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Letters to receive attention must be accompanied by the signature of the sender, but this will not be published unless so requested.

We will always be glad to receive articles of a practical nature relating to the textile industries, and will publish such as are available.

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

The announcement of the August Government cotton report indicates a high priced raw material market in the next crop year, which opens in September. Cotton to-day stands more than 3c. per pound higher than it was quoted a year ago, or an advance of more than 30 per cent. There has been no such recovery in the prices named for goods. In so far as cotton values affect merchandising, conