of the 32 ends working as extra warp the weave of the fabric is plain. Eight white ends working as four divide the border from the centre. The border ends are ply yarns. The centre ends and the filling are single.

Carding and Spinning Particulars.

The yarns of which dhooties are made would be manufactured in mills having the equipment of machinery found in the second division of mills as given in a previous article. The dhootie which is taken for an example will be supposed to be composed of 34s warp and 40s filling for the centre and 2-60s for the borders. These yarns are made from the following cottons: The 2-60s is made from 1⅜-inch American cotton and is combed. The 40s and 34s are made from a 1 3-16-inch staple American cotton and may be

EITHER COMBED OR CARDED.

For this article we will consider that they are carded, but as it is desirable that the yarn shall be as free as possible from neps the speeds and settings of the card will be different from those generally used for this count of carded yarn. All three cottons may be either mixed by hand or by machine; the advantages of machine mixing (by means of a bale breaker) have been already previously given. Each mixing should of course be in separate bins and as large as possible, so as to

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

The card sliver for the 2-60s yarn is combed and the general sequence of processes is as follows: Sliver lap machine, where it is doubled 14 into 1 and has a draft of about 2; a yard of lap at the front weighing 300 grains per yard for an 8¾-inch lap. Six of these laps are put up at the ribbon lap machine and made into a 260 grain lap at the front. Keep top leather rolls in good condition and well varnished. Six laps from the ribbon lap machine are put up at the comber, if it is a six-head machine, or eight laps if it is an eight-head machine,and the weight of the finished sliver is 45 grains per yard. The

SPEED OF THIS COMBER

is 90 nips per minute, the per cent of waste taken out being 16. Keep the detaching rolls well varnished, recipes for which have been given in previous articles as well as a means for keeping the laps of the leather from splitting. After passing the comber the sliver is put through two processes of leather covered top roll drawing frames, the doublings being 8 into 1 at the breaker and 6 into 1 at the finisher. The weight of the sliver at the finisher drawing is 70 grains per yard. This is made into .50 hank roving at the slubber and is then put through three processes of fly frames, the hank roving at each being as follows: First, 1 hank; second, 3½ hank, and fine frame, 12 hank. This is then taken to the ring spinning room and spun into 60s on a frame with a 1¾-inch diameter ring, 5-inch traverse, and a spindle speed of 8,000 revolutions per minute; after which it is doubled into 2-60s. The roving for the 40s filling is spun on a ring frame having a 1⅜-inch diameter ring, 5½-inch traverse and a spindle speed of 8,800 revolutions per minute, and then spooled and warped and put through a slasher. The roving for warp is spun into 34s on a warp spinning frame with a 1⅝-inch diameter ring, 6½-inch traverse, and a spindle speed of 10,200 revolutions per minute, after which it is taken to the conditioning room.

Dyeing Particulars.

BLUE.

Three per cent immedial indone B; 2 per cent immedial indone 3 B; 5 per cent sodium sulphide; 2 per cent soda ash; 30 per cent Glauber's.

GREEN.

Five per cent immedial yellow D; 5 per cent immedial indone B; 10 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's.

RED.

Six per cent primuline; 30 per cent Glauber's; 2 per cent sal soda, rinse; diazotize: 2½ per cent nitrite soda; rinse; develop: 2 per cent beta naphthol, rinse and soap at 150 degrees F.

YELLOW.

Mordant with tannine and tartar emetic, rinse; dye with 3½ per cent thioflavine T and rinse.

LIGHT GREEN.

Dye yellow with thioflavine T; and dye on top with 2 per cent brilliant green Y; rinse and give a weak soaping.

ORANGE.

Dye with 6 per cent primuline aftertreat with ½ degree Tw. solution of chloride of lime.

LIGHT BROWN.

Four per cent thion orange N; 4 per cent sulphide soda; 2 per cent soda ash; 30 per cent Glauber's salt; aftertreat with 2 per cent sulphate of copper.

MYRTLE GREEN.

Eight per cent thion green G; 2 per cent thion yellow G; 2 per cent thion green B; 10 per cent sulphide soda; 3 per cent soda ash; 25 per cent salt.

WINE.

Eight per cent thiogene red O; 8 per cent sulphide soda; 3 per cent soda ash; 25 per cent salt.

BLUE BLACK.

Ten per cent immedial brilliant black B; 10 per cent sulphide soda; 3 per cent soda ash; 25 per cent salt.

UNEQUALLY REEDED STRIPES

Under the above heading may be included an extensive type of cotton fabrics, variously known as satin or sateen stripes, doria stripes, etc.

They are made in all grades, from medium to fine, and used for many purposes, such as dress fabrics, curtain hangings, etc., and are usually shown in all white or solid colors.

They are characterized by prominent stripe effects which appear to stand up from the ground of the cloth.

The raised stripes are produced by crowding more ends in a given space than are contained in an equal space occupied by the ground ends and by weaving them differently. As a rule

the yarns forming the raised stripes are woven in satin or twill order, warp flush weaves, while those forming the ground weave plain.

Theoretically, warp ends weaving plain should take up or contract in length faster than ends weaving twill or satin, on account of the greater number of interlacings. This applies to cloths in which each dent contains the same number of ends throughout the entire width of cloth.

It has been found in practice that when weaving a fabric containing sections reeded, say, two ends per dent, and others four or five ends per dent, the yarns that are crowded in the reed will contract more than those reeded two ends per dent. For example, a

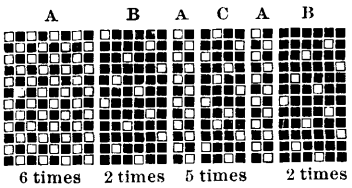


Fig 1.

warp stripe interlaced in five ends satin order and reeded five ends per dent would contract in length about as fast as the yarns weaving plain in the same fabric, if the latter were of the same counts of yarn and reeded two ends per dent. This fact explains the reason why satin stripe fabrics are usually woven from one beam.

A characteristic weave is shown in Fig. 1.

The warp lay-out of one repeat of the pattern is as follows:

Ends.	Dents.	Harnesses.
48	24	1 to 6
12	2	7 to 12
2	1	1 and 2)
4	1	13 to 16) 5 times.
2	1	1 and 2
12	2	7 to 12

Selvedges on harnesses 1 and 2.

The chain draft is shown in Fig. 2.

In Fig. 1 sections A weave plain, sections B weave 6 end warp satin, and sections C weave broken crow, warp face.

When combining weaves in this manner one of the principal points to consider is to bring the warp float of one section opposite the filling float of the adjoining section, or, as it is termed, they should be made to "cut" each other as well as possible. When this is done, the stripes have a more distinct and cleaner cut appearance than when it is ignored.

The construction data of the sample under consideration are: warp, 45s; filling, 40s Egyptian; finished width, 28 inches; width in reed, 29.9 inches; ends in warp, 2856; sley reed, 76. This represents the proportional number of ends per inch in the plain section. Average sley, 102. This indicates the average number of ends per inch in the entire width of cloth. Picks per inch, 80.

These goods may be woven on a single box dobby loom, the warp yarns being of one count, and one filling only being required.

The fabrics are found in many variations of patterns and qualities, and are subjected to suitable methods of finishing, according to the use to which they are intended to be put.

Carding and Spinning Particulars.

The mills that make unequally reeded stripes will be found in the second division, and while the count of yarn varies to a great extent for this class of goods, a good average count would be 45s warp yarn and 40s filling. It is not our intention to say much about the cotton warp yarn otherwise than a few general remarks, i. e., that the yarn is of 1¼ to 1⅜ inch American stock and carded, the hank rovings being as follows: for the slubber .55 hank, first intermediate, 2.50, and for the fine fly frame 10 hank, and is ring spun into 45s yarn. Further particulars for making this count of yarn may be found in previous articles dealing with the same length of stock and

Top.

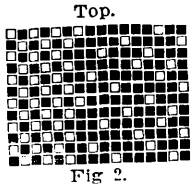


Fig 2.

making counts of yarn from 35s to 50s. In this article it is our intention to deal with

THE FILLING YARN

which is made from Egyptian cotton of 1⅜-inch staple. On account of its peculiar nature Egyptian cotton is especially adapted for filling yarns and it is a general custom to make the filling yarns of this kind of cotton, although it is not done in all styles of fabrics, and while the filling yarns of fabrics previously described might equally as well have been made out of Egyptian cotton, still for some special reason the kind of cotton given for filling yarns has been selected. The Egyptian bale is about 300 pounds heavier than the American bale, so

that so large a number will not be required in the mixing, which may be done by hand or by the use of a bale breaker. It will also be found that Egyptian cotton is much more easily handled than other kinds of cotton. By this we mean that it gives less trouble to operate it at the different processes. The mixing should be made in the same manner as described in previous articles. The cotton for this stock is put through three processes of picking and an opener. The beater used at each process is generally the two-bladed rigid type. The

SPEED OF THE BEATER

at the breaker picker is 1,450 revolutions per minute; at the intermediate picker 1,375 revolutions per minute, and at the finisher picker 1,200 revolutions per minute. The total weight of a lap at the breaker picker is 40 pounds or a 20-ounce lap; at intermediate picker, 38 pounds or a 12-ounce lap, and at the finisher picker, 35 pounds or a 12½-ounce lap. The instructions given in previous articles for picking should be followed. At the card the draft for this stock should not be less than 120. The flats should make one complete revolution every 30 minutes, and the speed of the licker-in should be about 300 revolutions per minute. The weight of the sliver at the front should be 45 grains and the production for a week of 60 hours should be not more than 500 pounds. The setting points should be set to the same gauges as given in last article, while the particulars given for grinding, cleaning, stripping and oiling that have already been given for the same length of staple of American stock may be used. Egyptian cotton is easily combed and, as one overseer puts it, might be combed with a rake; still considerable care should be given to it to see that it is properly done. The particulars for sliver lap machine, ribbon lap machine and six-head comber for an 8¾-inch lap are as follows: Sliver lap machine doubles 14 into 1 and weight per yard of lap is 295 grains; at the ribbon lap machine the doubling is 6 into 1, the weight per yard being 260 grains; at the comber the doubling is 6 into 1, the weight of the silver is 47 grains. The percentage of waste taken out at the comber for this stock for fabric named is 16. Use settings and turnings given in a previous article.

THE COMBER SLIVER

is next put through two processes of drawing, the weight per yard at the front being 70 grains per yard with doublings of 6 into 1 at each process. Use either metallic or leather top covered rolls, this stock running equally well on each. At the slubber the sliver is made into .50 hank roving and from here it passes through three processes of fly frames, the hank roving at each being as follows: First intermediate, 1 hank; second intermediate, 3 hank, and fine frame, 10 hank. The twist gear used at each process should be one tooth smaller than that used for the same hank of roving made from American cotton. Watch the rolls, both top and bottom, to see that they are properly set. After leaving the fine frame the roving may be either mule or ring spun, sometimes one and sometimes the other being preferred for certain reasons. For this fabric the roving is generally ring spun. For spinning 40s filling yarn of 1 5-16-inch staple Egyptian cotton use a frame with a 2¾-inch gauge, 1½-inch diameter ring, and a 5½-inch traverse, and spindle speed of 8,800 revolutions per minute.

Dyeing Particulars.

PEARL.

Four ounces immedial black N R T; ½ per cent sulphide sodium; 1 per cent soda ash; 10 per cent Glauber's.

SLATE.

One per cent diamine black B H; 4 ounces diamine fast yellow B; 1 per cent sal soda; 20 per cent Glauber's salt.

FAWN.

One per cent diamine fast yellow B; 4 ounces diamineral brown G; ½ ounce diamine brown B; 1 pound sal soda; 20 per cent Glauber's.

SCARLET.

Five per cent diamine scarlet B; 2 per cent sal soda; 30 per cent Glauber's.

RED.

Four per cent diamine fast red F; 2 per cent sal soda; 30 per cent Glauber's.

MYRTLE GREEN.

Four per cent benzo green G G; ½ per cent chrysophenine; ½ per cent benzo fast black; 3 per cent sal soda; 30 per cent Glauber's.

HELIOTROPE.

Two per cent tetrazo lilac B; 2 per cent sal soda; 25 per cent Glauber's.

LIGHT BROWN.

Two and one-half per cent diamine brown 3 G; 2 per cent sal soda; 25 per cent Glauber's.

DARK BROWN.

Three per cent diamineral brown G;

½ per cent diamine brown M; 1 per cent diamine catechine B; 2 per cent sal soda; 30 per cent Glauber's.

NAVY BLUE.

Six per cent diamine dark blue B; 2 per cent sal soda; 25 per cent Glauber's salt.

WINE.

Five per cent diamine Bordeaux B; ½ per cent diamine fast red F; 3 per cent sal soda; 30 per cent Glauber's.

PINK.

One-half per cent Erika pink G; 1 per cent sal soda; 10 per cent salt.

SKY BLUE.

One per cent diamine sky blue F F; ½ per cent sal soda; 15 per cent Glauber's.

BLACK.

Ten per cent immedial black N N; 2 per cent soda ash; 10 per cent sodium sulphide; 30 per cent Glauber's.

STOP PEG CHECKS.

The above term is used in cotton mills to indicate a type of fabric extensively made for dress goods and decorative purposes. In the dry goods trade the goods are found under various names.

They are an extension of the type of goods, unequally reeded stripes, explained in the last article, and are characterized by certain yarns in both warp and filling appearing to stand up from the ground cloth in regular or irregular block effects. They are usually woven white and bleached or dyed as may be required.

This article is really supplementary to the last one, the points referred to there applying equally as well here.

A check is almost always formed by a crossover effect in the filling in connection with a distinguishing stripe in the warp. If the effect warp way is not as prominent or more prominent than the effect filling way, a barry pattern is produced, objectionable in almost all classes of textile fabrics.

In stop peg checks the effect warp way is formed by crowding some of the ends and weaving them in a different manner from the others, as in unequally reeded stripes. The effect filling way is formed by interlacing the yarns in a certain manner, say plain, for a certain number of picks, then changing the order of interlacing to another weave, say a filling sateen, for a definite number of picks.

When weaving the plain section, the take-up motion of the loom works in the ordinary manner, whereas when weaving the filling satin section it is disconnected, as required, so that more picks will be inserted in a given space.

The device used for disconnecting the take-up motion is usually connected to one of the levers of the dobby and called into action by pegs placed in the pattern chain; hence the term, stop peg checks.

A friction let-off is preferable to a positive let-off motion for this class of goods. Fig. 1 illustrates an example of the simpler type, consisting of sections of plain, warp sateen and filling sateen. The analysis of the sample under consideration shows the following data: Warp, 60's; filling, 90's; cloth width, 27.5 inches. In the plain sections there are, in proportion, 72

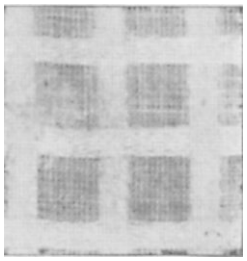


Fig. 1.

ends and 72 picks per inch. The average number of ends and picks per inch is 114 each.

The warp lay-out for one pattern is as follows:

Ends.	Dents.		
24	12	=	2 ends per dent
30	5	=	6 ends per dent
24	12	=	2 ends per dent
30	5	=	6 ends per dent
108	34		

One warp only has been used.

The harness draft is shown at Fig. 2.

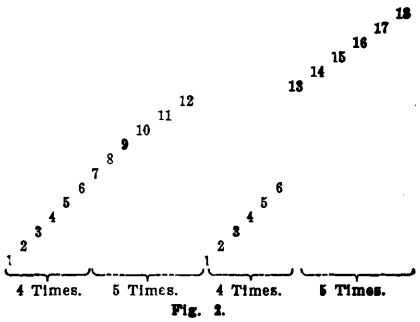


Fig. 2.

The chain draft, exclusive of selvedge, is shown in Fig. 3. In this figure marks \ correspond to the plain sections in the cloth; dots correspond to the warp satin sections in

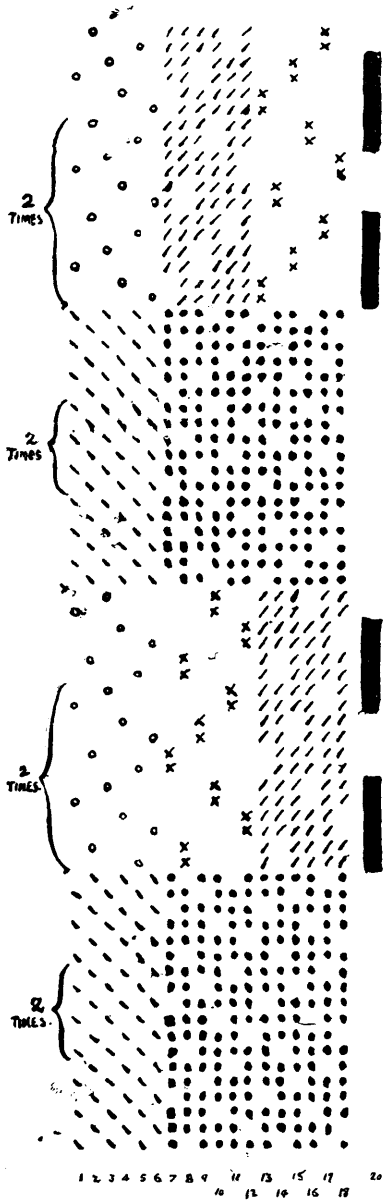


Fig. 3.

the cloth; circles correspond to the filling satin sections in the cloth; crosses correspond to the filling satin sections in the cloth where the same cross over the ends crowded in the reed, this is a filling satin with two picks in a shed; marks / correspond to the warp satin sections in the cloth where the same cross over the picks forming filling satin with the otherwise plain ends; solid marks indicate stop pegs.

The warp satin sections are woven two picks in a shed when the other sections of ends are weaving filling satin. On these picks the take-up motion is out of connection on 20 out of 30 picks, the entire 30 picks occupying only as much space as 10 picks in the plain sections.

The positions of the stop pegs cannot always be determined before the cloth is being woven. When a change is made from plain to filling satin it is not necessary to insert stop pegs for a few picks because the picks go in easier in the filling satin sections.

LOOM REQUIRED.

An ordinary single box dobby loom fixed with device referred to may be used when weaving these goods. One warp only is required.

Unequally reeded stripes and stop peg checks may be placed in the novelty class, being in demand one season and out of demand the next; also on account of varying considerably in pattern and quality. As such they are usually woven on looms fitted up for weaving from two or more warp beams.

Carding and Spinning Particulars.

The yarns for stop peg checks are made in mills of the second and third divisions of mills as given in a previous article. The counts of yarn used for this fabric differ according to the quality of the fabric desired, and for the carding and spinning particulars we will consider the sample to be made up of 60s warp and 90s filling yarns. Both of these counts of yarn will be combed, the warp yarn being made from 1⅜-inch Allen or peeler cotton and the filling yarn from either Egyptian of 1½-inch staple or, as is more general, from Sea Island cotton of 1⅝-inch staple. The processes used for the Sea Island cotton will first be described, and as the processes for 1⅜-inch American cotton have already been described only those points that differ from those already explained will be given. In mixing Sea Island

cotton a great deal of care should be taken to see that all bales put into the mixture staple the same. At the mixing bins the good sliver and picker waste from the machines up to the slubber will be mixed in. As

SEA ISLAND COTTON

has to be handled as little as possible, on account of the ease with which neps are put in, generally only one process of picking and an opener is used, although some mills use two processes. If only one process is used, the speed of the beater should be just high enough to beat out the dirt, and this varies according to the grade and quality of the raw stock. For a fair average a two-bladed rigid type of beater should make about 1,200 revolutions per minute, which will give the cotton passing through about 29 beats or blows per inch. The lattice apron of this machine is measured off and marked into yard spaces, and the cotton as it comes from the apron is weighed and spread evenly over this space. The lap at the front end weighs 30 pounds or a 10-ounce lap per yard. A variation of only six ounces either side of standard weight is allowed for this cotton. At the card the same care is taken to prevent neps and the speed of certain parts is changed to help this result. The speed of the licker-in is reduced about 50 revolutions per minute from that when American cotton is used. The

SPEED OF THE FLATS

is increased to make one complete revolution every 35 minutes; the flats are also set to a No. 10 gauge instead of a No. 12, as compared with American cotton. The cylinder and doffer are only stripped twice a day, but the card wire is always kept sharp and in perfect condition. The weight of the sliver at the front is 45 grains per yard and the production for a week of 60 hours should not be over 400 pounds per week. The sliver is next taken to the sliver lap machine or in some cases a drawing frame is used first and a sliver lap machine afterwards. If the former method is used, the weight of the lap should be about 230 grains per yard, the doublings being 14 into 1 for an 8¾-inch lap. These laps are doubled at the ribbon lap machine 6 into 1, the weight of the lap at the front being 220 grains per yard. If a drawing frame is used after the card, the ribbon lap machine is not used, and the weight of lap at the sliver lap machine should be 220 grains per yard. The laps at both the ribbon and sliver lap machines should be sized once a day. The laps are next put up at the comber and doubled according to the number of heads that it contains, either six or eight. The percent of waste taken out at this machine for this stock varies according to the overseers' ideas, but a good average percent is 22.

THE WASTE PERCENTAGE

should be taken from six different combers every day. Keep the rolls well varnished and other parts well polished and as free from dirt as possible. Watch the piecing and also for single. Keep your setting points to gauge and time. The sliver at this machine weighs 35 grains. This sliver is put through two processes of drawing frames, the revolutions per minute of front roll being 320, the doublings 6 into 1 at both processes, and the weight of sliver at the finisher being 60 grains per yard. Follow instructions given for drawing frames in previous articles. The sliver at the drawing frame should be sized 4 times a day, and a variation of only one grain per yard allowed. The drawing sliver is next put up to the slubber and made into .80 hank roving, after which it is put through three processes of fly frames, the hank roving at each being as follows: First intermediate, 2.25 hank; second, 5 hank, and fine, 18 hank. At the fine frames the roving is sized once a day. The usual care that has been previously explained should be given to all parts of the fly frames, and in addition the top leather rolls of the slubber should be varnished. It is best, but not always convenient, to have the slubber rolls used of a little larger diameter than when other cottons are used. This is on account of the length of the staple, to help prevent "licking." The roving is next spun, either a ring frame or mule being used, generally the latter. If a ring frame is used, the gauges should be as follows: For 90s yarn from this stock, 1¼-inch diameter ring, 5-inch traverse, 31 turns per inch and a spindle speed of 7,400. After being conditioned, the yarn is ready to use. For the warp yarn use the particulars given in the article on dhooties, except that the yarn is not twisted. A good size mixture for slasher is as follows: Water, 100 gallons; potato starch, 54 pounds; Yorkshire gum, 2 pounds; white soap, 1½ pounds.

SUSPENDER WEBBING.

Suspender webbing is, as the name implies, used for suspenders. It is of two types, elastic and non-elastic. The non-elastic type is made into suspenders in connection with elastic straps connected to the buckles. An advantage claimed for this webbing is that there is no friction on the clothing at the shoulders, the rubber at the front and back, on the part between the buttons and the buckles, taking care of variable tensions caused by the different movements of the body.

Being subjected to hard usage, the goods are made firm in the loom, of strong materials. They are of varying grades and qualities. In width they vary from 1 to 1¾ inches.

The analysis of a cotton webbing of a cheap grade shows the following data: warps, 117 ends of 2-40s cotton for face and edges; 50 ends of 2-20s for back; 24 ends of 2-30s for binders or stitchers; 25 ends of 42 rubber.

There are 90 picks of 2-16s filling per inch, finished. As these goods are held tight in the loom on account of the rubber warp, 60 picks per inch only would be put in in the loom, the webbing contracting 50 per cent in length after being woven.

The width of the web is 1 7-16 inches.

The full layout is shown in the harness draft, Fig. 1, the various warps being drawn as follows: binder ends through harness No. 1, rubber ends through harness No. 2, face and edge ends through harnesses Nos. 3, 4 and 5, and the back ends through harnesses Nos. 6 and 7. The daggers indicate where the ends are divided by the reed, the entire web occupying 27 dents of a reed containing 17 dents per inch.

Each binder end works between two back ends. To add bulk to the fabric, coarse ends are sometimes inserted in the centre of the cloth; these are drawn through the same harnesses as the rubber.

The chain draft is shown in Fig. 2.

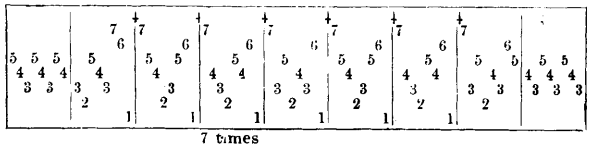


Fig. 1.

By comparing Figs. 1 and 2 it will be seen that the web is a multiple or compound fabric, all face ends being raised when back picks are inserted, all back ends depressed when face picks are inserted, all rubber ends raised on back picks and depressed on face picks, thereby being between the face and back fabrics.

The binders tie the fabrics into one compound fabric.

LOOM REQUIRED.

Suspender looms are made with more or less attachments according to requirements. They are capable of running upwards of 40 webs at the same time, so the production of one loom is considerable. The shuttles, one for each web in the simpler type, are actuated on the rack and pinion principle in a positive manner. On some goods, where silk filling is used for figuring purposes, three or four shuttles are required for each web.

Goods like the one under consideration would be woven on a positively acted side cam loom, actuated by interchangeable sectional cams. The cams are 12 picks to the round or repeat. One shuttle only is required for each web.

For more elaborate goods a dobby

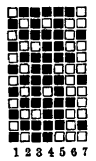


Fig. 2.

or jacquard head is used in connection with the cams, the latter working the harnesses for the ground, and the head motion actuating the figuring yarns.

Separate warp beams, or spools, are required for each different count of warp yarn, for each web.

Carding and Spinning Particulars.

Like other fabrics that have been already described in these articles, the yarns of which the webbing for suspenders is made vary as to

count, but in this especial case there is also a wide range of the stock used and also as to whether it shall be carded or carded and combed. The higher grades of webbing are composed of the longer stapled cottons, even the longest staple Sea Island cotton being used for the very fine grades, this cotton being of course combed, and from this down to the short stapled carded cotton. The sample that has been taken for this article is of medium grade and is composed of four different counts of yarn, which are as follows: 2-40s warp for face and ends and 2-20s for the back; 2-30s is used for the binder and 2-16s for the filling yarns. The 2-40s and 2-30s yarns would be constructed from the same staple and stock, or American cotton of 1 5-16-inch staple and the 2-20s and 2-16s would be made from peeler cotton of 1⅛-inch staple. The picking particulars that have been given in previous articles may be used for these counts and staple cottons may be used, the following exceptions being noted. The total weight of the lap at the different processes for the 1 5-16-inch stock is as follows: breaker picker, 40 pounds or a 16-ounce lap; intermediate picker, 38 pounds or a 12-ounce lap and at the finisher picker 35 pounds or a 12½-ounce lap. For the 1⅛-inch stock the weights would be as follows: 40 pounds or a 16-ounce lap at the breaker, 39 pounds or a 12½-ounce lap at the intermediate and 39 pounds or a 14½-ounce lap at the finisher picker. The beater speeds used would be the same for both cottons, i. e., 1,500 revolutions per minute at breaker and intermediate and 1,450 revolutions per minute at the finisher, which gives the cotton passing through the finisher picker about 42 beats or blows per inch. At the card the draft of the 1 5-16-inch stock should be not less than 100 and the speed of the licker-in 350 revolutions per minute, while the flats, 110, make one complete revolution every 50 minutes. The

WEIGHT OF THE SLIVER

should be about 60 grains per yard and the production 750 pounds per week of 60 hours. The draft for the 1⅛-inch stock should not exceed 95 and the speed of the licker-in is about 375 revolutions per minute, while the flats make a revolution every 55 minutes. The weight of the sliver should be 65 grains per yard and the production 850 to 900 pounds per week. For all other particulars, see previous articles. The main point of difference in the setting points would be at the licker-in and feed plate, which should be set to accommodate each staple. The slivers are next put through three processes of drawings, the doublings at each process being 6 into 1.

The weight of the sliver at the finisher drawing should be 70 grains per yard for both staples and the speed of the front roll 350 revolutions per minute. Either metallic or leather covered top rolls may be used, but should favor the metallic rolls for these stocks. The drawings should be sized four times a day, and kept within two grains either side of standard weight. Watch your stop-motions and also the drawing as it is being delivered to see that no cut work is made, for this causes a lot of trouble in subsequent processes. All drawing as it is delivered in full cans at the finisher drawing should be marked with chalk so that it may always be distinguished from other staples, kinds and weights. These slivers are then put through the slubber and made into .50 hank roving, after which they are made into the following hank roving at the different processes named: For the 2-40s yarn, first intermediate, 2 hank, and second, 8 hank; for 2-30s yarn, first intermediate, 2 hank, and second, 6 hank; for 2-20s yarn, first intermediate, 1.25 hank, and second, 4 hank; for 2-16s yarn, first intermediate, 1,and 3 at the second intermediate. These rovings should be sized once a day, six bobbins being sized from each different hank.

WATCH YOUR TWIST

to see that you are putting in neither too much nor too little, and also your tension to see that you are not putting too great a strain on the yarn and thus making strained or unevenly drawn roving. The layers per inch are also another important point and for the hank rovings given above a good number is as follows: For the 3 hank, 20 layers per inch; for 4 hank, 25 layers; 6 hank, 33 layers, and for 8 hanks, 38 layers. The top leather rolls should always be kept in good condition and if not should be sent to be recovered. In putting in new rolls always put two new rolls on the same arbor and not, as is sometimes done, one old roll and one new roll. Keep

ROLLS WELL OILED

and also the spindle stops, which should be oiled at least once a month. The roving is next spun on spinning frames into 40s, 30s, 20s, and 16s, respectively. The particulars for these frames, with the exception of the 16s, have been previously given. For spin-

ning 16s filling use a frame having a 2¾-inch gauge, 1½-inch diameter ring and a 6½-inch traverse with a spindle speed of 7,000 revolutions per minute of the spindles. The yarn is then put through several special processes different from the machinery used for regular cloth warp and filling, when it is ready for the suspender loom.

Dyeing Particulars.

SKY BLUE.

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

PINK.

One-half per cent erika pink G; 1 per cent sal soda; 10 per cent Glauber's.

LIGHT GREEN.

One-half per cent diamine fast yellow B; ½ per cent diamine green G; 1 per cent sal soda; 10 per cent Glauber's.

YELLOW.

One per cent chrysophenine; 2 per cent sal soda; 20 per cent Glauber's.

RED.

Two per cent diamine fast red F; 1 per cent sal soda; 20 per cent Glauber's.

SCARLET.

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

SLATE.

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

BROWN.

Two per cent diamine brown B; ½ per cent diamine fast yellow A; 2 per cent sal soda; 20 per cent Glauber's salt.

NAVY BLUE.

Three per cent diamine dark blue B; 1 per cent sal soda; 20 per cent Glauber's.

BLACK.

Five per cent oxydiamine black N A; 2 per cent sal soda; 20 per cent Glauber's; aftertreat with formaldehyde.

BRONZE.

Three per cent diamine bronze G; 2 per cent sal soda; 20 per cent Glauber's.

ECRU.

Two ounces diamine catechine G; ½ pound sal soda; 10 per cent Glauber's.

INDIAN DIMITY.

Under the head of dimity are a variety of cotton fabrics characterized by stripes and cords, in both warp and filling way of the fabric, but more commonly the stripes and cords are in the warp only.

Dimity originally was understood to mean a stout cotton fabric with raised stripes, cords, crimps or ridges in the warp way of the fabric. These fabrics were further ornamented by being printed in various colors lengthwise of the fabric, in small patterns. This fabric was principally used for furniture covering and for like purposes.

Under the head of Indian dimity is a class of fabrics somewhat similar to the dimity described above, but made with finer yarn and used principally as a dress fabric.

The stripes and cords, however, constitute

THE CHARACTERISTIC FEATURE

of the fabric; the fabric without these stripes and cords would in all respects resemble a fair quality of lawn, batiste or muslin.

The cords in an Indian dimity appear in the fabric at regular intervals across the entire width. These cords may be effected by working two or more ends on the same harness or by using a coarser thread than the body of the warp. The cord usually interlaces with the filling in the same manner as the ground; that is, on the plain weave order. In addition to these cords, the fabric, after it is woven, is printed in stripes in the direction of the warp, with high colors. The patterns of these stripes are usually conventionalized floral figures. These floral stripes may alternate with an appropriate geometrical figured stripe. In the latter stripe the colors are usually more subdued, thus producing contrast and variety, a very desirable feature in a dress fabric, especially so in the cheaper grades of printed dress fabrics.

Varying the quality of cotton fabrics is such a general practice and is carried to such an extent that some fabrics lose their individuality; a fabric such as an Indian dimity, that has features in addition to its construction, has considerable scope for variation, consequently we find various grades and styles of Indian dimity—some in which the cords are much farther apart than in others, or sufficiently spaced to allow the stripe to be

printed between the raised cords, and others in which the cords are very close together, with but two or three ends between each cord. (See weave Fig. 1.) In printed fabrics of this character, where the printed patterns are in the form of a stripe, the cords should not be too prominent, or, if they must be prominent, the printed stripe should be of such a design that the outline is of an indefinite character, so that if any inaccuracy occurs in the printing, that is, if the cloth does not run perfectly straight through the printing machine, and the printed stripe interlaces too much with the cord, it appears as if the printed stripe was promiscuously placed on the fabric. The happiest patterns are those in which the ends are not very prominent and the stripe is printed over them at apparently regular intervals. Fig. 2 represents the drawing-in draft; Fig. 3 the reeding plan.

ANALYSIS OF FABRIC.

Width of warp in reed, 30½ inches;

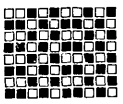


Fig. 1.

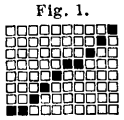


Fig. 2.

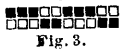


Fig. 3.

width of fabric finished, 29 inches; ends per inch finished, 94; 1,300x2 reed; ends in warp, 2,724.

Dressing: 1-2 E. white in 1 hed.
1 E. white.
1 E. white.
1 E. white.

4-5

Take-up of warp during weaving, 8 per cent; warp yarn, 1-80; filling yarn, 1-100. Picks per inch, 76.

LOOM REQUIRED.

Light-weight cotton fabrics, such as an Indian dimity, may be woven on any light built single box loom. The principal consideration should be given to the speed of the loom, as fabrics of this class require large production in order to amply compensate the manufacturers for making them. High-speed Crompton gingham looms would answer for weaving this class of goods.

FINISHING.

The fabric, after it is woven, is bleached, then slightly stiffened by immersing in a light solution of size. The size may be composed of the following ingredients: flour, wax and gelatine. After the sizing the fabric is dried, then slightly sprinkled with water, then run through a rotary press, after which follows the printing process. The fabric is then again slightly pressed in order to take out the creases which it contracted during the printing; then it is made up into laps or rolls.

Carding and Spinning Particulars.

The yarns that make up Indian dimity are made in mills of the third division, as given in a previous article. The fabric is generally made from Sea Island cotton of from 1⅝-inch to 1¾-inch staple. The sample under description is composed of 1-100s filling yarn and 1-80s warp yarn and for this article we will consider both yarns to be made from 1⅝-inch staple, Florida Sea Island cotton. Particular care should be paid to the mixing of this cotton and all bales not up to grade and staple should not be used. At the mixing bin the good sliver from the machines up to the slubber should be mixed with the raw stock. Too much waste should not be mixed on account of making the lap fleece. As this cotton is of a long staple it is very easy to put neps into it, and thus too great a speed of the beater of the picker should not be allowed. The beater should be run just fast enough to take out the dirt. This speed varies, on different stocks of the same length of staple, from 800 to 1,350 revolutions per minute. A good average speed of a two-bladed rigid type of beater for the breaker is 1,200 revolutions per minute, and for the finisher, 1,025 revolutions per minute. This latter speed gives the cotton passing through it about 29 beats or blows per inch. Sea Island cotton is generally put through only two processes of pickers and sometimes does not even pass through an opener, although this is an exception rather than a rule. At the breaker picker the lap at the front end weighs 30 pounds or a 12-ounce lap. These are put up and doubled 4 into 1 at the finisher picker, and the total weight of lap at this machine is 29½ pounds, or a 10-ounce lap. A variation of one-half pound either side of standard weight is allowed. These laps are put up at the card. The

DRAFT OF THIS MACHINE

for this stock varies according to the idea of the one in charge, but should not be less than 125. The top flats should be clothed with No. 36s wire

and should make one complete revolution every 35 minutes. The speed of the licker-in should be less than that used for shorter and coarser cottons and should not exceed 300 revolutions per minute, as it is claimed that this speed is high enough to tear it apart and clean it thoroughly and still not put neps into it. The doffer should be of as large a diameter as possible and should be clothed with No. 36s wire fillet. The cylinder fillet should be No. 34s. The weight of the sliver should be about 37 grains and the production, per week of 60 hours, 350 pounds. Clean, strip, and grind cards, as has been already stated in previous articles. The sliver is then taken to the sliver lap machine and for an 8¾-inch lap is doubled 14 into 1. The weight of the sliver at the front of this machine is 230 grains per yard of lap.

Watch your stop-motions on this machine. The laps are put up at the ribbon lap machine and doubled 6 into 1, although some mills make a heavier lap at the sliver lap machine, and only double 5 into 1 at the ribbon lap machine. The weight per yard of lap at the front of this machine is 210 grains. The rolls of the sliver lap machine for this stock are set as follows: Front to middle, 1¾ inches; middle to back, 2 inches and for the ribbon lap, front to second, 1¾ inches; second to third, 1⅞ inches; third to back, 2 inches. The laps are put up at the comber and doubled either 6 or 8 into 1, according to the number of heads that the comber contains, which we will consider to be 6. The sliver from this machine weighs 35 grains per yard; 25 per cent waste is taken out and the speed of the machine is 90 nips per minute. Use setting and timing previously given for this grade of stock. The cotton is next put through two processes of

DRAWING FRAMES,

the speed of the front roll being 350 revolutions per minute, and the weight of the sliver at the finisher drawing being 60 grains per yard. It is an important point to prevent all singles and doubles at this machine and to help make perfect drawing all stop-motions should be in perfect condition. Another important part to watch is the setting of the rolls. For this stock a good rule is as follows: Front to second, 1¾ inches; second to third, 1⅞ inches; third to back, 2 inches. These settings may be used at both drawings, although if settings are closed up 1-16 of an inch between each roll at the finisher drawing it will not injure the staple.

The top leather rolls of the sliver lap, ribbon lap, comber, and drawing frames should be kept in perfect condition and always well varnished. A stock of new and newly varnished rolls should always be kept on hand and the rolls on the machine examined frequently to see that they are perfect. Good recipes for varnish have been previously given. A part of the machines which it is not a general custom to give much notice to is the clearers. Now this is an important part and they should be looked after carefully to see that they are doing their duty properly. This refers to both top and bottom clearers on all machines on which they are used.

At the slubber the drawing is made into .80 hank roving. At this machine watch the top rolls, the build of the bobbin, the lay, twist, tension and traverse motion. For this stock the front rolls are generally varnished and if it is in a mill made to run this length of stock the top and bottom front rolls are of a larger diameter so that the stock will not lick up so easily. The roller settings for the slubber are as follows: front to middle, 1 11-16 inches; middle to back, 1⅞ inches.

THE SLUBBER ROVING

is then put through three more processes of fly frames, the hank roving made at each process being as follows: First intermediate, 2.25; second, 5, and fine, 18 hank for warp yarn and 20 hank for filling yarn. The warp yarn is ring spun on a frame having a 1⅜-inch diameter ring, 5¼-inch traverse, 39.08 twist per inch and a spindle speed of 9,600 revolutions per minute. The yarn is then spooled and warped and then run through a slasher, after which it is drawn in and is then ready to weave. A good slasher size for this yarn is as follows: Water, 100 gallons; potato starch, 70 pounds; tallow, 7 pounds; Yorkshire gum, 3 pounds; white soap, 2 pounds. Boil two hours and let stand 10 hours before using. Keep agitator running and keep size almost at a boiling point when sizing. The yarn for filling is generally mule spun, after which it is conditioned and then is ready for weaving.

Colors for Printing.

PALE VIOLET.

Prepare ten gallons of printing paste with one pound chrome violet M for printing; 60 pounds gum solution 1:1; two pounds glycerine; 33½ pounds

water. Heat to about 160 degrees F., allow to cool, then add 2½ pounds formic acid 90 per cent; 1 pound acetate chrome, 32 degrees Tw.

DEEP VIOLET.

For 10 gallons paste, 10 pounds chrome violet M for printing; 50 pounds starch tragacanth 65:1,000; 34 pounds water. Heat to about 160 degrees F., allow to cool; add 2½ pounds formic acid, 90 per cent, 3½ pounds acetate of chrome, 32 degrees Tw.

BLUE.

For 10 gallons paste, 14½ pounds chrome fast blue F R for printing; 3½ pounds chrome violet M for printing; 45 pounds starch tragacanth thickening; 12 pounds water; heat to about 160 degrees F.; allow to cool then add three pounds hyraldite A, dissolved in 3½ pounds water; one pound formaldehyde, 40 per cent; 2½ pounds formic acid; 15 pounds acetate of chrome; Steam through Mather & Platt. The pieces are then left exposed to the air for several hours, passed through a weak chrome bath, washed, soaped, rinsed and dried.

SKY BLUE.

Two and one-half ounces alizarine blue S P; 2½ pints gum thickening; 1 quart water; ½ pint acetate chrome 32 degrees Tw. Print and steam and soap.

PEA GREEN.

Two pints alizarine green D G paste; 1½ gallons tragacanth thickening; 1 gill acetate of chrome 32 degrees Tw.; 2 quarts water. Print, steam and soap.

PINK.

Four ounces rhodamine 6G; ½ pint water; 1½ quart tragacanth thickening; ¼ pint acetic acid, 9 degrees Tw.; ¼ pint acetate chrome, 32 degrees Tw. Print, steam and soap.

RED.

One pound brilliant Rhoduline red B D; 1 gill glycerine; 2 pints water; 1½ pounds acetic acid, 9 degrees Tw.; 1 gallon gum water, 1:1; 2 pints acetic acid tannic acid solution, 1:1. Print, steam one hour, soap.

PURPLE.

Five ounces methyl violet 2 R; 2½ quarts water; 3 pints acetic acid, 9 degrees Tw.; 1¼ gallons gum water 1:1; 1½ pints acetic acid, tannic acid solution 1:1. Print, steam one hour, soap.

GRENADINE.

Grenadine is a fine gauzy dress fabric made with various combinations of materials, such as silk and cotton, silk and wool, or cotton and wool, and some of the cheaper grades are made with all cotton yarns.

The fabric is plain and loosely woven and invariably ornamented by stripes, sometimes in both warp and filling, but usually in the warp only. These stripes may be of an ordinary satin or uneven sided twill weave. In the better grades of grenadine the ornamentation is more intricate, that is, the figuring is of such a character that it requires a special loom, such as a lappet or swivel loom. If the figuring is to be effected by means of an extra filling, the swivel loom is used. With the use of this loom the figuring is in the form of spots or set figures over the entire fabric.

The grenadine of which the analysis will follow. is a cotton warp and silk filling fabric, ornamented with a zigzag warp stripe, effected by the lappet attachment to the loom.

This method of forming stripes on a fabric was in use prior to the introduction of the swivel loom. The method of operation in this class of weaving consists of passing an independent set of threads through a series of needles set in a frame. This frame is situated between the reed and shuttle race way of the lay.

This frame is arranged so as to slide horizontally to and fro. This sliding is regulated by the pattern chain, and the needles are lowered at the proper time, so as to allow the figuring threads to interlace with the ground cloth, by passing the filling over the figuring threads, thereby binding the figuring threads into the ground structure of the fabric. The movements of the needles may be timed so as to interweave with the ground cloth at each throw of the shuttle or otherwise, as may be desired. The figuring threads, however, must be on a separate warp beam on account of the difference of take-up during weaving.

Diagram, Fig. 1, illustrates the method of interlacing the figuring threads into the ground structure of the fabric.

This fabric, as mentioned above, is of an openwork texture. The construction, that is, the ends and picks per

inch in the ground structure of the fabric, should be of such a number as to make the fabric firm enough to fulfill its purposes. As the fabric is used entirely for dress goods, it is subjected to considerable wear. In order to retain its characteristic feature, that is, transparency or openness of texture, the ends and picks per inch should be of such a number that in the finished fabric the meshes will be no larger than the diameter of the yarn used in the fabric; otherwise the fabric will not wear satisfactorily.

From the above it will be observed that in order to produce a fabric that is satisfactory in all its aspects, viz., appearance, feel or handle and wearing qualities, absolute accuracy is required in calculating for the construction of such a fabric. Grenadine may be woven in the gray, then dyed any color desired, or the warp may be dyed in the hank and the filling dyed after it is woven into the fabric. In the better grades these fabrics are usually woven with dyed yarns. The prevailing color for grenadines is solid black.

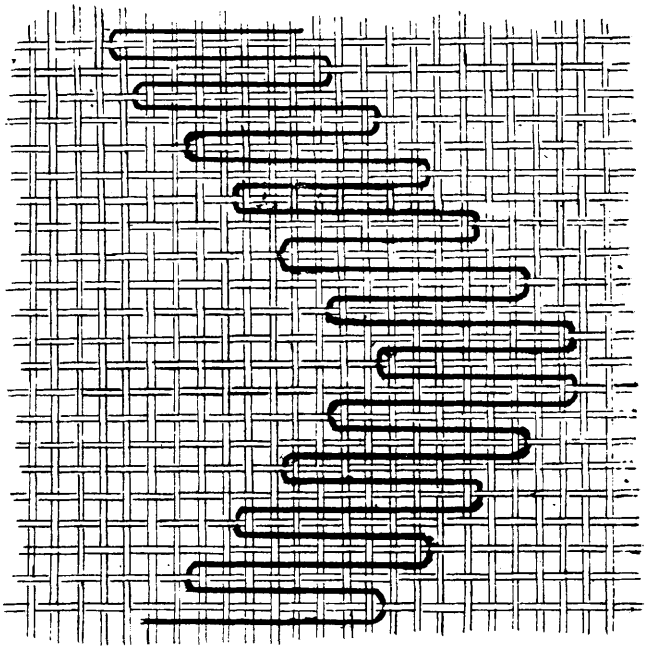


Fig. 1.

ANALYSIS.

Width of warp in reed, 30 inches; width of fabric finished, 27.5 inches; ends per inch in reed, 34; ends per inch finished, 92. Reed, 42x2; take-up of ground warp during weaving, 5 per cent; take-up of figuring warp during weaving, 12 times the length of fabric woven; ground warp, 1-60s cotton; figuring warp, 2-40s mercerized cotton.

In the drawing-in, the ground warp only is drawn through the heddles in the harness; the figuring warp passes over the harness into the eyes of the needles, the needles being in front of the reed. The figuring warp is not drawn through the reed, but is guided entirely by the needles.

Filling: 1¼ dram silk, picks, 90 per inch finished.

Fig. 2 shows ground and figure weave.

Fig. 3 ground warp drawing-in draft.

LOOMS USED.

These fabrics are woven on various looms, various makes of dobby looms, lappet, swivel or jacquard, depending entirely on the character of figure to be woven. The jacquard loom is used when the fabric is to be ornamented by large broken plaids, requiring too many ends to be conveniently handled on a dobby loom.

FINISHING.

The finer grade of grenadine requires

very little attention as regards finishing. After the fabric comes from the loom it is examined for broken threads or picks. The finishing is practically in the weaving. If the fabric is perfect when it comes from the loom, it is run through the rotary press, subjected to a little steaming and slight pressure, and then made up into laps ready for the consumer.

Carding and Spinning Particulars.

The counts of yarn used for the warp in the sample described above for grenadine are 1-60s ground warp and 2-40s for figuring warp. The staple cotton used for the ground warp would be about 1⅜ inch for Allen or peeler cotton, while that used for the figuring warp, which is mercerized, would be made from a Sea Island cotton, which is especially adapted for mercerizing purposes, of 1⅝-inch staple. The 1⅜-inch peeler cotton would be put through an opener and three processes of pickers, the speed of a two-bladed beater being as follows: Breaker, 1,500 revolutions per minute; intermediate, 1,400 revolutions per minute, and finisher, 1,400 revolutions per minute. The

WEIGHTS OF THE LAP

for this fabric would be, at the breaker, 40 pounds or a 16-ounce lap, intermediate, 38 pounds or a 12-ounce lap, and at the finisher, a 38-pound or a 13-ounce lap. For the Sea Island stock there would be an opener and two processes of pickers, the speed of a rigid two-bladed beater being as follows: 1,300 revolutions per minute at breaker and 1,200 revolutions per minute at finisher; the weight of the lap would be 34 pounds or a 10-ounce lap at breaker, and at the finisher a 30-pound lap or a 10½-ounce lap. For general instructions for mixing and picking, use those that have been previously given. At the card the particulars used for the peeler cotton are: A draft of not less than 110, with a licker-in speed of 300 revolutions per minute, flats (110) making one complete revolution every 35 minutes. The speed of the cylinder is 160 revo-

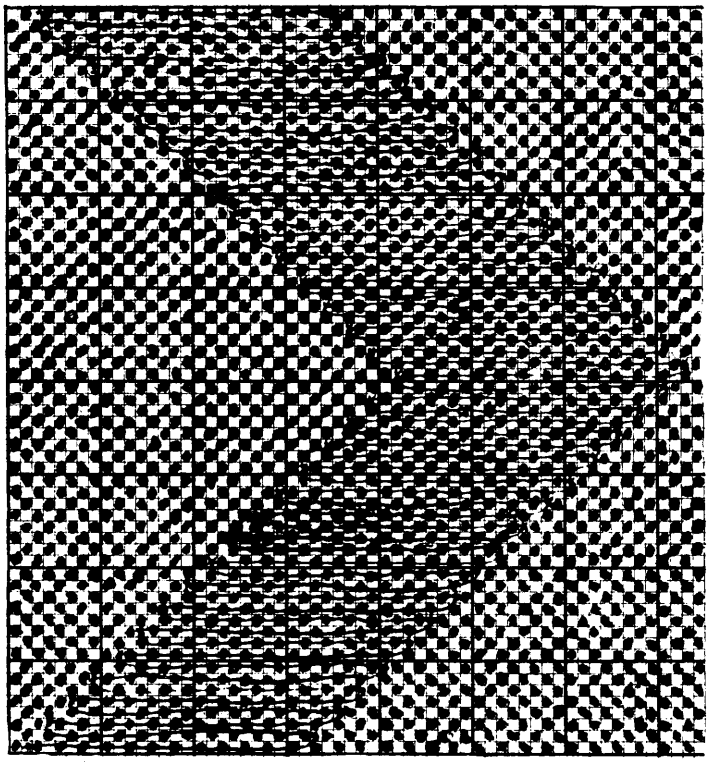


Fig. 2.

lutions per minute The production should be 500 pounds with a 45-grain sliver for 60 hours per week.

FOR SEA ISLAND STOCK

the draft should not be less than 130. The speed of the licker-in is 275 revolutions per minute, flat 1 revolution in 35 minutes, the weight of sliver 40 grains per yard and the production 350 pounds per week. The wire fillet used for both stocks should be 34s for cylinder and 36s for top flats and doffer. Use

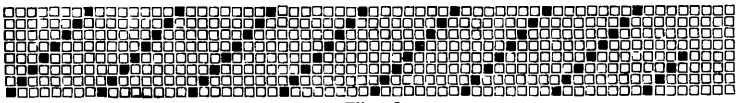


Fig. 3.

as large a doffer as possible. The setting points have been given previously for these stocks. Strip three times a day and grind each card at least a day every month. Both the Sea Island and the peeler cottons for this class of goods are combed and for this article we will suppose that an 8¾-inch lap is use. For

THE PEELER STOCK

the ends are doubled 14 into 1 at the sliver lap machine or, as it is sometimes called, the small doubler, the weight per yard of the lap being 300 grains, and at the ribbon lap or large doubler these laps are doubled 6 into 1, the weight of the lap being 280 grains per yard. These laps are put up at the comber and doubled 6 into 1. The percentage of waste taken out is 16 and the weight of the sliver is 45 grains per yard. Use settings and timings previously given. For the Sea Island stock the weight at the sliver lap is 220 grains per yard and these laps are doubled 6 into 1 at the ribbon lap machine, the weight of the lap being 215 grains per yard. At the comber the doublings are 6 into 1 and the weight of sliver is 35 grains per yard; 20 per cent of waste is taken out and the settings and timings used are the same as those given in the article on Indian dimity.

VARNISH.

Do not use the same varnish for the sliver lap, ribbon lap and draw box rolls and the leather detaching rolls of the comber. For the latter use a varnish that has less glue and a dead finish, while for the former rolls use a roll with a smooth, glossy finish, but use a varnish that does not peal or crack easily. Always keep rolls well varnished and in good condition. The comber sliver is next put through two processes of drawing frames, the doublings being 8 into 1 at the breaker for peeler and 6 into 1 for Sea Island, while at the breaker the doubling is 6 into 1 for both stocks. If metallic rolls are used they should be spread ⅛ of an inch farther apart than when leather top rolls are used. Watch the stop-motions. The weight of the drawing sliver at the finisher drawing is 75 grains per yard for the peeler and 60 grains for the Sea Island stock.

AT THE SLUBBER

the sliver for 60s yarn is made up into .50 hank roving, after which it passes through three processes of fly frames or speeders, being made into the following hank roving at each process: 1st intermediate, 1 hank; 2d intermediate, 3 hank and fine frame, 12 hank. The Sea Island stock is made into .70 hank at the slubber and passes

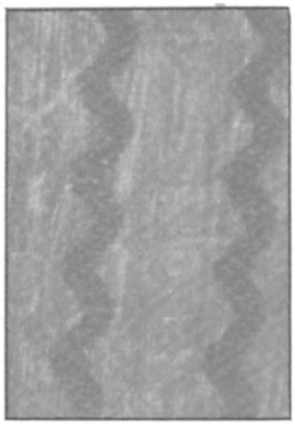


Fig. 4.

through two processes of fly frames, where it is made into 2.25 hank roving at 1st intermediate and 8 hank at finisher frame. Use all the precautions given in previous lessons as to rolls, etc., and remember that the Sea Island stock

REQUIRES LESS TWIST

per inch than the peeler. The peeler cotton is made into 60s hank on a warp spinning frame, the particulars of which have been given in a previous article, while the Sea Island is

made in 40s yarn on a warp frame having a 1½-inch diameter ring with a 6-inch traverse and a spindle speed of 10,000 revolutions per minute; this is then twisted and put through the mercerizing process, after which it is ready for use.

A good slasher sizing for 60s yarn for light-weight cloth is as follows: Water, 100 gallons; potato starch, 54 pounds; Yorkshire gum, 2 pounds, and white soap, 1½ pounds.

Dyeing Particulars.

Dyed in jig machine.

BLACK.

8 per cent thion black T G C; 8 per cent sulphide sodium; 3 per cent soda ash; 20 per cent salt.

BLUE.

6 per cent thion blue B; 10 per cent sulphide sodium; 3 per cent soda ash; 20 per cent salt.

Dye and rinse well. Aftertreat with 2 per cent peroxide sodium; 8 per cent sulphate magnesia; 8 per cent acetic acid, 8 degrees Be. Dissolve the sulphate of magnesia first, then put in the peroxide of sodium in small quantities, and enter the goods; work for 20 minutes first; then run the acetic acid into the bath, and gradually increase the heat to about 180 degrees F.

BROWN.

4 per cent thion brown R; 4 per cent thion brown O; 2 per cent thion orange N; 12 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt.

BRILLIANTE.

Brilliante is a cotton fabric of light or medium weight, distinguished by small, detached figures, usually of geometrical or simple character, arranged on a plain ground. The figures are formed with the filling, which is soft twisted.

The object sought is to cover the warp with the filling as much as possible, both in the ground and figure. It is obtained by using warp yarns considerably finer than those used for the filling in the same piece, aided by the slack twist in the filling.

The goods are used principally for shirtwaists and dress goods.

Fig. 1 illustrates a typical brilliante fabric, the analysis of which shows the following data: 88 sley, 66 picks, 50s warp, 30s filling; finished width, 26¾ inches. The pattern is complete on 100 ends and 84 picks. The figures are arranged in irregular positions, 8 in a repeat.

One of the figures is illustrated in Fig. 2; marks represent filling.

Like many other cotton fabrics,goods under this name are made in various

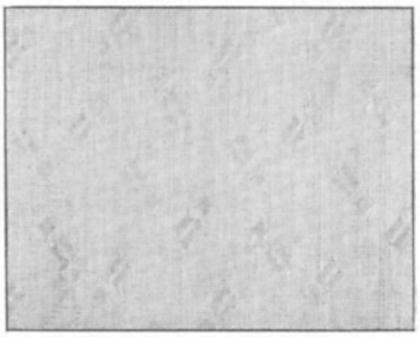


Fig. 1.

grades, variations in the counts of yarns necessitating corresponding variations in the counts of cloth. A fabric under consideration, shown in Fig. 3, has a filling so coarse, as compared with the warp, that it has the appearance of a poplin ground. This is a dobby pattern, the spots being arranged in a 4-end sateen or broken crow order. Each spot is made by the filling covering nine ends on two picks, as in Fig. 4. The float of the

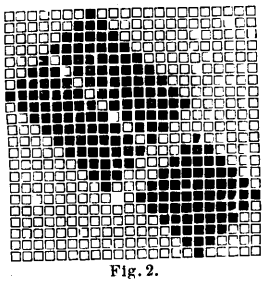


Fig. 2.

second pick of each alternate spot is moved over two ends.

LOOM REQUIRED.

Most brilliante patterns necessitate the use of a jacquard head. A machine of 300 or 400 hooks gives ample scope for designs. The goods being of firm structure, with all the ends taking up

practically evenly, they could be woven most economically on a light running single box loom fitted with a double lift, single cylinder jacquard. One warp and one filling only are required.

There being but little scope for developing other than small designs of this type, on dobby looms, they are made to but little extent on these looms. Experience has taught that

Fig. 3.

patterns like Fig. 3 require too many harnesses on a dobby loom for weaving plain to the best advantage.

FINISHING.

These goods are usually subjected to the English or French nainsook finishes, mercerized or printed. By the English finish the fabric, after it leaves 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.

The fabric illustrated in Fig. 1 has undergone the mercerizing process of finishing, having been mercerized in the piece. Brilliante is a type of goods in which the essential qualities of the pattern are improved by the mercerizing process.

When they are printed, the printed patterns are secondary to the weave effects and usually consist of small detached sprig or floral effects arranged a great distance apart.

Carding and Spinning Particulars.

The yarns of which brilliante is composed are made in mills of the second and third divisions as given in a previous lesson. The yarns used in the sample under consideration are 50s for warp and 30s for filling. Both of these yarns are combed and made from the same grade and staple of cotton. The filling is coarser and according to established rules should be made of a shorter length of staple, and this would be true if it were not for the fact that in order to produce certain effects in the cloth this yarn is required to have a softer twist than that generally employed for this count of yarn. The cotton used may be a peeler of 1⅜-inch staple.

THE MIXING

would be done as described in previous articles, the good sliver waste from the machines up to the slubber being thrown into the mixing bin. If the equipment of machinery does not include a roving waste machine, a good way to mix the roving waste is as follows: Run the roving waste through a picker, allowing it to run on the floor at the front, and not formed into a lap as is generally done; this is then gathered up and scattered over the mixing. This is a very good method, but is not generally used on account of the pickers having all they can do to keep up with the cards. This class of work is put through an opener and three processes of pickers. The pickers, if supplied with a rigid type of beater having two blades, have the following

SPEEDS

at each process: Breaker picker, 1,500 revolutions per minute; the fan speed 1,400 revolutions per minute; intermediate picker, 1,450 revolutions per minute; fan speed, 1,050 revolutions per

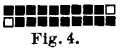


Fig. 4.

minute; finisher picker, 1,450 revolutions per minute; fan speed, 1,100 revolutions per minute. The weights of the lap at the different processes are as follows, the doubling at each process after the breaker picker being 4 into 1: breaker picker, total weight, 40 pounds; weight per yard, 16 ounces; intermediate picker, 39 pounds or a 12-ounce lap, and finisher picker, 36 pounds or a 12½-ounce lap. Of course the laps should be kept of as even a weight as possible, a variation of only 8 ounces either side of the standard weight being allowed at the finisher picker. These laps are put up

AT THE CARD

and for this fabric the draft should

not be less than 110. The licker-in speed should be 300 revolutions per minute. Flats should make one complete revolution every 38 or 40 minutes. The weight per yard of the sliver at front is 50 grains per yard and production for a week of 60 hours is 550 pounds. Set doffer to cylinder to a 5-1,000th-inch gauge; licker-in to cylinder to a 7-1,000th-inch gauge. Set cylinder screen at licker-in to 12 gauge, at centre to a 34 gauge, and at front, ¼ inch.

Set back plate to cylinder at 10 gauge at bottom and at 22 at top; licker-in screen to licker-in, 3-16ths inch from licker-in. Set licker-in knives, top knife at 12 gauge, bottom knife at 5 gauge; if only one knife, set at 5 gauge. Set feed plate to cylinder according to length of staple. This is

AN IMPORTANT POINT

many times overlooked by men in charge. The general rule is to set at this point the same for all lengths of staple. This is wrong, because in short-staple cotton the feed plate should be set closer than for long stock. For example, suppose the feed plate is set to licker-in at 7 gauge for 1⅛-inch stock and we will say that this gives the distance from bite of feed roll to licker-in 1¼ inches. Now we change to 1¾-inch Sea Island stock. If we do not reset the feed plate we are almost sure to break the fibre, and if the cotton is stapled at the front of card and compared with the staple at the back, it will be seen that this is what is being done. Of course the proper remedy for this is to get a feed plate with the proper shaped nose for each length of staple, but it is not always possible to do so; the

NEXT BEST REMEDY

is to set the feed plate farther back or to slow down the speed of your licker-in, so that the fibres will not be struck away from the feed roll so quickly. If the setting at this point is the same for all staples and gives a variation of ½-inch length in staple at front and back, note result. If the staple breaks, it is weakened so much. Set top flats to 12 gauge at back and to 10 gauge at other setting points. Set front stripping plate to 22 gauge at bottom and at top set from a 7 to a 12 gauge, according to the strip wanted.

At the sliver lap machine the doublings are 14 into 1 for an 8¾-inch lap, the weight of a yard of lap being 295 grains. These are doubled 6 into 1 at ribbon lap, the weight being 275 grains per yard. At the comber these laps are doubled either six or eight into one according to the number of heads. For a 6-head comber the sliver at coiler should weigh 45 grains per yard; speed of comber, 90 nips per minute; percentage of waste, 15; and draft about 27.50. Use same setting and timing as given in previous articles. At

THE DRAWING FRAME

two processes are used, the doublings being 6 into 1 at each process. The speed of front roll at each process should be 400 revolutions per minute, and the weight of the sliver at the finisher drawing should be 70 grains per yard. At the slubber this is made into .60 hank roving and is put through two processes of fly frames, the hank roving at each process for the 50s warp being 2.50 at first intermediate, and 10 hank at second process. For the 30s the hank roving at the first intermediate is 2 and at the second process 6 hank. Look out for the points that have been explained in previous articles. At the spinning room the roving for warp yarn is spun into 50s under the following conditions: diameter of ring, 1½ inches; length of traverse, 6 inches; twist per inch, 31.80; spindle speed, 10,000 revolutions per minute. The filling yarn is mule spun, with 2.75 times the square root of count for standard twist.

Dyeing Particulars.

NAVY BLUE.

Four per cent naphtamine blue 2 B; 25 per cent Glauber's; 3 per cent sal soda.

PINK.

One-half per cent Erika pink G; 20 per cent Glauber's; 1 per cent sal soda.

SKY BLUE.

One-half per cent diamine sky blue F F; 10 per cent Glauber's; 1 per cent sal soda.

PEA GREEN.

One per cent diamine sky blue; ½ per cent chrysophenine; 20 per cent Glauber's; 1 per cent sal soda.

ECRU.

One-half ounce naphtamine brown N; 1½ ounces naphtamine yellow N N; 10 pounds salt; 1 per cent sal soda.

YELLOW.

One per cent direct yellow G conc.; 20 per cent salt; 1 per cent sal soda.

RED.

Three and one-half per cent direct

scarlet B conc.; 25 per cent salt; 2 per cent sal soda.

BROWN.

Four per cent naphtamine brown R G; 30 per cent salt; 2 per cent sal soda.

GREEN.

Four per cent diamine green G; ½ per cent diamine fast yellow B; 25 per cent salt; 3 per cent sal soda.

BOOK MUSLIN.

Book muslin is a textile term that is somewhat of a misnomer, not having any connection with fabrics used for book coverings. The goods are used very extensively for stiffening and lining clothing and for the foundation work of ladies' hats; they are distinguished more by the feel or finish than by appearance. They vary in appearance from plain weave to small checks. Being made more for utility than effect, fancy weaves are not called for or

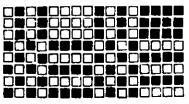


Fig. 1.

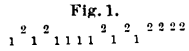


Fig. 2.

Fig. 3.

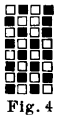


Fig. 4

necessary. One of the principal weaves used is a leno, one end crossing one.

An analysis of a book muslin sample shows the following data: Finished width, 32 inches; 24s yarn in both warp and filling, 54 ends and 45 picks per inch.

The weave is shown in Fig. 1, being on 16 ends and 8 picks. The general effect is shown by 8 ends and 8 picks, the next 8 ends differing only in the plain weave being reversed. Fig. 2 shows the harness draft and Fig. 3, the reed draft. The warp yarns average 8 ends in 5 dents, there being 16 ends in 10 dents per pattern. The 4 ends working as 1 are drawn through one heddle. The chain draft is shown at Fig. 4, the working of the first two, or selvedge, harnesses being plain.

Stop pegs are not required, the 3 picks in 1 shed coming into contact with each other.

Another book muslin fabric under consideration contains the same counts of yarns as the other sample. The count of this cloth is 43x38, and the width 35 inches finished. The weave is plain.

Book muslins are usually woven white and piece dyed in solid colors.

LOOM REQUIRED.

Any of the three classes of weaves mentioned may be woven on single box, fast, light running looms. The sample analyzed would require a dobby loom. The leno and plain weave samples could be woven best on cam looms. One beam only is required.

FINISHING.

Before finishing, the goods feel very sleazy. The effect obtained by finishing is to change this cloth into a very stiff, board-like fabric. Goods for linings are sized the least; those for stiffening and millinery purposes are sized heavily.

After being woven, the cloth is washed, dyed, dried, sized, dried and folded as desired. No burling, singeing or shearing is required, as perfect cloth is not absolutely essential and the glue or size, combined with the pressing, lays the loose fibres.

In sizing, the cloth passes through the size box and on to the drying cylinders. If a glazed finish is required, it is subjected to pressure by the heated rollers of the calender machine.

The sizing substances are usually glue, gum, flour and size, of variable proportions, mixed with water to the desired consistency. The weight of size in a piece will vary from about 5 per cent to 40 per cent of the entire weight.

Carding and Spinning Particulars.

The yarns that make up book muslin are made in mills of the first and second divisions. For this class of fabric a short-staple medium grade of cotton is used. The general staple is about one inch. In the better qualities of this fabric only the raw stock is used in the mixture, but the poorer qualities contain a certain percentage of waste, either comber or card being used according to the quality required. For this article we will consider that the mixture is made up without waste.

THE MIXING

for this class of cotton should be as large as possible because production is looked to more than quality, but the

quality should be as good as possible. The cotton is put through an opener and three processes of pickers. The speed of the beater of the opener should be 1,050 revolutions per minute, the fan on this machine making 350 revolutions per minute. This opener is generally directly connected to the breaker picker. This picker may be provided with either a pin, or, as it is sometimes called, a carding beater, or a rigid type having either two or three blades. If a two-bladed rigid beater, the speed should be 1,500 revolutions per minute; if a three-bladed beater, the speed should be reduced to 1,000 revolutions per minute. The fan speed should be 1,400 revolutions per minute. The draft of this picker should be about 1.85. The

WEIGHT OF THE LAP

at the front should be, total, 40 pounds; weight per yard, 16 ounces. These laps are put up and doubled 4 into 1 at the intermediate picker. The beater of this picker, if a two-bladed rigid type, makes 1,450 revolutions per minute with a fan speed of 1,050 revolutions per minute and a draft of 2.80. The total weight of lap at the front is 38 pounds or a 10-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. The speed of this beater, if two bladed, should be 1,450 revolutions per minute; fan speed, 1,100 revolutions per minute; draft, 2.80; weight of laps at front, 39 pounds or a 14½-ounce lap. The stock passing through this machine with these speeds receives about 41 blows or beats per inch. At the card the speed of the licker-in varies from 300 to 350 revolutions per minute, according to make of card. The speed of flats is 1 revolution every 45 minutes (110 flats).

THE CARDS

should be stripped at least three times a day and the doffer should be stripped an extra time if a very large production is being turned off. Use a coarse wire fillet for both doffer and cylinder for cards on this stock, and use settings given for indigo prints in a previous article. The draft of the card should not exceed 100 for this class of goods. The weight of the sliver should be 65 grains per yard and the production 850 pounds for a week of 60 hours. Grind cards as previously stated. The card sliver is next put through two processes of drawing, the doublings being 6 into 1 at each process. The speed of the front roll is 400 revolutions per minute for leather top rolls and 375 for metallic top rolls. Metallic top rolls will be found to be

AN ADVANTAGE

on this class of stock, but should be looked after to see that they are properly set. Generally speaking, metallic rolls should be set 3-16ths of an inch farther apart than leather top covered rolls. If metallic rolls are used, care should be taken to see that they are the same distance apart their entire length, because if they have sprung, cut work will be the result. The flutes of these rolls should be kept clean and the bearings well oiled and clean or bad results will be obtained. The weight of the sliver at the front of both breaker and finisher drawings should be 72 grains per yard. Drawings should be sized four times a day. The drawing should be put up to the slubber and made into .50 hank roving and put through two processes of

FLY FRAMES.

At the first intermediate it is made into 2 hank roving and at the second 5 hank. Of course these hank rovings will depend a great deal on the way a room is balanced and the amount of production to be turned off. Sometimes two different stocks of the same length of staple will be run together at the slubber and first intermediate frames that are going to be made into two different counts of yarn. This is often done in rooms where there are not enough frames to have each frame run a different stock, so that it may be necessary to alter the draft and hank roving of one or both stocks to the best advantage of each. Thus it will be seen that the hanks and drafts given here may be used as a foundation from which to work, and used if each machine is using this one staple, and grade and kind of cotton. The roving is taken to the spinning frame and made into 24s yarn. At the warp frame use a 2-inch diameter ring, 7-inch traverse, 23.27 twist per inch and 9,400 revolutions per minute spindle speed. For a filling frame use 1½-inch diameter ring, 6½-inch traverse, 15.9 twist per inch and a spindle speed of 7,600 revolutions per minute. A heavy sizing is used for this class of goods.

Dyeing Particulars.

Dyed on the jig machine.

BLACK.

Five per cent oxydiamine black A T; 3 per cent sal soda; 20 per cent salt.

BROWN.

Five per cent diamine brown B; 1

per cent diamine fast yellow B; 2 per cent sal soda; 25 per cent salt.

SLATE.

One and one-half per cent diamine black B H; 2 ounces diamine fast yellow B; 2 per cent sal soda; 25 per cent salt; make up a starch liquor with 10 ounces dextrine; 1 gallon water; mix cold. Add a little color to match shade required, and boil well for one hour. Starch on mangle and dry on the tenter frame.

MULL.

Mull may be defined as a thin, plain woven fabric, of which there are several varieties, as Swiss, India, starched, China or silk. The China or silk mull is a union fabric, usually with cotton warp and silk filling. This is the finest fabric of the above-mentioned varieties and is used exclusively for dress goods.

The Swiss and India mulls are fine, soft-bleached cotton fabrics, principally used for dress goods.

THE STARCHED MULL

is somewhat coarser than the Swiss or India mull and is used principal-

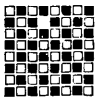


Fig. 1.
Design.

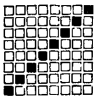


Fig. 2.
Draft.

ly for stiffening in various parts of a dress, usually dresses of unwashable material, and is also used as a foundation for ladies' silk trimmed hats, curtains, etc. Starched mull is a plain, loosely woven fabric and is stiffened in the finishing process by sizing.

These various qualities of mull differ in point of texture considerably from one another; the silk mull is in point of texture twice as fine as some grades of cotton mull.

The China or silk mull and also the cotton mull used for dress purposes are characterized by their

SOFTNESS.

This feature is partially brought about by the materials used and partially by the finish which the fabric receives. The silk mull requires less attention in finishing, as the materials used in the construction of the fabric, the silk filling in particular, and the high grade of the cotton warp, are in themselves conducive to producing a soft fabric.

In the cheaper grades of cotton mull, wherein the coarser counts of yarn are used, the warp yarn must first be well sized so as to withstand the tension and strain incurred during the process of weaving. This sizing, while it strengthens the warp yarn, imparts to the fabric a harsh handle or feel, due to the ingredients used in the size, which may be wheat, flour, farina or sago and a small quantity of softening materials, usually tallow or wax. The softening materials are necessary in order to make the yarn pliable; otherwise it would be inclined to be too brittle to weave readily. After the fabric is woven and ready for the finisher it is subjected to a

WASHING PROCESS,

which takes out all the sizing materials in the warp yarn, after which the fabric is subjected to a combination of sizing materials for the sole purpose of softening the fabric. The above process applies more particularly to the all-cotton fabrics.

This class of fabrics—mull—requires very little ingenuity on the part of the designer to produce, there being no ornamental features or fancy weaves. The goods are plain woven, depending for their beauty or attractiveness entirely on the finishing. Mull made for dress goods is of fine texture, and is finished very soft, while the fabric intended for lining or decorative purposes is much coarser in texture than the dress fabric, and is stiffened in the finishing and commonly known as starched mull.

The goods are usually

WOVEN IN THE GRAY

and the bulk of them are finished pure white or bleached, although these fabrics may be obtained in almost any color desired.

The China or silk mull is usually, like the all-cotton fabric, finished undyed. In the former case, however, the cotton yarn is bleached in the hank. The silk filling used in this fabric is raw silk, viz., tram silk. This is soft and very pliable and lends itself readily to the production of a soft fabric. The filaments of raw silk cannot be spun into a thread like wool and cotton, as they have no peculiarities of surface that correspond to the scales on the surface of the wool fibres; the wool fibres, when spun into a thread, are arranged so that these scales are opposed to one another as much as possible and thereby interlock and hold

fast to one another, and the more the threads are spun, the closer they engage one another and in consequence produce a stronger thread. The peculiarities of the cotton fibre are its twists. The cotton fibre under the microscope appears as a thin flat tube or ribbon, considerably twisted; these twists in the fibres give strength to the thread by interlacing with one another somewhat on the order of the scales in the woolen threads. In silk, however, the filaments can only be made into a thread by twisting a number of the filaments into fine threads, and these threads are again twisted until a thread of the desired count is obtained. Following is an

ANALYSIS

of a cotton and silk fabric:

Width of warp in reed, 28½ inches; width of fabric finished, 27 inches; ends per inch in reed, 76; ends per inch finished, 80; ends in warp including selvedges, 2,200; reed, 1,400x2; warp yarn, 1-60s cotton.

Filling, one dram silk, tram; 54 picks.

ANALYSIS OF STARCHED MULL.

Width of warp in reed, 33¼ inches; width of fabric finished, 30 inches; ends per inch in reed, 36; ends per inch finished, 40; ends in warp including selvedge, 1,220; reed, 1,300x1; warp 1-50s cotton.

Filling, 1-54s cotton; 36 picks.

LOOM REQUIRED.

Any ordinary single box loom may be used for weaving this fabric. The speed of the loom is the most important consideration if the selection of loom be optional; the finer grades of mull are usually woven on eight harnesses, straight draft, while the coarser grades are confined to four harnesses, drawn in the following order: 1, 3, 2, 4.

FINISHING.

Mull made for dress goods is of a very fine texture and softened in the finishing. This is accomplished by immersing the fabric in a solution of oily matters, the ingredients being composed of a liberal percentage of glycerine or cocoanut oil and a very small quantity of farina. Chloride of magnesium may be used with good results. This is a very powerful softener, as well as a weighting material, and has a great affinity for water, and has the power of attracting moisture to the cloth in which it is used. This attraction of moisture really constitutes the softening effect. The above method of softening applies in particular to all-cotton mull. In the silk filling goods the fabric is usually only boiled off, then run through a rotary press.

For stiffening the fabric, the goods, after they are bleached, are immersed in a solution of size composed of flour, tallow, and gum arabic; this stiffening is done in front of the drying cylinders, the goods running through the sizing trough on to the cylinders, which completes the finishing.

Bleaching Particulars.

Boil with 4 degrees Tw. caustic soda in a kier for 12 hours, and run through washing machine.

Give a second boil with 4 degrees Tw. caustic soda.

Wash through machine and run through solution of chloride of lime at ½ degree Tw. Place in bin for two hours. Pass through a solution of sulphuric acid ½ degree Tw. Pass through washing machine till all trace of acid is eliminated.

Starching Particulars.

One gallon: 4 ounces dextrine, 4 ounces cornstarch. Boil for one hour and starch through mangle.

Dry on the tenter frame.

LINON.

Linon, usually termed India linon or India linen, is a fine, closely woven plain fabric well known for its excellent wearing and washing qualities. It is made from combed cotton yarns of long-stapled stock.

It is made in various widths, from 27 inches to 36 inches, and in slightly varying constructions and qualities. The goods are made to resemble as closely as possible fine linen fabrics. The cloth structure is firmly made in the loom.

The analysis of a good quality India linon fabric shows the following data: Ends per inch, 108; picks per inch, 110; finished width, 36 inches; warp, 90s; filling, 110s. Each selvedge consists of 16 ends of 2-90s.

The yarns were reeded 2 ends per dent in the loom. The selvedges were also reeded 2 ends per dent, i. e., 2-ply yarns. Two of these would be equal to 4 of the single yarns.

Woven with about 94 ends per inch in the loom, it will be seen that a very

fine reed has been used. This was necessary in order that an even surface, practically free from reed marks, should result.

LOOM REQUIRED.

The goods may be woven on a single box plain loom of not too light construction. On account of the fairly large number of picks per inch and the fine quality of cloth, a firm, steady take-up motion on the loom is necessary.

The ends are drawn in in the regular 1, 3, 2, 4 skip shaft order, on twine harnesses. One warp beam only is required. Practically all fabrics usually woven on cam looms may also be woven on dobby looms, if necessary.

To weave the fabric under consideration, on a dobby loom, the ends should be drawn in straight on at least 8 harnesses to prevent overcrowding of the heddles.

FINISHING.

A good finish for these goods is to singe, wash, bleach, size or starch with a light Indian corn or potato starch, the former material being preferable; then calender, dry and make up as required. A second dampening and calendering, following the first calendering, improves the quality of the finish. Very little stiffening or starch is used because the goods are intended to be washed frequently. When finished, the goods have the appearance of a smooth linen finished lawn. They are slightly glossy.

Carding and Spinning Particulars.

The division of mills that make the yarns that India linon is composed of is the third. This division of mills, as given in a previous article, is the one that makes the finest yarns and is equipped with machinery suitable to do this. India linon is made from a good quality of Sea Island cotton of about 1⅝ to 1¾ inch staple. For this class of goods it is quality and not quantity that is the main consideration. The cotton is mixed as has been described in previous articles, the good sliver being mixed in at this point, as well as laps that are too light and cut sliver waste, if any is made at any of the processes. Some overseers put cut sliver through the last process again, and let it go at that, but the only proper method to remedy this kind of work is to put it back into the mixing.

FOR THIS FABRIC

the cotton is put through two processes of pickers, and an opener. The opener should be kept as full as possible so that as even a feed as possible will be obtained. The breaker picker is generally equipped with a two-bladed rigid type of beater, the speed of which is 1,200 revolutions per minute. Some overseers prefer a pin beater, but others claim that it puts neps into long-staple cotton. This is undoubtedly due to improper setting as well as not running it at the proper speed. The weight of the lap at the front of this picker is 32 pounds or a 9¾-ounce lap. These laps are doubled 4 into 1 at the finisher picker. This picker has a two-bladed beater, whose speed is 1,050 revolutions per minute, or about 29 beats per minute. The speed of this beater should be just high enough to get the dirt out of the cotton and not injure it. The total weight of the lap at the front of the picker is 30 pounds or a 9½-ounce lap. A variation of 6 ounces either side of standard is allowed; if laps weigh outside of this they are either put through the finisher picker again or if a great deal too light or too heavy they are put back into the mixing again. These laps are put up at the card. The cards used for this stock should be kept free of all dirt, etc., and the card fillet should be kept sharp and parts properly set to each other. The flats should make

ONE COMPLETE REVOLUTION

every 35 minutes, the licker-in speed should not exceed 280 revolutions per minute, and the weight of the sliver at the front should be 40 grains per yard. It is an important point that the cards should be kept extra clean. The production of a card for a week of 60 hours should not exceed 275 pounds. The draft should be not less than 130. After passing through the cards, the sliver is generally put through sliver lap, ribbon lap and comber processes. At the sliver lap the doublings for an 8¾-inch lap are 14 into 1. The weight of a yard of lap at the front of this machine is 220 grains. These laps are put up at the ribbon lap machine and doubled 6 into 1. The weight of a yard of sliver at the front of this machine is 210 grains. These are put up at the comber and doubled 6 into 1 if a six-head comber, or 2 into 1, if comber is an eight-head comber. Set and time the comber for this stock the same as given in a previous article on Sea Island cotton. Keep all parts of comber that the cotton comes in contact with well polished and free from dirt. If more than one end

breaks on the table the sliver at the front should be broken before entering the coiler and the broken ends pieced up before the sliver is allowed to enter can. If any single has entered the can, it should of course be removed and the end properly pieced again; be sure and make a good piecing, not one that will break back at the succeeding process or one that will not draw out. The sliver is then put through three processes of drawing, the doublings of which are all 6 into 1. The weight of the drawing at the front of the finisher drawing should be 65 grains per yard. For

THIS CLASS OF WORK

leather top rolls are generally used. These should be kept well oiled and varnished and in perfect order. The drawings should be sized four times a day and the ribbon lap at least once a day. Look out to see that your stop-motions are all in perfect order and working. Be sure that there are no laps on the third bottom steel roll or in fact on any roll, as this will tend to produce cut sliver as well as throw the size out. Keep drawing on heavy size of standard weight. This sliver is next put up at the slubber and drawn into .80 hank roving. The bottom steel rolls should be a little larger in diameter than when used for shorter staple. This is in order to prevent licking. The clearers on the slubber should be picked frequently and not allowed to collect until they drop down and pass into the work. The hank roving at the fly frame is as follows: for filling first intermediate, 2.25 hank; second intermediate, 5 hank; fine, 20 hank; for warp yarn,first intermediate,2.25 hank; second, 5 hank, and fine, 18 hank; for the selvedge yarn use the same hank roving as for the warp yarn. On this grade of stock the slubber rolls should be varnished and some overseers varnish the front rolls of their first intermediate frame. The leather top rolls should be

IN PERFECT CONDITION

and special care should be given to the rail or carriage and the parts that operate it to see that they change sharply and that there is no dwell at the top and bottom of the bobbin, for this may cause it to run over or under and make a bad bobbin, or if this does not happen, it will break back at the spinning frame or mule every time it gets to the top or bottom of the bobbin, thus causing a lot of trouble, besides the liability of singles, which should be looked out for at all processes. Full bobbins should never be thrown into the boxes, but should be packed. The roving for filling may be taken to either the mule or spinning room; if the latter, use a frame having a 5-inch traverse, 1¼-inch diameter ring and a spindle speed of 7,400 revolutions per minute. This yarn is then conditioned,then it is ready to use. The warp yarn is frame spun on a frame having a 2¾-inch diameter ring; 5-inch traverse, and a spindle speed of 9,400 revolutions per minute. This yarn is put through the spooler and warping processes and from here to the slasher, where sufficient beams are put up at the back to give the required number of ends at the front. For this class of goods the following size mixture may be used: Water, 100 gallons; potato starch, 70 pounds; tallow, 7 pounds; Yorkshire gum, 3 pounds; white soap, 2 pounds; boil two hours and let stand ten hours. Before using, keep agitator running, and keep size at almost boiling point.

Dyeing Particulars.

PINK.

Two ounces diamine fast scarlet 4 B; ½ pound sal soda; 20 per cent Glauber's salt.

PEARL.

Two ounces thion violet black A; 3 ounces thion black T B C; 1 per cent sulphide sodium; 1 per cent soda ash; 20 per cent salt.

NAVY BLUE.

Ten per cent immedial indone B B; 10 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

LIGHT BLUE.

Five per cent immedial sky blue F; 5 per cent sulphide soda; 1 per cent soda ash; 20 per cent salt.

ECRU.

Four ounces thion brown G; 1 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

SAGE GREEN.

One per cent thion green G; ½ per cent thion yellow G; 1½ per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

BROWN.

Eight per cent thion brown G; 2 per cent thion brown O; 10 per cent sulphide sodium; 2 per cent soda ash; 30 per cent Glauber's.

MYRTLE GREEN.

Two per cent thion yellow G; 6 per cent thion green G; 8 per cent sul-

phide sodium; 2 per cent soda ash; 30 per cent Glauber's salt.

SLATE.

Four ounces thion black T R; ½ per cent sulphide sodium; 1 per cent soda ash; 15 per cent Glauber's salt.

TAFFETA SILK LINING OR TAFFETINE.

This is a fabric made with a silk warp, cotton, linen or wild silk filling. Taffetine is a term variously used at different times; specifically it is a fine, glossy, closely woven, uncorded and untwilled fabric, used entirely for ladies' wear in the form of a lining, underskirts, etc. Taffetine derives its name from the more costly fabric, taffeta. This fabric is of

QUITE ANCIENT ORIGIN,

being in use as early as the 16th century as a dress fabric for both men and women. Taffeta of the 16th century was a thick, costly fabric, made with silk and wool. In the 17th century the fabric was defined as a soft, thin fabric. In the transition the goods have undergone a complete change of texture and in the 18th century taffeta was a very lustrous silk fabric, sometimes checked or flowered or striped with gold and silver.

The taffetine under consideration is a fine, plain-woven fabric with warp threads per inch greatly in excess of filling threads per inch and the warp of a much finer count than the filling.

THE FINEST QUALITIES

of fabrics are made on this basis. The warp yarn for these goods is invariably raw silk, technically known as organzine or thrown silk, and the filling may be cotton, linen or artificial silk.

The raw silk used for filling in silk fabrics is technically known as tram silk. This is similar to the organzine; the difference lies in the twisting of the filaments. These filaments are put together very loosely with

LITTLE OR NO TWIST;

consequently, they are not as strong as the more firmly twisted fibres, but sufficiently strong to answer as filling.

When the filaments cannot be drawn from the cocoon in one continuous thread, due generally to the cocoon being damaged by the worm in eating its way out, these cocoons are torn up and the filaments are combed and laid paralliel to one another, and the thread made from the damaged cocoons is known as spun silk.

The spun silk is not as smooth or as fine as the raw silk thread, although some of the fibres are of considerable length and strong enough to be used for warp threads. Spun silk is calculated by the weight of 1,000-yard same basis as cotton, namely, 840 yards to 1 hank, or, 840 yards of No. 1s equal one pound. Raw silk is calculated as to the size of thread, on the hanks in drams avoirdupois; thus, if one hank weighs 1 dram, it is known as 1 dram silk, or 256,000 yards equal 1 pound.

THE FILLING

for these fabrics is either cotton, linen or wild silk. Linen filling is used in the best grades of taffetine; linen yarn is prepared similarly to worsted thread, notwithstanding that linen is a vegetable fibre. The raw flax is first beaten or crushed in order to make it pliable; then it is combed, or passes through the process technically known as scutching. Flax fibres must be of a certain length in order to work properly. If too long, they are broken in a machine called a saw.

After the fibres are combed they are carded and the long fibres are spun into linen yarn, while the short fibres are converted into what is known as tow yarn. Taffetine is sold in both narrow and wide widths. The narrow fabric is usually about 19 inches wide. This narrow fabric is commonly

WOVEN DOUBLE WIDTH,

then cut in two after the fabric is woven.

In order that the ends may not fray out after the fabric is cut, the goods are made with a fast centre selvedge. In warping, extra ends are allowed just as in an ordinary outside selvedge. In the centre of the warp, these ends are reeded double as is the common practice for reeding selvedges, leaving one or more dents empty where the fabric is to be cut.

Fast centre selvedges are extensively used in the manufacture of ribbons, scarfs, cheaper grades of cassimeres and, in fact, any fabric characterized by its narrowness.

The fast centre selvedge consists of crossing one thread over two or more threads, similarly to the douping of threads in leno weaving.

See diagram, Fig. 1.

The douping or crossing of threads is effected by an attachment on the back of the loom, directly in the cen-

tre of the loom if but two pieces are to be woven; the threads that are crossed rest stationary in the attachment, while the crossing threads cross over from one side to the other at each pick or every two picks as may be desired. The crossing thread and the threads over which it crosses must be reeded in the same dent, as in leno weaving.

ANALYSIS.

Width of warp in reed, 40 inches, double width; width of fabric finished, 19 inches, single width; ends per inch finished, 106; ends per inch in reed, 100.

Reed, 50x2; ends in warp, double width, 3,920; outside selvedges, 80; centre selvedges, 80; equals total of 4,080 ends in warp.

Take-up during weaving, 10 per cent; warp, 1¼ dram organzine silk.

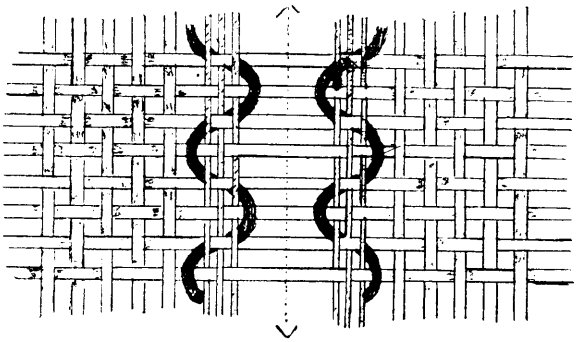


Fig. 1.

Dotted line indicates where fabric is to be cut.

Filling, 1-50s combed and gassed cotton; 88 picks per inch.

LOOM REQUIRED.

Plain woven silk warp fabrics may be woven on any light smooth-running loom. The essential consideration is the heddles. For this class of fabrics the French string heddles are considered the best, as they are less liable to break or chafe the warp during the process of weaving in comparison with the ordinary wire heddle.

FINISHING.

The goods require little in the way of finishing. After the fabric is dyed it is slightly stiffened by immersing in a light solution of size. The stiffening and the materials used in the construction of the fabric produce a crisp and rustling effect.

Carding and Spinning Particulars.

Taffetine is composed of yarns made in the second division of mills as given in a previous article. These mills are equipped with combers. The warp yarn of the fabric under description is silk and the filling yarn is cotton. For this class of fabric two kinds of raw stock may be used, either a medium staple Sea Island cotton, or an Egyptian cotton. We will assume that an Egyptian cotton of good grade and of 1⅜-inch staple is used. As Egyptian cotton is

MORE EASILY WORKED

than American cotton, the speeds at which the different machines are run are higher, as will be noted by comparing this article with some of the other articles in which an American cotton of the same grade and length of staple has been described. Egyptian bales of cotton are baled better and compressed more tightly than American bales, the average weight being 800 pounds, instead of 500 pounds, as compared with the American bales. The cotton should be allowed to stand in the bins a little longer than the American bales, so as to allow the cotton to expand. The good waste from the machines up to the slubber is put into the mixing. The cotton is then passed through either two or three processes of

PICKING

and an opener. Keep the opener well filled with raw stock so that as even a feed as possible may be obtained. The speed of the beater at the breaker picker is 1,500 revolutions per minute and the total weight of the lap at the front is 40 pounds or a 20-ounce lap. These laps are doubled 4 into 1 at the intermediate picker. The speed of this beater is 1,450 revolutions per minute. The total weight of the lap at the front is 37½ pounds or a 12-ounce lap. The

doublings at the finisher picker are 4 into 1, the speed of the picker being 1,450 revolutions per minute. The total weight of a lap at the front of the picker is 35 pounds or a 12½-ounce lap. These laps are put up at the card. The licker-in speed is 350 revolutions per minute. The flats make one complete revolution every 30 minutes, and the cylinder 160 revolutions per minute. The draft of the card for this class of goods is 135. The sliver at the front weighs 45 grains per yard and the production for a week of 60 hours is 550 pounds. Use the same

SETTINGS AT THE CARD

as have been previously given for 1⅜-inch-staple American cotton. The grinding and stripping times are also the same. The sliver is next put through a sliver lap machine, when it is doubled 14 into 1 for an 8¾-inch lap. The draft of this machine is about 2. The bottom steel rolls are spread as follows for this staple of cotton: Front to middle, 1⅝ inches; middle to back, 1⅞ inches. The weight of a yard of lap at the front is 295 grains. These laps are doubled 6 into 1 at the

RIBBON LAP MACHINE.

The bottom steel rolls of this machine are spread as follows: Front to second, 1½ inches; second to third, 1⅝ inches; third to back, 1¾ inches. The weight of a yard of lap at the front of this machine is 275 grains. A size of the lap at this machine should be taken once a day. A variation of 2 grains either side of the standard is allowed before changing the draft gear. These laps are put up at the comber and doubled according to the number of heads that the comber contains—generally 6 or 8. If a six-head comber is used, six laps would be put up at the back. The percentage of waste taken out for this stock is 18. The settings of the draw box rolls are: Front to middle, 1 7-16 inches; middle to back, 1½ inches. The speed of the comber is 90 nips per minute. The timings and settings are the same as given in a previous article. The percentages of the combers should be taken regularly, the general method being to take so many combers a day. Keep needles in good condition and straight and free from waste. See that the half lap needles are in good condition, and that the timings and settings are as they should be. About two combers a week should be scoured by a comber man and his helper. The weight of a yard of sliver at the coiler of this machine is 40 grains. This sliver is next put through two processes of

DRAWING FRAMES,

the doubling being either 6 ends up at both processes or, as is often done, 8 ends up at the breaker and 6 ends at the finisher. The weight per yard of the sliver at the finisher drawing is 74 grains. The top rolls used may be either metallic or leather. The settings of the rolls are as follows: Front to second, 1½ inches; second to third, 1⅝ inches and third to back, 1¾ inches. This setting is for leather rolls. If metallic rolls are used, set ⅛ of an inch wider. Size at the drawing frame four times a day. At the slubber the sliver is drawn into .50 hank roving, after which it is put through three processes of fly frames, the hank roving at each process being as follows: First intermediate, 1.25; second intermediate, 3; and fine frame, 10 hank. This cotton requires 1 tooth more twist than American cotton for the same hank roving. Set the jack frame bottom steel rolls as follows: Front to middle, 1 7-16 inches and middle to back, 1½ inches. Size 10 hank roving once a day. Watch the usual points at the speeders that have been already pointed out in previous articles.

THE FILLING

is either mule or frame spun, generally mules being used for this class of goods. If frame spun, the requirements of a frame are as follows: Gauge of frame, 2¾ inches; diameter of ring, 1¼ inches; length of traverse, 5½ inches; speed of spindles, 8,200 revolutions per minute. The yarn is then run over or through a gas flame to take off all fuzz and give it a lustre.

Dyeing Particulars.

The dyeing of goods composed of silk and cotton is generally done in open vats provided with a winch, in some cases also on a jigger if the material to be dyed requires it. Colors which dye silk and cotton are used, dyeing first with the substantive color, with soap and phosphate of soda, or common salt and a little sal soda. Should the silk require colors to be made a little brighter, acid colors are used in a bath of soap and acetic acid, or a basic color is dyed in a soap bath with acetic acid, the color dyeing both the cotton and silk a brighter shade. For pale shades: 10 gallons liquor; 5 ounces soap; ½ ounce sal soda; 3 ounces phosphate soda. For heavy shades: 10 gal-

lons liquor; 6 ounces soap; ½ ounce sal soda; 6 ounces phosphate soda; 10 ounces Glauber's salt. The temperature of the dye bath is generally about 195 degrees F. After dyeing, the pieces must be well rinsed, and raised with acetic acid, in cold water: 10 gallons water; 1½ pints acetic acid.

BLACK.

Eight per cent union black S; 1 per cent diamine fast yellow A; 30 per cent Glauber's; 2 per cent sal soda; 2 per cent soap. Top with alizarine black 4 B.

SEA GREEN.

One-half per cent diamine black H W; 4 ounces diamine fast yellow B; topped with new methylene blue N; new phosphine G.

For 10 gallons dye liquor: 6 ounces soap; ½ ounce sal soda; 3 ounces phosphate soda.

NAVY BLUE.

Three per cent diamine dark blue B; 1 per cent diamine brilliant blue G; topped with new methylene blue N X; metaphenylene blue B; indigo blue N.

PEARL.

Two ounces diamine gray G; 1-16 ounce diamine brown M; topped with aniline gray B.

SLATE.

Ten ounces diamine gray G; ⅛ ounce diamine brown M; topped with cyanol extra, orange extra.

LIGHT MAUVE.

One ounce diamine violet N; ½ ounce diamine brilliant blue G; topped with methyl violet B I.

VIOLET.

One per cent diamine violet N; ½ per cent diamine brilliant blue G; topped with methyl violet B I.

PINK.

Two per cent diamine rose B D; topped with rhodamine G.

RED.

Three per cent diamine fast red F; topped with safranine S 150; acid violet 4 R S.

SKY BLUE.

Four ounces diamine sky blue F F; topped with cyanol extra.

LIGHT BROWN.

One per cent diamine brown B; ½ per cent diamine yellow B; topped with Bismarck brown F F; thioflavine T.

MYRTLE GREEN.

Two per cent diamine black H W; 2 per cent diamine green B; 1 per cent diamine fast yellow B; topped with brilliant green; new methylene blue N.

SCARLET.

Three per cent diamine fast scarlet G B; ½ per cent diamine orange D C; topped with safranine G G S; tannine orange R.

CREAM.

One-quarter ounce diamine gold; ¼ ounce diamine orange B; 1-16 ounce diamine fast yellow B.

STEEL.

One-eighth ounce diamine gray G; topped with cyanol extra; aniline gray B.

VICTORIA LAWN.

Victoria lawn is a fabric resembling to a great extent a fabric previously explained, linon. It is usually made with slightly heavier yarn in the warp and contains a greater number of ends and picks per inch. It is very firmly woven.

It is especially used for aprons and ladies' heavy undergarments, having excellent wearing and washing qualities.

The usual widths are from 32 inches to 36 inches.

They are made in different grades. Retail prices for some are 12 and 15 cents for the 32-inch width, 23 cents, 27 cents, 32 cents and 38 cents for the 36-inch width.

A typical fabric, weighing about 8¾ square yards per pound, is constructed as follows: 124 ends per inch, 120 picks per inch, 36 inches wide, finished.

CALCULATIONS.

Thirteen square inches of the cloth under consideration weigh 8 grains. To find the number of yards per pound:

$$\frac{13 \text{ (sq. in.)} \times 7{,}000 \text{ (grs. per lb.)}}{8 \text{ (grs.)} \times 36 \text{ (cloth width)} \times 36 \text{ (inches per yard)}} = 8.777 \text{ yards per pound.}$$

To find the average number or count of yarn in the cloth:

124 (ends per inch) + 120 (picks per inch) = 244.

$$\frac{244 \times 8.777 \text{ (yds. per lb.)} \times 36 \text{ in.}}{764 \text{ (10\% allowed for contraction and size 764 used instead of 840)}} = 100 \text{ average number.}$$

ANOTHER METHOD

of finding the average number, without taking into consideration the number of yards per pound, is as follows:

Multiply the sum of the slay and pick by the number of square inches weighed and by .254 and divide by the weight in grains.

This is a simpler method, as will be seen by comparing the number of figures that have to be used in the two methods:

$$\frac{244 \times 13 \times .254}{8} = 100 \text{ average number.}$$

.254 in the above example is a constant obtained by dividing 7,000 (grains) by 36 (inches) and by 764 (yards per hank). The latter is used instead of 840, allowing 10 per cent.

The counts of the yarns are: warp, 85s; filling, 130s.

The weight of the warp yarns may be obtained as follows: 124 (ends per inch) times 36 inches (finished width) equals 4464. 4464 plus 40 for selvedges equals 4504, total number of ends in warp.

$$\frac{4504 \times 105 \text{ (length of warp)}}{85 \text{ (counts of warp)} \times 840} = 6.623 \text{ lbs. of warp in 100 yards of cloth.}$$

6.623 plus 5 per cent for size equals 6.954 pounds, weight of warp and size.

To find weight of filling: 120 (picks per inch) times 40 inches (width in reed) equals 4,800 yards of filling in one yard of cloth.

$$\frac{4,800 \times 100 \text{ (cloth length)}}{130 \text{ (filling counts)} \times 840} = 4.392 \text{ lbs. of filling in 100 yards of cloth.}$$

6.954 lbs. warp and size.
4.392 lbs. filling.

11.346 lbs., weight of 100 yard piece.

100 divided by 11.346 = 8.8 yards per pound.

The fabric under consideration, if woven on a dobby loom, could be woven on about 8 harnesses, straight draw, the ends in the body of the cloth being reeded 4 in a dent. The selvedge ends work 2 as 1, 2 doubles in 1 dent. The weave is plain throughout. A 12-harness straight draw, the ends reeded 3 in a dent, could be substituted.

LOOM REQUIRED.

The remarks made in connection with the preceding article, minon, also apply here. A single box cam loom, firmly made, one beam, is the best to use. Dobby looms, although capable of weaving goods of this class, are not usually run at as high a rate of speed as cam looms.

FINISHING.

The finishing process includes singeing, washing, bleaching, very light starching, drying and pressing, or calendering.

STARCHING.

After a bleaching process, the pieces are given a very good starching with 4 ounces of German white dextrine to a gallon of water, boiled for one hour, and starched through a mangle, and dried over a tenter frame, care being taken to have the goods perfectly straight.

Carding and Spinning Particulars.

The counts of yarn of which Victoria lawn is composed are made in the second and third divisions of mills as given in a previous article. The counts of yarn of which the sample under description is made are 85s warp and 130s filling. Both warp and filling yarns are combed. The cotton used for the filling yarn is 1¾-inch staple Sea Island stock and that used for the filling is either a long-staple peeler or a 1⅝-inch Sea Island. We will assume that both yarns are made from Sea Island stock. The cotton would first be opened, as has been previously explained, and put through an opener, and either one or two processes of picking, generally two processes being used; but it is the opinion of a great many carders that

ONE PROCESS IS BETTER

because of the fact that the more picking this cotton is given, the more neps are liable to be put in. The mixing is generally done by hand and not by machine, for the same reason. The cotton should be passed through the opener in the usual manner and should pass on to the lattice apron of the breaker picker, if two processes are used, and from here passed

through the feed rolls and to the action of the beater. This beater is generally of the two-bladed, or armed, type, and for this cotton there should only be made sufficient revolutions per minute to take out the dirt. The speed of the beater is 1,150 revolutions per minute, if two processes of picking are used. The weight of the lap at the front of this picker is 32 pounds, or a 10-ounce lap. These laps are put up and doubled 4 into 1 at the finisher picker, the speed of the beater being 950 revolutions per minute. The beats per minute for this stock are 29. The total weight of the lap at the front is 28 pounds or a 9½-ounce lap to the yard for the 1¾-inch stock and a 10½-ounce lap for the 1⅝-inch stock. A variation of ¼ pound is allowed either side of standard for 1¾-inch stock and ½ pound for 1⅝-inch stock. It is understood that every lap must be weighed. The lap is next put up

AT THE CARD

and the draft for the longer staple should not be less than 150 and for the shorter staple 135. The flats should make one revolution every 35 minutes and the speed of the beater should be reduced to 275 revolutions per minute for the same reason as given for the reduction of the speed of the beater of the picker. The counts of the wire used for the fillet should be 35s for cylinder and 37s for doffer and top flats. Special care should be given to the setting and grinding of the fillet for these cards, the wire being always kept sharp. Use the same settings as given in a previous article for this same grade of stock. The

WEIGHT OF THE SLIVER

should be about 35 grains per yard for the 1⅝-inch stock and 32 for the 1¾-inch stock. The production is 250 pounds per week of 60 hours for 1¾-inch stock and 275 to 325 pounds for 1⅝-inch stock. Both card slivers are taken to the sliver lap machines and doubled 14 into 1 for an 8¾-inch lap. The weight of a yard of sliver lap at this machine is 220 grains. These laps are doubled 6 into 1 at the ribbon lap machine, the weight of the lap being 210 grains per yard for both stocks. The laps of the ribbon lap and sliver lap machines should be weighed once a day and the weights changed at the ribbon lap machine to keep the laps at standard weight. The laps are next put up

AT THE COMBER

and doubled either 6 or 8 into 1, according to the number of heads that the comber contains. The setting and timing of the comber for this stock have been previously given. The draw box rolls should be set from the 1¾-inch stock as follows: Front to middle, 1 13-16 inches, middle to back, 1⅞ inches. It sometimes happens that the draw box will not allow the rolls to be spread this distance and about the only method to overcome this defect in this machine, as well as in other machines where a like difficulty occurs, is to reduce the draft between the middle and back rolls so that the speed of the rolls will be equal, and set rolls just to staple, which will avoid breaking the cotton; but this has the fault of bringing all the draft between the middle and front rolls. The weight of the sliver at the comber for this stock is 35 grains per yard for both stocks. The percentage of waste taken out for the 1¾-inch staple is 25 per cent and for the 1⅝-staple is 22 per cent. This sliver is next put through two processes of

DRAWING.

These drawings should be equipped with leather top rolls and especial care should be given to the leather top rolls of the sliver lap, ribbon lap, comber and drawing frame machines. The leather detaching rolls of the comber require a somewhat rougher varnished roll than the others, the leather rolls used for the other machines having a smooth, glossy finish. The varnish used for all the rolls should be that which will prevent all licking. The weight of the sliver at the finisher drawing should be 60 grains per yard for both stocks, the doublings at each process being 6 into 1. At the slubber this is made into .80 hank roving. The front top rolls should be of a larger diameter than those used for shorter staples and should be varnished with a varnish which will give them a smooth, glossy finish. The settings should be 1⅞ inches from front to middle and 2 inches from middle to back. The slubber roving is then put through three processes of fly frames and made into 18 hank roving for 1⅝-inch stock, the hank roving at each process being as follows: 1st intermediate, 2.25 hank; 2d, 5 hank; and fine 18 hank. Sometimes the front rolls of the 1st intermediate fly frame are varnished. This yarn is next put through

THE SPINNING FRAME

and made into 85s on a frame having a 5-inch traverse, 1⅜-inch diameter

ring and a spindle speed of 9,400 revolutions per minute. From here it is spooled and warped and put through a slasher. The roving for the filling yarn is put through three processes of fly frames, the hank roving at each process being as follows: 1st, 2.25 hank, second 7.75 hank and fine 24 hank. This is mule spun into 130s and from here is taken to the conditioning room.

BIAZ, OR LINEN FINISH SUITING.

Biaz is a medium-grade cotton fabric resembling linen in appearance. This effect is usually obtained on ordinary cotton yarns in the finishing process, or in somewhat easier form, by using mercerized yarns or mercerizing the fabric in the piece. They are usually shown white.

The term biaz is an uncommon one in this country. It is an Asiatic native name, pronounced be'az.

ORIGIN.

The goods are said to have originated at Biaz, a place in the central part of Asia, and to be still manufactured there for home use and for export to Russia. The goods bearing this name are better known in America as "linen finish suitings," and are principally used for ladies' summer suitings. The eastern goods are more heavily filled with foreign matter than ours and are used for various purposes.

ANALYSIS.

The analysis of a typical biaz fabric shows the following data: Ends per inch, 56; picks per inch, 44; finished width, 32.5 inches; weight. 4.57 yards per pound; warp, 19s; filling, 20s; the ends were reeded 2 in each dent. The weight would probably be considered 4½ yards per pound.

CALCULATIONS.

To find number of yards per pound.

A small piece 4 in. x 3 in. weighs 15.7 grs. 4x3 = 12 sq. inches.

$$\frac{12 \text{ (sq. in.)} \times 7{,}000 \text{ (grains)}}{15.7 \text{ (grains)} \times 32.5 \text{ (width)} \times 36 \text{ (inches per yard)}} = 4.57 \text{ yards per pound.}$$

To find average counts of yarn in the cloth:

56 ends + 44 picks = 100.

$$\frac{100 \times 32.5 \text{ (width)} \times 4.57 \text{ (yds. per lb.)}}{764} = 19.4 \text{ average count.}$$

or

$$\frac{100 \times 12 \text{ (sq. in.)} \times .254 \text{ (constant)}}{15.7 \text{ (grains)}} = 19.4 \text{ average counts.}$$

The sizes of the yarns are about equal. For practical purposes a warp of 19s and a filling of 20s would answer.

LOOM REQUIRED.

This fabric may be made on any of the light, fast running cam looms. On account of the small number of ends per inch a set of two-twine harnesses would be preferable. One warp and one shuttle only are required.

FINISHING.

The finishing of biaz is really the principal characteristic which distinguishes it from many other plain woven cloths. It has a more glossy effect than Indian linen, one finishing process being somewhat similar to that of the latter fabric, with the beetling process added.

A finish suitable for this cloth is as follows: Bleach, mangle and dry; fill with a light starch on the starch mangle; stretch and dry. After drying and cooling, it is run through the damping machine; then through the glazed calender on both sides, under very heavy pressure. The cloth is then dampened, beetled, changed and turned, and again beetled and made up as required.

Carding and Spinning Particulars.

For biaz the same instructions may be followed as were given in the article on indigo prints, with the following exceptions:

The slubber roving is .50 hank and this is put through two processes of fly frames. At the first intermediate the roving is made into 1.20 hank and at the second into 3.50 hank. This is then passed directly to the spinning room and spun into 19s warp yarn on a frame having a 2¾-inch gauge, two-inch diameter ring, 7-inch traverse; 20.71 twist per inch and a spindle speed of 9,400 revolutions per minute. This is then spooled and warped, after which several warps are put up and run through the slasher and run upon a beam having the required number of ends wanted for weaving. The filling yarn is spun into 20s on a frame hav-

ing a 2¾-inch gauge, 1½-inch diameter ring, 6½-inch traverse, 14.53 twist per inch, and a spindle speed of 7,300 revolutions per minute, after which the yarn is conditioned.

Dyeing Particulars.

OLIVE.

Five per cent pyrol olive G; 5 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

BRONZE.

Five per cent pyrol bronze G; 5 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

BLACK.

Ten per cent thiogene black M conc.; 10 per cent sulphide sodium; 2 per cent soda ash; 25 per cent salt.

SLATE.

One per cent thion black T B C; 1 per cent sulphide sodium; 1 per cent soda ash; 10 per cent salt.

ECRU.

Three-quarters per cent thion brown G; 1 per cent sulphide sodium; 1 per cent soda ash; 10 per cent salt.

RED.

Six per cent diamine fast red B B; 2 per cent sal soda; 25 per cent Glauber's.

BROWN.

Five per cent immedial brown B; 5 per cent immedial cutch O; 10 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt.

SKY BLUE.

One and one-half per cent thion blue B conc.; 1½ per cent sulphide sodium; 1 per cent soda ash; 20 per cent salt. Develop with peroxide of hydrogen.

NAVY BLUE.

Eight per cent thion navy blue R; 8 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt. Develop with peroxide of sodium.

COBURG SUITING.

Coburg, of which there are several varieties, may be defined as a thin dress fabric made from cotton and worsted or cotton and silk.

Coburg derives its name from the city of Coburg, in Germany, where it was first manufactured. The all-cotton fabric known as coburg is an inexpensive dress fabric imitating the genuine fabric principally in the character of the weave only.

The weave for these fabrics is an

UNEVEN-SIDED TWILL,

giving the face of the goods a very pronounced twill effect. The accentuation of the twill is in part due to the number of ends per inch used in the construction of the goods. The ends per inch in the sample under consideration equal twice the number of picks per inch.

This is somewhat in excess of the number of ends required to make perfect cloth. A perfect cloth is understood to mean a cloth in which the warp and filling yarns are equal in diameter, and the space between the threads is equal to the diameter of the yarn. This principle of construction applies particularly to plain woven cotton fabrics, more so than to any other class of fabrics. In fabrics of a special construction, such as coburg, the ends per inch are more or less crowded, with the consequent result of a pronounced twill effect on the face of the

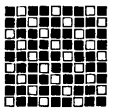


Fig. 1.

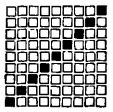


Fig. 2.

fabric, which characterizes the goods.

Cotton coburgs are commonly made with a three-harness twill weave $\frac{2}{1}$. The ends per inch required in order to produce a perfect cloth, according to the above principle of constructing a perfect fabric, with the given counts of yarn, would be as follows:

Weave repeats on three ends with two intersections. Three ends plus two intersections equals 5; as 5 : 3 :: 120, the number of ends that will lie side by side of 1-20s cotton in one inch.

Formula: 5 : 3 :: 120 : x equals 72.

The calculation shows that 72 ends and 72 picks of 1-20s would give a perfect cloth.

In some fabrics an analysis will show 120 ends and 54 picks in the finished fabric. The inequality of ends and picks per inch characterizes cloths of special construction, as the fabric in question. Cotton coburgs are principally used for dress goods, made up

into wrappers, shirtwaists, shirtwaist suits, etc. The goods are woven in the gray, then dyed and in most cases printed or bleached and then printed. The goods, however, have no particular coloring scheme or style of printed patterns. Some are finished in pure white or bleached without any printed pattern. Again they may be dyed any color desired. In most cases the goods are dyed and printed. The characters of patterns that are most popular in this class of goods are small geometrical figures or small conventionalized floral figures in but one or, at the most, two colors.

ANALYSIS.

Width in reed, 37½ inches; width,

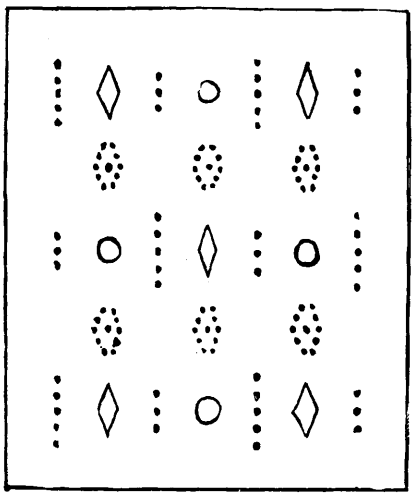


Fig. 3.

finished, 36 inches. Reed, 1,400x3; number of ends in warp, 4,374; 26 ends selvedge; equals 4,400 number of ends.

Number of ends, per inch, finished, 120; number of picks per inch, finished, 54; take-up in weaving, about 10 per cent; warp yarn, 1-26s cotton; filling yarn, 1-26s cotton.

Fig. 1. Three repeats of weave; twill running to the left.

Fig. 2. Drawing-in draft.

The warp may be drawn in on 6 harnesses; 9 harnesses would avoid crowding of the harnesses and give better results in weaving.

Fig. 3. A sample of printed pattern.

LOOM REQUIRED.

Common cotton fabrics as a rule may be woven on almost any light running high speed loom. Twill weaves, in which more than four harnesses are required, are usually woven on dobby looms. A Northrop dobby loom would answer for the class of goods analyzed. Broken or miss picks in these fabrics are hardly noticeable, the filling showing very little of itself on the face of the fabric.

FINISHING.

The goods are first all boiled off, then dyed or bleached, as may be required, after which they are slightly stiffened by running through a light solution of size, then printed, after which they are made up into laps and then shipped.

Carding and Spinning Particulars.

Under most conditions the same instructions given for indigo prints may be followed. The main point of difference is that of the hank rovings at the slubber and fly frames or speeders. At the slubber the hank roving is .40 and at the first intermediate 1.50, while at the second intermediate it is made into 5.25 hank roving. This roving is then ring spun into 26s for both the warp and filling yarns. For the warp yarn use a frame having a 6½-inch traverse; 1¾-inch diameter ring; 2¾-inch gauge of spindle and a spindle speed of 9,700 revolutions per minute.

THIS YARN

is then run on a spooler, after which the spools are put up and run on to a beam. Several beams are then put up at the slasher, being run through this machine to be sized and run on to a beam at the head end. The filling frame has a 2¾-inch gauge; 1⅜-inch diameter ring; 6-inch traverse; 17.84 twist per inch, and a spindle speed of 8,000 revolutions per minute. After being made, the yarn should be conditioned by putting it into a steam chest or some similar compartment,although some mills merely immerse the full boxes of yarn into a tank of water and take them out immediately.

Dyeing Particulars.

For cotton warp coburgs:

BLACK.

Five per cent union black S; 30 per cent Glauber's salt.

WINE.

Three and one-half per cent diamine Bordeaux B; 30 per cent Glauber's salt.

LIGHT BLUE.

One and one-half per cent diamine sky blue F F; ½ per cent diamine steel

blue L; 8 ounces thiocarmine R powder; 30 per cent Glauber's salt.

NAVY BLUE.

Two per cent diamine black B H; ¼ per cent naphthol blue black; ¼ per cent formyl violet S 4 B; ½ per cent union black S; 30 per cent Glauber's.

BROWN.

One per cent diamine orange B; 1 per cent diamine fast yellow B; ½ per cent union black S; 1 per cent diamine brown M; ½ per cent Indian yellow G; 35 per cent Glauber's salt.

GREEN.

Three per cent diamine green G; 1 per cent diamine black H W; 1 per cent diamine fast yellow B; 30 per cent Glauber's.

SCARLET.

Four per cent diamine scarlet B; 1 per cent fast scarlet B; 30 per cent Glauber's salt.

SLATE.

Six ounces union black; 2 ounces naphthol blue black; 1 ounce diamine Bordeaux B; 2 ounces diamine orange B; 30 per cent Glauber's salt.

For coburgs, all wool:

For 100 pounds piece goods: Dye with 15 per cent Glauber's salt, 4 per cent sulphuric acid, for light and medium shades; for dark shades add a little more if required.

SLATE.

Four and one-half ounces cyanole green B; ½ ounce acid yellow A T; 1 ounce azo orseille B B.

RED.

Five per cent naphthol red F B; 1 per cent orange extra.

OLIVE.

Two per cent cyanole green 6 G; 2½ per cent acid yellow A T.

PEACOCK BLUE.

Two per cent indigo blue S G N; 1 per cent cyanole extra.

BROWN.

Two and one-half per cent acid yellow A T; 2 per cent lanafuchsine S G; ¾ per cent cyanole green 6 G.

SKY BLUE.

One ounce cyanole F F pat.; ½ ounce acid violet 6 B S.

MAUVE.

One per cent azo wool violet 7 R; 1 ounce cyanole extra pat.

NAVY BLUE.

Three per cent azo navy blue 3 B; 1¼ per cent azo navy blue B.

BLACK.

Five per cent azo merino black B E.

KID FINISH CAMBRIC.

Kid finish cambric is a name given to a soft-finished plain cloth which is fairly lustrous on both sides, but more so on the face than on the back. It is used exclusively for dress linings. It varies in width from about 24 to 27 inches, and is shown in black and staple shades.

The fabric derives its name from its appearance after being subjected to the finishing process.

The cloth itself before finishing does not differ from many other plain cloths now shown on the market. It is fairly well filled with foreign substances; the retail price at which it is sold, about 5c. per yard for goods 24 inches wide, and the firm feel necessary, preclude the possibility of putting very much cotton into it.

The analysis of a sample under consideration shows the following: Finished width, 25½ inches; ends per inch, 64; picks per inch, 54; warp yarn, 34s; filling yarn, 38s; weight, 8 1-3 yards per pound.

CALCULATIONS.

A sample 4 inches x 3 inches in size weighs 11 grains, indicating a fabric weighing approximately 8 1-3 yards per pound.

$$\frac{2,333.33}{11 \text{ grs.} \times 25.5 \text{ in.}} = 8.31 \text{ yards per pound.}$$

Allowing 20 per cent for size and contraction, the average counts of yarns used may be found as follows:

$$\frac{118 \times 25.5 \times 8.31 \times 1.20}{840} = 35.6 \text{ average number.}$$

In the above calculation 118 represents the sum of the sley and pick, 25.-5 the width of the cloth, and 8.31 the number of yards per pound.

Assuming the counts of the warp yarns to be 34s, the counts of filling required to make the given weight of cloth may be found as follows:

$$\frac{118 \text{ (sum of sley and pick)}}{35.6 \text{ (average counts)}} = 3.31.$$

$$\frac{64 \text{ (sley)}}{34 \text{ (warp counts)}} = 1.88.$$

$$3.31 - 1.88 = 1.43.$$

$$\frac{54 \text{ (pick)}}{1.43} = 37.7\text{s counts of filling required.}$$

38s filling would be used.

LOOM REQUIRED.

As these goods are not noticed very

closely after being made into garments, being hidden when in use, little attention is paid to picking out ordinary misweaves in the loom. Those that are made are covered to a more or less extent in the finishing process.

The chief consideration, therefore, is a large production, which can best be obtained from light running cam looms. Ordinary or automatic looms may be employed, one warp beam and one shuttle only being required. The cloth is reeded one end per heddle and two ends per dent.

FINISHING.

This process is really the principal one in making these goods, giving them, as it does, the characteristic name. It gives to the cloth a somewhat leathery feel, not too harsh or stiff, while yet adding a fair amount of foreign matter.

After bleaching, dyeing and mangling, the cloth is dried on the drying machine and allowed to cool. It is then conditioned on the damping machine and allowed to lie for about two hours, after which it is hot swiss calendered on a five-bowl compound lever calender, using light pressure. It is afterwards filled on an ordinary two-bowl compound lever starch mangle with a mixture somewhat as follows:

Dextrin	200 pounds
Potato starch or farina	20 pounds
Cornstarch or maize	20 pounds
Oleine oil	2½ gallons
Carbolic acid	½ pint

Water, sufficient to make 120 gallons when boiled. Boil for 15 minutes.

After being filled, the cloth is dried on the drying machine and allowed to cool, then conditioned on the damping machine and allowed to lie at least two hours. It is then hot swiss calendered on a three-bowl dead set calender, using light pressure, after which it is ready for making up.

Carding and Spinning Particulars.

The yarns for the grade of goods under description are made in mills having the equipment of those of the second division. The yarns for this fabric do not have to be combed. They are made from cotton of a middling grade of 1 1-16 to 1 3-16 inch staple. This cotton is mixed as has been previously described. The cotton should be allowed to stand as long as possible after opening before being worked. The cotton is passed through an opener and three processes of pickers. Use the usual precaution in feeding the opener, being sure to keep the pin roller clear of cotton, especially sliver waste, which is apt to wind around this roll on certain makes of openers. After passing through the opener the cotton is fed to the breaker picker. The beaters of all the pickers are of the two-bladed rigid type. The speed of the beater at the breaker picker is 1,500 revolutions per minute. The total weight of the lap at the front end of the breaker picker is 42 pounds. These laps are doubled 4 into 1 at the intermediate picker, the speed of the beater at this machine being also 1,500 revolutions per minute. The total weight of the lap at the front of this machine is 39 pounds or a 14-ounce lap. The laps are doubled at the finisher picker 4 into 1. The speed of the beater is 1,425 revolutions per minute.

THE TOTAL WEIGHT

of the lap at the front is 40 pounds or a 14½-ounce lap. An allowance of one-half pound either side of the standard total weight of lap is made for this class of goods. At the card the speed of the licker-in should be 350 revolutions per minute. Do not make the card do the work of the picker, but watch to see that the speed of the beater is correct and that the settings of the feed roll and grid and grate bars are right to take out the dirt, seed shells, bits of leaves, etc. It is too often that the licker-in is called upon to do the work that the picker should, and a kick is made that the cards are not doing their duty. The speed of the flats is one complete revolution every 55 minutes. The wire fillet used on the doffer and flats is No. 34s and on the cylinder is No. 35s. Grind and strip cards as described in a previous article. After grinding, the setting points should be all gone over. Do not have the flats too tight or they are apt to cramp and face, if not loosen, the wire on the cylinder. Be always sure to set flats to cylinder by the highest flats, generally five being left for this purpose. The weight of the sliver should be about 50 grains per yard and the production 750 to 900 pounds per week of 60 hours.

THE CARD SLIVER

is put through three processes of drawing, the doublings being 6 into 1. The speed of the front roller should be about 400 revolutions per minute if leather is used, and 350 revolutions per minute if metallic top rolls are used. The drawing should be sized at least twice a day and four times a day is better. The setting of the bottom steel rolls should be especially looked after, as well as the knock-off motions, to see that no single is allowed to pass. If

these motions are not in perfect working order single will be allowed to pass, which will throw your numbers all out and cause a great deal of trouble to remedy. When changing the draft to change weight, always have same size draft gear on machines running the same kind of work. The weight per yard of the sliver is 70 grains per yard. The drawing sliver is drawn into .60 hank roving at the slubber. Watch

THE TRAVERSE MOTION

to see that it is in working condition. After passing the slubber, the roving is passed through two processes of fly frames, the hank at each process being 2 at the first and 6.50 hank at the second for the warp yarn and 8 hank for the filling yarn. Size these yarns once a day and be sure to keep them on the mark. Watch the build of bobbins, traverse motion, rolls and setting of same. The roving for warp yarn is made in 34s on a frame with a 1⅜-inch diameter ring, 6½-inch traverse, 27.70 turns per inch and spindle speed of 10,200 revolutions per minute. The yarn is then spooled, warped and slashed. The filling is spun into 38s on a frame having a 1⅜-inch diameter ring, 5½-inch traverse, 23.12 twist per inch and spindle speed of 8,800 revolutions per minute.

Dyeing Particulars.

PINK.

Four ounces Erika G; 15 pounds Glauber's; 2 pounds sal soda.

LIGHT BLUE.

One-half per cent diamine sky blue F F; 15 per cent Glauber's; 2 per cent sal soda.

MAUVE.

One-half per cent diamine violet N; 15 per cent Glauber's; 2 per cent sal soda.

LIGHT SLATE.

One-quarter per cent diamineral blue R; 1-16 per cent diamine fast yellow B; 10 per cent Glauber's; 2 per cent sal soda.

LIGHT FAWN.

One-quarter per cent diamine catechine G; ⅛ per cent diamineral brown G; 10 per cent Glauber's; 2 per cent sal soda.

SLATE.

One and one-half per cent diamine black B H; ¼ per cent diamine fast yellow B; 20 per cent Glauber's; 2 per cent sal soda.

PEA GREEN.

One-half per cent diamine green G; 10 per cent Glauber's; 2 per cent sal soda.

ECRU.

One-eighth per cent diamine catechine 3 G; ⅛ per cent diamine catechine B; 10 per cent Glauber's; 2 per cent sal soda.

ROYAL BLUE.

Two per cent diamine blue 3 R; 2 per cent diamine brilliant blue G; 20 per cent Glauber's; 2 per cent sal soda.

SEAL BROWN.

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

WINE.

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

RED.

Four per cent diamine fast red 2 B; 2 per cent sal soda; 15 per cent Glauber's.

NAVY BLUE.

Five per cent diamine black B H; 1 per cent diamine brilliant blue G; 20 per cent Glauber's; 2 per cent sal soda.

BLACK.

Three per cent diamine jet black O O; 3 per cent diamine jet black S S; 30 per cent Glauber's; 2½ per cent sal soda.

BOTTLE GREEN.

Five per cent diamine black H W; 2 per cent sal soda; 20 per cent Glauber's; 2 per cent diamine fast yellow B.

BEIGE.

Under the head of beige is a class of dress goods, the characteristic of which is their mottled or mixed effect. This effect is brought about by various methods. The method used in producing the effect largely influences the quality of the fabric, but the general appearance remains the same.

We will describe beige as made by three different methods: First, this fabric as originally made of yarns spun from wool dyed in the stock; this dyed stock is then mixed with undyed stock, then spun into a thread; generally several mixtures go into one fabric.

These mixtures of dyed and undyed stock are varied. The proportions used may be 50 per cent of each; an-

other mixture may have a more or less percentage of either stock; and another mixture may be composed of still a different percentage from the first two.

The threads then spun from these mixtures are arranged in some order in the warping and also in the weaving, producing what are commonly known as indefinite plaid effects in connection with the mixed or mottled effects.

THE SECOND METHOD

is to use a combination of twist yarns, usually three or four different colored threads, as, for example, black and white, black and slate, slate and white, and the other may be a pearl and white. These combinations of threads may be arranged similar to the arrangement in the first method, likewise producing an indefinite plaid effect. The use of black and white, slate and white, and colors of similar shades, produces gray effects. Grays and browns are the prevailing colors in this class of goods. The colored yarn used in this particular class is usually worsted, while the white in most cases is a cotton thread.

Fig. 1.

THE THIRD METHOD

of producing this mixed or mottled effect is brought about by printing the goods.

This method is usually practiced on the cheaper grade of goods, goods composed entirely of cotton yarn; the effect, however, imitates very closely the wool dyed in the stock fabric or the goods composed of twist yarns. In the finer grade of fabrics the twill weave is much in evidence, while the cotton goods are mostly woven plain. The plain weave is more adapted to the particular character of printing; in order to give the plaid effect in connection with the mixed or mottled appearance, the goods are subjected to two processes of printing:

ANALYSIS OF COTTON BEIGE.

Width of warp in reed, 38 inches; width of fabric finished, 36 inches; reed, 1,000 by 2; number of ends in warp, 2,076; 28 ends each selvedge equals 56; total ends in warp, 2,132. Number of ends per inch finished, 60; picks per inch finished, 48; take-up of warp during weaving, 12 per cent; warp and filling yarn 1-26. The 1,000 reed means 1,000 dents in 36 inches of reed. The 2,076 is the number of ends in warp without the selvedge.

Fig. 1. Sample of fabric as produced by means of twist yarns; the fabric is plain woven.

LOOM USED.

For the better grade of fabrics the pick and pick loom is required to give the best effects. The goods woven pick and pick will be less inclined to appear stripy; this effect would be undesirable; the stripes should be of an indefinite nature.

The sample of fabric shown in Fig. 1 is woven on a 4x1 box loom, in which no less than two picks of one color must be woven before it changes on to the next color; unless the colors are carefully graded they will produce a fabric more or less striped. In the printed cotton beige fabric a single box loom fills the requirements. This grade of goods is woven with undyed yarns; the effect, as already mentioned, is produced by the printing machine after the goods are woven.

FINISHING.

The cotton fabric, after it is woven, is boiled off, after which it is slightly stiffened, then subjected to the printing machine, after which it is pressed, then made up into laps or rolls and then shipped.

Carding and Spinning Particulars.

Beige is a dress goods generally made from wool and sometimes of wool and cotton, other grades being made from all-cotton yarns. The cotton is dyed in the stock. Some of the grades of beige are made from combed yarn, whereas other grades are made from carded yarns. The staple of the cotton does not exceed 1⅜ inches in length for an American cotton. Mix cotton as has been previously stated. Three processes of pickers are used,

the particulars being the same as given for etamine. The particulars for the cards and drawing frames as given in that article may be also followed.

AT THE SLUBBER

the drawing sliver is made into .60 hank roving, and is then put through two processes of fly frames or speeders, the hank roving at the first intermediate being 1.75 and at the second intermediate being 5 hank. Speeders should be looked after to see that the rolls are properly set; that top rolls are in good condition; that there are no dead spindles; that the spindles are oiled once a day; the build of bobbin correct; traverse motion working properly, and frame at all times clean and neat. The bobbins when doffed should not be thrown into doffing box or truck, but should be packed in. The boxes or trucks should be cleaned out before doffing. After changing a frame from one kind of work to another the new roving should be sized and tested for twist, and the tension watched. After the speeders the yarn is put through

THE SPINNING FRAME,

where the proper colors of yarns are doubled together and spun into 26s yarn, the warp frame having the following particulars: Length of traverse, 6½ inches; diameter of ring, 1¾ inches; gauge of frame, 2¾inches, and spindle speed of 9,700 revolutions per minute. The yarn is then spooled, warped and slashed. For the filling frame use a 2¾-inch gauge of frame; 1⅜-inch diameter ring; 6-inch traverse and a spindle speed of 8,000 revolutions per minute; the diameter of the front bottom steel roll of spinning frames being one inch for both warp and filling.

Dyeing Particulars—Yarn Dyeing.

NAVY BLUE.

Four per cent naphtamine blue 2 B; 30 per cent Glauber's; 2 per cent sal soda.

MEDIUM BROWN.

Three per cent naphtamine brown N; 1 per cent naphtamine yellow N N; 20 per cent salt; 2 per cent sal soda.

RED.

Four per cent diamine fast red B B; 25 per cent salt; 2 per cent sal soda.

DARK BROWN.

Four per cent naphtamine brown 6 B; 25 per cent salt; 2 per cent sal soda.

SLATE.

One and one-half per cent naphtamine black D; 20 per cent salt; 2 per cent sal soda.

OLIVE.

Three and one-half per cent naphtamine olive R; 20 per cent salt; 2 per cent sal soda.

GREEN.

Six per cent immedial green G G; 6 per cent sulphide soda; 2 per cent soda ash; 25 per cent Glauber's.

DARK BOTTLE GREEN.

Eight per cent immedial green; 8 per cent sulphide soda; 2 per cent soda ash; 25 per cent salt.

ECRU.

One-half per cent diamine catechine G; 20 per cent salt; 2 per cent sal soda.

BLACK.

Ten per cent immedial black N N; 10 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt.

MAROON.

Six per cent immedial Bordeaux G; 6 per cent suphide sodium; 2 per cent soda ash; 30 per cent salt.

LIGHT BLUE.

Six per cent immedial sky blue F F; 6 per cent sulphide sodium; 2 per cent soda ash; 30 per cent salt.

Printing Particulars.

Cotton beige is also printed on the piece. To get a good imitation of the woven fabric, it has to be printed on both sides of the piece. After printing one side of the fabric and drying, the pieces are rolled up on a roller and the other side of the piece is printed, so that both sides of the piece present the same appearance. The goods are given a soft finish to imitate a piece of dress goods. The colors printed on are made as fast as possible, so that the goods can be washed when required.

The goods are printed, dried and steamed in a Mather and Platt at 212 degrees F., excluding the air as far as possible. Wash in cold water, soap lukewarm, rinse and dry.

BLUE.

Seventy parts immedial indone B N; stir well to a paste with 20 parts caustic soda lye, 77 degrees Tw.; 50 parts glycerine; then add 150 parts reducing paste A. The whole is heated for some time to 140 degrees F. and cooled; stir in 80 parts China clay; 60 parts saturated solution of common salt; 570 parts alkaline gum thickening.

GREEN.

Ninety parts immedial green G G; 300 parts alkaline gum thickening; 40 parts China clay; 30 parts saturated

common salt solution; 150 parts reducing paste A; mix and stir; when cool add 40 parts China clay; 30 parts saturated common salt solution; 320 parts alkaline green thickening.

BLACK

Seventy parts immedial black N L N; 150 parts reducing paste A; heat together to 120 degrees F.; allow to cool down, then stir in a mixture of 160 parts China clay; 120 parts saturated solution of salt; 500 parts alkaline gum thickening.

BROWN.

Mix as the blue with 70 parts immedial brown B; 10 parts immedial yellow D.

DARK SLATE.

Thirty parts immedial black N B; mix as the green.

LIGHT SLATE.

Ten parts immedial black N G; 2 parts immedial direct blue B; mix as the green.

ECRU.

Five parts immedial yellow D; 2 parts immedial cutch G; mix as the green.

OLIVE.

Fifty parts immedial olive B; 20 parts immedial bronze A; mix as the green.

BRONZE.

Forty parts bronze A; 10 parts cutch G; mix as the green.

FAWN.

Fifty parts immedial cutch O; 10 parts immedial brown R R; mix as the green.

LIGHT BLUE.

Forty parts immedial sky blue; mix as the green.

POPLIN.

Poplin is a name given to a class of goods distinguished by a rep, rib, or cord effect running width way of the piece. It referred originally to a fabric having a silk warp and a figure of wool filling heavier than the warp. At the present time it refers more to a ribbed fabric than to one made from any particular combination of materials.

Cotton poplin is usually made with a plain weave, the rep effect being obtained either by using a fine warp as compared with the filling, or a large number of ends as compared with picks per inch, or both.

IRISH POPLIN,

made principally in Dublin, is a fabric made of China organzine silk warp and colonial wool filling. The manufacture of this cloth has continued in Dublin since 1693, when a number of Huguenot silk weavers emigrated from Lyons, France. The industry is still carried on there to some extent on hand looms, the weavers owning their own looms. The materials are supplied by the firms for whom they work and are given out ready for weaving. The Irish poplin is a light-weight variety of poplin, sometimes called single poplin, and is celebrated for its uniformly fine and excellent wearing qualities.

Brocaded poplin is made with elaborate jacquard designs of various types.

TERRY POPLIN

is a very durable fabric, made on the principle of cloth construction explained in the article on "Terry Pile Fabrics." By throwing to the surface alternate ends of the silk warp an appearance somewhat resembling terry velvet is obtained.

The bulk of cotton poplin goods are woven and finished white. Those that are shown in colors, except those of poor quality, are yarn dyed. They are not piece dyed, for the reason that when fine and coarse yarns are combined in the same fabric they do not take the dyes equally.

For a given length of poplin cloth a much greater length of warp is required than for an equal length of cloth where the warp and filling yarns and ends and picks are practically equal, because the coarse filling lies in the cloth in practically a straight line, the warp yarns having to do all the deflecting.

The analysis of a typical cotton poplin of good quality shows the following data: Ends per inch, 104; picks per inch, 48; finished width, 27 inches; weight about 6 yards per pound; warp yarns, 2-68s; filling yarns, 2-60s. Plain weave.

CALCULATIONS.

To find number of yards per pound 2½ yards weigh 2,940 grains.

$$\frac{7{,}000 \text{ (grs. per lb.)} \times 2.5 \text{ (yds.)}}{2{,}940 \text{ (grs.)}} = 5.95, \text{ say } 6 \text{ yds. per pound.}$$

To find average counts of yarn, assuming the warp yarn to have contracted 10 per cent in length from warp to finished cloth, and the filling 4 per cent in width:

104 (ends) divided by .90 ..... 115.55
48 (picks) divided by .96 ..... 50.00

165.55

$$\frac{165.55 \times 27.5 \text{ (width)} \times 6 \text{ (weight)}}{840} = 32.5 \text{ aver. counts.}$$

In dealing with the preceding calculations it has been considered that the yarns were mercerized before being woven, and the counts indicated after mercerizing. The mercerizing process tends to contract the length of yarn to a greater or less degree, depending upon the quality of the yarn, the mercerizing liquor, and the machinery used. If mercerized under tension, there is not a very large contraction, but if the yarn is allowed to contract it may do so to the extent of 20 to 30 per cent, that is, a cotton yarn spun to 50s may contract in the mercerizing bath to 40s or 35s yarn.

Both warp and filling in the sample under consideration are mercerized, and are 2-ply yarns of good quality.

To find the counts of filling required to give the stated weight, assuming the warp yarn to be 2-ply 68s:

165.55 divided by 32.5 (ave. counts) 5.09
115.55 (slay) divided by 34 (warp counts) 3.39

1.70

Fifty divided by 1.70 equals 29.4 equals 2-59s filling required. The counts would be indicated as 2-60s.

The selvedges consist of eight double ends on each side.

To find number of ends in warp:

104 (ends per inch) x 27.5 (cloth width) = 2,860.
2,860 + 16 for selvedge = 2,876, total ends.

To find weight of warp in 100 yards of cloth:

$$\frac{2{,}876 \text{ (ends)} \times 100 \text{ (yards}}{840 \times 34 \text{ (counts)} \times .90 \text{ (10\% contraction)}} = 11.18 \text{ lbs. warp.}$$

To find weight of filling in 100 yards of cloth:

$$\frac{48 \text{ (picks)} \times 27.5 \text{ (cloth width)} \times 100 \text{ (yds.)}}{840 \times 30 \text{ (counts)} \times .96 \text{ (4\% contraction)}} = 5.45 \text{ lbs. filling.}$$

To find weight of 100-yard cut:

11.18 lbs. warp.
5.45 lbs. filling.

16.63 lbs. yarn in 100 yards of cloth

To find number of yards per pound:

100 divided by 16.63 = 6 yards per pound.

LOOM REQUIRED.

For plain weave poplins an ordinary plain cam loom is required, one warp and one filling being sufficient. It is not advisable to use automatic looms unless the same are equipped to change the cop or bobbin before the preceding one has spent itself, because a mispick is one of the defects that shows most prominently in this class of goods.

FINISHING.

The fabric under consideration, having been bleached and mercerized in the yarn, requires very little aftertreatment. It is washed, conditioned, calendered lightly and made up, book fold.

Carding and Spinning Particulars.

When making the yarns for poplin the same particulars may be followed as have been previously given in the article on "Lawn." For this particular grade of poplin the warp yarn is 2-68s and the filling yarn 2-60s. Use the instructions given for making 60s warp yarn, with the following exceptions. The spinning frame for the warp yarn would be as follows: For making 68s warp yarn, 1⅜ inches diameter of ring; 5½ length of traverse, and spindle speed of 10,000 revolutions per minute. This yarn is then spooled and twisted into 2-ply, the twist put in being 39.17 turns per inch. After being twisted, the yarn is warped and slashed. For spinning the 60s filling yarn use a frame having a 1¼ inch diameter ring; 5-inch traverse, 27 twists per inch and a spindle speed of 8,000 revolutions per minute. This yarn is spooled and twisted into 2-60s, after which it is conditioned and is then ready for use.

Dyeing Particulars.

BRONZE.

Five per cent pyrol bronze; 5 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

GREEN.

Six per cent pyrol green G; 6 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

BLUE.

Six per cent pyrol blue B; 6 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

ECRU.

One-half per cent immedial catechine

G; 1 per cent sulphide sodium; 2 per cent soda ash; 10 per cent salt.

OLIVE.

Two per cent immedial indone B; 6 per cent immedial yellow D; ½ per cent immedial catechine G; 9 per cent sulphide sodium; 2 per cent soda ash; 25 per cent salt.

WINE.

Eight per cent diamine Bordeaux B; 2 per cent sal soda; 25 per cent salt.

RED.

Five per cent diamine fast red B B; 2 per cent sal soda; 25 per cent salt.

NAVY BLUE.

Eight per cent katigen indigo B; 8 per cent sulphide sodium; 2 per cent soda ash; 30 per cent salt.

SLATE.

One per cent thion black T B; 2 per cent sulphide sodium; 1 per cent soda ash; 10 per cent salt.

SKY BLUE.

One per cent diamine sky blue F F; 1 per cent sal soda; 10 per cent salt.

SEA GREEN.

One-half per cent immedial green B; 1 per cent sodium sulphide; 2 per cent soda ash; 10 per cent salt.

COTTON-MOHAIR FABRICS.

Mohair fabrics, commonly so called, are used exclusively for dress goods, in the form of tailor-made suits, skirts, children's coats, etc.

The name, mohair, is acquired from the material used in the construction of the fabric. This material, mohair, the product of the Angora goat, is used principally in the filling only; the warp may be cotton, worsted, or silk, according to the quality of fabric wanted.

The characteristics of mohair fabrics are their crispness and glossy appearance. These features are effected by the mohair. Mohair, like wool, is an animal fibre, but differs from the latter in so far that the fibres are longer and coarser than wool, and mohair is not as soft or as crinkled as wool; in brief, it may be described as a long, straight, glossy animal fibre. These fabrics

VARY CONSIDERABLY

in regard to quality, style and width, but all are plain woven fabrics. Some are elaborated into spot patterns by means of the filling floating over a given number of ends in some geometrical form.

Again, the spots may be formed by the use of an extra warp. This warp floats on the back of the fabric for a given space, then comes to the face for a required number of picks. This extra warp is usually mercerized, the yarn differing in color from the body of warp and being arranged in groups of two or more ends across the entire breadth of warp. These groups of threads may alternate, as, for example, one group may be yellow, the next green, another red

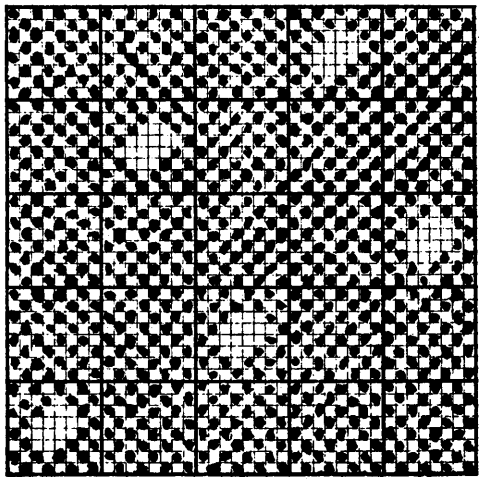


Fig. 1.

or any color that may strike the fancy of the designer, providing that the color thus used produces some degree of harmony. This will give plenty of variety to the fabric, and if these various groups of threads are made to work on some sateen or broken twill order, they will give the appearance of a large design, or, as generally mentioned, a jacquard effect. In filling floated fabrics, it is most important that the distribution of the figure should be so that the eye is not attracted by lines formed by the unequal distribution of the figure. This objectional feature is most likely to occur in designs of this character. It is somewhat difficult to tell if the distribution is perfect without extending the design for four or even more repeats. In designs which consist of set figures, the difficulty of arrangement is somewhat eliminated by ar-

ranging the figure on some irregular sateen basis, the irregular sateen being preferred to the regular sateen basis as the former gives a somewhat stiff appearance, the latter giving a mixed effect more suitable for this class of fabrics. Figure 1 shows one repeat of the design, the spot based on a 5-harness sateen order. Figure 2 shows one repeat of figure based on $\frac{1}{3}$ broken twill. Figure 2 presents a more mixed effect than Fig. 1.

Considerable quantities of mohair are woven plain throughout. In this style of fabrics the ornamentation, if such is desired, is effected by means of twist or fancy colored threads arranged in some order, usually in the warp only, though a similar arrangement may be carried out in regard to the filling. These fancy colored

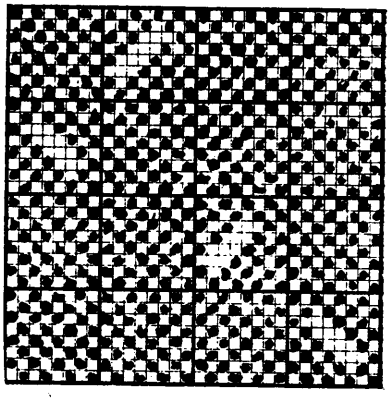


Fig. 2.

threads may be arranged in almost any way possible; the object, however, is to have a fine hair-line stripe throughout the entire length of fabric. Still another method of breaking the monotony of a plain fabric is to skip a dent in the reed at certain intervals; this may be carried out with fancy colored threads if desired. These fabrics, as mentioned above, are made in various qualities. We will here deal with the cotton warp and mohair filling fabric. This particular class is usually piece dyed. The warp, however, is dyed before it is beamed. When twist yarn is used, that is, a twist composed of two different colored threads, one of the two threads in some fabrics is a worsted thread; when such is the fact, the warp is not dyed until woven into the fabric; the cotton end composing one of the twist threads will not take the color in a worsted dye. When cotton only is use in the twist one of the threads is dyed before it is twisted, that is, if a colored and white thread is to be the twist wanted.

ANALYSIS OF COTTON MOHAIR.

Width in reed, 60½ inches; width finished, 54 inches; ends per inch in reed, 44; ends in warp, 2,660; ends in selvedge, 78 (39 each side, 3 in a dent); total ends, 2,738; reed, 44x1.

Dressing 2 ends black
1 end black, white
2 ends black
1 end black, white
2 ends black
1 end black, white
2 ends black
1 end black, white
2 ends black
2 ends black, white

16

Ends in warp.

1,664	black cotton	10 2-80
996	black white cotton	6 2-80
78	bleached cotton	0 2-80
2,738		16

Filling 1-15s mohair, 48 picks.

LOOM REQUIRED.

The plain mohair, or the fabric in which the ornamentation is effected by means of fancy colored threads, may be woven on any light-weight loom; the roller, dobby or Northrop loom may be used to advantage. The loom could make better cloth if it had a warp stop-motion, as it is very important that no ends be left out in the weaving; if they are, they must be sewed in before the fabric is finished, thus entailing another expense.

Fancy figured mohair requires the use of a jacquard loom, on account of the number of ends in the repeat of the pattern, which would be too great for the dobby loom.

The warp for mohair fabrics is reeded one end in one dent, and woven with considerable tension on the warp beam.

FINISHING.

After the fabric is woven it is examined and mended if necessary, then scoured, after which it is dyed. These fabrics are dyed in various colors and shades. After the dyeing process, the fabrics are sheared on the face, then doubled and made up into rolls, ready for the market.

Carding and Spinning Particulars.

Mohair is composed of all mohair or a cheaper grade which is made up of mohair and cotton. The count of the

yarn used for the sample under description is composed of 1-15s mohair filling and 2-80s warp yarn. The yarn for the filling is made in cotton mills of either the first or second division as classified in a previous article. The yarn is made from an American cotton, either peeler or Allen seed being used. The staple is 1½ inches, and cotton should be of a good grade. As this cotton is apt to be very dirty, it is generally put through an opener and three processes of picking.

THE MIXING

should be as large as possible, and if possible the mixing should be allowed to stand for at least three days before using so that it may dry out and expand. If this is done it will be found that the cotton is easier to work and the dirt will be taken out very much easier. At the mixing be sure that the grades of the cotton of each bale are the same and do not under any circumstances use a creamy bale. Each bale should be stapled before being put into the mix to see that it is up to staple. Keep the hopper of the opener well filled with cotton so as to obtain as even a feed as possible. The

SPEED OF THE BEATER

at the breaker picker for this stock is 1,450 revolutions per minute, the beater used being of a two-bladed type. The weight of a 40-yard lap at the front of the breaker is 40 pounds or a 16-ounce lap. At the intermediate picker the speed of the beater should be 1,400 revolutions per minute, the lap at the front weighing 37½ pounds or a 12-ounce lap. At the finisher picker the speed of the beater is 1,350 revolutions per minute. The total weight of the lap is 35 pounds or a 12½-ounce lap. At the finisher picker the good waste laps, or, as they are sometimes called, cut roving waste laps, are mixed in with the raw stock, one lap cut waste to three laps of good cotton. In mills that do not have a roving waste picker it is

THE GENERAL CUSTOM

to take out the middle two laps and spread the cut waste evenly in this span and use up the waste in this manner. These laps are sometimes put up at the cards, but the general custom is to put them through the finisher picker again in the proportion named above. A variation of not more than one-half a pound either side of standard is allowed, every lap being weighed. If the laps weigh over or under this allowance they should be run over again. This point cannot be looked into too closely and it will save a lot of trouble in the evenness of the numbers at the fine frames and in the spinning room. The laps from the picker are put up

AT THE CARD,

the speed of the licker-in being 350 revolutions per minute; speed of flats, one complete revolution every 45 minutes (110 flats). The cards should be properly set, ground and stripped at least three times a day. Keep the wire sharp at all times and it is a good plan to grind the flats on a special grinding machine for flats, they being taken off the cards for this purpose. The weight of the sliver at the card is 45 grains per yard. As the sliver is to be combed, the card sliver is put up at the sliver lap machine, where it is doubled 14 into 1 (i. e., for a 8¾-inch width lap). The weight of a yard of lap at the front is 290 grains. These laps are put up at the ribbon lap machine and doubled six into 1, the weight of a yard of lap at this machine being 275 grains. These laps are put up at the comber and doubled according to the number of heads that the comber has. The percentage of waste taken out at this machine is 18 per cent. The weight of the sliver is 35 grains per yard. This sliver is put through two processes of

DRAWING FRAMES,

the doubling at each process generally being 6 into 1, although some mills double 8 into 1 at the breaker and 6 into 1 at the finisher. The weight of the sliver at the front of the finisher drawing should be 70 grains per yard. Either metallic or leather top rolls may be used for this class of work, generally the latter being used. See that the leather top rolls on all machines are in perfect shape and well varnished; size the ribbon laps at least once a day and drawing frames four times a day. The drawing sliver is put up at the slubber and drawn into .55 hank roving, after which it is put through three processes of fly frames, the hank roving made at each process being as follows: First intermediate, 1.50, 2d, 4.50 and fine frame, 16 hank. This yarn is taken to the spinning frame and spun into 80s on a frame with a 2¾-inch gauge of frame, 1⅜-inch diameter ring, 5½-inch traverse and spindle speed of 9,600 revolutions per minute. This yarn is then spooled and then twisted into 2-ply 80s yarn, many times two differ-

ent colored yarns being twisted together. The yarn is then respooled and run upon a beam, after which the beams are put through the slasher and sized.

Dyeing Particulars.

MEDIUM BROWN.

Three per cent naphtamine brown N; 1 per cent naphtamine yellow N N; 20 per cent salt; 2 per cent sal soda.

DARK BROWN.

Four per cent naphtamine brown 6 B; 25 per cent salt; 2 per cent sal soda.

SLATE.

One and one-half per cent naphtamine black D; 20 per cent salt; 2 per cent sal soda.

OLIVE.

Three and one-half per cent naphtamine olive R; 20 per cent salt; 2 per cent sal soda.

DARK BOTTLE GREEN.

Eight per cent immedial green; 8 per cent sulphide soda; 2 per cent soda ash; 25 per cent salt.

BLACK.

Ten per cent immedial black N N; 10 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt.

MAROON.

Six per cent immedial Bordeaux G; 6 per cent sulphide sodium; 2 per cent soda ash; 30 per cent salt.

HERRINGBONE STRIPES.

Herringbone stripes are certain weave effects resembling herring bones. They are developed to the greatest extent in men's wear fabrics, woolens, worsteds, cotton worsteds and all-cottons, although in these goods the arrangements of various colors in the warp yarns form one of the principal component parts of the pattern. Herringbone weaves in ladies' dress goods are usually shown in white.

These weaves are a development of ordinary twill weaves in which the twills, instead of running in one unbroken line diagonally across the piece, run for a certain number of ends one way and a certain number of ends in the reverse direction, thus breaking the continuity of the twill. They differ from wave effects in having the two ends defining the turning points of the twill arranged to work opposite each other, i. e., when one is raised the other is depressed. This may be seen at the points indicated by the daggers in Figs. 1 to 5.

The foundation twills principally used when developing these weaves for men's wear goods are the even flushed twills $\frac{2}{2}$ and $\frac{3}{3}$, Figs. 6 and 7, the former forming the greater proportion. Figs. 1 to 5 show some of the other weaves used, the number of ends in each section and the number of sections in a repeat being made to vary according to rquirements. The daggers indicate the cutting points.

Although the principle may be extended to large weaves, it is seldom that the effects are made from a weave base greater than eight ends and eight picks.

Fig. 8 illustrates a herringbone effect in a cotton cloth made with weave Fig. 1. In the gray the warp appears to stand up from the cloth in the sections weaving $\frac{3}{1}$ on the face. This prominent effect is modified in the finished cloth.

Fig. 8 is one of a line or range of patterns made and finished in England, for sale in northwest Africa. The construction of the cloth is as follows: width in gray, 30½ inches; ends per inch, 68; picks per inch, 72; warp, 35s; filling, 48s; yards per pound, 7.72, say 7¾. The ends have been reeded equally throughout, 2 ends per dent. The selvedges consist of 12 ends of 2-ply 30s yarn on each side.

CALCULATIONS.

To find number of ends in warp:

68 (ends per inch) x 30½ (inches) = 2,074 ends.
2,074 + 24 (selvedges) = 2,098 ends in warp.
24 2-ply yarns represent 48 single yarns.

In the above calculation 24 of these were considered when multiplying the ends per inch by the width, leaving but 24 to be added.

To find weight of warp:

$$\frac{2098 \text{ (ends)} \times 105 \text{ (yds.)}}{840 \times 35} = 7.05 \text{ lbs. warp.}$$

To find weight of filling:

$$\frac{72 \text{ (pks.)} \times 33 \text{ in. (width in reed)} \times 100 \text{ (yds.)}}{840 \times 48} = 5.89 \text{ lbs. filling.}$$

To find number of yards per pound:

7.05 lbs. warp.
5.89 lbs. filling.

12.94 lbs. weight of cut.

100 (yds.) divided by 12.94 = 7.72 yards per pound.

The finished fabric has been heavily sized or filled, giving but 6 2-3 yards per pound.

LOOM REQUIRED.

The class of goods under consideration is generally woven on fast run-

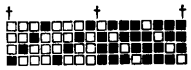


Fig. 1.

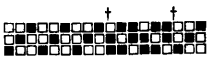


Fig. 2.

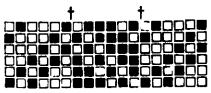


Fig. 3.

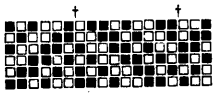


Fig. 4.

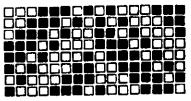


Fig. 5.

Fig. 6.

Fig. 7.

ning, side cam, single box looms. One warp only is required and the goods are reeded equally throughout.

FINISHING.

This fabric has been subjected to the "back filled" process of finishing. This consists of bleaching, mangling, drying, damping, calendering, stretching and filling. The mixture for back filling is composed of wheat starch, farina, China clay, oleine oil, cocoanut oil, bluing, carbolic acid and water. After being filled, it is dried, dampened, calendered and made up as required.

Carding and Spinning Particulars.

The yarns of which herringbone stripes are composed are made in mills of the second division, as given in a previous article. The count of the yarns put into this style of fabric varies, and for this article we will consider that the count of the yarn used is 35s for warp yarn, 48s for filling and 30s for the selvedge. The staple of the cotton used for the 30s and 35s yarn is 1¼ inch and for the 48s is 1 3-16 inch of a middling grade.

THE MIXINGS

should be as large as possible so that as little variation as possible will be found between the different mixings, and also there should be two mixings of the same length of staple, one being used while the other is being worked. If the mixing is put through a bale

Fig. 8.

breaker one mixing may be done away with. This is so that the cotton will be allowed to expand as much as possible before being put through the pickers. An opener and

THREE PROCESSES OF PICKERS

are generally used for both lengths of staple. Follow the rules already given in connection with the openers. At the breaker picker the speed of a two-bladed rigid type of beater is 1,500 revolutions per minute and of a three-bladed beater is 1,000 revolutions per minute. If a pin beater is used the speed is 1,200 revolutions per minute. The total weight of the lap at the front of this picker is 40 pounds. The laps are put up at the intermediate picker and doubled 4 into 1. The speed of a two-bladed beater at this machine is 1,450 revolutions per minute, a three-bladed beater, 950 and a pin beater, 1,100 revolutions per minute. The total weight of a lap at the front of this machine is 38 pounds or a 14 ounce lap for both stocks. These

laps are put up at the breaker picker and doubled 4 into 1. At this picker the cut waste laps are put in in the proportion of three laps of raw stock to one lap of cut waste, the waste lap being generally inserted between the back and third lap. The speed of this beater is 1,400 revolutions per minute; for two-bladed beater, 925 revolutions per minute; and 1,050 revolutions per minute for a pin beater. The total weight of the lap at the front is 39 pounds or a 16-ounce lap for a 40-yard (in length) lap. The laps are next put up

AT THE CARD.

This card should have a licker-in speed of 350 revolutions per minute. The wire used should be 110s for cylinder and 120s for doffer and top flats. The top flats should make one complete revolution every 45 minutes and should be looked after to see that they are properly cleaned and ground. Grind and strip and set as per instructions given in a previous article on the same length of staple. The weight of the sliver at the front should be 45 grains per yard and the production 650 pounds per week of 60 hours. The cottons are next put through the sliver lap machine, the doublings being 14 into 1 and the weight per yard of lap being 290 grains per yard. These laps are put up at the ribbon lap machine and doubled 6 into 1, the weight per yard of lap being 275 grains.

AT THE COMBER

the laps are doubled 6 into 1 and the weight per yard of the sliver is 40 grains per yard. For this class of goods 16 per cent of waste is taken out. Keep the leather top rolls in good condition and well varnished and the comber free from dirt. At the drawing frames the doublings at the breaker are 8 into 1 and at the finisher, 6 into 1. This is not the case in all mills, as the number of doublings used varies. The weight per yard at the finisher drawing is 70 grains. This is put through the slubber and made into .60 hank roving. The slubber roving for the 30s and 35s yarn is made into 2 hank roving at the intermediate fly frame and 6.50 at the fine frame. The hank roving for the 48s is 2.50 at the intermediate and 9.50 at the fine frame.

THE SIZING

of the cotton should be as follows: At pickers, every lap and a variation of not more than one-half a pound from standard weight allowed; at the card once a week; at sliver and ribbon lap once a day; at drawing frame four times a day; at slubber once a week, at intermediate once a week; and at fine frame once a day.

The roving for 30s selvedge yarn is made on a frame having a 6½-inch traverse, 1¾-inch diameter of ring, 26.02 twist per inch and a spindle speed of 9,800 revolutions per minute; for the 35s the same conditions exist except that a 1⅝-inch diameter ring is used, a 28.10 twist per inch and a spindle speed of 10,300 revolutions per minute. The yarn is then spooled and warped and put through a slasher. The filling yarn may be either mule or ring spun; if the latter, use a frame having a 1¼-inch diameter ring, 5½-inch traverse, 25.98 twist per inch and a spindle speed of 8,400 revolutions per minute. This yarn is then conditioned, after which it is ready for the loom.

Dyeing Particulars.

BRONZE.

Five per cent pyrol bronze; 5 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

GREEN.

Six per cent pyrol green G; 6 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

BLUE.

Six per cent pyrol blue B; 6 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

OLIVE.

Two per cent immedial indone B; 6 per cent immedial yellow D; ½ per cent immedial catechine G; 9 per cent sulphide sodium; 2 per cent soda ash; 25 per cent salt.

WINE.

Eight per cent diamine Bordeaux B; 2 per cent sal soda; 25 per cent salt.

RED.

Five per cent diamine fast red B B; 2 per cent sal soda; 25 per cent salt.

NAVY BLUE.

Eight per cent katigen indigo B; 8 per cent sulphide sodium; 2 per cent soda ash; 30 per cent salt.

SLATE.

One per cent thion black T B; 2 per cent sulphide sodium; 1 per cent soda ash; 10 per cent salt.

SKY BLUE.

One per cent diamine sky blue F F; 1 per cent sal soda; 10 per cent salt.

SEA GREEN.

One-half per cent immedial green B; 1 per cent sodium sulphide; 2 per cent soda ash; 10 per cent salt.

UNION LINEN LAWNS.

These fabrics, as the name implies, are made up of cotton and linen yarns. The cotton in most cases forms the warp and the linen is woven in as filling.

Union linen lawns are plain woven fabrics made in various textures in regard to ends and picks per inch, and also the quality and counts of yarn.

The goods are used for various purposes, principal among which are furniture coverings, summer outing suits and dusters. The goods, when used for the above purposes, are usually finished without bleaching. The cotton yarn is usually dyed to match the color of the unfinished linen warp or filling, as the case may be.

The fabric as used for household purposes is usually finished white or bleached.

CLASSIFICATION AND ORIGIN.

Woven fabrics may be divided into three classes, generally speaking, and from these there are derived all the various weaves now in use, with the possible exception of the leno weave, which may be placed in a class separate from the three foundation weaves, to wit, the plain weave or cotton weave, second, the twill weave, and third, the satin weave. The first-named in the division covers a greater variety of fabrics than the combined number of the latter two, the weave in connection with the kind and quality of yarn and also the texture. Notwithstanding that there may be several textures in any particular fabric, these are the distinguishing features that characterize the wide range of cotton fabrics.

The origin of the name is derived sometimes from the city or country in which the fabric was first made, or from the name of the maker; or, again, it may be given to the fabric from the nature of the material of which it is made, as, for example, union linen lawns; the name lawn implies that the fabric is plain woven.

In

THE CONSTRUCTION

of these fabrics there is considerable latitude in regard to ends and picks per inch and counts of yarn. Some grades of linen lawns are made up very firmly, again others may be constructed rather loosely.

ANALYSIS.

Width of warp in reed, 38 inches; width of fabric, finished, 36 inches; ends per inch, finished, 60; ends in warp, 2,160; ends in selvedges, 20; total, 2,180.

Reed, 27½x2; take-up of warp during weaving about 8 per cent; warp, 1-40s cotton.

Filling, 1-20s linen, 300 yards per hank; 56 picks.

Analysis of a coarser grade of union linen lawn: width of warp in reed, 37½ inches; width of fabric, finished, 36 inches; ends per inch, finished, 52; ends in warp, 1,872; ends in selvedges, 16; total, 1,888.

Reed, 25x2; warp, 1-30s cotton.

Filling, 80s linen, 300 yards per hank; 50 picks per inch; take-up during weaving, 10 per cent.

Fig. 1. weave.

Fig. 2 drawing-in draft.

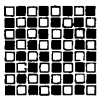


Fig. 1.

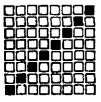


Fig. 2.

WEAVING AND FINISHING.

Fabrics used for dress goods, that is, outer garments, require more attention in the weaving than almost any other class of fabrics. The goods should be woven faultlessly, or, if the fabric has any faults, these faults must be mended so as not to show in the finished fabric; otherwise the goods can only be sold as seconds and at a greatly reduced price; consequently, a weaver has charge of but four looms on plain woven fabrics, intended for dress material. The looms used for these goods may be plain cam looms, roller looms, or clipper looms, running at from 120 to 140 picks per minute. The goods, after they come from the loom, are burled and mended, then boiled off if finished without bleaching, or they may be bleached, then pressed, made up into laps and are then ready for shipment.

Carding and Spinning Particulars.

Union linen lawn is composed of two fibres, linen and cotton, the warp yarn being cotton and the filling yarn linen. Several grades of this fabric are made, two of which are taken for example. In these two the warp yarn is 1-40s for

the fine and 1-30s for the coarser fabric. These yarns are made in the same division of mills and, in fact, the same mills make the two classes of fabric. Where this is the case,

THE DIFFERENT PROCESSES

weights per yard, etc., are the same up to a certain point. We will consider the two counts to be made of the same staple and grade of cotton, which would be 1 5-16-inch staple peeler cotton. The bales should be opened, stapled and graded before being put into the mixing, which may be done either by hand or by machine,that done by the bale breaker being better because it opens the cotton more thoroughly. The good sliver from the machines up to the slubber is mixed in at this point either as it is collected, or, as is often done, on mixing days. The cotton is put through three processes of picking and an opener.

AT THE OPENER

the general instructions given in previous articles should be followed. At the breaker picker the type of beater used may be either a pin or 3-bladed rigid type. The speed of the pin beater is 1,200 revolutions per minute and of the three-bladed type 1,000 revolutions per minute. The weight of the lap at the front of this machine is 40 pounds or a 16-ounce lap. At the intermediate picker the speed of a three-bladed beater is 975 revolutions per minute, the doublings being 4 into 1. The total weight of lap at the front of this machine is 37½ pounds or 15 ounces per yard. At the finisher picker the doubling is 5 into 1. The speed of a two-bladed rigid type of beater is 1,425 revolutions per minute. The total weight of a 40-yard lap is 33 pounds or a 13-ounce lap. At this machine the cut roving waste laps are mixed in the proportion of three laps of good cotton to one lap of cut waste. It is

GENERALLY THE CUSTOM

to prepare these laps at the intermediate picker. At the card the draft should not exceed 100 and the speed of the licker-in is 350 revolutions per minute. The wire fillet used should be that used for medium counts of yarn, or No. 110s for cylinders and No. 120s for doffer and top flats. The speed of the top flats (110 to set) should be one complete revolution every 50 minutes. The weight of the end sliver at the front should be 45 grains per yard and the production 650 pounds per week of 60 hours. Strip cards three times a day and grind once every three weeks. After grinding, set all important parts. Clean out fly at regular intervals for this class of work, it being done twice a day. Watch the strips from the top flats to see how the flats are working. Always have plenty of

SPARE BANDS

on hand so that if one breaks, another may be put on without loss of time. Always see that the brackets used for the stripping brush are properly set for both doffer and cylinder and also see that they are properly stripped by the card attendants, for too often are they only half stripped if they are not watched. The yarn used for this class of goods is combed and at the sliver lap the weight per yard is 290 grains, the doublings being 14 into one. At the ribbon lap the doublings are 6 into 1 and the weight of a yard of lap is 270 grains per yard.

AT THE COMBER

the doublings are 6 into 1 and 16 per cent of waste is taken out. The weight of the sliver at the coiler is 50 grains per yard. Follow the particulars for setting, timing and varnishing the rolls as given in a previous article. The doublings at the breaker are 8 into 1, two processes of drawing being used. The weight per yard at the breaker drawing is 90 grains per yard. At the finisher drawing the doubling is 6 into 1 and the weight per yard is 70 grains. At the slubber the drawing sliver is made into .60 hank roving. The yarn is next put through two processes of speeders or fly frames. At the first intermediate the hank roving is 2 and at the second or finishing speeder the hank roving is 6 for 30s yarn, and 8 hank for 40s yarn. The roving is next taken to

THE SPINNING ROOM

and spun into 30s on a frame having a 6½-inch traverse, 1¾-inch diameter ring, 26.02 twist per inch and a spindle speed of 9,800 revolutions per minute. For spinning 40s, a frame with a spindle speed of 10,000 revolutions per minute, 28.46 twist per inch; 1⅝-inch diameter ring and 6½-inch traverse, is used. After being spun, the yarn is spooled and then run on a beam. Several of these beams are put up at the back of the slasher and after being slashed are run on a beam at the front.

Dyeing Particulars.

OLIVE.

Five per cent pyrol olive G; 5 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

BRONZE.

Five per cent pyrol bronze G; 5 per

cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

BLACK.

Ten per cent thiogene black M conc.; 10 per cent sulphide sodium; 2 per cent soda ash; 25 per cent salt.

SLATE.

One per cent thion black T B C; 1 per cent sulphide sodium; 1 per cent soda ash; 10 per cent salt.

ECRU.

Three-quarters per cent thion brown G; 1 per cent sulphide sodium; 1 per cent soda ash; 10 per cent salt.

RED.

Six per cent diamine fast red B B; 2 per cent sal soda; 25 per cent Glauber's.

BROWN.

Five per cent immedial brown B; 5 per cent immedial cutch O; 10 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt.

SKY BLUE.

One and one-half per cent thion blue B conc.; 1½ per cent sulphide sodium; 1 per cent soda ash; 20 per cent salt. Develop with peroxide of hydrogen.

NAVY BLUE.

Eight per cent thion navy blue R; 8 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt. Develop with peroxide of sodium.

SATIN CHECKS.

Satin checks, so-called, derive their name from the appearance of the pattern, which consists of variable block effects, usually equal in size in the same piece, on the plain weave basis.

Some of the larger effects resemble checkerboards and are known as such. They are also known as dice checks.

A satin check fabric made in England for the northwestern Africa export trade is similar in construction and finish to the "herringbone" fabric, considered in a preceding article and the data given there in connection with these items will also apply here.

The weave principle upon which the cloth has been constructed may be seen in Fig. 1, which is composed of warp flush and filling flush weaves arranged on the plain cloth base, four square sections completing the weave. In this case the complete weave is on 48x48, each section being on 24x24. The base weaves used are the $\frac{1}{5}$ and the $\frac{5}{1}$ twills.

The object in alternating blocks of warp flush weaves with blocks of filling flush weaves is to produce a cloth whereon the pattern seems to appear stronger when viewed in certain directions than when viewed in others, with two weaves that have the same structure, although differing in appearance. This principle is developed on an extended scale in white damask tablecloths.

The shadow effect seen in these

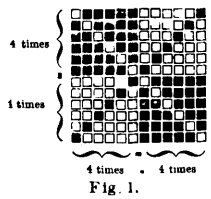


Fig. 1.

Fig. 2.

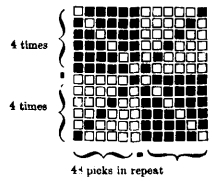


Fig. 3.

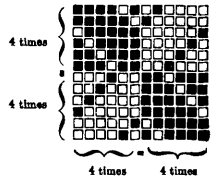


Fig. 4.

goods is an optical illusion, due to the reflection of the light after it falls on the filling being at a different angle to that reflected from the warp, both being viewed from the same position. The larger the section and the greater the proportion of one yarn as compared to the other in the same, the more lustrous will be the general appearance of the goods.

Fig. 2 shows the harness draft and Fig. 3 the chain draft for producing

the weave. Fig. 2 is known as a sectional drawing-in draft.

One of the principal points to be noted in the construction of these weaves is to make the warp floats of each section oppose the filling floats of the adjoining sections, both warp way and filling way. If this is not done, a ragged or indistinct pattern will result, in addition to the cloth not having as firm a feel.

Another point is that it is advisable to arrange the base weaves in such positions that although there are four sections in each repeat of the weave, the two filling flush sections will be exactly alike and the two warp sections alike, whenever possible.

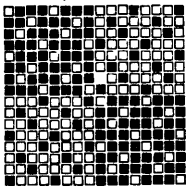


Fig. 5.

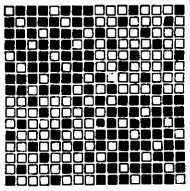


Fig. 6.

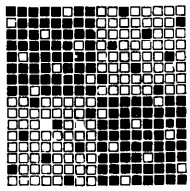


Fig. 7.

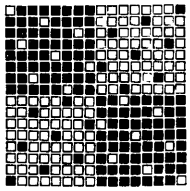


Fig. 8

This may perhaps be better understood by reference to Figs. 1 and 4. Fig. 4, although composed of the same base weaves as Fig. 1, would not make as clean and even an appearance in the cloth as the latter.

A satin check made with Fig. 5 would be preferable to one made with Fig. 6, other conditions being equal. Both of these weaves are built up from broken crow weave bases and cut on all sides.

Weave Fig. 7 would be preferable to weave Fig. 8. Both are made from the same 8-end satin weave bases, started in different relative positions.

LOOM REQUIRED.

Being woven white and with one count of filling only, a single box dobby loom is generally used when weaving these goods. The two base weaves, one warp flush and the other filling flush, are seldom made on more than 8 ends and 8 picks each, therefore a 16-harness dobby, with a selvedge motion extra, is large enough to allow ample scope for producing a variety of patterns. An 18 or 20 harness dobby should be used if there is no selvedge motion on the loom.

Carding and Spinning Particulars.

As the fabric considered is similar in construction and finish to that described under "Herringbone Stripes," the carding and spinning data need not be repeated.

Dyeing Particulars.

BRONZE.

Five per cent pyrol bronze; 5 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

GREEN.

Six per cent pyrol green G; 6 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

BLUE.

Six per cent pyrol blue B; 6 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

OLIVE.

Two per cent immedial indone B; 6 per cent immedial yellow D; ½ per cent immedial catechine G; 9 per cent sulphide sodium; 2 per cent soda ash; 25 per cent salt.

WINE.

Eight per cent diamine Bordeaux B; 2 per cent sal soda; 25 per cent salt.

RED.

Five per cent diamine fast red B B; 2 per cent sal soda; 25 per cent salt.

NAVY BLUE.

Eight per cent katigen indigo B; 8 per cent sulphide sodium; 2 per cent soda ash; 30 per cent salt.

SLATE.

One per cent thion black T B; 2 per

cent sulphide sodium; 1 per cent soda ash; 10 per cent salt.

SKY BLUE.

One per cent diamine sky blue F F; 1 per cent sal soda; 10 per cent salt.

SEA GREEN.

One-half per cent immedial green B; 1 per cent sodium sulphide; 2 per cent soda ash; 10 per cent salt.

NANKEEN, or NANKIN.

Nankeen, or nankin, pronounced nan-kēn, is a name given to a class of fabrics woven with the plain weave, the distinguishing effect of which is their peculiar yellowish brown color. This color is natural to the cotton of which they are made, the religiosum variety of the gossypium herbaceum class.

The goods are worn by Chinese people in all parts of the world.

The original nankeen fabric derived its name from Nanking, the ancient Chinese city, now known as the "southern capital," being first constructed there from a native cotton. The

PURE NANKEEN FABRIC

is finished and worn in the natural color and is of Chinese manufacture. The raw cotton is rough, short and hard to work, so much so that the supply of cotton of this type and color grown is not enough to supply the demand for the woven goods. For the last half century or more large quantities of so-called nankeen fabrics of British manufacture have been, and are being today, exported to China, the principal market for the same being at Canton. These goods are woven white and subsequently dyed the required color, dyers being able to imitate the qualities of the original nankeen color in all respects.

KINO,

pronounced ke-no, was one of the drugs formerly used for giving the nankeen color. Its chief component part is tannic acid.

Nankeen fabrics, deriving their name more particularly from their peculiar color, are made to vary to some extent in counts of yarns and constructions of cloth, although being kept to medium counts and weights.

A characteristic fabric is made as follows: Counts of warp, 26s; counts of filling, 22s; ends per inch, 68; picks per inch, 64; width, 27 inches finished.

At the present time nankeen fabrics are not necessarily those made exclusively of cotton. A sample under consideration is made from silk scrapings or waste and cotton warp, mixed before going through the preparing machines, and silk waste filling. The mixed fibres in the warp appear later in the same yarn, the yarn being single spun. The fabric is very uneven, more so in the filling than in the warp, but quite uneven in both.

LOOM REQUIRED.

Like other plain cloths, a light, quick running plain cam loom is used for their production. Woven a solid color, one warp and one shuttle only are required. The ends are reeded two in a dent throughout.

FINISHING.

Very little finishing is required for the pure goods. After being burled and brushed they are sheared or singed, or both, crabbed, washed dried, and made up as required.

Imitation nankeens in addition to the above are subjected to the process of dyeing.

Carding and Spinning Particulars.

For carding and spinning particulars, see article on "Tartan Plaids," the counts of yarns for nankeen being similar to those explained in said article.

Dyeing Particulars.

This class of goods is dyed on the gigger dyeing machine in the open width. The method of dyeing is to take the thoroughly boiled and wet out goods and roll smoothly on the first roll of the gigger. Sew the leaders on with smooth, flat seams, then fill the machine with water about six inches above the inside rolls; heat to the required temperature and add ¼ to ½ of the dissolved dye (for light shades it is best to add the color in four portions; for medium or dark shades, the dye may be added in two portions). Then start the machine and pass the cloth through the liquor on to the opposite roll, add more of the dye and return; repeat until shade desired is produced.

A fine nankeen shade may be dyed with the following dyes:

No. 1. Dye with 3 per cent extract fustic; 3 per cent alum. Boil together and add to dye bath in four portions, dyeing at 120 degrees F.

No. 2. Dye with 1-10 per cent diam fast yellow B; 0.08 per cent diam catechine G; 0.015 per cent diam catechine B: 1 per cent soda; 2 per cent soap. Start dyeing at 100 degrees F., heating

slowly to 180 degrees F., then add 5 per cent Glauber's salts in two portions and run to shade.

No. 3. Dye with 2 per cent immedial orange C; 1 per cent katigen brown G G; 3 per cent sodium sulphide; 2 per cent Turkey red oil. Start dyeing at 100 degrees F., heat to 180 degrees F. slowly, and run to shade.

MUSLIN---Foundation Muslin.

Foundation muslin is a fabric used to impart stiffness to parts of garments, principally light-weight dresses of lawn or goods of similar character used for graduation and other purposes. It is loosely woven and of very light weight. The requisite body is imparted to it in the finishing process by one or more stiffening ingredients.

The cloth is woven plain. The ends are drawn single through the heddles and reeded two in each dent, with the possible exception of the selvedge ends.

The analysis of a characteristic foundation muslin shows the following data: Ends per inch, 72; picks per inch, 68; counts of warp, 110; counts of filling, 120; finished width, 31½ inches; weight, 20 yards per pound. The selvedges consist of 12 ends of 60s yarn on each side, reeded 3 ends per dent. The counts of yarns here stated are as found in the finished cloth. All the yarns are somewhat hard twisted and are free from loose fibres.

CALCULATIONS.

31½ inches times 36 equals 1,134 dents occupied by the warp; 1,134 minus 8 for selvedges equals 1,126 dents; 1,126 times 2 equals 2,252 ends of 110s warp; 8 times 3 equals 24 ends of 60s warp; 2,276, total ends.

To find weight of warp in 100 yards of cloth, assuming 10 per cent contraction in length from warp to cloth of the fine yarn and 5 per cent contraction of the coarse yarn:

$$\frac{2{,}252 \times 110 \text{ (length)}}{110 \text{ (counts)} \times 840} = 2.681 \text{ pounds of 110s warp.}$$

$$\frac{24 \times 105}{60 \times 840} = .05 \text{ pound of 60s warp.}$$

2.681 pounds 110s.
.05 pound 60s.

2.731 pounds, total weight of warp.

The 60s warp has been considered as having been run from spools, separate from the main warp.

To find weight of filling in 100 yards of cloth:

72 (sley) — 1 = 71.
71 divided by 2.1 (constant) = 33.82 dents per inch in reed.
1,134 divided by 33.82 = 33.53 in., width in reed.

$$\frac{68 \text{ (picks)} \times 33.53 \times 100 \text{ (length)}}{120 \text{ (counts)} \times 840} = 2.261 \text{ lbs. filling.}$$

In the preceding calculation the gray and finished widths of the cloth have been assumed to be equal, the cloth having been stretched but little, and tentered to the full width, in the process of finishing. The finished width of most fabrics is less than the loom or gray cloth width, requiring that the difference between them be taken into consideration when ascertaining the amount of filling required.

To find number of yards per pound:

2.731 pounds warp.
2.261 pounds filling.

4.992 pounds, total weight.
100 divided by 4.992 = say, 20 yards per pound.

LOOM REQUIRED.

A light, fast running, single box cam loom is preferable for these goods, the ends being drawn through twine harnesses on account of the large number of ends and picks per inch and fine yarn. Being a very light sheer fabric, considerable care has to be taken with it in weaving to prevent misweaves of all kinds, particularly thick and thin places, and broken ends and picks.

FINISHING.

This process is really the one which makes the characteristic qualities of foundation muslin as distinct from other plain woven goods. A fabric of the construction mentioned, being similar in all respects except in the finish, would not be known by the same name if finished differently. In fact, many of the cotton fabrics derive their name from the finishing process to which they have been subjected, irrespective of the construction of the cloths. The purpose for which it is to be used determines, to a more or less degree, the construction and quality of plain woven cloths.

Foundation muslins are usually woven in natural color, after which they are bleached and finished white, somewhat as follows: Burl, singe, bleach, size with gum or gum "tragasol," condition, calender and make up.

When required in colors, the goods are dyed in the piece.

Dyeing Particulars.

BLACK.

Eight per cent union black S; 1 per cent diamine fast yellow A; 30 per

cent Glauber's; 2 per cent sal soda; 2 per cent soap. Top with alizarine black 4 B.

SEA GREEN.

One-half per cent diamine black H W; 4 ounces diamine fast yellow B; topped with new methylene blue N, new phosphine G.

For 10 gallons dye liquor: 6 ounces soap; ½ ounce sal soda; 3 ounces phosphate soda.

NAVY BLUE.

Three per cent diamine dark blue B; 1 per cent diamine brilliant blue G; topped with new methylene blue N X; metaphenylene blue B; indigo blue N.

PEARL.

Two ounces diamine gray G; 1-16 ounce diamine brown M; topped with aniline gray B.

SLATE.

Ten ounces diamine gray G; ⅛ ounce diamine brown M; topped with cyanol extra; orange extra.

LIGHT MAUVE.

One ounce diamine violet N; ½ ounce diamine brilliant blue G; topped with methyl violet B I.

VIOLET.

One per cent diamine violet N; ½ per cent diamine brilliant blue G; topped with methyl violet B I.

PINK.

Two per cent diamine rose B D; topped with rhodamine G.

SKY BLUE.

Four ounces diamine sky blue F F; topped with cyanol extra.

LIGHT BROWN.

One per cent diamine brown B; ½ per cent diamine yellow B; topped with Bismarck brown F F; thioflavine T.

MYRTLE GREEN.

Two per cent diamine black H W; 2 per cent diamine green B; 1 per cent diamine fast yellow B; topped with brilliant green; new methylene blue N.

CREAM.

One-quarter ounce diamine gold; ¼ ounce diamine orange B; 1-16 ounce diamine fast yellow B.

STEEL.

One-eighth ounce diamine gray G; topped with cyanol extra; aniline gray B.

SILENCE CLOTH--Filling Backed

Silence cloth, or table felting, is a heavy cotton fabric used to cover the table, under the linen cloth, for the purpose of preventing damage to the finish of the table and to make the cloth look whiter.

Standard widths of these goods are 54 and 64 inches.

In order to make heavy, thick, firm fabrics it becomes necessary to depart from single cloth structures and interlace the yarns on one or other of the compound weave principles, such as backed, double or heavier ply cloths. In these fabrics some of the yarns, while forming part of the structure, may appear only in the centre or the back, not showing on the face.

THE SIMPLEST FORM

of these is either a warp-backed or filling-backed fabric. the former of which was shown in the article on "Cotton Cassimeres."

Filling-backed fabrics, especially those of the reversible type, i. e., those

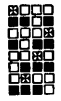


Fig. 1.

with the face and back similar, that are made with filling flush weaves, are excellently adapted for making silence cloths, because a heavy nap is required on both sides of the fabric and this can be obtained best by using soft yarn. The nap is obtained principally with the filling yarns, which are soft and coarse, as warp yarn must have considerably more twist than is required for filling in order that it may withstand the wear and tear of the movements caused by the heddles and reed during weaving.

Fig. 1 shows a weave for a filling-backed fabric with a $\frac{1}{3}$ twill on each side. Marks ⊠ represent the face weave; solid type represents the back weave.

A cloth woven with this design would show the warp on both sides, when in the gray, but only one-half of the filling on each side.

The individualities of the yarns are lost in the finishing process; in silence cloths, therefore, such a cloth, if woven with Fig. 1, picked one pick white and one pick color, would have a white sur-

face on one side and a colored one on the other. As the loose fibres of the filling would practically cover the warp, the color of the latter would be of little consequence. On the score of economy it would be best to have it white.

THE ANALYSIS

of a silence cloth, before finishing, shows it to have been constructed as follows: Ends per inch, 68; picks per inch, 40 (20 on the face and 20 on the back); warp counts, 11.6, probably intended for 11.5; filling counts, 2⅞; width, 58 inches; weight, 1.45 pounds per yard; weave, Fig. 1. This cloth would finish 54 inches.

The warp has contracted 18 per cent in length. The filling lies straight, showing little, if any, shrinkage from loom to cloth. It is soft-twisted, containing but five turns per inch.

Very heavy silence cloths are constructed on the double or higher ply cloth principles.

LOOM REQUIRED.

For weaving filling backed silence cloths a heavy loom is required. Although they may be woven on cam looms, a dobby would be preferable, unless it was certain that the same pattern would be run on the loom continually. One warp and one shuttle only are required. On account of the coarse filling and the width of the cloth, the shuttles should be large.

FINISHING.

The processes of bleaching and napping constitute practically all the finishing these goods receive, being woven and finished white.

Carding and Spinning Particulars.

Silence cloth is made up of yarns which are made in the first division of mills, as given in a previous article. The counts of yarn vary according to the weight of the cloth and in the sample that has been taken for description are as follows, 11½s for filling and 2.75s for warp. These yarns are soft twisted to allow them to be easily brushed so as to cause a short, soft nap. The yarns are made of short stock, but as a general rule waste (except cut roving waste) does not enter into the mixing. The staple used would be about ¾ to ⅞ inch in length. The mixing should be large and at each mixing the cut roving waste laps should be mixed in. Mixing for this class of goods is done by hand and it is the general rule to work for production and not for quality, as a great many defects are covered up in the brushing of the cloth.

TWO PROCESSES OF PICKING

are used. The mixing after being allowed to stand is fed to the feeders. The seeds, fly, etc., should be taken out at regular intervals and care taken to see that the pin beater is properly set so that the correct amount of cotton will be fed to the breaker picker, to which the opener is generally attached. The beater of this picker is generally of a two-bladed rigid type and for this stock its speed is 1,550 revolutions per minute. The total weight of the lap at the front should be about 40 pounds or a 16½-ounce lap. At the finisher picker the doubling is four into one, the speed of the beater, 1,500 revolutions per minute, and the total weight of the lap 39 pounds or a 14½-ounce lap. A variation of not over 8 ounces either side of standard total weight should be allowed. Care should be taken to see that the drafts are properly directed so as to make an even lap that does not have a tendency to split or lick up. The eveners should be properly looked after to see that they are working properly and the dirt, seed, etc., cleaned from under and about the machines at regular intervals. If possible the pickers should be run so that they may be stopped as early as possible in the week so as to clean out the cages and feed rolls, etc.

AT THE CARDS

the draft should not exceed 95 and the wire fillet used on the cylinder should be No. 90s and on the doffer and top flats No. 100s. Grind and clean cards as given in previous articles. The settings of the different parts of the cards should be the same as those given for indigo prints in a previous article. The weight of the sliver should be 65 grains per yard and the production from 800 to 1,000 pounds per week of 60 hours. For this class of goods two processes of drawing frames are used. The frames may be fitted with either leather covered or metallic top rolls; generally speaking the former are preferred for various reasons. The doublings are 8 into 1 and the weight of the sliver at the finisher drawing frame is 75 grains per yard. The speed of the front roll is 400 revolutions per minute.

At the slubber the sliver is made into .40 hank. For

THE WARP YARN

this is spun into 2.75 (single) soft twist. For the filling yarn there is one process of fly frame at which the slubber roving is made into 1.25 hank. The setting of the rolls should be looked after to see that they are properly

spread and that the top rolls are in good condition. The speeder or fly frames should be scoured at least once a year. After passing the fly frame the roving is made into 11.5s, being put in single, on a frame having a 7-inch traverse, 1⅝-inch diameter ring and spindle speed of 6,500 revolutions per minute. This yarn is also soft spun.

ORLEANS LININGS.

Orleans linings comprehend a class of goods, of various qualities and patterns, having a cotton warp and worsted filling. They are used principally for lining the heavier garments for outer and winter wear, and are seen in black and all the fashionable shades. A large proportion are made with the 5-end twill, $\frac{1}{4}$, ground, Fig. 1, the selvedge being woven plain, or with

Fig. 1.

two picks in a shed and catch thread on the outside.

The cheapest grades are woven white, then piece-dyed in solid colors. Better grades have warp dyed yarns, the filling in the same being woven white and dyed to match the warp after it leaves the loom. By this method cotton warp yarns of two colors may be used, say black and white, the black being used for the body of the cloth and the white for the selvedges, the dyes used for the wool not affecting the cotton to any appreciable extent.

Advertising has educated the retail

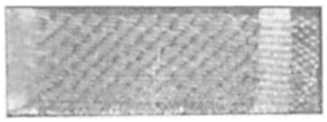


Fig. 2.

dealers and consumers to the fact that cotton warp goods with a white selvedge, the ground being of color, are more to be depended upon not to crock than similar cloths of solid color.

The worsted filling used is of a naturally lustrous type, which is capable of being made more lustrous by the finishing process. The yarns are required to be of good quality in order to finish and make up satisfactorily.

Fig. 2 illustrates a characteristic

ORLEANS LINING,

unfinished, containing three counts, colors and qualities of warp yarns. The ground warp is of a dark slate color (probably intended for black). This is of 30s counts, is reeded 3 ends per dent, and weaves as shown in Fig. 1. The section just inside the selvedge is solid white, is of 3-ply 100s counts, is reeded 8 ends per dent, and weaves two picks in a shed; there are 24 white ends on each side. The selvedges proper consist of 16 ends of 3-ply 60s black cotton on each side and are reeded 4 ends per dent; they weave plain. The selvedge ends are drawn 2 as 1 through each heddle; the remainder of the ends are drawn single.

CONSTRUCTION.

The construction of the cloth is 80 square, i. e., 80 ends and 80 picks per inch.

The fabric under consideration, Fig. 2, would require 9 harnesses, 5 for the ground, 2 for the white warp and 2 for the selvedges, and could be handled best on a dobby loom. By exceptional care in beaming the yarn it would be possible to put the three counts of warp on the same beam, but it is not advisable to do so for various reasons. One is that the 3-100s yarn, being so crowded in the reed, would under normal conditions take up faster than the ground warp and thereby become tighter. Being 3-ply yarn of good quality it might stand the strain of weaving all right, but would not stretch to any extent in finishing. If the ground cloth was stretched to its limit in finishing, the white yarn would be liable to break during that process. For the best results it would be advisable to run the white and selvedge yarns from spools, and the ground warp from the main beam. The white yarn should be run with a minimum amount of tension.

The white ends in this sample are so crowded in the reed as to cover the filling entirely; these would show solid white even after the filling was dyed to match the ground warp. It is something out of the ordinary to have such an elaborate selvedge as this on a lining fabric, the general run of the goods having a solid color ground and a few white ends for selvedge.

LOOM REQUIRED.

For ordinary lining fabrics where the ground weave does not occupy more than 5 harnesses, a cam loom with a selvedge motion would be the

best to use. A loom weaving 5 ends sateen could readily be changed over to weave a 5-end twill by changing the order of treading the cams, or, if the cams are cast in one piece, by changing the order of tying up the harnesses. One shuttle only is required.

FINISHING.

The finishing process consists of burling, singeing, crabbing, dyeing, drying and shearing and pressing on hydraulic press.

Carding and Spinning Particulars.

Orleans linings are made up of worsted and cotton yarns. The counts of these vary according to the grade of the lining desired. The cotton warp yarns of the sample analyzed are: main warp 30s, section just inside the selvedges, 3-100s, and the selvedge itself 3-60s. These counts of yarn are made in the third division of mills as given in a previous article. While the count of the main yarn is only what may be called a medium count, still, it is made in mills where fine counts are made. It must be understood that while the mills making fine count yarns may and do make low or coarse count yarns, the medium and low count mills cannot make high count yarns with equal success.

FOR THE YARNS

in the fabric to be described, three different lengths of staple cotton are used. These are mixed either by hand or with the bale breaker, the latter being the better method, because no matter how closely the laborers are watched, they do not break up the cotton as it should be done. The mixing should be allowed to stand as long as possible in order to dry out. Three processes of pickers are used and the same beater speed may be used for the three different lengths of staple. At the breaker picker a two-bladed beater of the rigid type is generally used. The speed of this beater is 1,500 revolutions per minute. Care should be taken to have the feed rolls and cages taken out and cleaned at regular intervals, which should be as frequently as possible. Be careful to get a lap that does not split. The weight of the lap at the breaker picker should be about 40 pounds for all three staples. At

THE INTERMEDIATE PICKER

the laps are doubled 4 into 1. The speed of this beater is 1,450 revolutions per minute. The weight of the lap at the front is 37½ pounds. At the finisher picker the laps are doubled 4 into 1, and the speed of the beater is 1,400 revolutions per minute. The total weight at the front may be the same for all staples or they may have different weights, according to the ideas of the ones in charge. If of different weights, the weight of the lap for the 30s yarn, which would be made out of 1⅛ to 1 3-16 inch staple cotton, would be 39 pounds or a 14½-ounce lap; for the 60s yarn (1 3-16 to 1 5-16 inch staple), 35 pounds or a 12½-ounce lap; and for the 100s yarn (1½ to 1⅝ inch staple), 35 pounds or a 12½-ounce lap. The staples of cotton given above are for the fabric under description and do not apply to all fabrics made up of the same counts of yarn. Look out for the drafts and see that the required number of laps are always up at the different processes and also that

THE EVENING MOTIONS

are in perfect working order. A variation of half a pound either side of the standard weight is allowed, but all laps that vary more than this should be run over again through the finisher picker. Look out to see that the picker tender on the finishers does not pull enough lap off of a heavy lap to make it the required weight. Enough laps should be made between Monday and Friday noontime to enable the cards to be run the rest of the week. This is so that the picker men may have time to clean the pickers and make all repairs on the machines that are required.

THE CARDS

should be equipped with fine counts of wire fillet. The draft at the card for the 30s yarn should not exceed 95, for the 60s 100, and for the 100s not less than 100. The flats for the coarser yarn should make one complete revolution every 55 minutes, for the middle count in 50 minutes, and for the fine count in 40 minutes. Grind, strip and set as described in previous articles when these counts of yarns have been described. The weight per yard of the sliver should be 45 grains and the production 800 pounds for the 1 3-16-inch staple, 700 pounds for 1 5-16-inch staple and 550 pounds for 1⅝-inch staple for a week of 60 hours. All the card sliver for this fabric is combed. It is

THE GENERAL METHOD

to run the cotton in succession through the following machines: sliver lap, ribbon lap and comber, but a great many mill men nowadays prefer the following arrangement: one process drawing frame, sliver lap and comber.

If the former method is used, the doubling at the sliver lap machine (for an 8¾-inch width lap) is 14 into 1, and at the ribbon lap machine 6 into 1. The weight of the lap at the sliver lap machine is 295 grains per yard, and at the ribbon lap machine 275 grains per yard for 1 3-16-inch staple, 290 grains at sliver lap and 275 grains at ribbon lap for 1 5-16-inch stock and 280 grains and 265 grains for 1⅝-inch stock. Size at ribbon lap once a day, an allowance of five grains either side of standard weight being allowed before changing draft gear. At the comber the doubling is according to tne number of heads that comber contains (6 or 8). The usual setting and timings should be used. The percentage of waste taken out at the comber is as follows: 15 for 1 3-16, 16 for 1 5-16 and 18 to 20 for 1⅝ inch stocks.

TWO PROCESSES OF DRAWING

are used, the doubling at the breaker being 8 into 1, and at the finisher 6 into 1. The weight of the sliver at the finisher drawing is 70 grains per yard for all the cotton. Size drawings four times a day, an allowance of 2 grains per yard either side of standard weight being allowed, before changing draft. At the slubber the sliver is made into .60 hank roving for all stocks.

To make 30s yarn the cotton is put through two processes of fly frames. At the first intermediate, the hank roving made is 2, and at thefine frame 6. This is made into 30s yarn on a warp spinning frame with a 2¾-inch traverse, 1¾-inch diameter ring, and a 6½-inch traverse. The yarn is then spooled, warped and put through the slashers.

THE SLUBBING ROVING

for the 60s yarn is put through three processes of fly frames, the hank roving being 1 at first intermediate, 3 at second intermediate and 12 at jack frame. This is spun into 60s yarn on a frame having the following particulars: 1½-inch diameter ring, 6-inch traverse, and spindle speed 10,000 revolutions per minute.

The yarn is then spooled, made into 3-ply yarn, spooled and run on to a selvedge warp.

The slubber roving for 100s yarn is also put through three processes of fly frames. At the first intermediate it is made into 2 hank, at the second into 6 hank, and at the fine or jack frame, 20 hank roving. This is spun into 100s on a spinning frame having a 2¾-inch gauge, 1⅜-inch diameter ring, 5-inch traverse and a spindle speed of 9,400.

After being made into 100s yarn it is spooled and twisted into three-ply yarn, after which it is spooled and warped and put through a slasher.

At the sliver lap machine, ribbon lap machine, comber and drawing frame the leather top rolls have to be varnished, and should be kept in perfect condition, both as to varnish and leather.

THE VARNISH USED

for the comber rolls should be of a heavier or rougher kind than that used for the other rolls. Several recipes for varnish have been already given, but the following will also be found to be an excellent one: For comber rolls use 8 ounces plate glue, 8 ounces ground gelatine, 12 ounces burnt sienna, 1 ounce oil originum, 3 pints acetic acid, 1 pint water. For the other rolls use the same mixture, excepting that vermilion should be used instead of the burnt sienna. This will make a much smoother roll than the varnish used for the combers. Many also varnish the front rolls of the slubber; when this is done the varnish used should be thinner than the others, being thinned with the acetic acid.

Dyeing Particulars.

Dyeing orleans linings, as in all other classes of goods, is done in a good many ways, according to the quality and the price the goods are sold at. A fine quality black orleans is woven with a black warp, which will stand the after processes of finishing and dyeing, which are crabbing, scouring, singeing and steam lustring; then dyeing either with a logwood black on a chrome mordant or one of the blacks which dyes the worsted filling at one dip in an acid bath. If the goods have white cotton threads in the selvedges, the dyer will select one of the blacks which have no affinity for cotton in the acid bath. Dyestuffs suitable for the warps on this class of goods are

THE SULPHUR BLACKS,

which are sold under several names, but all dye in the same manner in a bath composed of the dye, sodium sulphide, soda ash and common salt or Glauber's salts. Another black suitable for this class of goods is the diamine blacks, developed. These blacks are dyed in the following manner: first the warps are dyed in a boiling bath with the diamine black and Glauber's, then treated in a cold bath with nitrite of soda and muriatic acid, then in a third cold bath with phenylenediamine. Fast slate shades are dyed the same as the blacks, only using about half the proportion of dyes and shad-

ing with small portions of red or yellow of the same group of dyes. Orleans

FOR FANCY COLORS

are woven with white cotton warps and worsted filling, which are dyed either with the direct colors, which dye the cotton and worsted at one bath, or the four-bath method. The first method consists in dyeing in a bath composed of the direct cotton dyes and wool dyes which dye in a neutral bath with Glauber's salts at boil. The second method is to first dye the worsted filling with aniline dyes in a bath with acid and Glauber's salts. Wash well. Then treat the warps with tannic acid, or sumac, in a cold bath; then in a third bath, with tartar emetic, or one of the antimony salts; then in a fourth bath dye the warp to shade with basic dyestuff. The dyeing of this class of goods, like that of all other goods dyed in the piece, requires considerable practice and skill.

SHADOW CHECKS.

Shadow checks are a class of patterns of set check or block effects of a very faint character. Viewed from certain directions, they appear to have a faint stripe or to be without pattern entirely. They are seen in apparel goods of various materials, from silk to cotton, and usually in plain, simple twill, or other small regular weave. The goods are always shown in white, black or solid color.

Shadow checks are the faintest check effects that appear in woven goods and are made by arranging a certain number of ends of yarn twisted to the right and a certain number twisted to the left, and picking the filling in a similar manner. For example, a shadow check of the shepherd plaid type, i. e., a check with alternate blocks of equal size, might have the warp yarns arranged 10 ends of right twist and 10 ends of left twist alternately, the filling being inserted 10 picks of right twist and 10 picks of left twist.

A MODIFICATION

of this might be made by arranging the yarns in both warp and filling, 4 right twist, 2 left twist, 4 right, 4 left, 2 right, 4 left; 20 ends and 20 picks per pattern.

As the yarns are all of the same counts, material, quality and color, and are reeded equally, it follows that something out of the ordinary causes the check effect. It is an optical illusion, due to the reflection of the light that falls upon the fabric being deflected at a different angle in the sections composed of right twist yarns to the sections composed of the reverse twist yarns.

In a shadow check of the shepherd plaid type under consideration, the face yarns are arranged 16 of each

Fig. 1.

twist alternately in both warp and filling. The face weave is the 4-end basket.

LOOM REQUIRED.

These goods require box looms of the simplest type, with two boxes at one end and a single box at the other.

The manner of preparing the warps determines to some extent the type of shedding motion to use, whether cam or dobby. As the finished fabrics are required to be in one solid color, and some warp yarns differ from others only in the direction of twist in the same, care has to be exercised to keep the yarns where they belong and to tie in the right twist when an end breaks.

ONE OF TWO METHODS

may be adopted to assist in keeping the yarns in order:

First, tint the yarns of one twist with a light substance that may be noticeable in the loom and yet wash out readily before it is dyed, the other warp yarns being in the gray. By this method the warp yarns may all be readily drawn on one beam, and woven on a cam loom.

Second, place the different twists of yarns on separate beams and draw them through separate sections of harnesses. When this method is adopted it is advisable to use the dobby in preference to cams on account of the number of harnesses required.

Two colors or kinds of bobbins should be used, one for each kind of twist, so that the filling will not be liable to get mixed; or if cops without tubes are used, the shuttles should be marked so as to be easily distinguished. Tubes of different colors can be used if the cops are built on tubes.

IMITATIONS

of shadow checks have been shown to some extent in cotton warp and mo-

hair or lustre worsted filling goods. These are made with the warp yarn all the same twist, the shadow effect, warp way, being obtained by reeding some dents with more ends than others.

In a fabric of the type of goods under consideration, the yarns are arranged as follows:

WARP.

Ends.		Dents.
18	in	9
1		1
18		9
1		1
10		5
1		1
10		5
1		1
10		5
4		4
10		5
4		4
10		5
1		1
10		5
1		1
10		5
1		1

Total, 121 ends in 68 dents, per pattern.

FILLING.

Right twist yarn.	Left twist yarn.
10	6
10	6
6	6
6	6
6	10
6	10
6	6
6	6
6	6
62 +	62 = 124 picks per pattern.

As these fabrics are characterized by the pattern, the constructions of the cloths vary considerably. The fabric under consideration contains an average of about 55 1-3 ends per inch of 2-120s cotton, the same twist throughout. Each pattern contains 121 ends and measures 2 3-16 inches; 121 divided by 2 3-16 equals 55 11-35 or 55 1-3 per inch.

There are 48 picks of worsted per inch.

Shadow stripes are made by using only one kind of filling, the warp yarns being arranged as in shadow checks, with the take-up of the cloth regular. An irregular take-up would make a check effect.

Carding and Spinning Particulars.

The carding and spinning data for this class of fabric are those given in the article on batiste and need not be repeated here.

Dyeing Particulars.

These goods are dyed with 30 per cent Glauber's salt and run at a temperature of 190 degrees F. until the wool is dark enough, when the steam is turned off and the bath cooled down and the goods run until the cotton warp is dyed to shade.

LIGHT PINK.

One-half to 2 ounces erika pink.

BLACK.

Five per cent union black S B.

LIGHT BLUE.

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

LIGHT SLATE.

Two ounces diamine black B H; dye as pink.

RED.

One-half pound benzo fast red 4 B; dye as pink.

YELLOW.

Dye as pink. Eight ounces chrysophenine.

ORANGE.

Dye as pink. One pound Mikado orange B.

SCARLET.

Dye as pink. One pound diamine scarlet B.

LIGHT WINE.

Dye as pink. One pound diamine Bordeaux B.

LIGHT AMBER BROWN.

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

TOBACCO BROWN.

One-half 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.

BARATHEA.

Barathea, or barrathea, is a name used to denote a certain effect in woven fabrics, obtained principally by the manner in which the warp yarns are interlaced.

The effect combines to a greater or less degree several well-known types of

woven effects. Viewed in certain ways the effect is that of a stripe. Upon close examination it appears like a broken cord, and yet somewhat like a basket weave.

An examination of Fig. 2, the weave will reveal how these effects are obtained. This weave is complete on 24 ends and four picks, having been repeated in the picks. At the points indicated by the space there is a break in the regular formation of the pattern, caused by one section, which is in all respects like the other, in so far as the effect it makes is concerned, being raised half way of one

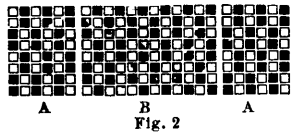


Fig. 2


Fig. 3.

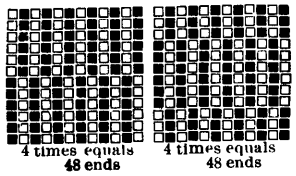


Fig. 4.

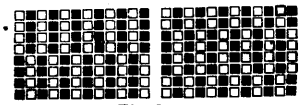


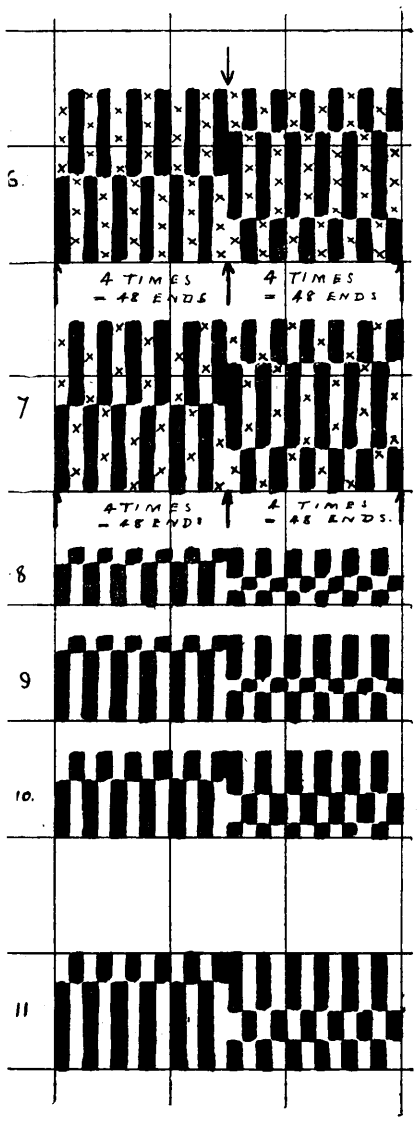
Fig. 5.

cord above the other, or, as it is termed, one section is "set across" the other. It is at these points that a cut effect is obtained, which defines the stripe warp way. One repeat of the weave, in the number of picks it contains, is represented in the cloth by two repeats of the effect, or two cords warp way.

Section A, or B, of Fig. 2 is simply repeats of warp cord weaves. Each section represents six repeats of the two end cord, Fig. 3, and if woven alone would form an unbroken cord or rep effect across the cloth. The greater the number of ends in each section of the weave, as compared with the number of picks, the more pronounced will be the cord appearance. The nearer square the complete pattern appears in the cloth, the more will it resemble a basket effect.

The patterns vary from square to effects several times longer filling way than length way of the cloth.

When constructing cloths with warp



cord weaves, of which barathea weaves are an extension, considerably more ends than picks per inch are required, the object being to cover the filling yarns entirely.

Barathea fabrics in all-silk, or with silk warp and cotton filling, are ex-

tensively used in the manufacture of gentlemen's neckties. They are usually shown in white, black, solid and staple colors, although occasionally made in more than one color.

The construction of two of these fabrics is as follows: White, fine silk warp and spun silk filling, weave, Fig. 2; 280 ends and 72 picks per inch; 23 1-3 ribs per inch. Black, fine silk warp, ply cotton filling, weave, Fig. 4; 480 ends and 100 picks per inch; 10 ribs per inch. They are seldom made with larger effects than this for tie silks.

Baratheas are excellent wearing fabrics, the yarns exposed to wear, the warp yarns, being necessarily fine and of good quality. They are made to differ in the sizes of ribs used, small effects being used more than large ones. The size is regulated by one or both of two factors; first, the number of ends and picks in a repeat of the weave; second, the number of ends and picks per inch, of yarn in the cloth. Figs. 2, 4 and 5 are the weaves generally used, the number of ends in each section varying accord- to requirements.

The two sections comprising the repeat, no matter how many ends used, usually contain an equal number of ends.

With the weaves already noted the effect produced on the back of the cloth is an exact duplicate of that on the face. A modification or extension of these weaves, used principally in the larger effects, is shown in Figs. 6 and 7.

The solid marks in Fig. 6 indicate a weave that would form an effect on the face of the cloth similar to that made with weave Fig. 4. These represent where the warp would show on the face, coming together and covering the raisers indicated by the crosses. The latter indicate a broken plain weave on the back.

Fig. 7 would make the same face effect in the cloth as Fig. 4, if woven with the same construction, but the back of the cloth would show a broken twill effect. A firmer fabric would be produced with weaves 6 and 7 than with No. 4, with the same amount of material.

Further extensions of these weaves are illustrated in Figs. 8, 9, 10 and 11.

The patterns indicated may be woven on ordinary single box silk dobby looms. If two colors are used in the same fabric they are arranged in the warp. As the warp covers the filling there is nothing to be gained by using more than one color of filling.

LOOP OR KNO CLOTH.

Loop or kno cloths are characterized by small loops of warp yarn projecting from the face of the cloth, usually in set, regular order.

They are novelties, not standard goods, and as such are not limited to any one construction, quality or material. They are generally made with cotton, wool or silk yarns. The yarns forming the loops are used for ornamental purposes only.

Fig. 1 is an example of a loop pattern on a $\frac{2}{2}$ twill ground. The loop yarns in this particular instance

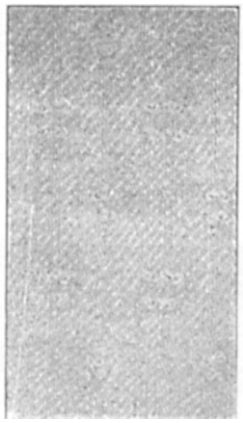


Fig. 1.

are arranged as extras, not showing on the face of the cloth, except where they are required to form the loops. Figs. 2, 3 and 4 show the weave, harness draft and chain draft respectively to produce Fig. 1. The ground ends are drawn through harnesses 1, 2, 3 and 4, and the loop yarns through 5, 6, 7 and 8. The weave is complete on 52 ends and 60 picks, including 4 wire picks.

THE LOOP YARNS

weave $\frac{1}{3}$, except where they are required to loop, and are tied between two face ends raised on opposite sides of the ties. Crosses in Fig. 2 show where the loop yarns are raised over the wires to form the loops. Circles indicate tying points, two ends working together as one. Crosses in Fig. 4 indicate where the wires go between the warp yarns in place of the regular shuttle. All the face warp is down, and the take-up motion of the loom is stopped on these picks.

THE CONSTRUCTION of sample Fig. 1 is 85.8 ends and 66 picks per inch average. The ground cloth is 66 square and there are 12 loop or extra ends to every 40 ground ends. The warp is all two-ply yarn of similar count. The filling is single yarn.

LOOM REQUIRED.

Loop effects may be woven on loop pile carpet looms, or on ordinary dobby or jacquard looms provided with special mechanisms or attachments, and beam stands, upon which one or more extra beams may be placed, varying according to requirements. The loop yarns take up faster, and more intermittently, than the ground yarns, requiring a greater length of warp for a given length of cloth.

There are

VARIOUS METHODS

by which the loops may be obtained, each of which requires different attachments. Some of these are as follows:

First. The loop yarns are arranged to work gauze or leno in connection with wires fastened to one or more of the harness frames. These yarns go from one side to the other of the wires and as the cloth is drawn down, slide over and away from them and are left in loops.

Second. Wires are inserted across the cloth in place of the regular shuttle, on the picks required to form the loops, on the principle applied when making loop pile carpets. These wires are automatically withdrawn after the ground filling has secured the loops.

Cloth illustrated in Fig. 1 has been made on this principle. Two extra spools or beams have been used, one for ends on 5 and 6, and one for ends on 7 and 8.

Third. The loop yarns are allowed to come off the warp beam at about the same tension as the ground ends, except on the picks when they are required to loop, when they are forced forward a greater length by a positive motion. On these picks the yarns are eased after the shuttle has crossed the shed, and the shed closed before the reed reaches the fell of the cloth. This is, perhaps, the simplest method.

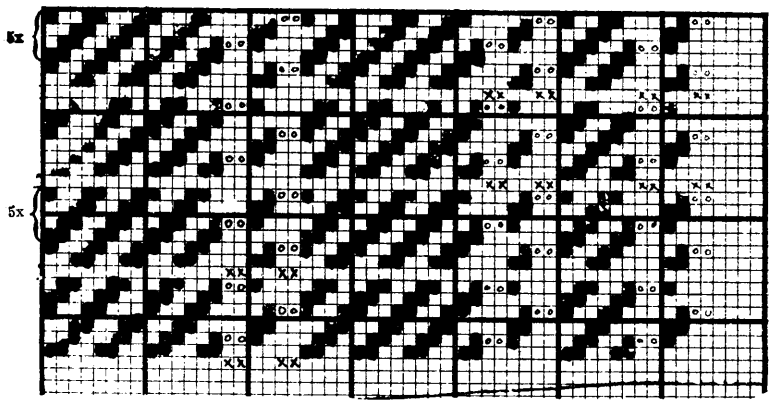


Fig. 2.

Fourth. The loops may be made on a loom with a terry reed motion (see article on terry toweling), but this is liable to make the cloth look barry where the three picks are beaten up together, as the ground ends offer considerably more resistance than on an ordinary terry towel fabric, there being only a relatively small portion of the ends weaving terry.

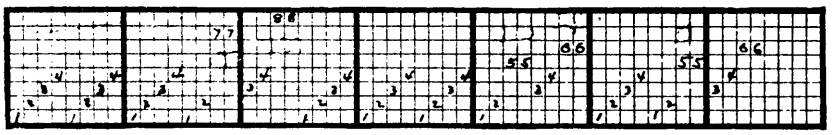


Fig. 3.

Dyeing Particulars.

LIGHT SLATE.

One per cent diamine black B H; 1

per cent sal soda; 20 per cent Glauber's salt.

ECRU.

One-half per cent diamine catechine G; ¼ per cent diamine fast yellow B; 1 per cent sal soda; 20 per cent Glauber's.

NAVY BLUE.

Eight per cent immedial new blue G; 10 per cent sodium sulphide crystals; 2 per cent caustic soda lye, 75 degrees Tw.; 30 per cent Glauber's.

BOTTLE GREEN.

Eight per cent diamine black H W; 2 per cent diamine fast yellow B; 2

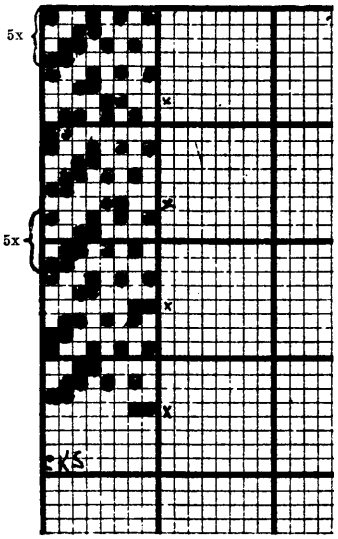


Fig. 4.

per cent sal soda; 20 per cent Glauber's salt.

GRAY.

One per cent immedial black N L N; 1 per cent sodium sulphide; ½ per cent caustic soda solid; 20 per cent salt.

MAROON.

Five per cent immedial maroon B; 6 per cent sodium sulphide; 1 per cent caustic soda solid; 20 per cent salt.

MODE.

One per cent immedial brown B V; 1 per cent immedial yellow D; 2 per cent sodium sulphide; ½ per cent caustic soda solid; 20 per cent salt.

GREEN.

Eight per cent immedial green G G; 10 per cent sodium sulphide; 2 per cent caustic soda solid; 20 per cent salt.

BLACK.

Six per cent para diamine black B B; 2 per cent sal soda; 20 per cent salt.

RED.

Five per cent diamine fast red F; 2 per cent sal soda; 20 per cent salt.

PEA GREEN.

One-half per cent diamine green G; 1 per cent sal soda; 10 per cent salt.

SKY BLUE.

One per cent diamine sky blue F F; 1 per cent sal soda; 15 per cent salt.

CREPONS.

These fabrics are made up of a combination of cotton worsted, or cotton, worsted and silk. The goods are usually piece dyed and used principally for ladies' wear in the form of skirts. The character of the patterns for these fabrics is such that the best effects can only be obtained with the use of the jacquard loom. In this treatise we will consider the fabric as woven on the harness loom. The harness loom is utilized either because the manufacturer has no jacquard loom on hand or wishes to reduce the cost of weaving.

THE WEAVE

for these fabrics is based on the doubled cloth system. Under the head of doubled cloth we comprehend the combining of two separate textures into one fabric requiring separate warp and filling threads for each texture. Combining the two textures into one fabric is effected by interlacing the warp or filling threads, or both, of one texture into those of the other at regular intervals.

The pattern being effected with the warp and filling of one system of threads forms a raised figure on the face of the goods. This raised figure depends as much on the nature of the yarn as it does on the weave. The cotton in the goods is principally used as a back for the raised figure; the worsted forms the figure. If silk is used, the silk forms the figure and the worsted or wool goes into the body of the goods, and in the finishing of the fabric contracts considerably, thus accentuating the figure.

In a foregoing paragraph it was

suggested that the best effects are only obtainable with the use of the jacquard loom, by reason of the fact that the patterns are too large to be operated on the harness loom, and as a rule the quality of the fabric is not made as fine as the jacquard loom fabric; however, a harness loom that can operate 24 harnesses can produce some very clever effects. The variety in regard to texture in these fabrics can be comprehended best by comparing several fabrics of different textures. Some idea may be obtained by the following constructions.

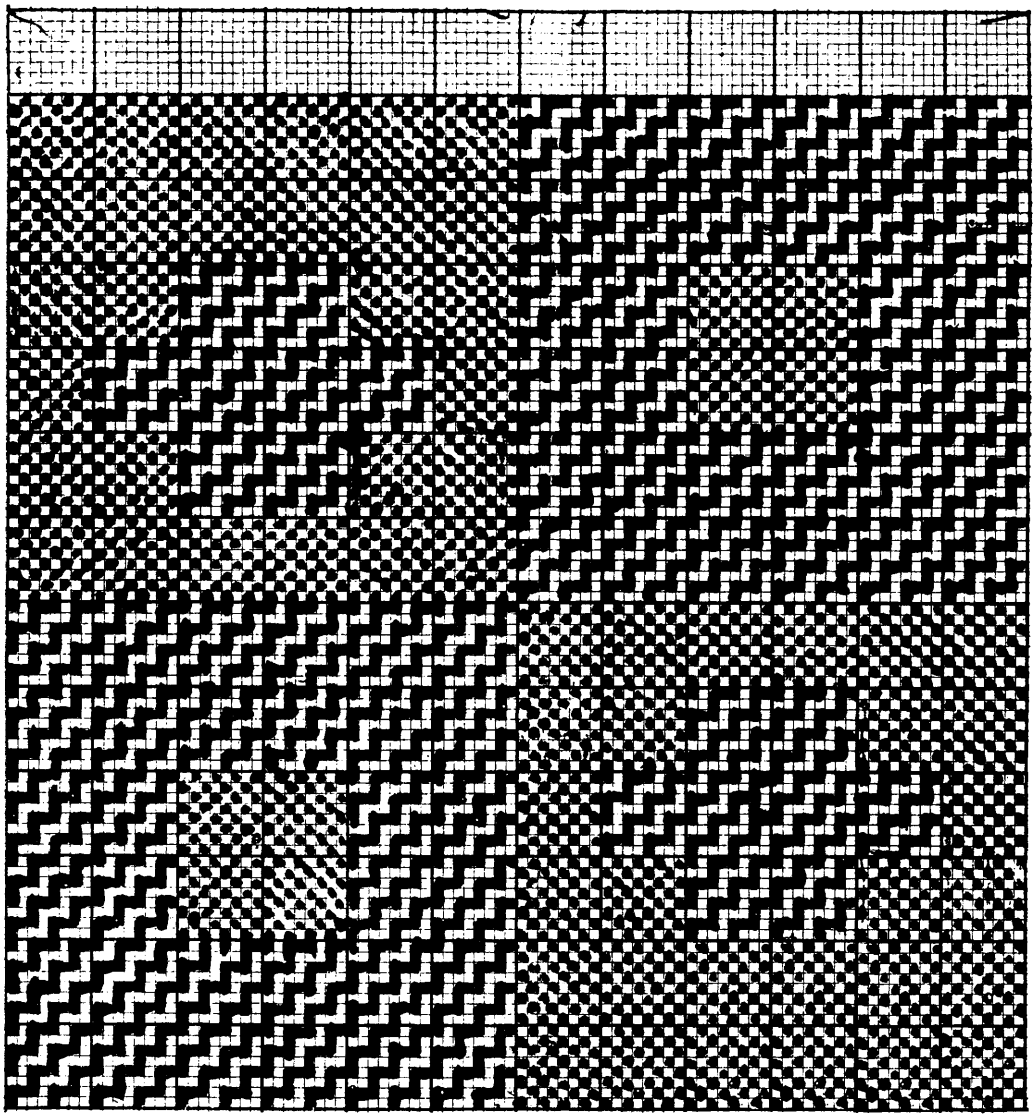


Fig. 1.

A texture for a cheap grade crepon: Width in reed, 56 inches; finished at 52 inches; warp plan, one end face

warp, 2-32s mohair, 1 end back warp, 2-50s cotton; 15x4 reed; filling, 1-30s cotton filling; 60 picks.

A better grade may be made with the same warp plan, by using one pick

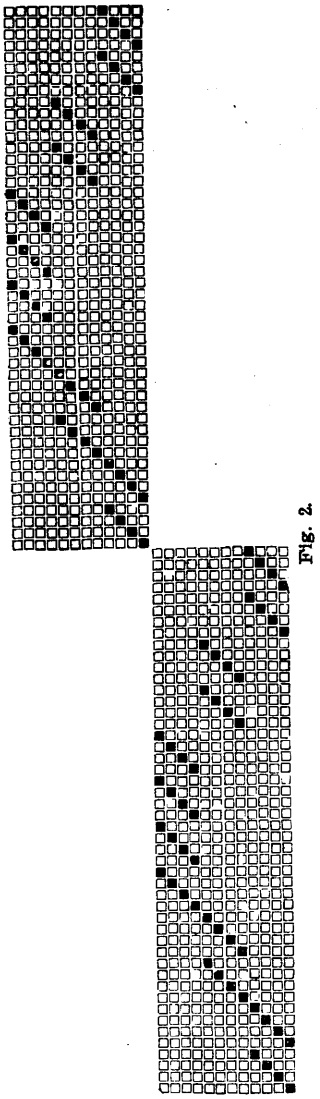


Fig. 2.

worsted to alternate with one pick cotton. The worsted will be face filling.

The character of the pattern for this grade of crepon may be any conventionalized figure, arranged usually in some zigzag manner, imitating as much as possible the larger patterns made on jacquard looms. The raised figure or blister effect covers as much space or divides equally with the ground in most fabrics of the cheaper grades. In the better grades there is usually more figure than ground. Fig. 1 shows a design illustrating the crepon weave and proportion of figure to ground for fabrics on 20 to 24 harnesses. Fig. 2 shows the drawing-in draft.

A texture for a fine grade of crepon that may be woven either on the jacquard or harness loom:

Warp arrangement, 4 ends face warp, 2 ends in 1 heddle, 1¼ dram silk; 20x3 reed; 1 end back warp, 2-60s cotton; filling 3 picks, 1 dram silk, 1 pick, 2-30s worsted; 80 picks per inch, 60 face picks, 20 back picks.

This construction can be made up to the best advantage, in regard to pattern, with the jacquard loom.

In finishing the cheaper grades, wherein the fabric is made up of cotton and worsted, the cotton yarn is dyed before it reaches the loom. After the fabric is woven it is dyed for the worsted. The prevailing color for these fabrics is solid black. The worsted in the goods contracts considerably during the finishing, producing the blister effect by which the goods are characterized.

Carding and Spinning Particulars.

Crepon is made up in many different ways and out of different fibres, sometimes wool and cotton yarns being employed. Other combinations are cotton and silk, wool and worsted, all wool, all worsted, all cotton, etc. When the same fibre is used throughout the cloth, the twist put in the yarn plays a very important part. For example, one yarn, generally the warp, is very tightly twisted, while the filling yarn is stock twisted. When the cloth constructed from these yarns is dyed, the action of the dye on the yarns is entirely different and contracts one more than the other, thus causing the raised or puffed effect of crepon.

ANOTHER METHOD

used is to have part of the warp yarn with the regular twist, while another part has a reverse twist put in, the effect produced being the same as before. In the cloth under description the backing or picking warp is to be 2-60s cotton yarn. To produce this yarn the mechanics' data, etc., required would be as follows: The mixing should be as large as possible and should be allowed to stand at least 48 hours before being used, so that the cotton will

have become thoroughly expanded before being used.

THE COTTON

should be of a good middling grade and of 1 5-16-inch staple. The raw stock is passed through an opener and three processes of picking. The hopper of the opener should be kept full of cotton, a small percentage of good waste from the machines up to the slubber being put in at this machine. The speed of the beater, which is generally of the two-bladed, rigid type, should be at least 1,500 revolutions per minute. The weight of the lap at the front end should be 40 pounds, or a 16-ounce lap (the total weights given are for a lap 40 yards in length). Four of these laps are put up at the intermediate picker and run through and made into a lap weighing 38 pounds, or a 10-ounce lap. The speed of the beater for this machine is 1,450 revolutions per minute. These laps are in turn put up at the back of

THE FINISHER PICKER.

The speed of this beater is 1,350 to 1,400 revolutions per minute. The weight of the lap at the front is 39 pounds, or a 14½-ounce lap. Every lap should be weighed and all laps varying more than one-half a pound from the standard should be put to the back of the finisher picker and run through again. It is very important to see that this is done, because nothing will throw yarn numbers off more quickly than laps that vary.

Another important question in the picker room is what to do with the

CUT ROVING WASTE.

Of course, the best thing to do is not to make it. As it is made, the next question is how to use it up. Up-to-date mills are installing a cut roving waste machine in their plants, but there are a great many mills which have no such machine. In this case the waste is put through the intermediate picker, the two centre laps at the back of the picker being removed and the waste spread evenly between the two remaining laps. To help stop these laps from licking, four or six ends of slubber roving are run into the lap at the front end of the picker. These laps are run in with the raw stock laps at the back of the finisher picker in the proportion of one lap of cut waste to three laps of cotton as long as they last. As little cut waste should be run as possible because it not only causes licking laps, but it

CAUSES UNEVEN WORK

and weak roving and yarn; it is continually breaking back in the creels, requiring one and sometimes two teeth of twist more than when not used. The laps from the picker are put up at the card, the setting of which should be the same as given in previous articles when the same grade and staple of cotton were used. The speed of the flats should be one complete revolution every 37 minutes. The speed of the licker-in should be 300 revolutions per minute. The production should be about 550 pounds for a week of 60 hours. Watch all the setting points. Set at least once a month all over. Grind cards lightly and often. Strip three times a day and keep cards as clean as possible and well oiled. Doff cans when full and don't allow them to become so full that they fall over. Care should be taken that no single or double is allowed to pass through.

The

DRAFT OF THE CARD

for this kind of work should not be less than 100 and the sliver should weigh 50 grains. This sliver may be either combed or passed directly to the drawing frame. Generally, however, it is combed. Different methods and machines are used nowadays for combing, but the general method is to have the card sliver run through a sliver lap machine, where it is doubled 14 into 1, and the weight of the lap is 300 grains per yard. From here it is passed to the ribbon lap machine and doubled 6 into 1. The weight of a yard of lap at this machine is 290. From here it is passed to

THE COMBER

and doubled 6 into 1, the weight of a yard of sliver being 60 grains. At the ribbon lap machine the laps should be sized once a day, and if the weights are coming uneven, twice or even three times a day. The comber sliver is next put through two processes of drawing, the doublings being 8 into 1 at the breaker and 6 into 1 at the finisher. The weight of sliver at finisher is 80 grains per yard. This cotton is then put through the slubber and made into .40 hank roving. At the first intermediate the roving is 1 hank and at the second 3 hank, while at the jacks the roving is 12 hank. Be careful of the settings of the rolls. They should not be spread too far apart, causing a strain, nor should they be so close as to cause a breaking of the fibre. The 12-hank roving is

spun into 60s on a spinning frame having a 2¾-inch gauge of frame, 1½-inch diameter ring, and a 6-inch traverse. The twist put in is in excess of that generally used for warp yarn, sometimes as high as 6.40 times the square root of the count being used, instead of 4.25, the usual twist. After being spun, the yarn is spooled and twisted into 2-ply 60s yarn, after which it is warped and run through the slasher and beamed.

Dyeing Particulars.

Crepons are woven sometimes with a black warp, dyed with sulphur black and piece dyed with wool colors.

BLACK.

Five per cent anthracene chrome black P F; 4 per cent acetic acid; 1 per cent oil of vitriol. Boil 45 minutes. Afterchrome with 1 per cent bichrome 30 minutes.

NAVY BLUE.

Four per cent azo chrome blue T B; 4 per cent acetic acid; 1 per cent oil of vitriol. Afterchrome, 1 per cent bichrome 30 minutes.

The warps are also colored with immedial sulphur colors to shades required and dyed in the piece with wool colors.

BROWN.

Two per cent anthracene chrome brown D W; 1 per cent anthracene acid brown G; ½ per cent anthracene yellow B N; 3 per cent oil vitriol. Afterchrome, 1½ per cent chrome.

PEARL.

One-quarter per cent anthracene chrome blue G; 1 per cent oil of vitriol. Afterchrome, 2 ounces bichrome.

SLATE.

One per cent anthracene chrome blue G; ⅛ of an ounce anthracene yellow B N; 2 per cent oil of vitriol. Afterchrome, 1 per cent bichrome.

MODE.

Four ounces anthracene chrome blue G; 2 ounces anthracene chrome red A; 1½ ounces anthracene yellow B N; 2 per cent oil of vitriol. Afterchrome, 1 per cent bichrome.

SNUFF BROWN.

One-half per cent anthracene chrome red A; 1½ per cent anthracene chrome brown D; 1¼ per cent anthracene yellow B N; ¼ per cent anthracene chrome blue F; 3 per cent oil of vitriol. Afterchrome, 1½ per cent bichrome.

GREEN.

Three per cent anthracene chrome blue G; 1 per cent brilliant milling green B; 1½ per cent anthracene yellow B N; 4 per cent oil of vitriol. Afterchrome, 2 per cent bichrome.

WINE.

Two per cent wool red B; 1 per cent anthracene chrome blue R; 3 per cent acetic acid; 1 per cent oil of vitriol. Afterchrome, 1 per cent bichrome.

SAGE.

Two ounces anthracene chrome blue B B; 2 ounces anthracene yellow B N; 1-16 ounce anthracene red A; 1 per cent oil of vitriol. Afterchrome, 1 per cent bichrome.

SHADE CLOTH.

Shade cloths for window shades, window curtains or window blinds derive their name from the use to which they are intended to be subjected. They comprise a large variety of counts, widths, weights and qualities. The lower grades are made from low to medium qualities of stock, extending to the usual grades of print cloth fabrics. Better grades are made in all grades of cotton to the best Egyptian and Sea Island.

The widths vary from a few inches for small door and house windows to three or four yards, or more, for large plate glass store windows. The general run of goods is of medium width. The narrow shades are made by cutting a wider cloth in two or more sections or narrow widths. For example, a shade cloth finishing 54 inches wide might be cut in three strips, each of which would be 18 inches in width. The

MEDIUM-WIDTH GOODS

are woven in one width, with two selvedges only, one on each side. It is not necessary to have special selvedges for each width (for cloth to be cut up into two or more widths) because the sizing or filling put on to and into the goods during the finishing process prevents the edges from unraveling for a considerable time after they have been cut if they are handled with due care.

The wide shade cloths are usually considerably heavier in proportion than the narrow goods on account of the extra hard usage to which they are subjected.

THE DISTINGUISHING FEATURE

of these goods is in the smooth, polished and firm appearance of the same after they have been finished.

They are usually finished in white or solid colors, or with a printed heading in addition.

The cloth basis of the shade may be any one of many of the plain woven cloths that have been described, with the possible extension in width as noted.

A shade cloth under consideration has a plain cloth for a basis of the following construction: Width, 44 inches; ends per inch, 64; picks per inch, 64; length, 100 yards; weight, 3⅛ yards per pound; warp counts, 22s; filling counts, 24s. The finished width of this cloth is 42 inches.

LOOM REQUIRED.

The loom required will vary in slight details according to the weight and width of cloth required. For narrow goods the automatic or quick running plain looms will answer all requirements, the weave being plain in all cases, with one warp and one filling only required.

The principal change necessary to weave wide fabrics is in placing two or more warps in the loom, end to end, instead of one large beam. These sectional warps are run on shells instead of solid beams. The rod running through them all is supported on bearings between every two shells, as well as at the ends, when in the loom.

Combining warps in this manner obviates the necessity of having to prepare them on a very wide slasher, which would otherwise be necessary to accommodate the wide beam, as well as overcomes the difficulty caused by long beams warping and getting out of true.

FINISHING.

The cloths are woven white, then piece-dyed in the color or tint required.

One method of finishing 42-inch shade goods is as follows: Shear and singe on both sides so that all loose fibres are dispensed with; wash, bleach, dye, mangle and dry. After being cooled, run through a damping machine and allow to remain in a damp state for a short time, then stretch on the belt-stretching machine to 43 inches in width, after which fill on the friction starch mangle with the following mixture: Maize or cornstarch, 100 pounds; oleine oil, 50 per cent, two quarts; carbolic acid, one-half pint. Water sufficient to make, when boiled, 100 gallons. After filling, dry on drying machine and allow to cool; run through damping machine and allow to lie at least two hours. Run through wide or Scotch hydraulic mangle; strip, turn and repeat the process. Strip, run through canroy machine.

For white shade cloth the dyeing process is not necessary. Fancy shade cloths, in addition to the processes noted, are run through a printing machine for the purpose of receiving a pattern at one end of each shade. The color or tinsel applied is of a firm character. The patterns are printed every so often in the piece, according to the length of shade required, and extend from side to side.

Carding and Spinning Particulars.

For carding and spinning particulars the reader is referred to the warp data in the article on "Buckram," and to the filling data in the article on "Book Muslin."

Dyeing Particulars.

These goods are dyed on the jig in rolls of about 10 pieces of 50 yards, with sulphur colors.

ECRU.

One-half per cent immedial cutch G; ⅛ per cent immedial yellow D; 1 per cent sulphide sodium; 1 per cent soda ash; 20 per cent salt; afterchromed with ½ per cent chrome.

OLIVE.

One per cent immedial yellow D; 2 per cent immedial dark green B; 2 per cent immedial olive B; 5 per cent sulphide sodium; 2 per cent soda ash; 25 per cent salt; afterchrome with 1 per cent chrome.

NAVY BLUE.

Ten per cent immedial blue B; 2 per cent immedial indone R; 12 per cent sulphide sodium; 2 per cent caustic soda; 25 per cent salt.

DARK GREEN.

Ten per cent immedial green B B; 10 per cent sulphide sodium; 2 per cent caustic soda; 25 per cent salt.

MAROON.

Ten per cent immedial maroon B; 10 per cent sulphide of sodium; 2 per cent caustic soda; 25 per cent salt; aftertreat with 1 per cent chrome.

SLATE.

One per cent immedial black N L N; 1 per cent sulphide sodium; 1 per cent caustic soda; 10 per cent salt; aftertreat with ¼ per cent chrome.

RED.

Eight per cent diamine fast red F; 2 per cent sal soda; 30 per cent salt; aftertreat with 1½ per cent fluoride of chrome.

BROWN.

Five per cent immedial brown B; 5

per cent immedial brown G; 10 per cent sulphide sodium; 2 per cent caustic soda; 25 per cent salt; afterchrome with 1½ per cent chrome.

BISHOP'S LAWN.

Bishop's lawn is a fine, plain woven fabric, slightly lighter in weight than linon or India linon. It is a white fabric with a blue tint and is principally used for light dresses and underskirts.

Like a great many other plain cotton goods,bishop's lawn varies slightly in weight, count and quality, but the latter is usually very good.

The finish and blue tint seen in these goods are the principal characteristic features which distinguish them from other fine cotton fabrics. A cloth of the same construction and quality might be known by another name if finished differently.

The

ANALYSIS

of a bishop's lawn of good quality indicates the following construction: ends per inch, 104; picks per inch 112; warp counts, 100; filling counts, 120; finished width, 27 inches.

The ground of the fabric is reeded two ends per dent. The selvedge is neat, the yarns being arranged in a somewhat unusual manner. From the ground cloth outwards, they are as follows:

12 ends singles in four dents; 24 ends as 12 in six dents; 8 ends as 2 in one dent; total, 44 selvedge ends in 11 dents on each side.

The selvedge and ground ends are of the same counts.

CALCULATIONS.

To find number of ends in warp: 104 (sley) divided by 2 (ends per dent) equals 52 dents per inch; 52x27 (width) equals 1,404 dents occupied by warp; 1,404—22 for selvedges equals 1,382 dents for ground; 1,382x2 equals 2,764 ground ends plus 88 selvedge ends total 2,852 ends.

To find width in reed, assuming 10 per cent shrinkage from warp to finished cloth: 27 inches divided by .90 or 90 per cent equals 30 inches in reed.

To find weight of warp, assuming 105 yards of warp for 100 yards of cloth:

$$\frac{2{,}852 \text{ (ends)} \times 105 \text{ (length)}}{100 \text{ (counts)} \times 840} = 3.565 \text{ lbs. warp in } 100 \text{ yards cloth.}$$

To find weight of filling in 100 yards of cloth:

$$\frac{112 \text{ (picks)} \times 100 \text{ (length)} \times 30 \text{ (width in reed)}}{120 \text{ (counts)} \times 840} = 3.333 \text{ lbs. filling.}$$

To find weight of cut:

3.565 lbs. warp.
3.333 lbs. filling.

6.898 lbs. weight of 100 yard cut.

To find number of yards per pound: 100 (length) divided by 6,898 (weight) equals 14.49, say 14½ yards per pound.

LOOM REQUIRED.

This fabric may be woven on any of the light running cam, single-box, looms. One beam only is required. On account of the large number of ends per inch,care should be taken not to have a coarser twine harness than is absolutely necessary. If difficulty is experienced with crowded heddles and ends, the cone motion may be substituted for the cams with advantage.

FINISHING.

After being prepared and bleached in the ordinary manner, the goods are opened out to the full width and run through a light starch,- blued to suit requirements, on a starch mangle, and dried. They are then dampened, calendered on a "swissing" or "rolling" calender, folded and made up as required.

Carding and Spinning Particulars.

Bishop's lawn is made in mills having the equipment of machinery as given in the third division. i. e., machines for making fine counts of yarns. On this class of goods the sampling of the cotton as to grade and staple is a very important part in thefinished fabric. The counts of the yarn of the sample of the cloth taken for description are for the warps 100s and for the filling yarn 120s. For these counts the cotton used would be Sea Island and the staple 1¾ inches. Every bale should be graded and stapled before it is allowed to be put into the mixing, and this mixing should be allowed to stand as long as possible and also should be as large as convenient. For this class of cotton it would be better if it were opened and put through a blower and then sent through a line of trunking, so that it would be dried out as much as possible before being worked.

ONLY TWO PROCESSES

of pickers and an opener are used for this cotton, because it should have as little beating as possible to get the

dirt out. The usual instructions that have already been given, relative to the opener and pickers, should be followed. The speed of the breaker beater (which should be of a two-bladed rigid type) should be 1,350 revolutions per minute, and the lap in front should weigh 29 pounds. These laps are put up at the back of the finisher picker and doubled 4 into 1. The speed of this beater should be 1,200 revolutions per minute, which gives the cotton passing through about 29 beats or blows per inch. For this class of goods it is not the general custom to mix in cut waste. The picker room should be looked after to see that all the eveners are working properly and to try and make laps that don't split. In order to do this, look after

THE DRAFTS

to see that they are putting the cotton passing through the picker in the proper place. At the finisher picker the laps, as they are taken off,should be weighed, and all those having a variation of half a pound either side of standard should not be allowed to be put up at the card, but should be run over again. The total weight of a lap at the finisher should be 30 pounds or a 10-ounce lap. These laps are put up at the card. This card should be set close at the points between the cylinder and doffer and cylinder and flats and also between the cylinder and licker-in, but between the licker-in and feed plate the setting should be so that the distance between the bite of the feed roll and teeth of the licker-in is just a little greater than the length of the staple. It is

A GENERAL FAULT

of carders to set these two parts the same for all lengths of staple, and this should be looked after and remedied, because if the proper distance is not maintained between these parts the stock will be shorter in length at the front (if set too close), or will not be properly carded (if set too far apart). For long-staple cotton, some overseers claim that it is an advantage to reduce the speed of the licker-in. Their reason for so doing is that they claim that the licker-in is nothing more or less than a beater, and if we slow down the beater for long-staple cotton, why not slow down the licker-in in the same proportion? The wire fillet used on the cylinder should be No. 110s, or No. 34s wire, and for the doffer and top flats No. 130s, or 36s wire. The

SPEED OF THE FLATS

should be one complete revolution every 38 minutes and the licker-in 30 revolutions per minute. The cards should be stripped three times a day, and ground at least once a month. The flats should be ground so as to always have a sharp needle point. If possible, the flats should be taken off and ground on a flat grinding machine and it will be found that the best results will be obtained. The production of a card for a week of 60 hours should be 225 pounds; the weight of the sliver, 35 grains per yard; the draft of the card being 125. In this article, we have drafted high and carded light. In some cases, for this kind of goods and cotton,overseers have been known to draft as high as 180, which makes our draft of 125 look rather small. After passing the cards, the sliver is put through either a line of drawing or a sliver lap machine, according to the lay-out of the mill. In mills that are now being built and in the old mills that are installing new machinery,

THE COMBERS

being put in are generally of the eight-head type, having laps 10½ inches wide. The weights, etc., that we give in this article will be for the older type of 8¾-inch-width laps. The weights for larger laps may be obtained by proportion. We will also assume that the equipment is as follows: Sliver lap, ribbon lap and combers.

The doubling at the sliver lap machine is 14 into 1, and the weight of the sliver is 225 grains per yard. At the ribbon lap machine the doublings are 6 into 1, the weight of a yard of lap being 200 grains per yard. In some mills, the sliver laps are made a little heavier and only five doublings used at the ribbon lap. When this is the case, the weight of a yard of sliver lap is 270 grains per yard.

For the top leather rolls of these machines use a

VARNISH

as follows: Seven ounces gelatine glue, one quart acetic acid, two teaspoons oil of origanium. Color with burnt sienna. In dog-day weather or for slippery cotton use ground charcoal and gum arabic. This varnish may be also used for the drawing frames and comber rolls (both detaching and those in the draw box). The laps from the ribbon lap machine are put up at the comber. At this machine the percentage of waste taken out is 22 to 25. The speed is 85 nips per minute. The rolls should be varnished at least once every two weeks, needles picked and brushes cleaned once a week. Comber percentages

should be taken every time a comber is changed from one stock to another and the percentage of four every day. Set comber same as for Indian lawn. The weight of the sliver should be about 35 grains per yard. The comber cans should be put up at the back of the drawing frame, being doubled 6 into 1 at both the breaker and finisher. The

WEIGHT OF THE SLIVER

at the finisher drawing should be 65 grains per yard. Watch the stop-motions to see that they are all in proper working order and also the roll settings; also keep the rolls well varnished. At the slubber the drawing is made into .80-hank roving, after which it is put through three processes of fly frames. At the first intermediate it is made into 2.25 hank, at the second into 5, and at the fine frame into 20 hank for warp yarns; for filling yarns the slubber and first would be the same hank, at the second intermediate the hank is six and at the fine frame, 24 hank. Watch the build of the bobbins, the lay, twist and tension. Also keep a sharp watch on double and single, also bunches. Sometimes the slubber and first intermediate top leather rolls are varnished, the varnish used being a little lighter than that used for drawing frames.

THE ROVING

is spun into 100s from the 20-hank roving on a warp frame having 1⅜-inch diameter ring, 5-inch traverse, and spindle speed of 9,400 revolutions per minute. This yarn is then spooled, warped and put through the slasher, at which the following size may be used: 100 gallons of water; 75 pounds potato starch; 7 pounds tallow; 3 pounds Yorkshire gum; 2 pounds white soap; Boil two hours and let stand 10 hours before using. Keep agitator running and size almost at boiling point.

The 24-hank roving is made into 120s yarn on the mule.

Dyeing Particulars.

PINK.

One-half per cent rose B D; 1 per cent sal soda; 10 per cent salt.

SKY BLUE.

One-quarter per cent diamine sky blue F F; 1 per cent sal soda; 10 per cent salt.

CREAM.

Two grains diamine catechine 3 G; 1 per cent sal soda; 10 per cent salt.

ECRU.

Two per cent diamine catechine 3 G; ¼ ounce diamine fast yellow B; 1 per cent sal soda; 10 per cent salt.

PEA GREEN.

Two ounces diamine green B; 1 per cent sal soda; 10 per cent salt.

RED.

Five per cent diamine fast red F; 2 per cent sal soda; 20 per cent salt.

SAGE GREEN.

One per cent diamine green G; 1 per cent sal soda; 15 per cent salt.

WINE.

Four per cent diamine Bordeaux B; 2 per cent sal soda; 25 per cent salt.

SCARLET.

Three per cent diamine scarlet B; 2 per cent sal soda; 25 per cent salt.

ROYAL BLUE.

Five per cent diamine sky blue; 2 per cent sal soda; 25 per cent salt.

ROBES.

A cotton fabric with an unglazed surface, printed on one side, in highly colored patterns, this fabric is made up into robes, wrappers or gowns, hence the name. The fabric was originally produced in cashmere effects, and used primarily as a dress fabric.

This fabric, however, resembles in point of texture and general appearance the cloth known as "cretonne," which is also a printed cloth, but used principally for furniture coverings, curtains, comfortables and such purposes. The term robes is applied to both twilled and plain woven fabrics. The fabric used for robes is usually made from a 64-square printing cloth, or its equivalent, while the fabric used for household purposes is made from various textures.

The

CHARACTER OF PATTERNS

for robes is almost without limit, but the scale, or size of the figure in the design, however, should not be too large, as the numerous folds would destroy the effect of the repeat of the design. The designs best suited for this class of goods are small floral or geometrical figures, distributed in such a manner that they will not appear in the finished garment in rows or lines, but rather in an all-over effect, so that the various figures constituting the design may be seen at a glance.

THE COLORINGS

may be almost any conceivable com-

bination imaginable, providing of course that there be harmony in the colors used. The number of colors used varies from 4 to 10 different shades, the darker colors usually forming the background, while the lighter and brighter colors form the figures.

In regard to the construction for these fabrics the designer has little in the way of ingenuity, the important feature of the goods depending on the printing machine.

The fabric is composed of plain cotton yarn with

THE COUNTS

varying very little, a common texture being 64 ends and 64 picks, of 1-30s both warp and filling, sometimes arranged 70 ends and 58 picks, another texture being made with 64 ends and 48 picks, 1-30s warp and 1-26s filling, made in widths from 27 to 36 inches.

The goods are woven on high speed looms. The Northrop loom is well adapted for this class of goods. The cost of weaving is an important consideration in the production of these goods, as the retail price does not warrant an unnecessary expense.

FINISHING.

The goods, after being woven, are prepared for the printer by boiling off, then passed over heated cylinders to dry, after which they are ready for printing. After the printing process they are ready for the merchant.

Carding and Spinning Particulars.

The yarns to make robes are manufactured in the first division of mills as given in a previous article. The mixture for this cloth varies according to the mill making the goods and also the quality of the goods required of the manufacturer. Generally speaking, there is a certain percentage of waste used for this class of goods, and not only the percentage differs, but the quality of the waste used also. Some mills will use only comber waste, and other mills only comber and card waste, while other mills will use any kind of waste they can obtain, and run it through. The mixing plays an important part and the percentage of waste put in varies from 10 to 100 per cent. Production and plenty of it is the cry of the owners making this class of goods. This being the case, quality is somewhat lacking. To make up for this, the goods are brushed, which has a twofold advantage. It gives a

NAP

to the goods, as well as hides the neps in the cloth. When good raw stock is used, the length of staple is very short, rarely being over seven-eighths of an inch in length. The counts for the sample of cloth under description are 30s for both warp and filling. The mixings are made, as before stated, large and with the proper proportion of waste mixed in. This is then run through three processes of pickers, first being run through an opener. This opener has a fan, which makes 165 revolutions and carries the cotton to the aprons of the breaker picker and leaves the cotton in an open, airy state. This lattice or apron carries the cotton to the feed rolls of the beater. This beater is of the two-bladed type and makes 1,500 revolutions per minute. The proper drafts should be maintained at both pickers, so that a hard lap will be made. There are several methods by which, it is claimed, the laps may be made and will run off smoothly and without licking, but as near as can be found out by experimenting, no one remedy will fill all conditions. Judgment at this point is needed. The weight of a full lap at the head end of the breaker picker should be about 16 ounces per yard. These laps are put up at the intermediate picker and doubled four into one. This picker is equipped with a two-bladed rigid type of beater and has a speed of 1,450 revolutions per minute.

THE TOTAL WEIGHT

of a lap from this machine is 37 pounds or a 10-ounce lap. These laps are put up at the finisher picker and doubled four into one. This picker has the same style of beater as the other two; the speed is, however, slightly reduced, being 1,375 revolutions per minute. The total weight of a lap is 39 pounds, or a 14½-ounce lap. In some mills they omit the intermediate process of pickers, using just the breaker and finisher, and for this class of goods would advise two processes of picking. The laps are put up at the card. For this class of work the draft of the card does not exceed 90 and very often is not more than 85. The card fillet used on both the doffer and cylinder, as well as the flats, is coarse. The general count used is No. 33 wire or No. 100s for cylinder and No. 35 or No. 120s count for the doffer and flats. The settings used for this class of work are similar to those given for indigo prints. The speed of the cylinder is 165 revolutions per minute; licker-in, 350 revolutions per minute; flats, one complete revolution every 50 minutes. The weight of the sliver is 65

grains per yard, and the production is from 850 to 1,000 pounds per week of 60 hours, according to the quality and quantity required.

THE CARD

for this class of work should be ground once a month and stripped twice a day, although in some instances the doffer is stripped a third time. The waste taken out should not exceed 8 per cent. After leaving the card the sliver is put through two processes of drawing, the doublings at the breaker being six into one, and at the finisher six into one. The weight of a yard of sliver is 75 grains. The speed of the front roll largely depends on the call for drawing, and the manner in which the room is balanced. As frequently happens, the drawing frame is the machine to get an increase in speed so as to keep up with the slubbers or cards, and to do so the speed of the front roll is increased. The speed varies from 325 to 450 revolutions per minute, according to requirements. As the drawing frame is the last machine that can really be said to even the silver, care should be taken to see that all stop-motions are in perfect working order, and that they act quickly so as to prevent an end passing through before the frame stops. Whole sets of drawing or card sliver should not be put up at the back of the frame, because it tends to make uneven yarn. If a size at the front be taken when the tops of a can are running through, it will be found to be heavier than the standard; the middle about the standard, and when the can is almost empty it will size light. If the cans are equipped with springs, it will help overcome this defect to a large extent, and it will also help to stop the "breaking back" of the ends.

THE DRAWING

is put up at the back of the slubber and made into .60-hank roving, after which it passes through two processes of fly frames and is made into 2-hank roving at the intermediate, and 6 at the fine frame. The proper lay of the roving on the bobbin is 14 rows per inch for the 2 hank, and 33 lays per inch for the 6 hank roving. Twist jack roving so that it will bear its own weight when put in the creels at the successive machines. Be particularly careful about single,double and bunches. Sizing should be accomplished at the picker as follows: Every finisher lap should be weighed and if the weight varies more than half a pound, either side of standard weight, it is put back to be run over again. The cards should be sized once a week. The drawing frame finisher should be sized four times a day, and a variation of two grains to the yard either side of standard should mean a change. The fine roving is sized once a day and there is no hard and fast rule for changing.

The 6-hank roving is spun into 30s warp yarn on the spinning frame, two into one, on a frame having a 1¾-inch diameter ring, 2¾-inch gauge of spindle, 6½-inch traverse, and a spindle speed of 10,000 revolutions per minute. As soft a twist as possible is used so that it will nap well. The yarn is next spooled and warped, and run through a slasher. The 6-hank roving for the filling yarn is spun into 30s filling at the mule, as it requires a soft twist, for reasons before stated. After being spun it is taken to the conditioning room and remains there until wanted for use.

Dyeing Particulars.

NAVY BLUE.

Ten per cent immedial indone blue 2 B; 10 per cent sulphide sodium; 4 per cent soda ash; 30 per cent salt.

GREEN.

Eight per cent immedial green G G; 8 per cent sulphide sodium; 4 per cent soda ash; 30 per cent salt.

RED.

Six per cent diamine fast red F; 2 per cent sal soda; 30 per cent Glauber's; aftertreat with 2 per cent fluoride of chrome.

YELLOW.

Five per cent immedial yellow G G; 5 per cent sulphide sodium; 30 per cent salt; 4 per cent soda ash.

OLIVE.

Four per cent immedial olive 3 G; 4 per cent sulphide sodium; 30 per cent salt; 3 per cent soda ash.

BROWN.

Five per cent immedial brown B; 5 per cent immedial cutch O; 10 per cent sulphide sodium; 4 per cent soda ash.

MYRTLE GREEN.

Eight per cent immedial dark green B; 8 per cent sodium sulphide; 4 per cent soda ash; 30 per cent salt.

ORANGE.

Ten per cent immedial orange C; 10 per cent sodium sulphide; 4 per cent soda ash; 30 per cent salt.

BORDEAUX.

Ten per cent immedial Bordeaux G;

10 per cent sodium sulphide; 4 per cent soda ash; 40 per cent salt.

SLATE.

One per cent immedial black N N; 2 per cent soda ash; 1 per cent sodium sulphide; 25 per cent salt.

ECRU.

One per cent immedial cutch G; ¼ per cent immedial yellow D; 2 per cent sodium sulphate; 25 per cent salt.

BLACK.

Six per cent immedial brilliant black 5 B V; 6 per cent sodium sulphide ; 4 per cent soda ash; 50 per cent salt.

BENGAL STRIPES.

Bengal stripes is a name given to a type of gingham consisting of white and colored stripes, alternately arranged in small effects in regular order, the colored yarn having been dyed with Bengal indigo.

They were originally made in Bengal, India, the home of some of the many species of the plant from which indigo is extracted, Indigo Fera, and derive their name from that fact. They differ from some other types of striped ginghams only in having colored warp yarns that have been dyed with Bengal indigo.

INDIGO

has been used as a dyestuff for hundreds of years and has attained a reputation for itself that is responsible for a continued call for indigo-dyed goods in the market, although similar appearing goods may be made much more cheaply with modern aniline dyes. Goods dyed with the latter possess more merit than most of the so-called indigo-dyed goods, the colors of which do not penetrate beyond the surface of the yarns.

Indigo dyeing, if done properly, requires more time than is now thought advisable or necessary to devote to any ordinary class of dyed goods and has been substituted to a very large extent by anilines. The amount of indigo used has been steadily growing less for a number of years, and it appears probable that there will be very little of it used in the commercial world a few years hence.

USES OF BENGAL STRIPES.

Bengal stripes are used principally for skirtings, aprons, etc. Fig. 1 is an illustration of a typical fabric, the analysis of which shows it to be an article that can be depended upon to wear well.

The warp yarns are arranged 8 of blue and 4 of white, alternately, the filling being all white. The white yarn in both warp and filling has been bleached before being woven. The blue warp yarn was dyed in the skein with Bengal indigo.

The fabric illustrated is practically a warp face cloth, the warp yarn

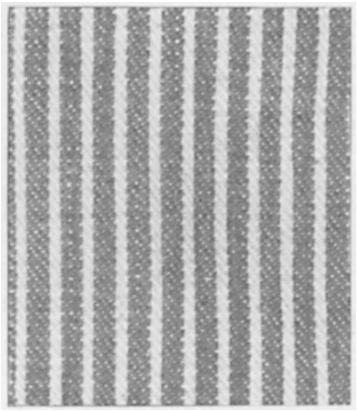


Fig. 1.

showing very prominently in alternate blue and white stripes, whereas the filling is almost hidden. Several factors tend to produce this effect, among which may be mentioned, first that two out of every three ends are raised on each pick, the weave being the 3-end warp flush twill to the left (Fig. 2);

Fig. 2.

second, that the warp yarns are harder twisted than the filling yarns and are approximately twice as heavy; third that the cloth contains considerably more ends than picks per inch.

ANALYSIS.

An analysis of the fabric shows the following construction data: Finished width, 29.7 inches; ends per inch, 67.2; picks per inch, 48; warp pattern, 8 blue and 4 white; warp counts, 9s; filling counts, 16s; yards per pound, 2.5.

Perhaps the simplest method of counting the number of ends per inch in a stripe pattern, and the most accurate, is to count the number of ends in each pattern; or if the latter is small, count several patterns on a given width and calculate accordingly.

For example, there are 12 ends per pattern in Fig. 1 and 7 patterns on 1¼ inches.

$$\frac{\text{7 (ends) x 12 (patterns)}}{\text{1.25 (inches)}} = \text{67.2 ends per inch.}$$

The greater the width measured and the number of patterns counted, the less the liability of error. When the full width of cloth is available for analysis purposes, it is advisable to measure and count the whole number of complete patterns, omitting sections of patterns and selvedges.

The layout of the entire warp is as follows:

White for selvedges.	White for ground.	Blue.		White.	Blue.
10 as 9			=	10	
	4	8 / 8 = 164 times	=	656	1,312
10 as 9			=	10	
				676	1,320

676+1,320 = 1,996 ends in the warp.

The selvedge ends, with the exception of the two outer ends on each side, are drawn single. The two ends at each side are drawn together as one.

The entire 164 complete patterns in the above warp layout occupy 29¼ inches in the cloth.

$$\frac{12 \times 164}{29.25} = 67.2 \text{ ends per inch.}$$

LOOM REQUIRED.

These goods may be woven on single box cam or dobby looms, the former preferred. Six harnesses would be necessary if wire heddles were used on a dobby loom, whereas three twine harnesses would be sufficient. The ends are drawn in straight and the selvedges drawn the same as the ground yarns, one end through each heddle and three ends per dent.

FINISHING.

There is practically no finish given these goods, beyond burling, brushing and making up.

Carding and Spinning Particulars.

The yarns of which Bengal stripes are made are manufactured in mills of the first division as given in a previous article. The method of mixing the cotton in these mills would probably be by hand. In the up-to-date mills, however, openers are employed, especially if a large amount of cotton is used. The method generally used in such a case is to have several high-speed openers attached in a row the cotton being delivered on an endless apron, which carries it to a blower. This fan blows the cotton to the picker room to a condenser, which in turn deposits the open cotton upon an endless apron, which runs over the mixing bins. At every bin there is a chute which, when dropped, allows the cotton to be dropped into the bin.

AN IMPORTANT POINT

to look out for, when this method is used, is the danger of fire. By this method the cotton is thoroughly opened and may be used as fast as delivered, as it is in a loose, fluffy, dried-out condition. The number of openers used is according to the amount of cotton required by the mill. When this method is employed, the good sliver up to the slubber is put into the centre hopper. This insures a thorough and uniform mixing of this waste, which is always the "bugbear" of cotton mills. The stock used for Bengal stripes varies according to the quality of cloth desired, but generally a ⅞-inch to 1 inch staple is used. An opener and two processes of picking are used.

THE HOPPER

of the opener should be well filled and is connected directly with the breaker picker. The speed of this beater, which is of the three-bladed rigid type, is 1,400 revolutions per minute. In this breaker picker there are two beaters and two sets of cages. The forward beater is a two-bladed beater and the speed of this is also 1,400 revolutions per minute. The total weight of a lap at the front end is 40 pounds or a 20-ounce lap. The picker tenders generally allow this lap to be made as large as possible, but the weight per yard remains the same. These laps are put up at the finisher picker and doubled 4 into 1. This picker is equipped with either a two-bladed rigid or a pin beater; in either case the speed is 1,450 revolutions per minute. The total weight of the lap is 46 pounds net for a 52-yard lap, or about a 14⅛-ounce lap. This lap is put up

AT THE CARD,

the draft of which should not exceed 100. The speed of the cylinder should be 165 revolutions per minute; licker-in, 375 revolutions per minute, and flats one complete revolution every 45 minutes (110 flats). The fillet of the cylinder should be No. 33s wire or 100s and for the doffer and top flats No. 34s wire or 110s. The cards should be set and ground the same as given for indigo prints. The cards should be stripped three times a day of 10½ hours. The weight of the sliver per yard should be 55 grains and the production 900 pounds for a week of 60 hours. This sliver is put through two processes of drawing, six ends up at both the breaker and finisher drawing. The weight of the sliver is 75 grains at the finisher. The speed of the front roll is 400 revolutions per minute. The drawing should be sized

three times a day. For this class of work either metallic or leather covered top rolls may be used, but in either case should be looked after to see that they are in perfect condition. Watch the

STOP-MOTIONS

to see that they are in perfect working condition, and that the frame tenders do not block them up with cotton to keep them from working. The drawing sliver is now put up to the slubber, where it is made into .40-hank roving. Be careful to set the bottom steel rolls properly,so as to obtain the best results, and watch the twist and tension. The slubber roving is made into 1 hank for warp and 1.20 hank for filling at the first intermediate and at the second or (in this case) the five frame is made into 2.25 hank for the warp and 3.50 for the filling yarn. These rovings are then taken to the spinning room and at the warp frame made into 9s on a frame having a 3¼-inch gauge, 2⅛-inch diameter ring and a 7-inch traverse. This is then spooled, warped and put through a slasher. The roving for filling is spun into 16s on a filling frame having a 6½ to 7-inch traverse, 1½-inch diameter ring and a 2¾-inch gauge. This yarn is then conditioned.

Dyeing Particulars.

BLUE.

Eight per cent immedial indogene G C L conc.; 10 per cent sulphide sodium; 4 per cent soda ash; 30 per cent Glauber's salt.

BLACK.

Ten per cent immedial black N R T; 10 per cent sulphide sodium; 4 per cent soda ash; 30 per cent Glauber's salt.

BROWN.

Five per cent immedial cutch O; 5 per cent immedial brown B R; 10 per cent sulphide sodium; 4 per cent soda ash; 30 per cent Glauber's salt.

OLIVE.

Five per cent immedial olive B; 5 per cent sulphide sodium; 25 per cent salt; 3 per cent soda ash.

DARK GREEN.

Ten per cent immedial dark green B; 10 per cent sulphide sodium; 30 per cent salt; 4 per cent soda ash.

MAROON.

Eight per cent immedial maroon B; 8 per cent sulphide sodium; 4 per cent soda ash; 30 per cent salt.

TURKEY RED.

Turkey red is a name given to fabrics that have been subjected to the Turkey red dyeing process. They are usually cloths constructed with the plain or small twill weaves, and are found in various widths. They are used for signal flags, dress goods and for many other purposes where a bright red color that will withstand severe tests of light, wear and weather is required. The analysis of two characteristic fabrics shows the following construction data:

Sample 1. Plain weave; 64 ends and 52 picks per inch; 30s yarn in both warp and filling. A fabric of this type could be woven on either automatic or ordinary plain cloth looms.

Sample 2. Three end twill weave, for ground; 66 ends and 72 picks per inch; 36s warp for the ground of the cloth, and 2-36s warp for the selvedges; 24s filling. The ground of this sample is drawn one end in each hed-

Fig. 1.

Fig. 2.

dle and three ends in each dent. The selvedges weave two ply ends as one, 2 picks in each shed (Fig. 2), with catch thread on the outside, and are reeded 2 ends per dent. The two ply ends, as one, represent 4 single strands of yarn in each dent. There are 16 ply yarns in each selvedge.

It would be advisable to weave a fabric of this character on a dobby, in preference to a cam loom, because of the difference in weave of selvedges and ground. The former being on 4 and the latter on 3 picks necessitates 12 picks before they repeat together. Six harnesses would be required for the ground ends, and 3 for the selvedge ends, one of which would be for the catch thread.

CALCULATIONS.

In analyzing the twill fabric, a piece 2½ x 4 inches was found to weigh 12 grains, i. e., 10 square inches weigh 12 grains.

12 divided by 10 equals 1.2 grains per square inch.

The average number of the yarn was found as follows: 66 (ends) plus 72

(picks) equals 138 inches, which weigh 1.2 grains. 138 divided by 1.2 equals 115 inches per grain. 115 plus 10 per cent (for take up) equals 126 inches of yarn per grain. 126 times .2314 equals 29.1, say 29, average number.

By comparing the relative sizes of the yarns, warp and filling, by crossing and twisting them, it was found that 18 ends of warp were of the same diameter as 12 picks of filling.

Assuming the warp counts to be 36s, the filling counts were found as follows:

138 (sum of sley and pick) divided by 29 (average number) equals 4.76.

66 (sley or ends per inch) divided by 36 (warp number) equals 1.83; total 2.93.

72 (picks) divided by 2.93 equals 24.5, say 24, filling required.

Carding and Spinning Particulars.

The counts of the yarns of which Turkey red is made vary according to the quality desired. The stock being used also varies in length of staple and also grade. In one of the samples taken for this article the warp yarn is 1-36s and the filling yarn is 1-24s. For these yarns and quality of cloth the staple of the cotton used would be 15-16 of an inch in length and of a good grade.

THE MACHINERY USED

would be found in the second division of mills as given in a previous article.

All bales of cotton should be graded and sampled before being put into the mixing and all those not up to grade and length of staple should be placed one side and not used in the mixing. If the mill is up-to-date or of a recent construction the method of mixing would be as described in the last article. In older mills the cotton would be mixed by hand. If the latter method is employed, the mixing should be made from as many bales as possible and allowed to stand as long as possible to dry out.

PERIODS OF MIXING

of course vary according to the output of the mill in which the cloth is made. If space is plenty, which is not generally the case, a double mixing should be made, one mixing being used while the other is drying out, thus insuring that green cotton is not used. The cotton is then put through an opener and three processes of picking. The hopper of the opener should always be kept at least half full of cotton and the lifting apron should work easily and care should be taken to see that the slats are all whole. The pin beater should be adjusted so as to feed the proper amount of cotton to the breaker picker. This picker is generally of a combination type, having two sets of beaters and two sets of cages. The breaker beater speed is about 1,400 revolutions per minute, and is of a three-bladed, rigid type. The forward beater is generally of a two-bladed, rigid type, and its speed is 1,400 revolutions per minute. The

WEIGHT OF THE LAP

at this picker is 40 pounds, or a 16-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. This machine has a single beater of two blades, rigid type, the speed of which is 1,425 revolutions per minute. The weight of lap at this machine is 38 pounds or a 12-ounce lap. These are put up at the finisher picker and doubled 4 into 1. The weight of a lap at the head end of this frame is 48 pounds or a 14½-ounce lap. In the picker room care should be taken to see that the drafts are properly regulated and that the eveners are working properly, and also that the cotton is thrown upon the top cage to help prevent splitting laps. Every lap should be weighed and a variation of one-half pound either side of standard weight is allowed. All laps varying over or under this allowance should be put back and run over again. Roving waste is mixed in the good cotton in many ways, one of which has been previously given. The laps are then put up at the card. At this machine the speed of the licker-in should be 375 revolutions per minute. The flats should make one complete revolution every 45 minutes. The wire fillet used should be No. 33 or 100 for cylinder and No. 35 or 120s for the doffer and top flats.

THE CARD SETTINGS

should be the same as given in a previous article on indigo prints. Strip three times a day for a 10½-hour day and grind at least once a month. Keep the flats free from fly and all quick motions well oiled, especially the main cylinder bearings, which, if not properly attended to, heat up and cause blistering. The draft of this card should be about 100; the weight of the sliver is 60 grains per yard and the production is 700 pounds for a week of 60 hours. Watch the wire fillet to keep it sharp. For this sample we will consider the yarns to be combed. When this is the case, the sliver is taken from the card and put through the sliver lap

machine, ribbon lap machine and the comber, or it may be taken from the card and put through a process of drawing, sliver lap and then to the comber. We will consider the former method. Here again a great deal depends on the size and make of comber being used. For this article we will take the older styles of six-head, 8¾-inch lap, combers. The weight of a yard of lap at the sliver lap machine (doublings being 14 into 1) would be 295 grains. At the ribbon lap machine the doublings would be 6 into 1, and the weight of lap 260 to 275 grains per yard. The laps are put up at the combers and doubled 6 into 1. The weight of the sliver is 48 grains per yard. Sixteen per cent of waste is taken out at the comber. The comber sliver is next put through two processes of

DRAWING FRAMES.

The weight of a yard of sliver at the finisher is 70 grains and the doublings 6 into 1 at each process. Size four times a day and don't skip a size. This sliver is put up at the slubber and made into .60 hank roving. For the warp yarn this is put through two processes of fly frames; at the first intermediate it is made into 2.25 hank and at the fine into 7.50 hank. This is taken to the ring frame and spun into 36s on a frame with a 2¾-inch gauge, 1 9-16-inch diameter ring, and a 6-inch traverse, the spindle speed being 9,600 revolutions per minute. The yarn is then taken and spooled, warped and slashed.

The slubber roving for the filling is also put through two processes of fly frames. At the first intermediate it is made into 2 hank and at the second into 5 hank, after which it is spun into 30s filling yarn on a frame with a 2¾-inch gauge, 1⅜-inch diameter ring, 6-inch traverse, and spindle speed of 7,350 revolutions per minute. This yarn is then taken and conditioned.

Dyeing Particulars.

The dyeing of Turkey red has been handed down from generation to generation for the last 500 years, and possibly long before that time. The city of Adrianople, and also the city of Salonica, were formerly famous for this celebrated color. It is not so ancient as indigo blue, because the clothes around mummies in Egypt 2,000 years B. C. have indigo colors on them. The original Turkey red was a process of long duration. Thirty days were often consumed before the finished cloth or yarn was produced.

The cloth was oiled in olive oil, dried, and hung up in long chambers for some days, to age the goods, and fix the oil in the fibre. The goods were then oiled again, and aged, the process being repeated several times.

The short process of Turkey red is to oil with a solution of Turkey red oil, 20 per cent, and then dry. Oil again and dry, and allow to remain for a few hours in that state, and pass through a solution of acetate of alumina at 6 degrees Tw. Dry in hot air and pass through a dunging bath of cow dung and bi-arseniate of soda. Tnis process will take away the surplus mordant from the cloth, and fix the alumina in the fibre. The cloth is well washed in water, and then dyed with about 15 per cent alizarine red paste, 4 per cent bullock's blood, 1½ per cent nutgalls, and enough acetate of lime to correct the water.

The goods are dyed for one hour, and well rinsed, dried and passed through a solution of Turkey red oil, about 5 per cent, dried, and steamed for one hour. The goods are then well soaped in a strong bath of hot soap, and well rinsed, and finished as required.

LAMP WICKING.

Lamp wicking is usually constructed of coarse low-grade cotton yarns. There are three general forms or types: braid wicking, flat wicking and round, hose or tube wicking.

They are made in sizes varying from a small fraction of an inch, in the braid and flat types, for miners' and similar lamps, to several inches in width, in the flat and round types, for large oil lamps and stoves.

The principal objects sought to be secured in these goods are strength,

Fig. 1.

Fig. 2.

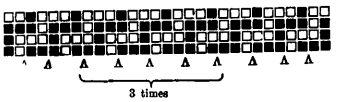


Fig. 3.

thickness and moisture-absorbing qualities.

BRAID WICKING.

This differs from a solid braid, as in braided rope and clothes lines, in having a core of very soft, coarse roving, around which have been braided finer yarns of a good strength and quality. There are 10 strands of roving for the core and 32 ends of fine 2-ply mercerized yarn for the braided covering. The latter imparts the requisite strength to the fabric, while the other desirable qualities are furnished by the roving. This wick is so constructed that the core could be withdrawn without interfering with the construction of the covering, There are about 72 yards per pound.

FLAT WICKING.

There are three methods adopted for making heavy, thick fabrics: First, by means of coarse yarns; second, by means of compound structures of cloth; third, by combining the first and second methods.

Flat lamp wicking requires an extra large surface, one deeper than can ordinarily be obtained by using coarse yarns in a single weave structure. It is usually woven with coarse warp yarns and comparatively fine, strong filling yarns, with double plain weaves of equal structure arranged 1 and 1 in both warp and filling, the two single fabrics being bound together into one compound fabric by other yarns, termed ties or binders, which interlace with both with more or less frequency. Where as firm a structure as is possible is wanted, the ties are arranged as extras to work the single plain weave, as shown by the crosses in Fig. 1. This entire figure is the base weave upon which the design for this wicking has been constructed. Ends 1 to 4, repeated, would form a tube or hose pipe fabric, the picks going first into one cloth and then the other on alternate picks. Solid type shows the face weave, type □ the back weave, type face ends raised when back picks are inserted. Back ends are depressed on picks 1 and 3, when face picks are inserted. The complete weave is shown in Fig. 2, and is on 38 ends and 4 picks. Letter F indicates face ends. B indicates back ends. T indicates ties. The arrows indicate where the ends are divided by the reed, eight dents being used.

The construction data of this wicking is as follows: Warp, 2-ply 5s cotton; filling, 2-ply 15s cotton; width, ⅝ inch; ends in wick, 38, of which seven are ties; picks per inch, 18½. The warp contains very little twist in the single strands and only five turns per inch in the ply yarn. There are not any selvedges such as are usually made on other types of goods.

ROUND, HOSE OR TUBE WICKING.

This wicking has been made with weave Fig. 3, with two ends working together as one. An examination of this will show that it is constructed on the same principle as the first four ends of Fig. 1, the two cloths being tied only at the sides where the filling changes from interlacing with one series of ends to the other series every pick. The arrows indicate where the ends are reeded. The two outer dents on each side contain only four ends each, whereas the remainder of the warp is reeded six ends (3 doubles) per dent

The construction of this wicking is as follows: Warp, 2-ply 5s cotton soft twisted; filling, 3-ply 15s cotton; width, 1⅜ inches; ends in wick, 106 as 53; picks per inch, 28; yards per pound, 15. The warp yarns are arranged 52 ends of white and 1 of blue, repeated once.

LOOM REQUIRED.

For braid wicking a braiding machine is required. For flat and round wicking, narrow ware cam looms, varying in construction according to the weight and width of wicking to be woven, are used.

For the narrow wicking an ordinary tape loom may be used, in which each wicking has its separate warp or warps. The warps for wide wicking are usually run on wide beams, and the yarn divided in the loom. In order to make a soft wicking on these the tying ends are run from a beam as in an ordinary loom. The other yarns are run from one or two separate beams, and are regulated by an attachment which draws them forward in a positive manner in order to avoid the strain usually caused when the yarn has to draw the beam forward.

Each of the fabrics under consideration has been woven from one beam. In the flat wicking the plain ends work tighter than the other ends on account of the larger number of interlacings. This causes them to sink below the plane occupied by the double cloth ends and also causes the latter to be and appear somewhat loose.

FINISHING.

There is practically no finishing given these goods, as they are simply cut into definite lengths and packed, after being woven. The yarn for some of the wicking is bleached or dyed before being woven. Where colored yarns are used, they are usually arranged in the warp to make a striped fabric.

Carding and Spinning Particulars.

Manufacturers of wicking generally buy their yarns from cotton yarn

mills and it is in this latter class of mills that coarse and fine counts of yarns are made. Generally speaking, the so-called yarn mills do not belong to any of the divisions of mills given in a previous article, but are rather in a class or division by themselves, being ready and equipped to fill orders for all counts of yarn, either carded or combed. Of course there are yarn mills making a specialty of fine yarns, but, generally speaking, this class of mills make yarn for the knitting trade, which as a rule does not call for as high counts of yarn as a fine goods mill.

In this class of mills a great many

MORE CHANGES

are made than in mills making cloth, some of the latter mills' card rooms running from one year's end to the next without a change in the hank roving or stock, whereas in the yarn mills changes are made daily. This is on account of filling the orders for small knitting plants, of which there are a great number throughout the country. Generally speaking, more care has to be used in a yarn mill than in a cloth mill, both on account of the many changes and also on account of the yarn being sold and not woven in the same mill, where the smaller defects may be covered. Of course, in both mills the yarn should run as even as possible, but this fault should be looked after particularly in yarn mills. In yarn mills

THE TWIST

of the yarn is less than in cloth mills, and this class of mills is generally equipped with mules instead of spinning frames to obtain this result. Particular care should be taken in yarn mills to see that no "mix-ups" occur in any part of the card room on account of the carelessness of those changing the gears, and it is a good idea to have specially prepared forms to be filled out when each change is made at the slubbers, fly frames and mules or spinning frames. After these forms are made out by the one making the change, they should be handed in and checked by the overseer.

For making the tube wicking, the counts of the yarn are as follows: 2-ply 5s warp soft twist and 3-ply 15s regular twist, while the filling or centre portion or core is made up of 2-ply 1 hank roving. These counts of yarn are all made from the same

STAPLE AND GRADE

of cotton, generally cotton from ⅞ to 1 inch in staple of a good grade being used. In large mills an opening shed is built and the cotton is opened and fed to the opener hoppers or feeders, several being placed in a row and from here blown over to the mill proper, where it is received and carried by arrangements of endless belts to its proper bins. When the cotton is thus opened it is in a dry, fluffy state and may be used at once and does not have to stand, as is the case when the cotton is mixed by the hand method, which has been previously described.

The cotton is put through a feeder and three processes of pickers. The feeder picker should always be kept filled up with cotton, so that the lifting apron will always be filled up. The breaker beater is equipped with two sets of cages and two beaters. The breaker beater has three arms and blades, and its speed is 1,400 revolutions per minute.

THE FRONT BEATER

has two blades and its speed is also 1,400 revolutions per minute, but it must be remembered that the cotton does not receive as much beating as it does at the three-bladed beater,on account of having one less blade. The weight of a yard of lap at the machine is 16 ounces. On the breaker picker there is no evener and the amount of cotton fed is regulated by the distance of the pin or stripping beater from the lifting apron. The laps from this machine are put up and doubled 4 into 1 at the intermediate picker.

This picker is generally equipped with a two-bladed beater, its speed being 1,400 revolutions per minute. The weight of a yard of lap at the front is 12 ounces. This picker has an evener, which should be looked after carefully to see that it is doing its duty. The laps from this picker are put up at the

FINISHER PICKER,

and doubled 4 into 1. This picker may be equipped with either a two-bladed rigid beater or a pin beater which has three arms equipped with pins. If the latter beater is used, the speed for this style should be 1,400 revolutions per minute. The weight of a 50-yard lap should be 46 pounds or a 14.7-ounce per yard lap.

Every lap should be weighed and a variation of one-half a pound either side of standard allowed. All laps which vary more than this should be put back to be run over again. Care should be taken to see that every lap is weighed, and if laps do not weigh within the limit, the evener should be

adjusted to allow the next lap to come within this weight limit. These laps are put up at the card, the draft of which should not exceed 100. The speed of the flats should be one revolution every 40 minutes (110 flats); the speed of the licker-in 300 revolutions per minute and the doffer about 13½ revolutions per minute. The general instruction for settings, grinding and stripping given previously may be followed. The

PRODUCTION OF A CARD

for 60 hours for this class of work is 850 pounds and the weight of the sliver 65 grains per yard. If the yarn is combed, it passes through the sliver lap machine, where it is doubled 16 into 1 for an 8¾-inch lap, the weight per yard being 420 grains. These laps are put up at the ribbon lap machine and doubled 6 into 1. The weight of a yard of lap at this machine is 440 grains for a 10½-inch lap. The ribbon lap machines should be sized twice a day and a variation of seven grains per yard allowed before changing the draft gear. These laps are put up on an 8-head comber and doubled 8 into 1. The weight of a yard of sliver at the delivery end of this machine should be about 65 grains per yard.

THE SAME SETTINGS

and timing for this machine may be used as have been given previously for a 6-head, 8¾-inch lap comber of the Heilman type of combers. The percentage of waste taken out is 18. This sliver is then put through two processes of drawing, the weight at the finisher drawing being 70 grains per yard. If the cotton is not combed, three processes of drawing frames are used, the weight of the sliver being the same as when combed. Size drawing four times a day, allowing two grains either side of standard weight. The drawing sliver is next put through the slubber and made into .40 hank roving. From here it is passed to the first intermediate fly frame and made into 1 hank roving. The roving for the core is twisted slightly more than that used for the warp and filling yarns, generally 1 or 2 less teeth used on the twist gear being sufficient. The roving for the core is then twisted into 2-ply. For the warp yarn the yarn is soft spun at the mule into 5s yarn and then twisted into 2-ply yarn. For the filling yarn the first intermediate roving requires one more process of fly frames, which makes it into 3-hank roving. This is taken either to the mule room or the spinning room and spun into 15s, after which it is twisted, being made into 2-ply 15s yarn.

The rules and instructions for the top rolls given in previous articles may also be applied to this article.

EOLIENNE.

Eolienne is the name applied to a fine dress fabric characterized by having the filling of a much coarser count than the warp, and in consequence producing a corded effect across the breadth of the goods. This class of goods is made up of a raw silk warp and either cotton or worsted filling, with the warp ends per inch greatly in excess of picks per inch.

In fabrics constructed on this basis

THE WARP THREADS

practically cover the filling and produce—with a silk warp—a very glossy fabric, another feature of an eolienne.

This fabric finds favor with the feminine sex practically the year around, being very popular for dressy indoor occasions in the cooler periods of the year, as well as dressy outdoor wear for summer.

The goods are made up in the gray, then dyed in the piece, in any color that the trade desires. The darker shades find most favor for fall and winter use, while the lighter shades are preferred for summer wear. Eolienne

VARIES IN WIDTH.

The cotton filling fabric finishes at 27 inches, while the better grade worsted filling finishes at 40 inches and retails at from 85 cents to $1.25 per yard and the narrow cotton filling fabric retails at from 25 to 45 cents per yard. The variation in price is naturally influenced by the material in the goods, that is, the ends and picks per inch, consequently we find a comparatively wide range in the construction of these fabrics. The manufacturer, however, must bear in mind that the fabrics should be perfectly firm in order to withstand the wear of a dress fabric.

PLAIN WOVEN FABRICS

lend themselves more readily to a variation in texture with a given count of yarns than does any other method of interlacing warp and filling threads, this being due to plain woven fabrics having more intersections to the repeat of the weave than any other weave.

In varying the texture, we must bear in mind the nature of the material to

be used, as certain kinds of yarns require less ends per inch than others of a given count to produce a firm fabric. In the construction of an eolienne which is made up of a silk warp, silk, being the smoothest of textile fibres, would require more threads per inch than a fabric composed of woolen fibres, as the silk threads will not cling to one another or full up in the finishing as would a fabric composed of woolen fibres; consequently silk warp fabrics usually have a very high warp texture.

ANALYSIS.

Cotton filling fabrics: Width of warp in reed, 30 inches; width of fabric finished, 28 inches; ends per inch in reed, 90; ends per inch, finished, 96.

Reed, 45x2.

Silk warp, 21-23s dennier silk; cotton filling, 2-50s combed cotton; 58 picks.

WORSTED FILLING EOLIENNE.

Width of warp in reed, 44 inches; width of fabric, finished, 40 inches; ends per inch in reed, 150; ends per inch, finished, 166.

Reed, 50x3.

Silk warp, 21-23s dennier silk; total number of ends in warp, 6,600; 40 ends additional each side for selvedge, 80; total, 6,680 ends.

Worsted filling, 1-50s French spun; picks per inch, 64.

These fabrics may be woven on any light, smooth running roller or dobby loom. The warp is drawn straight on eight harnesses through French string heddles. The speed of the loom may with advantage run from 130 to 140 picks per minute.

FINISHING.

Eolienne requires little in this respect. After the goods reach the dye house, they are boiled off, then dyed as desired, run through the rotary press and made up into laps or rolls of about 40-yard pieces. Then they are ready for the commission house.

Carding and Spinning Particulars.

The yarns for eolienne are made in mills of the third division as given in a previous article. The count of yarn taken for an example of this class of goods is 2-50s cotton filling, the warp yarns being made of raw silk. In this article we will give the foundation for making this count of yarn for this class of goods. While the count of yarn is not what would be called a fine one, still the general construction of the goods calls for a fairly good length of staple of a good grade of cotton, sometimes the yarns being mercerized and gassed. The sample calls for a cotton of good grade of from 1½ inch to 1 9-16 inch staple. This cotton is put through two processes of picking, the speed of the beaters being 1,500 and 1,250 revolutions per minute, respectively, for the beater and finisher. The weight of the lap at the finisher should be 37½ pounds, or a 12-ounce lap. The card should be equipped with 35s wire fillet for the cylinder and 37s for doffer and flats. The speed of the licker-in should not exceed 300 revolutions per minute; the speed of the flats, one complete revolution every 40 minutes, and about 9½ per cent of dirt, strip, etc., taken out. Strip three times a day and grind as before stated.

SETTINGS

should be close. Special attention should be paid to the licker-in, both as regards its speed and also as to its setting. The feed plate should be set far enough away not to break the staple and not so far as to allow the licker-in to continuously draw bunches into the cylinder. The draft should be about 110 and the weight of the sliver 55 grains per yard. The production should not exceed 525 pounds for a week of 60 hours. The cotton sliver is next put through a sliver lap machine, the doublings for an 8¾-inch lap being 16 into 1, the weight being 400 grains per yard. These laps are put up at the ribbon lap machine and doubled 6 into 1, and made into a lap on a 10½-inch spool. The weight of this lap should be about 420 grains. These are put up at the comber and doubled 8 into 1. For the Heilman machine the end cam should be set as follows: with the 80-tooth gear out of mesh, set roller on pawl arm in heel of large cam, turn index gear to 5½ and slide 80-tooth gear into mesh and bolt. Set detaching rolls to fluted segment with 21 gauge. Set nippers to open at 3½ index gear and close at 9¼. Set lifters down at 6¾ and up at 8¾ to 9; top combs down at 5; detaching rolls beginning to move at 6 and feed roll at 4, or according to amount of waste to be taken out. Set cushion plate to half lap with an 18 gauge and top combs to fluted segment with a 21 gauge. Use a 15-16-inch stock gauge. Use a 30-degree angle on nipper knife. For this stock take out 18 to 20 per cent waste. The weight of the sliver delivered is 60 grains per yard. Speed of comber is 100 nips per minute.

The sliver is next put through

TWO PROCESSES

of drawing frames. For this class of goods use a front roller speed of 350

and have leather top rolls well varnished and see that all stop-motions work properly.

Weight of sliver at finisher drawing frame is 70 grains per yard. At the slubber make .55 hank roving and use three processes of fly frames, the hank roving at each being 1.25 at first; 4 at second, and 10½ at fine frame. Spin the roving into 50s, on a ring frame, with a 2¾-inch spindle gauge, 1¼-inch diamond ring and a 5-inch traverse. If mercerized yarn is wanted, spin with a soft twist, otherwise use the regular cloth twist, which for this yarn would be as follows: twist per inch, 22.98; revolutions per minute of front roller, 100 plus; revolutions per minute of spindle, 7,250. After which the yarn goes through the usual processes to be twisted into 2-ply 50s.

Dyeing Particulars.

PINK.

One-quarter per cent Erika pink G; 1 per cent sal soda; 10 per cent Glauber's salt.

LIGHT BLUE.

One-half per cent diamine S K blue; 1 per cent sal soda; 10 per cent Glauber's salt.

OLIVE.

Two per cent diamine green G; ½ per cent diamine fast yellow B; ¼ per cent diamine brown B; 1 per cent sal soda; 20 per cent Glauber's.

HELIOTROPE.

Two per cent diamine heliotrope; 1 per cent sal soda; 20 per cent Glauber's salt.

NAVY BLUE.

Eight per cent immedial indigo B; 8 per cent sulphide sodium; 5 per cent soda; 20 per cent Glauber's.

MYRTLE.

Eight per cent immedial deep green B; 8 per cent sulphide sodium; 5 per cent soda ash; 30 per cent Glauber's.

FAWN BROWN.

One per cent diamine brown B; ½ per cent diamine fast yellow B; ½ per cent sal soda; 20 per cent Glauber's.

SEAL BROWN.

Four per cent diamine brown B; 1 per cent diamine fast yellow B; 1 per cent diamine catechine B; ½ per cent sal soda; 30 per cent salt.

BLACK.

Ten per cent immedial black N N; 10 per cent sulphide of sodium; 30 per cent Glauber's salt; 5 per cent soda ash.

SAGE GREEN.

One-half per cent diamine green G; 1 per cent sal soda; 30 per cent salt.

PEARL.

One-sixteenth per cent diamine dark blue G; 1 per cent sal soda; 20 per cent Glauber's.

SLATE.

One per cent diamineral black B; 1 per cent sal soda; 20 per cent Glauber's.

HANDKERCHIEFS.

Cotton handkerchiefs are constructed in various ways. Some are made from ordinary plain cotton cloth cut up and either hemmed, embroidered (usually with initials) or ornamented with Battenburg or other forms of lace. Others are what may be termed "made in the loom," and are of such types as hemstitched, in which a leno weave is used for the four borders to make a perforated effect, and corded handkerchiefs, in which corded effects are made for both the side and cross borders.

They vary in size, weight and quality, from the utilitarian red bandanna to the ladies' dainty ornamental lace article.

In a characteristic handkerchief of the cord type, the layout of the entire warp, including the drawing-in draft, is as follows:

	Ends.	Harness.		Dents.
Selvedge	32 as 16	1 2		8
	32	3 4 5 6		16
Border	10 as 2	7 8		2
	6	3 4 5 6		3
	10 as 2	7 8		2
	6	5 6 3 4		3
	10 as 2	7 8		2
	14	3 4 5 6		7
	40 as 8	7 8		8
	14	5 6 3 4		7
	10 as 2	7 8		2
	6	3 4 5 6		3
	10 as 2	7 8		2
	6	5 6 3 4		3
	10 as 2	7 8		2
Body	1080	3 4 5 6		540
	152	Draw border		46
	56	3 4 5 6		28
			Skip	1
	56	3 4 5 6		28
	152	Draw border		46
	1080	Draw body		540
	152	Draw border		46
	32	3 4 5 6		16
Selvedge	32 as 16	1 2		8
	3008 ends			1369

From the above layout it will be seen that two handkerchiefs are woven in the loom at the same time, side by side, one empty dent separating them, and that one beam only has been used. Each warp cord border consists of 100 ends working as 20.

THE SAME EFFECT

could be obtained by using a coarser

yarn, but the probabilities are that if this was done it would become necessary to use two beams. Twenty-eight dents have been occupied between the cords and centre empty dent to allow ample width for turning the edges under for hemming purposes.

The construction data of this handkerchief are as follows: Warp counts, 32s; filling counts, 40s; ends per inch, 72 in plain part, 79 average; picks per inch, 70 in plain part, 77 average; ends in handkerchief, 1,504; picks in handkerchief, 1,454; width in loom, 40 inches; width in gray, 38 inches; weight, 4.5 yards per pound.

One of the principal points to consider in handkerchief weaving is the arrangement of the chain draft for the filling pattern and loom mechanism so that there will not be any more bars of pattern chain used than is necessary.

THE FILLING PATTERN

of the handkerchief under consideration contains 1,454 picks. On an ordinary dobby head this would require 727 bars of double index, or 1,454 bars of single index chain. To avoid this excessive amount of chain there are several devices or loom attachments now on the market, comprising double or more cylinder repeater, multiplier, or handkerchief motions.

Most of these require separate chain bars for the two borders and a certain number of bars for the plain, varying according to the type of motion used.

Fig. 1 shows the chain draft that has been used to produce the handkerchief referred to, with the layout shown; 86 double-index bars have been used for each handkerchief, one for the plain in centre and borders, and 85 for the cord

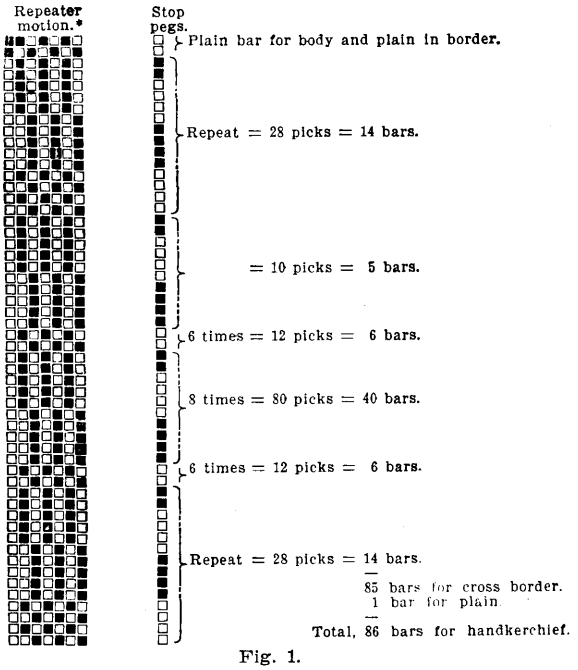


Fig. 1.

cross borders, with a repeat motion that is not on the market. The selvedges have been woven plain. The harnesses for these have not been indicated on the chain draft, because they are worked in a positive manner by the lifter knives.

LOOM REQUIRED.

The handkerchief was woven in a single box dobby loom from one beam. It might at first thought appear to be an advantage to weave cross borders of this type with coarse filling in a 2x1 box loom, using one pick of coarse instead of five picks of fine filling, but the lower speed at which it is necessary to run box looms and the more attention they require from weaver

* Repeater motion refers only to left-hand vertical series of squares.

and loom fixer, lessen this seeming advantage. Single box cam looms, with handkerchief motions attached, in which sliding cams work the plain weave or remain in an open-shed position for a number of picks as required, are sometimes used. These admit of a much greater speed and steadier motion than dobby looms.

FINISHING.

Cord handkerchiefs are usually bleached, cut, hemmed, folded, pressed and made up as required. Plain cloth handkerchiefs are similarly treated or are printed, usually red and white or blue and white, instead of being bleached.

Carding and Spinning Particulars.

The yarns that compose handkerchiefs are made in mills of the second and third divisions, as given in a previous article. Generally speaking, handkerchief yarns are combed, even the coarser yarns for the poorer quality of handkerchiefs. The handkerchief taken for a sample is made up of 32s warp yarns and 40s filling yarns, and it is often found that a different count of yarn is used in the cords.

For the sample under description, a good quality of American cotton of about 1 5-16 to 1⅜ staple would be used. This would be mixed, as has been before described,

MACHINE MIXING

being used if possible, as it leaves the cotton in a more desirable condition. An opener and three processes of picking are used, although in some fine cloth mills only two processes of picking are used, and excellent results obtained. Some overseers consider that an intermediate picker is not necessary, and, in fact, claim that instead of benefiting the cotton, it is a detriment, as it puts neps into the cotton. While this may be true, good results are obtained by either process, and one has to be governed by circumstances as he finds them, as it very often happens in a cotton mill that no hard and fast rule can be given, the object being to get a good clean, even yarn with strength, and on the mark as to count, and also to get as much as possible as cheap as possible. At the feeder have it feeding as even as possible and remember that on the pin roller

DEPENDS THE EVENNESS

of the lap at the breaker. The breaker is equipped with two sets of cages and beaters, the breaker beater having three blades, and making 1,400 revolutions per minute, while the front beater has two blades, and also makes 1,400 revolutions per minute. It will thus be seen that the cotton passing under the three-bladed beater receives one-third more beating than when passing under the forward beater of the same machine. A full lap should weigh 40 pounds, or a 16-ounce lap. If three processes of pickers are used, these laps are doubled 4 into 1 at the intermediate picker. The total weight of a lap at this machine should be 38 pounds, or a 14-ounce lap. At the finisher picker the doublings are also 4 into 1. The speed of a beater of this picker is 1,425, if equipped with a pin beater, and 1,450 if a two-bladed rigid type is used. The total

WEIGHT

of a lap is 37½ pounds for a 40-yard lap, or a 15-ounce lap. All the laps as they are taken off the picker should be weighed, a variation of one-half a pound either side of the standard weight being allowed. The roving waste (cut) should be mixed as before stated, or better still if it is run through a special roving machine, and then put back into the mixing. In this manner scarcely any "lickin" laps are made, granted, of course, that too much cut waste is not being made, or too little cotton being used. Cut roving waste and also card, sliver lap, ribbon lap, comber and drawing frame good waste is a serious problem, and it should not be allowed to accumulate, but should be used up as fast as made. The laps are put up

AT THE CARD.

This card is, generally speaking, the so-called English card. It should have as large a doffer as possible, either a 26 or 27 inch diameter being used by mill men nowadays. The size of wire fillet used should be that used for making medium counts of yarn, i. e., No. 34 or 110s for cylinder, and No. 36s or 130s for doffer and flats. The draft of the card should not be less than 110. The speed of the licker-in should be about 400 revolutions per minute. The flats should make one complete revolution every 40 minutes. Strip, grind and set as given in previous articles. The production of the card for a week of 60 hours should be 600 pounds. If this yarn is to be combed, it is generally run through the sliver lap machine, where it is doubled 14 into 1,and weighs 250 grains

per yard for an 8¾-inch lap, after which it is put up at the ribbon lap machine and doubled 6 into 1, the weight of a yard of lap at the front being 275 grains. These laps should be

SIZED TWICE A DAY,

a variation of 5 grains per yard either side of the standard weight being allowed before changing. At the comber use the same settings, timings and gauges as given in the last article. The combed sliver should weight 45 grains for a 6-head comber, and proportionately more for an 8-head comber. For these goods about 15 per cent of waste is taken out. Watch the needles on the half laps and top combs, for remember that if these are broken or bent, the cotton is not receiving its proper combing, and as this is an extra item in the cost, these little points should be looked after. Another part of the comber to watch is the table, to keep it free from dirt and oil, and well polished and smooth at all times. This is because after leaving the comber the cotton receives no more cleaning, so that dirt even in the sliver is apt to stay there.

PERCENTAGES OF THE COMBER

should be taken frequently and all comber percentages kept as even as possible, for if there is much variation it will show up and make uneven yarn. Another point to watch is the leather top rolls. These should be kept well varnished, with a varnish which will last at least three weeks, although the detaching rolls should be given one coat of varnish every week. Varnish should be applied with a brush. At the drawing frame, the comber sliver is put through two processes, the doublings being 8 into 1 at the breaker, and 6 into 1 at the finisher. The weight per yard at the finisher drawing frame is 70 grains per yard. At this machine

THE MAIN POINTS

to watch are the knock-off motions, roller settings and top rolls. For drawing frame top leather rolls a varnish should be used which is smoother and glossier than that used for the comber rolls. Usually this is obtained by using Venetian red, instead of burnt sienna, as a color mixing. At the slubber, the drawing is made up into .60 hank roving. Watch the twist and tension. If top leather rolls are varnished, the same varnish as is used for the drawing frame may be used, except for the fact that it is thinned down by adding acetic acid or vinegar. The roving is then put through two processes of fly frames. At the first intermediate it is made into 2 hank, and at the fine it is made into 6½ for warp, and 8 hank for filling. At these frames watch the following parts: tension, twist, setting of steel rolls, traverse and roving waste. Be sure to have no dead spindles. The

YARN FOR THE FILLING

is spun into 40s on a frame with a 1⅜-inch diameter ring, 5½-inch traverse, and a spindle speed of 8,800 revolutions per minute, after which the filling is conditioned, and is then ready for weaving. The roving for warp is spun into 32s, on a frame with 2¾-inch gauge, 1⅝-inch diameter ring, and spindle speed of 10,000 revolutions per minute. The yarn is then spooled, warped and put through a slasher, and run upon a beam at the front. Generally speaking, this beam is made up of sections of small beams known as handkerchief beams, on which are wound the required number of ends.

DIAPER CLOTH.

Cotton diaper cloth may be considered a staple fabric, being made in the same widths, grades and patterns year in and year out.

Standard widths are 18 inches, 20 inches, 22 inches, 24 inches and 27 inches.

Essential qualities required for these goods are freedom from foreign matter, and ability to absorb moisture. Being subjected to excessive washings when in use, they have to be of fair quality.

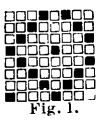


Fig. 1.

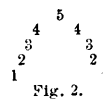


Fig. 2.


Fig 3.

For the ordinary qualities of goods, Allen Seed, Benders, Mobile, New Orleans and Texas cotton of middling and strict middling grades are used. In the lower qualities, card and roving waste is used for the filling.

CONSTRUCTION.

A diaper fabric under consideration

is constructed as follows: Width, 18¾ inches, probably intended for 18 inches; ends per inch, 62; picks per inch, 46; warp counts, 30s; filling counts, 14s; weight, 7.83 yards per pound; weave, Fig. 1. The selvedges consist of 24 ends of 30s as 12 on each side, and have been reeded 4 ends per dent; they weave plain. The body of the cloth has been reeded two ends per dent.

The combination of a filling flush weave, only one end out of 4 being up on each pick, and a soft, coarse filling as compared to the warp, tends to make the face of the cloth very soft. This is aided by the finishing process, which renders the fabric absorbent to a large degree, as well as antiseptic.

Fig. 2 shows the centre or point harness draft, and Fig. 3 the chain draft, to use to produce the fabric under consideration. As harness number 5 works like harness number 1, it might be omitted, and the ends drawn on number 1 instead.

If the ends were drawn in straight, the chain draft would be similar to the weave, with selvedges extra.

CALCULATIONS.

$$\frac{46 \text{ (picks)} \times 20 \text{ (width in reed)} \times 100 \text{ (length of cut)}}{14 \text{ (counts)} \times 840} = 7.82 \text{ lbs. filling.}$$

100 (yds.) divided by 7.83 (yds. per pound) = 12.77 lbs. weight of cut.

12.77 — 7.82 = 4.95 lbs. warp.

18¾ (width of cloth) x 62 sley = 1,162.

1,162 + 24 for selvedges = 1,186, total ends.

$$\frac{1{,}186 \text{ (ends)} \times 105 \text{ (length)}}{4.95 \text{ (weight)} \times 840} = 30\text{s warp counts.}$$

LOOM REQUIRED.

Diaper cloth may be woven on single box dobby or cam looms. If woven on the latter, a cam arrangement of 8 picks to the round, with selvedge motion extra, would be required. As it is not necessary to stop production for ordinary misweaves, the cam loom would be the best to use on account of its steadier running.

FINISHING.

The object of the finishing process is to rid the fabric of the cotton wax and foreign matter, and render it absorbent, white and clean. This is accomplished by treating with an alkaline solution of caustic soda, bleaching, washing and drying. It is then sterilized by formaldehyde or steam, dried, and made up, usually in 10-yard bolts covered with a sealed wrapper.

BALINE.

Baline comprehends a class of goods that is, in point of texture, between the coarser stuff known as burlap and the lighter and somewhat finer material known as canvas.

Baline is practically a coarse kind of canvas. It is made from the best grades of jute, flax and hemp and is used for numerous purposes. The very coarse quality is used principally for wrapping merchandise, and the finer grades are used for curtains and upholstery purposes, and also for stiffening wearing apparel, etc.

Baline, as used for stiffening wearing apparel, is inserted between the surface cloth and the lining, usually at the lapels and sleeves, in order both to stiffen and retain the shape or setting of that portion of the garment.

THE GOODS

are made in various widths; that used for upholstery purposes ranges from 50 inches to 64 inches, and that used for tailoring purposes usually comes in narrow widths from 22 inches to 36 inches. The narrow goods, however, are usually woven double width with fast centre selvedges, then cut in two parts during the finishing.

Baline is made in several qualities, The best grades are made up entirely of tow yarn, a short flax fibre, another grade is made with a combination of tow yarn and hemp or jute. and the lower qualities are usually made entirely from either hemp or jute.

In the combination fabric the hemp or jute usually figures as filling, while the flax or tow yarn is used for the warp, because the latter is with less difficulty made up into a smoother and stronger thread than either hemp or jute. The

WARP AND FILLING

for these goods interlaces on the plain

weave system. The goods used for decorating purposes are dyed in the piece and the prevailing colors are dark red, garnet, and various shades of blue. The goods used for wrapping merchandise and tailoring purposes are finished in their natural color, which is a kind of drab, or light brown, depending on the material used in the construction of the goods.

The baline used for tailoring purposes is the finest in point of texture, and the goods used for decorative purposes closely resemble the common burlap, as far as texture is concerned. In the finishing, the coarser grade of baline receives considerable attention, being dyed and sheared, and presents a much more attractive appearance than the common burlap, which is only pressed after it comes from the loom.

Analysis of goods used for stiffening:

Width in reed, double width, 50 inches; finished at 47½ inches.

Reed, 16x2, 34 picks per inch; warp, 12 cut tow yarn; filling, 12 cut jute; ends in warp, 1,600; extra ends for all, 8; total, 1,608; weight per yard, 15 ounces.

Take-up in warp during weaving about 15 per cent.

FINISHING.

The finishing of these goods depends entirely upon the use for which the fabric is intended. The quality used for upholstery purposes and curtains is dyed after the goods are woven, then sheared on both sides and usually softened, especially so if intended for curtains. The goods used for tailoring purposes are finished in their natural color and stiffened. Some are stiffened much more than others, depending on the use for which they are made. The materials used for stiffening are glue and flour. If a very stiff finish is desired, equal proportions of glue and flour are used. The goods used for wrapping are merely sprinkled, then pressed, after which they are made up into rolls or laps.

Dyeing Particulars.

NAVY BLUE.

Three and one-half per cent formyl blue B; 30 per cent Glauber's; 2 per cent alum.

BLACK.

Five per cent jute black G; 30 per cent Glauber's; 3 per cent alum.

RED.

Five per cent fast red R; 30 per cent Glauber's; 3 per cent alum.

SKY BLUE.

One per cent patent blue B; 25 per cent Glauber's; 3 per cent alum.

Most of the acid colors can be dyed on this fabric with Glauber's and alum at the temperature of about 190 degrees, in a jig dye machine The goods are boiled out with Glauber's salt and sal soda to soften the fibre a little before the dyeing operation.

The addition of a little acetic acid the last fifteen minutes is beneficial to most colors.

HONEYCOMB CLOTH.

Honeycomb cloth derives its name from its very close resemblance to an ordinary wax honeycomb.

In combination with other weaves the honeycomb type of weave is extensively used in the manufacture of honeycomb and so-called crochet quilts. It is also used for cotton warp and wool filling shawls and baby carriage robes, in which the warp is considerably finer than the filling in order that it will show as little as possible.

The honeycomb type of weave was formerly used to some extent in the construction of cotton toweling. The cell-like fabric, which is practically identical in appearance on both sides, would appear to be excellently adapted for toweling, the plain weave portions giving the necessary strength and the long floats of yarn readily absorbing moisture, but for some reason or other it is not seen in the market to any extent at the present time.

Low and medium counts of yarn are usually used for honeycomb cloths.

Figs. 1 and 2 illustrate two honeycomb weaves, on 8 ends by 6 picks and 8 ends by 8 picks, respectively. A study of these will show that some ends and picks interlace more than others in a repeat of the weave and that they are constructed on diamond bases.

Unlike the majority of single weave cloths, the effect in honeycomb cloth differs entirely from that seen on the design paper, the diamond effect on the paper being substituted by the cellular effect in the cloth. This feature is due to the fact that yarns appear more or less prominent, when woven into the cloth, according to the smaller or greater amount of interlacings respectively.

WEAVES.

In the type of cloth under consideration the longer floats of warp and filling form the ridges of the honeycomb cells, while the yarns which interlace to a greater degree form the recesses of the same. The long warp floats on one side are opposite the filling floats on the other.

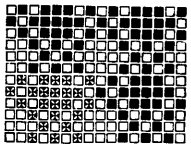


Fig. 1.

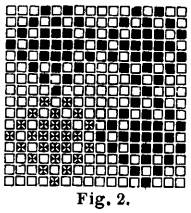


Fig. 2.

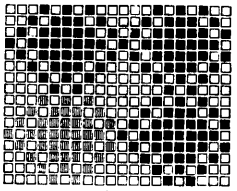


Fig. 3.

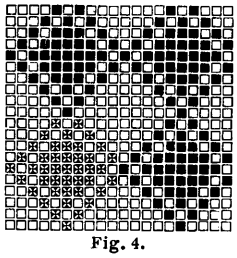


Fig. 4.

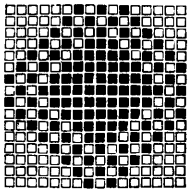


Fig. 5.

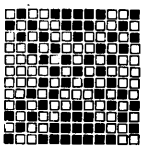


Fig 6.

Honeycomb weaves vary in size within certain limits. The larger the weave, the less firm the structure of the cloth. Figs. 3 and 4 illustrate weaves on 10 x 8 and 10 x 10, respectively. With the same amount of material, cloths constructed with these would not be as firm as they would if weaves Figs. 1 and 2 were substituted.

When large effects are desired, the weave is modified and strengthened by the addition of a plain weave around the diamond, or, as it is termed, a double diamond is used for a base.

Fig. 5 illustrates a weave of this type.

Fig. 6 illustrates another variation of the honeycomb weave on 12 x 12. The type of design illustrated in Figs. 2 and 4 is the one generally used. The crosses in Figs. 1 to 4 indicate one repeat of the weave.

These fabrics are made on ordinary dobby looms. One beam only is used.

BRIGHTON CLOTH.

Brighton cloth is distinguished by a general effect on the face somewhat similar to honeycomb cloth, but unlike the latter, it is not reversible, the appearance on the back differing from that on the face. The principal difference between honeycomb and Brighton weave effects is that the cells of the former appear of uniform size, on the square or rectangular base, whereas those of the latter appear in

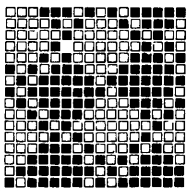


Fig. 1.

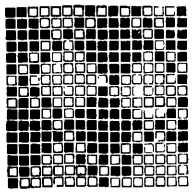


Fig. 2.

two sizes, large and small, alternately, both warp way and filling way, on the drop or plain weave order base.

Brighton cloth is not essentially a cotton cloth, the Brighton weave, which distinguishes the fabric, being used in fabrics made with other materials. The Brighton type of weave is used in making cloths intended for dress goods, also in combination with other weaves to form parts of large jacquard pat-

terns, in substitution for the honeycomb weaves.

In designing the jacquard patterns care must be exercised to have the Brighton weave correct, the long floats of warp and filling being in certain positions in relation to each other, or the effect will be spoiled. For illustration, Figs. 1 and 2 are two weaves which at first glance appear to be similar. Fig. 1 is a correct Brighton weave and differs from Fig. 2 in having the long

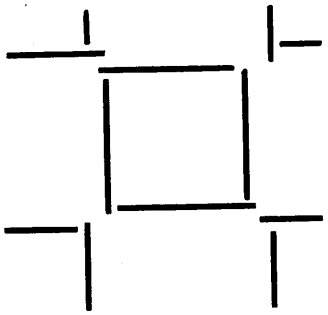


Fig. 3.

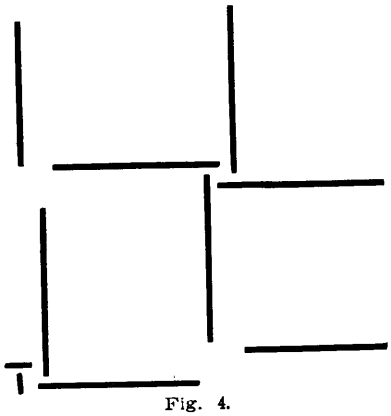


Fig. 4.

floats of yarn form a square, whereas in the latter they form a cross. Figs. 3 and 4 represent the long floats in Figs. 1 and 2, respectively, vertical lines indicating warp floats and horizontal lines filling floats.

Figures 5 to 7 illustrate the several stages in the construction of a 12 x 12 Brighton weave. Fig. 5 shows the 12 x 12 diamond base. Crosses in Fig. 6 indicate a second line of twill in one direction, added to the base, Fig. 5. Marks ▫ in Fig. 7 indicate where warp spots have been added in the left and right hand corners of the large spaces, the same now being divided into two warp flush and two filling flush diamonds of equal size.

The ridges of the cells in the cloth are formed by the long floats of warp at the sides and the long floats of filling at the top and bottom of each diamond. The two sizes of cells are formed by the intervals between the ridges being greater and less (as will be seen by Fig. 3, which simply indicates the ends and picks covered by the long floats in one repeat of

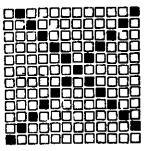


Fig. 5.

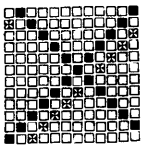


Fig. 6.

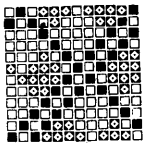


Fig. 7.

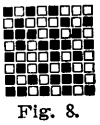


Fig. 8.

weave Fig. 1), thereby enclosing larger and smaller areas, alternately.

Brighton weaves are made on the same number of ends as picks, this number being a multiple of 4, on from 8 x 8 upwards. Figs. 1, 7 and 8 are the weaves generally used, the same being on 16 x 16, 12 x 12 and 8 x 8 respectively.

LOOM REQUIRED.

Brighton cloth is woven on a single box dobby loom from one warp and one filling. It is usually woven white and piece dyed afterwards.

GALATEA.

Galatea cloth has been somewhat in demand the past two or three years by women requiring serviceable and neat-appearing cotton fabrics at a medium price. One selling house advertises it as being particularly suitable for children's dresses that have to be subjected to excessive wear, washing and ironing; also for women's outing suits, and shirtwaists.

The demand appears to be increasing, probably partly due to the fact that

one or more firms are specializing on the fabric and are advertising it.

GALATEA

is usually finished 27 inches wide and retails at 14 to 20 cents per yard. It is shown in plain colors as well as in figured, dotted and striped designs on white and colored grounds. The patterns are obtained by printing. Some manufacturers have evidently found that they can take a standard type of fabric and extend its use by varying the process of finishing it. The base of the cloth, i. e., the fabric previous to bleaching, dyeing or printing, is nothing more than an ordinary 5-end warp sateen of fair quality.

A galatea in a

SIMPLE STRIPE PATTERN

is considered here, the analysis of which shows the following construction data: Width of cloth, 27 inches; ends per inch, 124; picks per inch, 56; warp counts, 23s, right twist; filling counts, 24s, right twist; weight, 3¾ yards per pound; weave, 5-end warp satin. (Fig. 1.)

Fig. 1.

Fig. 2.

Each selvedge consists of 24 ends working as 12 and weaves 2 picks in a shed. The cloth has been reeded 5 ends per dent in the body of the cloth and 6 ends per dent in the selvedges.

CALCULATIONS.

27 inches x 124 sley equals 3,348 ends, plus 8 extras for selvedges (there being 1 end per dent more than in the ground) equals 3,356, total ends.

$$\frac{\text{3,356 (ends) x 105 (length)}}{\text{23 (counts) x 840}} = \text{18.24 lbs. warp in 100 yards of cloth.}$$

$$\frac{\text{30 (width in reed) x 56 (pks.) x 100 (length)}}{\text{24 (counts) x 840}} = \text{8.33 lbs. filling.}$$

18.24 lbs. warp.
8.33 lbs. filling.

26.57 lbs., weight of 100 yard cu
100 divided by 26.57 = 3.76 yards per pound.

When weighing a small sample of the cloth under consideration 5⅝ square inches was found to weigh 10.7 grains.

$$\frac{\text{5⅝ (sq. inches) x 7,000 (grs.)}}{\text{10.7 (weight) x 27 in. (cloth width) x 36 (inches per yard)}} = \text{3.78 yards per pound.}$$

LOOM REQUIRED.

Galatea can be produced most economically on single box cam looms in which an auxiliary motion is used for actuating the selvedge yarns.

On account of the large number of ends per inch, and the fact that four out of every five ends are required to be on the face every pick, the cloth is woven face down in the loom and the harnesses actuated as shown in Fig. 2. The drawing-in draft is straight, with the ends drawn one through each heddle.

FINISHING.

The finishing of galatea is of simple character. It consists in bleaching, if for white, and printing, if for colored, patterns. A light starch, just enough to make the fabric handle firm, is used.

Carding and Spinning Particulars.

Galatea is made up of yarns the average count of which is about 25s. For this article we will consider the warp to be 23s and the filling yarn 24s, both right twist. The cotton used for this fabric would be peeler cotton of a medium grade and 1⅛-inch staple. If large quantities of this cloth are required, the mixing should be done by machines. Any of the methods previously described may be used, the object being to have a dry, fluffy cotton fed to the openers. If only a small mixing is going to be used, the mixing may be done by hand, but when mixed in this manner

THE MIXING

should be allowed to stand longer before using, so that it will become thoroughly dry and not have to be fed green. When cotton is fed green to the pickers there is more likelihood of a fire at these machines. The cotton is next put through three processes of pickers and an opener. At the breaker picker there are generally two sets of cages and two beaters. The first beater that the cotton comes in contact with has three blades and its speed is 1,100 revolutions per minute. The front beater of this machine has two blades and its speed is 1,425 revolutions per minute. The total

WEIGHT OF THE LAP

at this machine is about 40 pounds, although in a great many mills the laps

at the front of the breaker and intermediate pickers are allowed to become as large as can be handled before doffing them. The weight per yard is 16 ounces. The laps from the breaker are put up and doubled four into one at the intermediate. The beater on this machine is generally of a 2-bladed type and the speed of it 1,400 revolutions per minute. The total weight of a 40-yard lap is 37½ pounds, or a 15-ounce lap. At the finisher picker the beater may be either the pin or the 2-bladed rigid type. If the former, the speed should be about 1,350 revolutions per minute, and for the rigid type 1,450. It will be at once seen that a greater number of blows will be struck with the pin beater, but it is claimed that the pins of this beater enter the cotton and do not strike it as forcibly as the blade of a rigid type beater. On the other hand, many carders object to the pin beater, especially on the longer-staple cotton, claiming that it

PUTS IN NEPS.

For this fabric the total weight of a 40-yard lap should be 36¼ pounds. A variation of one-half either side of standard should be allowed and every lap weighed. Look out for split laps and see that every part of the picker is working freely, that the evener motions are in perfect order, for remember, it is on this arrangement that the evenness of the lap depends. At the card the draft should not be over 105. The speed of the licker-in is 375 revolutions per minute. Flats (110) make one complete revolution every 45 minutes. Use medium count wire fillet. Strip, grind, clean, etc., as given in previous articles. The production for this fabric should be 775 pounds per week of 60 hours and the weight per yard of sliver should be 60. This is then put through three processes of drawing frames. For this class of goods

METALLIC ROLLS

may be used to good advantage. For this length of staple with metallic top rolls spread the bottom steel rolls as follows: Front to second 1 5-16 inches; second to third, 1 7-16 inches; third to back, 1 9-16 inches. If leather top rolls are used instead, close rolls a good sixteenth. The speed of the front roll may be anything up to 400 revolutions per minute, according to the amount of drawing needed. As has been said many times before, as this is really the last machine at which evening takes place (to any great extent), watch to see that the stop-motions are working properly. Also watch the clearers and see that the sliver is being coiled properly in the can, because nothing causes more waste and trouble than poorly coiled sliver in cans. Size four times a day and allow a variation of two grains per yard (average) before changing. Scour drawings frequently. The weight per yard of sliver at the finisher drawing is 75 grains per yard. The doublings are 6 into 1. At the slubber the drawing is made into .45 hank roving, after which it is put through two processes of

FLY FRAMES

and made into the following hank roving at each: first intermediate, 1.65; fine, 5 hank. This is taken to the spinning frame and for the warp is spun into 23s, with a right-handed twist. Otherwise than being twisted right-handed, the particulars are as follows: 2-inch diameter ring, 7-inch traverse, 9,500 revolutions per minute spindle speed and a twist per inch of 22.7 + . The yarn is then spooled, warped and put through the slasher.

The filling yarn for this fabric is also a right twist, otherwise the particulars for the frame are as follows: 1½-inch diameter ring, 6½-inch traverse, spindle speed 7,600 revolutions per minute. The yarn is then conditioned.

Dyeing Particulars.

Following are dyeing particulars for 100 pounds of goods.

PINK.

Four ounces Erica pink G; 10 pounds Glauber's; 1 pound sal soda.

LIGHT BLUE.

Six ounces diamine sky blue F F; 10 pounds Glauber's; 1 pound sal soda.

CREAM.

Four ounces immedial yellow D; 2 ounces immedial cutch G; 1 pound sulphide sodium; 2 pounds soda ash; 10 pounds salt.

NAVY.

Ten pounds immedial indone B; 10 pounds sulphide sodium; 3 pounds soda ash; 30 pounds salt.

WINE.

Six pounds brilliant Bordeaux R; 2 pounds sal soda; 30 pounds Glauber's.

TAN.

One pound immedial cutch B; 1 pound immedial yellow D; 3 pounds sulphide sodium; 30 pounds salt; 3 pounds soda ash.

VELOUR.

Velour is a type of filling pile fabric, of fair to good quality, made on the weave principles explained in the article dealing with velveteens. It differs from velveteen in having pile filling of some material other than cotton.

Velour for dress and cloaking purposes is made with 2 or 3 ply cotton yarns for the warp and filling of the ground cloth, and mohair or lustre worsted filling for the pile. The cloth widths range from about 27 inches to 54 inches. The weights and qualities also vary, as will be inferred from a recent retail price list for 32-inch goods. These prices range from $2 to $4 per yard.

The better qualities of dress velours are usually from 27 inches to 32 inches wide.

Large quantities of velour fabrics are also used for curtain and upholstery purposes, the points of the fibres receiving and reflecting the light and indicating full, deep colors. The peculiar manner in which the cloth is constructed makes it an excellent wearing fabric. In jute velours, which are used for upholstery purposes to a greater extent than animal fibre pile velours, the pile yarn is of jute.

In dress fabrics, velours are usually of solid color. For upholstery purposes they are of solid or various colors and patterns, the result of printing, embossing, cutting or burning.

The word velour, or velure, is also given to a pad of pile fabric used by hatters for smoothing and giving a lustre to the surface of hats.

THE ANALYSIS

of a characteristic velour fabric, 50 inches wide, retailing for $2.25 per yard, indicates the following construction data: Ends per inch, 68; picks, per inch, 225,including 45 ground picks and 180 pile picks; warp counts, 2-ply 20s cotton; ground filling counts, 3-ply 15s cotton; pile filling counts, 25s worsted; weight, 21.13 ounces per yard; weave, Fig. 1. The picks are arranged 2 ground to 8 pile.

When analyzing pile fabrics care must be taken not to omit to consider the structure of the cloth. If analyzed as an ordinary fabric the weave for the fabric under consideration would appear as shown in Fig. 2, and there would appear to be an equal number of

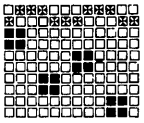


Fig. 1.

Fig. 2.

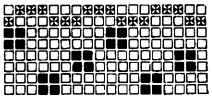


Fig. 3.

ground as pile picks. Fig. 3 shows a weave that could be used if the pile was required to be shorter and less dense than with Fig. 1. Crosses in Figs. 1 to 3 indicate ground picks; ■ indicate pile picks.

Another point to consider is the method of ascertaining the counts of the

PILE FILLING.

Obviously a definite length cannot be measured with any degree of accuracy after it has been cut into very small pieces. Knowing the construction and weight of the fabric, and the counts of the ground yarns, the pile yarn counts may be found as follows:

$$68 \text{ (ends)} \times 50 \text{ (width)} = 3{,}400 \text{ ends.}$$

$$\frac{3{,}400 \times 105 \text{ (length)}}{10 \text{ (counts)} \times 840} = 42.5 \text{ lbs. warp.}$$

$$\frac{45 \text{ (picks)} \times 55 \text{ in. (width in reed)} \times 100 \text{ (length)}}{15 \times 840} = 19.64 \text{ lbs. of ground filling.}$$

$$\frac{21.13 \text{ ozs. (weight per yard)} \times 100 \text{ (length)}}{16 \text{ (ozs. per pound)}} = 132.06 \text{ lbs. weight of 100 yard cut.}$$

42.5 lbs. warp.
19.64 lbs. ground filling.

62.14 lbs. ground yarn.

$132.06 - 62.14 = 69.92$ lbs. pile filling.

$$\frac{180 \text{ (picks)} \times 55 \text{ in. (width in reed)} \times 100 \text{ (length)}}{69.92 \text{ (lbs.)} \times 560} = 25 + \text{ counts of pile filling.}$$

LOOM REQUIRED.

Velours require a two-box dobby loom of heavy pattern, with a special take-up motion on account of the large number of picks per inch. One beam only is required.

FINISHING.

The finishing process consists of cutting, singeing or gassing, scouring, bleaching (if for white), dyeing and drying. Upholstery goods are printed after being dried, usually by the discharge process. Embossed effects are almost entirely confined to solid color fabrics and are obtained by pressure under suitable heated and prepared rollers.

For other data regarding filling pile fabrics the reader is referred to the articles on "Velveteen" and "Velveteen Cutting."

Carding and Spinning Particulars.

Velour is made out of two different lengths of staple of American peeler cotton and a worsted yarn. The counts of yarn used in the sample under description are as follows: Warp counts, 2-ply 20s, which is made from 1 1-16-inch stock, and for ground filling counts 3-45s, which is made out of 1 5-16-inch stock, and for pile filling, 25s worsted yarns, which is equal to a 16 2-3s (single) cotton yarn. The cottons for both lengths of staple are stapled in the usual manner and in large mills are mixed by machines, while in small mills, or mills using a small quantity of these lengths of staples, the mixing is done by hand. For both stocks the

PICKING PARTICULARS

are practically the same and one method will answer for both. They are put through three processes of pickers and an opener, the breaker picker, being known as a combination picker, having two sets of cages and two beaters; the first, or that beater coming into contact with the cotton first, has three blades and revolves at a speed of 1,125 revolutions per minute, while the front beater is generally two-bladed, having a speed of 1,500 revolutions per minute. The total weight of a lap is 40 pounds or a 16-ounce lap These laps are put up at the intermediate picker and doubled four into one. At this picker the beater is of a rigid, two-bladed type and its speed is 1,425 revolutions per minute The total weight of a 42-yard lap is 38½ pounds, or a 14½-ounce lap. At the finisher picker, the speed of a three-bladed pin beater is 1,400 revolutions per minute, and of a two-bladed rigid beater 1,450 revolutions per minute. The total weight of a 50-yard lap is 46 pounds net for the 1 1-16-inch stock or a 14½-ounce lap and 39 pounds net or a 12½-ounce lap for the 1 5-16-inch stock.

AT THE CARD

there are several minor changes from one stock to the other, the principal ones being as follows: The distance from feed plate to licker-in should be increased so as not to injure or break the longer staple. For the shorter stock the draft should be not more than 100. Set feed plate to licker-in to 7-1,000th gauge: flats to cylinder, 7-1,000ths; doffer to cylinder,7-1,000ths; doffer comb to doffer, with a 10-1,000ths gauge,the other settings being the same as those used for indigo prints. For the longer stock set feed plate to licker-in 17-1,000ths; flats to cylinder, 7-1,000ths; doffer to cylinder, 5-1,000ths, etc. The draft for this length of staple should not be less than 100 and 110 of a draft is better. The percentage of all waste at the card for 1 1-16-inch stock should not exceed 7¼ per cent and for 1 5-16-inch staple 8½ per cent. Strip, grind and clean as shown formerly when the same lengths of staple were being described. The weight per yard for 1 1-16-inch staple should be 60 grains per yard and for the 1 5-16-inch stock, 55 grains per yard. The

PRODUCTION

for a week of 60 hours should be as follows: 1 1-16-inch staple, 750 pounds and 1 5-16-inch staple, 550 pounds. The 1 5-16-inch stock is combed (although for all grades of velour the yarn is not combed). The general method followed is as follows: Sliver lap 16 into 1 or an 8¾-inch lap; weight of finished lap per yard, 420 grains. The sliver laps are doubled 6 into 1 or to a 10½-inch lap, the weight being 440 grains per yard. These laps, in turn, are put up at the comber and doubled eight into one, the weight of the finished sliver being 65 grains per yard. Set the comber as before described for this length of staple. For this class of goods 16 per cent of waste is taken out. Use one of the receipts for varnish that have been given from time to time, and keep all leather rolls in good condition, no matter whether they are on sliver lap, ribbon lap, combers, drawing frames or slubbers and speeders. The sliver from the comber is put through

TWO PROCESSES OF DRAWING,

the doubling 6 into 1 at each process. The speed of the front roll depends upon conditions, but a fair speed is 350 revolutions per minute. The weight

per yard of finished sliver is 75 grains. The 1 1-16-inch stock is put through three processes of drawing, the weight of the sliver being 75 grains per yard. Size at the ribbon lap twice a day, an allowance of five grains per yard being allowed from standard before changing. At the drawing frame size four times a day, a variation of two grains per yard being allowed. The drawing frame should be set for 1 5-16 inch stock, front to second, 1 7-16 inch; second to third, 1 9-16 inch and third to back, 1¾-inch for leather top rolls; for metallic rolls, spread rollers ⅛ to ¼ of an inch farther apart.

AT THE SLUBBER

the drawing is made in .60 for both stocks, after which the slubber roving is put through two processes of speeders for 20s yarn, the hank roving at each process being 1.50 at first, and 4 at second. This is spun into 20s on a frame with a two-inch diameter ring; 7-inch traverse; 21.24 twist per inch, and spindle speed of 9,400 revolutions per minute, after which the yarn is spooled and twisted into 2-20s and then warped and put through a slasher. The slubber roving for 45s is put through two processes, the hank roving at each being 2.50 at first and 10 hank at the fine. This roving is spun into 45s on a frame with 1¼-inch diameter ring; 5½-inch traverse; 25 + twist per inch and a spindle speed of 8,500 revolutions per minute. The yarn is then twisted into 3-45s yarn and conditioned.

Dyeing Particulars.

WINE.

6 per cent brilliant diamine Bordeaux R; 3 per cent sal soda; 30 per cent Glauber's; topped with 1 per cent saffranine.

NAVY BLUE.

8 per cent immedial indogene B; 8 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt; topped with 1 per cent brilliant green G; 1 per cent methyl violet B.

OLIVE.

6 per cent katigen olive G N; 2 per cent katigen green 2 B; 1 per cent katigen brown B; topped with 1 per cent auramine; 1 per cent brilliant green crys.

BROWN.

6 per cent immedial cutch G; 2 per cent immedial yellow D; 1 per cent immedial brown B; 10 per cent sulphide of soda; 3 per cent soda ash; 30 per cent salt; topped with 2 per cent auramine; 2 per cent Bismarck brown.

SLATE.

3 per cent immedial black N N; 4 per cent sodium sulphide; 3 per cent soda ash; 30 per cent salt; topped with 4 ounces methyl violet B; 1 ounce brilliant green B.

GRAY.

1 per cent immedial black N N; 2 ounces immedial yellow D; topped with 2 ounces brilliant green B; 2 ounces methyl violet B.

FAWN BROWN.

4 per cent immedial brown B; 2 per cent immedial brown R R; 6 per cent sulphide soda; 3 per cent soda ash; 30 per cent salt; topped with 2 per cent Bismarck brown R.

BOTTLE GREEN.

6 per cent immedial green B B; 2 per cent immedial dark green B; 8 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt; topped with 1 per cent brilliant green B.

PEACOCK GREEN.

4 per cent immedial new blue G; 4 per cent sulphide sodium; 3 per cent soda ash; 25 per cent salt; topped with 2 per cent brilliant green B.

All these shades are dyed with the sulphur colors, well rinsed with water and dyed again at 180 degrees F., and well rinsed in water again and dried.

BLACK.

10 per cent immedial brilliant black G; 10 per cent sodium sulphide; 3 per cent soda ash; 30 per cent salt; topped with 4 per cent immedial indone B; 4 per cent sodium sulphide; 3 per cent soda ash; 20 per cent salt. Rinsed and soaped.

GLORIA SILK or GLORIA CLOTH.

Gloria silk or gloria cloth is a name applied to a fabric used extensively for umbrellas. This fabric is made up of fine organzine silk warp, and either cotton, worsted or mohair filling.

The finest grades of this fabric are made with a fine organzine silk warp and fine French spun Australian worsted filling of a very high texture,

both warp and filling, while in the cheaper grades cotton is substituted for worsted.

The fabric made with silk and worsted is oftentimes used as a dress fabric, with a slight change in texture; the counts of the materials may be a little finer and the ends and picks per inch are less than in the umbrella fabrics.

The fabric used as dress goods is commonly known to the trade as lansdown. This fabric, by reason of the texture, is softer to the touch than the gloria cloth.

Both fabrics are made in the gray, then dyed in the piece. The fabric used for umbrellas is usually dyed black and the fabric intended for a dress is dyed in various shades of solid colors, such as lavender, pink, blue, sometimes finished in pure white or bleached and sometimes the goods are dyed black, if the trade desires it.

A distinguishing feature of these fabrics in conjunction with the materials used is the weave, which is a three-end twill, $\frac{2}{1}$, and is woven in a width of about 45 inches in reed.

In the best grades of the umbrella

Fig. 1.

Fig. 2.

fabric the construction is of such a high texture that the fabric need not be waterproofed as are some fabrics used as a protection against the elements, as, for instance, raincloth, which is rainproofed during the finishing process. The texture of the gloria cloth is sufficiently compact to be impervious to the rain.

ANALYSIS

follows of fabrics used for umbrellas and also fabrics used for dress goods.

First, Gloria cloth: width of warp, in reed, 45 inches; width of fabric finished, 40-41 inches; ends per inch in reed, 55x3, equals 165; ends per inch finished fabric, 180; warp, 1¼ dram organzine silk.

Take-up during weaving, 8 per cent.

Practically no shrinkage in cloth in length during finishing.

Filling, 160 picks per inch; 1-70s French spun Australian worsted.

Second: Lansdowne: width in reed, 45 inches; width of fabric finished, 40-41; ends per inch in reed, 150—50x3 reed; ends per inch in finished fabric, 168; warp, 1¼ dram organzine silk.

Filling, 150 picks; 1-90s French spun Australian worsted.

These fabrics are woven on harness looms; the warp is drawn straight on six harnesses, through French string heddles. This particular heddle is almost indispensable in silk weaving.

Fig. 1, two repeats of weave.

Fig. 2, drawing-in draft.

Carding and Spinning Particulars.

Gloria cloth is made up from many different raw stocks and may be either composed of worsted, silk, mohair or cotton yarns or a combination of any two. Gloria is sometimes called umbrella cloth on account of its extensive use for covering this article, and when used for this purpose it is generally constructed from cotton yarns. The counts of the yarn used vary from 40s to 60s, but a good average would be 45s for both warp and filling. The raw stock used for the better cloth is Egyptian cotton of 1⅜-inch staple, but it is the general rule nowadays to mix Allen 1⅜-inch staple cotton with the Egyptian, so as to cheapen the cloth, the proportion of American cotton used varying from one-sixth to one-half, the blending being generally done at the breaker drawing frame. The cottons should be mixed and up to the drawing frame run separately. They should be mixed in the usual manner; if a bale breaker is used better results will be obtained and the mixings will not have to stand as long to dry out as when hand mixings are made. The cotton is put through an opener and three processes of pickers. On the opener the stripping roll should be set about one-half an inch from the lifting roll and

THE HOPPER

should always be kept three-quarters full of cotton. The processes of pickers used may be three, as stated before, or two, the breaker being what is known as a combination picker, that is, having two beaters and two sets of cages. For various reasons the latter method is considered the better of the two. In this article we will consider the processes to be three separate pickers, although the speeds of the beaters given may be used if two processes of pickers are used. The speed of the breaker beater is 1,350 for a two-bladed beater and 900 revolutions per minute for a three-bladed beater. The total

weight of a lap at the front would be about 40 pounds, or a 16-ounce lap. These are doubled 5 into 1 at the intermediate picker. The speed of the beater of this picker is 1,300 revolutions per minute. The total weight of a lap at this machine is 37½ pounds,or a 15½-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. The speed of this beater is 1,200 revolutions per minute, and the weight of a lap is 31½ pounds, or a 12½-ounce lap.

THE SPEEDS

of the beater given above are for the Egyptian stock. The Allen seed would require a higher speed of the beater to get the dirt out, the increase being about 100 revolutions per minute at each process. Every lap should be weighed as it is taken from the finisher picker, a variation of one-half a pound from the standard weight being allowed. The laps are then put up at the card and given a draft of 110. The speed of the flats is one complete revolution every 40 minutes; set and grind as usual. The production should be about 500 pounds a week of 60 hours, the weight of the sliver being 50 grains per yard. Strip cards three times a day for a 10½-hour day. The card sliver is next put through a sliver lap machine, the doublings for an 8¾-inch lap being 16 into 1. The weight of a yard of this 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 275 grains per yard. The spread of the rolls at the ribbon lap for this staple is, front to second, 1⅝ inches; second to third, 1¾-inches; third to back, 1⅞ inches. These laps are put up at the comber and doubled either 6 or 8 into 1, according to the number of heads the comber contains. For this article we will assume 6. The speed is 90 nips per minute, the weight of sliver delivered being 40 grains per yard. The percentage of waste taken out is 16. If larger laps than 8¾ inches are used the weight of the lap, etc., will be proportionately heavier. Set and time as given in a previous article. At the drawing frame the doubling at each of the two processes used is 6 into 1. It is at this machine that the blending is done, three ends of American cotton being run in with three ends of Egyptian.

THE WEIGHT

of the drawing at the front should be 50 grains per yard. The rolls should be set as follows: front to second, 1½ inches; second to third, 1⅝ inches,and third to back, 1¾ inches. Size four times a day and allow a variation of two grains per yard either side of standard before changing. Varnish and change leather top rolls frequently. At the slubber the silver is made into .70 hank roving and is then put through three processes of fly frames, the hank roving at each process being as follows: First intermediate, 1.40 hank; second intermediate, 3.40 hank, and fine frame, 9.40 hank. The twist per inch put into the roving is very important and for making these yarns the following twists are used at the slubber: 73 turns per inch; first intermediate, 1.01 per inch; second intermediate, 1.85 per inch, and fine, 3.7 per inch. Lay close and size fine frames once a day, and slubbers once a week.

BETTER RESULTS

are obtained if either self-weighted rolls are used on the fine frames or if not using self-weighted rolls take weight off of second roll and take one tooth of draft out between second and third rolls. Watch the leather rolls to see that they are in perfect condition. The yarn is taken to the mule room and spun with a soft twist for both warp and filling; the warp yarn is then run on to spools, after which it is warped and slashed and is then ready for the beam. Particular care has to be taken with this fabric to keep it free from neps on account of their showing up so plainly when made up on the umbrella, and it is a good plan to watch the beaters, flats and settings at the card, percentage and settings at the comber.

Dyeing Particulars.

Gloria cloth is made for the umbrella trade. When composed of silk and wool it is dyed by special colors, made by such firms as the Cassella Color Co., Continental Co. and others, the colors dyeing wool and silk in one bath. For cheap imitation gloria cloths of cotton and wool, a union black is dyed: 5 per cent union black B, 20 per cent Glauber's salt. Boil forty minutes, and run without steam for forty minutes longer.

For

ALL COTTON CHEAP GLORIAS,

which are not glorias at all, as the only real gloria cloth is made from silk and wool, the aniline salt black is dyed; the goods are passed through a solution of aniline salt, dyed and aged and developed and washed.

CANVAS.

Canvas is a term applied to heavy, plain weave cloths made with coarse, ply cotton yarns. It does not refer to any particular grade or weight of cloth.

Canvas cloth is used for mail bags, coverings for boats, in the manufacture of tents, etc. The

ANALYSIS

of a heavy characteristic canvas fabric indicates the following construction data: ends per inch, 31; picks per inch, 24; warp counts, 6-14s; filling counts, 9-14s; cloth width, 24 inches; reed width, 25¼ inches; weight, .72 (72-100) yard per pound; plain weave. A characteristic feature of heavy, plain cotton fabrics is seen in this cloth in that the warp has contracted in length about 25 per cent. Goods of this character would be woven on heavy cam looms of the type used for weaving duck.

Fig. 1 is a weave of the mock leno type, sometimes termed a canvas weave. Cloth made with this weave

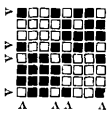


Fig. 1.

is characterized by small perforations, caused by some of the ends and picks, indicated by the arrows, cutting or opposing each other, while other ends and picks in the same weave come closely together. This cloth is used as a base or ground for embroidery work, and the perforations noted have a distinctive value as an aid in indicating readily where to insert the needle.

Carding and Spinning Particulars.

Canvas is made up in a great many grades, but usually the counts of the yarns do not vary as much for the different grades as for different grades of finer fabrics. The sample of canvas taken for description is made up of 6-14s warp and 9-14s filling. This count of yarn (considering the fabric) would be made up of from 15-16 to 1 1-16 inch staple, of a medium grade, and for this grade of fabric the cotton would not be combed. If large mixings are required, i. e., over 60 bales a day, a bale breaker should be used or some arrangement made whereby the mixing can be done by machines; if a smaller amount of cotton is required, then a hand mixing will answer. It will be found a great advantage to use machinery for mixing; any of the up-to-date machines and systems are all right. The cotton is next put through an opener and three processes of pickers. The pin roll, or, as it is sometimes called, the evener roll, should be set about one-half an inch from the lifting apron. The breaker picker is what is known as a combination picker, having two sets of beaters and two sets of cages.

THE BEATER

that first receives the cotton is generally of a three-bladed type and its speed is 1,400 revolutions per minute. The front beater of this same machine has two blades, and its speed is 1,450 revolutions per minute. The total weight of a lap at the front end of this machine is 40 to 50 pounds, according to length of lap run. Some overseers do not have a full lap knock-off on either the breaker or the intermediate picker, but the attendant doffs this lap at will. These breaker laps are doubled four into one at the intermediate picker. This picker is equipped with an evener motion and has a two-bladed beater, the speed of which is 1,400 revolutions per minute. The weight of a full lap is about 40 pounds, but generally this picker has no full lap knock-off, so the laps would weigh more or less for a full lap, but just the same per yard. Four of these laps should be doubled into one at the finisher picker. This is equipped with a pin beater, the speed of which is 1,400 revolutions per minute. The total weight of a 46-yard lap is 48½ pounds gross, or 46 pounds net, or a 12-ounce lap. Every lap should be weighed on this kind of stock, for it is generally a very sensitive cotton to weather conditions. Watch the evener motions to see that they are working properly and are clean. Run good sliver waste up in the usual manner. At the cards the draft should not exceed 100 and the flats should make one complete revolution every 40 minutes; set and grind as instructions in article on indigo prints. Strip out every three hours or three times (both cylinder and doffer) a day for a 10½-hour day. If humidifiers are run,

THE HUMIDITY

should be about 55 degrees. The production of a card for a week of 60 hours should be 650 to 750 pounds, the

weight of the sliver being 55 grains per yard. The card sliver is next run through either two or three processes of drawing as required for the quality of the canvas. In the sample three processes are used, six ends up at each process. The spread of the rolls for 1-inch stock with leather top rolls is as follows: front to second, 1⅛ inches; second to third, 1 3-16 inches; third to back, 1⅜ inches. For metallic top rolls spread of rolls ⅛ inch wider all through. Watch all stop-motions on this machine, for practically the last doubling is done at this machine, so that it is very important to see that the stop-motions are in good order. Varnish rolls as often as possible, and see that clearers are properly placed and picked. The sliver should be sized four times a day and should weigh 75 grains per yard. If humidifiers are used over these machines, they should give a mean temperature of 60 to 65 degrees. The drawing sliver is run through the slubber, and made into 40 hank roving. The settings for rolls at this machine are as follows: front to second, 1 1-16 inches, and second to back, 1¼ inches. Clean steel rolls of all laps, etc. The slubber roving is then put through two processes of fly frames, at the first intermediate being made into 1 hank roving and at the second, 3 hank roving. The roving on the finer frame should be sized once a day, the roll settings used for both being front to second, 1-16 inches and second to back, 1¼ inches; the doublings at each being 2 into 1.

AT THE SPINNING ROOM

the roving is spun into 14s on a warp frame with a 3-inch gauge of frame, 7-inch traverse, 2⅛-inch diameter ring, 17.77 twist per inch and a spindle speed of 9,000 revolutions per minute. This is then doubled into 6-14s or 6-ply 14s, after which it is put through a slasher and run on a beam.

The 14s filling yarn is made on a 1½-inch diameter ring, 6½-inch traverse, a 12.16 twist per inch and a spindle speed of 6,800 revolutions per minute. This yarn is then twisted into 9-ply 14s or 9-14s, after which it is conditioned, when it is ready to be woven.

BACK-CLOTH.

Back-cloth is a reinforcing cloth used in calico printing to support a fabric being printed. Any plain cloth of suitable width may be used as a back-cloth, therefore the term does not refer to any particular width, weight or quality of fabric.

The back-cloth passes through the printing machine between the machine and the cloth to be printed. Both cloths, the back and the printed, emerge from the printing machine together. The back-cloth is immediately folded, whereas the printed cloth goes through other machines to "set" the color. The color on the back cloth, not being "set," is easily washed out. In a public cloth finishing establishment, the back-cloth is usually bleached, after serving its purpose at the printing machine, and finished as required. The back-cloth is usually wider than the cloth it is intended to support, and the color touches it only lightly on the outer portions.

Appendix.

CRASH.

Carding and Spinning Particulars.

Crash is generally composed of yarns varying from 14s to 20s, both warp and filling having the same count of yarn. This class of fabric is made from cotton whose staple varies from ⅞ to 1 1-16 inches. For this article we will consider the counts of the yarn to be 16s and the staple of the cotton 1 1-16 inches in length. If large lots of this class of goods are to be handled, say over 35,000 pounds per week, preparing machines should be used, which are nothing more or less than several (from 3 to 7, according to capacity of mill) hoppers or openers in a row delivering the cotton on to an endless apron which carries it to and drops it into a line of trunking.

The cotton is conveyed to the mixing bins through this trunking, the motive power being powerful fans. This allows the cotton, when it reaches the bins, to be in a fluffy dry state. This cotton is next fed to the openers and is passed through three processes of picking. At the

BREAKER PICKER

the cotton passes through first a 3-bladed rigid type of beater, which has a speed of 1,100 revolutions per minute, and then a 2-bladed beater, the speed of which is 1,375 revolutions per minute. The total weight of a lap is 40 pounds, or a 16-ounce lap. At the intermediate picker the speed of the 2-bladed beater is 1,300 revolutions per minute, and the weight of the lap is 38 pounds, or a 13-ounce lap. At the finisher picker there is a pin beater (three arms) the speed of which is 1,350 revolutions per minute. The total weight of a 52-yard lap is 46 pounds net, or a 14⅛-ounce lap. Allow one-half pound variation either side of standard weight. At the card, set the same as for indigo prints. The top flats should make one complete revolution every 45 minutes. The sliver should weigh 60 grains per yard, and the production should be 775 to 825 pounds per week of sixty hours. Watch the setting points to see that all cards are set as nearly as possible alike. Strip three times a day and watch help to see that they strip every card. Grind as before stated. The sliver is next put through three processes of drawing frames. The speed of the front roll at the finisher for this stock should be 350 to 400 revolutions per minute, and the weight per yard of lap 75 grains. Watch the knock-off motions to see that they are all in proper working condition. For this class of work metallic top rolls may be used to excellent advantage. Size four times a day.

THE DRAWING SLIVER

is put through the slubber and made into .46 hank roving and from here put through two processes of fly frames, at the first intermediate being made into 1.10 hank, and at the second intermediate, or in this case the fine frame, 3.25 hank. Keep the top rolls in good condition and the bottom steel rolls set properly. This roving is taken to the spinning frame and spun into 16s warp yarn on a frame with 2¾-inch gauge of frame, 2-inch diameter ring, 7-inch traverse and spindle speed of 9,400 revolutions per minute. Twist per inch, 19. This yarn is then spooled, warped and put through the slasher, where it is heavily sized.

The 3-hank roving for the filling yarn is spun into 16s filling on a frame with 1⅝-inch diameter ring, 6½-inch traverse, 13 twist per inch and spindle speed of 7,000 revolutions per minute. After leaving the spinning frame, the yarn is conditioned.

HAMMOCK CLOTHS.

Carding and Spinning Particulars.

Hammock cloth is generally made in mills making low counts of yarn, or in mills or small plants which make a specialty of this one grade of goods. The counts as well as the staple of the cotton differ according to the quality of the fabric to be made. There is also another factor which enters into the manufacture of this class of fabric and that is its strength. Strength in yarn may be obtained by several different methods, either doubling and twisting two or more yarns together or using a longer staple, or a combination of both, always considering that machines through the mill are properly adjusted and set. Another method to obtain strength is to twist, tighten, or in other words put

in more twist per inch. For the sample of hammock cloth we will suppose it to be made up of 3-10s warp and filling, and we will assume the staple of the cotton to be ⅞ inch in length, straight cotton being used in the mixing. In the cheaper grades of this cloth comber and card stripping waste is put into the mixings in certain proportions. The cotton would be mixed by hand and

TWO PROCESSES

of picking used. The cotton should be allowed to stand as long as possible to dry out so as to be more easily worked, and it also lessens the liability of fires in the picker. The breaker picker should be a combination picker with two sets of screens and two beaters. The back beater has three blades and has a speed of 1,000 revolutions per minute. The forward beater has two blades and has a speed of 1,400 revolutions per minute. If the lap measures 40 yards, the weight should be 40 pounds or a 16-ounce lap. Generally, however, the lap is allowed to run as large as possible before being doffed. These laps are doubled 4 into 1, and come under the action of a two-bladed rigid beater, the speed of which should be about 1,375 revolutions per minute. The main points are to look out for fires, keep lappers very near full, watch the eveners and piano motions and keep all parts in good working order. The total weight of a lap at the finisher, for a 40-yard lap should be 37 pounds, or a 14½-ounce lap. Weigh every lap and allow a variation of three-quarters of a pound either side of standard. These laps are then put up at the card, which is fitted with coarse wire fillet.

THE DRAFT

should not be more than 90 and the speed of cylinder 165 revolutions per minute and the licker-in speed 350 revolutions per minute. Flats make one revolution every 50 minutes (110 flats). Strip cylinders three times a day and doffer two times. The weight of the sliver should be 65 grains per yard and the production not less than 950 pounds for a week of 60 hours. The cotton is next put through two processes of drawing frames, the doublings being 8 into 1 at the breaker and 6 into 1 at the finisher. The weight per yard at the finisher drawing should be 80 grains; size three times a day. Metallic rolls may be used to good advantage for this class of work. Watch all the knock-off and stop-motions at this machine and also look out for cut drawing. The roll setting for metallic rolls for seven-eighths inch stock is, front to second, 1⅛ inches, second to third, 1¼ inches, and third to back, 1½ inches. In a great many mills the sliver at the drawing frame is sized only twice a day. The cans of drawing are put up to and run through the slubber, which makes it into .60 hank roving, which is afterwards put through one process of fly frames and made into two hank roving. Size this class of roving once a day at the fine frame. Look out to see that the hank clock cannot be moved and hanks made. It is next taken to the spinning room and made into 10s for warp on a frame with 3-inch gauge of frame, 2¼-inch diameter ring, 7-inch traverse and spindle speed of 8,600 revolutions per minute, after which it is twisted into 3-ply 10s at twister, and then spooled, warped and put through the slasher. For the filling yarn the two hank roving is spun on a filling frame with a 1⅝-inch diameter ring, 7-inch traverse and spindle speed of 6,400 revolutions per minute, after which it is twisted into 3-ply 10s.

MADRAS.

Carding and Spinning Particulars.

Madras is made up of various counts of yarn according to the quality wanted, and in the finer qualities of this fabric, silk is used for the stripes. Egyptian or a fine Sea Island cotton is generally used in the finer qualities. In this article we will consider the filling yarn to be made up of 80s Egyptian cotton with a staple of 1⅝ inches. Egyptian cotton, generally speaking, is more easily worked than American cotton, and for this reason higher speeds are used than when the same counts of yarn are made from American cotton. The cotton is generally mixed by hand, after which it is put through three processes of pickers. At the breaker picker the speed of the three bladed beater is 1,050 revolutions per minute. The total weight of the lap at the front of this machine is 49 pounds, or an 18-ounce lap. At the intermediate picker the speed of a two-bladed beater is 1,450 revolutions per minute, while the total weight is 38 pounds, or a 12-ounce lap. These are put up at the finisher picker and run through a two-bladed rigid beater, the speed of which is 1,400 revolutions per minute. The total weight of a 50-

yard lap is 37½ pounds,or a 12½-ounce lap. Allow the usual amount of variation from standard weight of lap, and follow instructions for the picker room for high-grade and fine yarns. The cotton is next passed to the card.

THE DRAFT

of this card should not be less than 110. The top flats should make one complete revolution every 30 minutes. The speed of the licker-in should be about 350. The weight of the sliver is 50 grains and the production for this class of goods is 475 pounds per week of 60 hours. Strip, grind, etc., the same as when Sea Island cotton is used. In mills that are especially equipped for fine counts of yarn the wire on the card will be fine. After leaving the card, the full cans are put up to the sliver lap machine. In the general type used the machine has 16 ends doubled into 1 at the front. This lap weighs about 295 grains per yard. These laps are put up at the ribbon lap machine and doubled six into 1. The weight per yard of lap at this machine is 275. This is for a six-head comber. The comber is the next machine and at this machine the laps are doubled 6 into 1. The settings of this machine should be the same as when Sea Island cotton of the same length is used. The weight per yard of the combed sliver is 40 grains, and the speed of the comber 90 nips per minute. Several recipes for varnish for the leather-covered top rolls have been previously given and the following

RECIPE

will be found to be an excellent addition to those already given: Eight ounces of plate glue, 8 ounces of ground gelatine, 12 ounces of burnt sienna, one ounce of oil origanum, three pints acetic acid, one pint of water. The ribbon laps should be sized twice a day and a variation of five grains per yard either side of the standard weight allowed before changing. The combed sliver is next put through two processes of drawing frames, the weight per yard of a yard of finished drawing being 60 grains. The doublings at these machines are 6 into 1. Size the finishers four times daily and allow two grains per yard before changing. The cotton is next put through the slubber and made into .60 hank roving. This is then put through three processes of fly frames, at the first intermediate being made into 1.50 hank roving, at the second intermediate 4.50 and at the fine frame 16 hank. Egyptian cotton requires an extra tooth of twist as compared with Sea Island cotton of the same length of staple and hank roving. The middle top rolls on the fine or jack frame should not be dead weighted. This roving is taken to the spinning room and made into 80s yarn (filling) on a frame with a 1¼-inch diameter ring, 5-inch traverse, 29.07 twist per inch and spindle speed of 7,400. This yarn is then taken and conditioned.

GINGHAMS.

Carding and Spinning Particulars.

The yarns that make up ginghams (common) vary from 26s to 40s for both warp and filling. For the sample of gingham under description we will consider the yarns to be No. 40s for both warp and filling. This yarn would be made from a medium grade of peeler cotton of about 1 3-16-inch staple. The cotton after being put through a bale breaker or an opener known as a preparer is put through three processes of pickers at the breaker picker. The speed of the three-bladed beater should be 1,150 revolutions per minute, and of the two-bladed beater of the same machine, 1,400 revolutions per minute. The total weight of the lap should be 40 pounds, or a 16-ounce lap. At the intermediate the speed of the beater should be 1,400 for a rigid two-bladed beater. The total weight of lap should be 38 pounds or a 12½-ounce lap. The finisher picker should be equipped with a pin beater, the speed of which should be 1,425 revolutions per minute. The weight of a full lap should be 39 pounds or a 14-ounce lap.

At the card use the same settings, etc., as given for indigo prints. The flats should make one complete revolution every 50 to 55 minutes. Speed of doffer should be 350 revolutions per minute.

THE WEIGHT

of the sliver should be 60 grains per yard and the production 800 pounds for a week of 60 hours. The sliver is next put through three processes of drawing frames, the speed of the finisher drawing being 400 revolutions per minute. Watch the settings,and size at this place four times a day, a variation of two grains either side of standard weight being allowed.

The weight of the sliver at the fin-

isher drawing should be 70 grains per yard. Either metallic or leather covered top rolls may be used to good advantage on this stock. The drawing sliver is next put through the slubber and made into .60 hank roving. This is put through two processes of fly frames and made into 2 hank roving at the first intermediate and 8 hank at the second. Watch the tension and waste and be especially careful of mix-ups. Size the fine roving at least once a day. The roving is taken to the spinning room and made into 40s on a warp frame with a 1⅝-inch ring, 6½-inch traverse, 28.46 twist per inch and a spindle speed of 10,000 revolutions per minute. The yarn is then spooled and warped, after which it is run through the slasher. A good size is as follows: water, 100 gallons; potato starch, 54 pounds; Yorkshire gum, 2 pounds; white soap, 1½ pounds.

The 8 hank roving for filling yarn is made on a frame with 1⅜-inch diameter ring, 5½-inch traverse, 23.72 twist per inch and a spindle speed of 8,800 revolutions per minute. This yarn is then conditioned.

SCRIM.

Carding and Spinning Particulars.

Scrim is made of cotton counts of yarn from 20s to 40s. For this article we will consider the cotton to be 1 3-16-inch staple peeler of a medium of 32s count. This class of goods is made in mills of the first division as given in a previous article. Large mixings should be made by hand and the cotton is then put through an opener and three processes of pickers. The breaker picker has two sets of cages and two beaters, the back beater having three blades and making 1,050 revolutions per minute. The front beater has two blades and makes 1,300 revolutions per minute. The total weight of a 40-yard lap at this machine is 40 pounds, or a 16-ounce lap. The speed of the beater of the intermediate beater (two bladed) should be 1,400 revolutions per minute, and the total weight of the lap is 37½ pounds,or a 12-ounce lap. At the finisher the lap should weigh 39 pounds,or a 14½-ounce lap, while the speed of the beater (of a pin type) should be 1,400 revolutions per minute. Every lap should be weighed and a variation of half a pound either side of standard weight allowed to pass, all others being put back to be run over again.

THE CARD CLOTHING

should be of a medium count wire, the wire for doffer and top flats being two points finer than the cylinder. The draft of card should be about 100 and the sliver should weigh 65 grains per yard. The production should be 750 pounds for a week of 60 hours, For other particulars for card follow those given for indigo prints. The cotton is next put through the sliver lap machine and doubled 16 into 1, the lap weighing 320 grains per yard. These laps are put up at the ribbon lap and doubled 6 into 1, the weight per yard being 440 grains for a lap 10½ inches in width. These laps are put up to an eight-head comber and made into a 65-grain sliver, taking out 17½ per cent of waste. For roller varnish and other particulars about comber, see article on madras. The comber sliver is put through two processes of drawing frames, the doublings being 6 into 1 at each process. The weight per yard of the finished drawing is 75 grains. The same roller varnish may be used on the drawing frames as at the comber. Size four times a day and look out for the knock-off motions to see that they are in proper working order. The sliver is next put through the slubber and made into .60 hank roving. This is then put through two processes of fly frames or speeders, the hank roving at each being as follows: First intermediate 2 hank, and fine 6½ hank. Keep the leather top rolls in good condition and watch to stop double, single and bunches.

THE ROVING

is then taken to the spinning room and spun into 32s on a warp frame with a 1⅝-inch diameter ring, 6½-inch traverse, 26.87 twist per inch and spindle speed of 10,000 revolutions per minute. The yarn is then spooled, warped and run through the slasher, where it is put through a special size.

The roving for the filling is spun into 32s on a frame with a 1⅜-inch diameter ring, 6-inch traverse, 21.21 twist per inch and a spindle speed of 8,800 revolutions per minute. This yarn is conditioned.

Some of the white cloths, such as ducks, pique, etc., which in most seasons are always white, may be dyed to follow a freak of fashion.

CREAM.

For 100 pounds goods, two ounces immedial yelow D; 2 ounces immedial cutch B; 1 pound sulphite sodi-

um; 20 pounds salt; ½ pound soda ash.

MAUVE.

Two ounces diamine violet N; 10 pounds Glauber's; 1 pound sal soda.

ECRU.

One-half pound immedial cutch G; 4 ounces immedial yellow D; 2 pounds sulphide sodium; 10 pounds salt; 1 pound soda ash.

SKY BLUE.

One pound immedial indone B; 2 pounds sulphide sodium; 2 pounds soda ash; 10 pounds salt.

LIGHT SLATE.

One and one-half pounds immedial black N R T; 3 pounds sulphide sodium; 20 pounds salt; 2 pounds soda ash.

PIQUE.

Carding and Spinning Particulars.

The yarns for pique vary according to the quality wanted. A good quality and average grade of pique may be made from 30s yarns of 1⅜-inch peeler cotton (carded). After being put through a bale breaker the cotton is put through three processes of pickers, the speed of the beater at each process being as follows: 1,500 revolutions per minute (two-bladed beater) for the breaker picker, 1,400 for the intermediate picker (two blades), and 1,375 to 1,450 for the finisher picker, according to the grade of cotton used. The total weight of a finished lap should be 35 pounds or a 12½-ounce lap. At the card the draft should not be less than 100 or more than 110. The flats (110) make one revolution every 37 minutes. Strip three times a day. The weight of sliver should be 60 grains per yard; production, 750 pounds for a week of 60 hours.

The card sliver should be put through

THREE PROCESSES

of drawing frames. These should be equipped with leather covered top rolls, the speed of the front roll of the finisher drawing being 350 to 400 revolutions per minute, according to production required. The weight of the sliver from this frame should be 75 grains per yard.

This sliver is put through the slubber and made into .50 hank roving. For 9s filling yarn the slubber roving is put through one process of fly frames and is made into 2 hank roving. If a large quantity of pique is being made the yarn for 9s may be made of a much lower grade and staple of cotton, but otherwise it is better to construct the yarn by the method given.

The slubber roving for 30s yarn is put through two processes of fly frames, at the first intermediate being made into 2 hank and at the second being made into 7.50 hank. This roving is taken to the spinning room and spun into 30s on a warp frame having a diameter of ring 1¾ inches, length of traverse 6½ inches, twist per inch, 26.02 and a spindle speed of 9,800 revolutions per minute. This yarn is then spooled and warped, after which it is run through the slasher.

The No. 9s yarn is made on a filling spinning frame with a 1⅝-inch diameter ring, 7-inch traverse, 9.75 twist and a spindle speed of 6,200 revolutions per minute.

The 30s yarn is made on a frame with a 1⅜-inch diameter ring, 6-inch traverse, 19.17 twist per inch and a spindle speed of 8,300 revolutions per minute.

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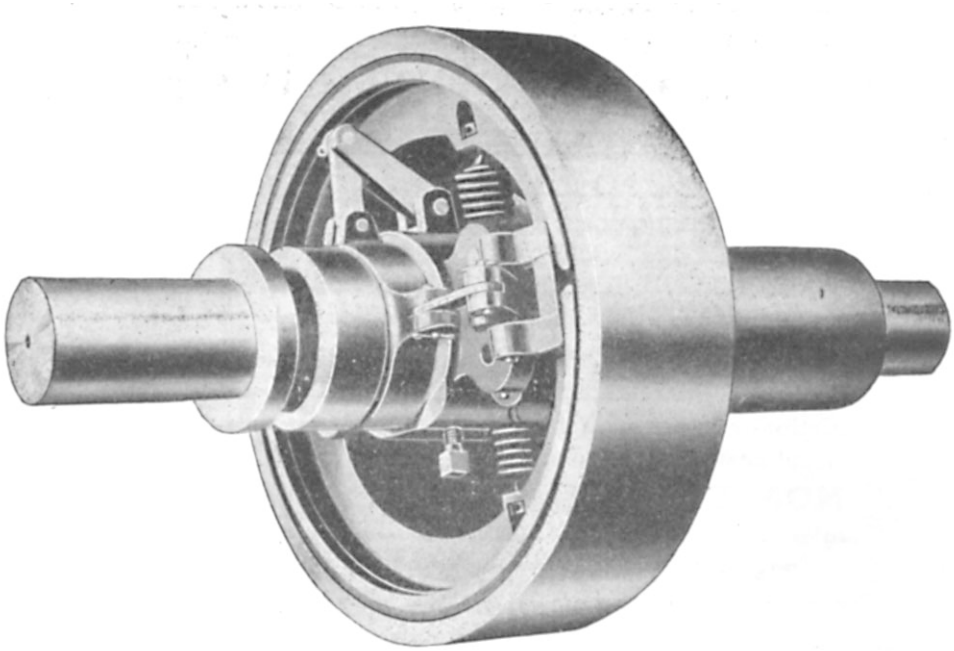


Automatic Friction Clutch

There has been for a long time a demand for an automatic friction clutch. In many instances where clutches are used, the instant that it is thrown into contact there is an immense strain upon belts, bearings, shaftings, etc., and it has always been impossible to overcome this defect. On a woolen card, for instance, we know that when it is started up the belt is thrown on gradually, that the operative or whoever starts up the set has to stand by each belt and gradually start the cylinder. In a room where there are perhaps 100 looms or 10 sets of cards, a great deal of unnecessary wear and tear could be obviated if it were possible to economically apply power gradually. Up to the present time, however, it has been impossible to obtain this desired condition.

Recently there has been perfected the Hilliard Automatic Clutch, which has the following special features.

THE SPECIAL FEATURES

of the Hilliard Automatic Clutch are as follows:

First: It is not manually operated only in so far as engaging and disengaging of mechanism is concerned. This is accomplished by means of a small shifting lever that can be thrown in and out at will on any size clutch with thumb and forefinger. As a result, no expensive shifting device is necessary.

Second: The clutch is entirely automatic in so far as application of tension to frictional parts is concerned. This result is obtained by means of gear driven mechanism actuated by driving member, insuring a more gradual and accurate increase of friction and a more positive drive than is now possible to obtain by the use of any other clutch on the market.

Third: The clutch being automatic in adjustment, machinery connected therewith is started gradually and as slowly as practicable in conformity with any given speed of power transmission; all excess strain and wear on line-shafting, hangers, pulleys and belting is, therefore, entirely eliminated.

Fourth: Release is obtained instantly by throwing out the hand lever to disengage the driven from the driving mechanism, there being no unwinding of parts to accomplish this result.

Fifth: The automatic self-tightening of clutch takes care of all increased loads, the mechanism being so constructed that any slippage of clutch will instantly increase the force of the frictional engagement.

Sixth: No end thrust is created on shafting by this clutch.

Seventh: It is very neat in design, there being no protruding parts, and is therefore within the requirements of all factory laws. It is economical of space on shafting, both as to length and diameter of clutch.

Eighth: It assures immunity from effects of careless handling by ignorant or hasty employes; the clutch being self-regulating, the machinery will start only at a safe speed.

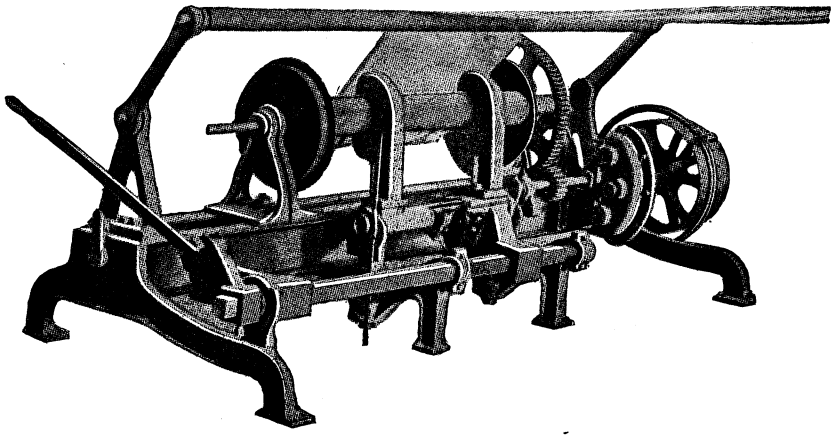
The features of this clutch herein enumerated make it especially desirable for installation in textile mills and electric light plants, and, in fact, on any machinery.

We manufacture both solid and split clutches for cut-off couplings, and with extension sleeve, for clutch pulleys, ranging in sizes from 25 to 1,000 horse power.

This clutch, besides being automatic, as above described, can be used also as an ordinary friction clutch or cut-off coupling, so that on another machine or in any part of the mill where it is necessary to immediately apply full power, the Hilliard clutch can be used. The writer has seen these clutches in operation in the plant of the Hilliard Clutch & Machinery Co., at Elmira, N. Y., and has compared them with practically all friction pulleys which are now being used in textile mills and he has never seen one which could do all of the work which the Hilliard clutch can be depended upon to perform.

A neat catalogue with full description of the workings of this clutch, fully illustrated and giving prices, can be had by writing to the

HILLIARD CLUTCH & MACHINERY CO.
ELMIRA, NEW YORK



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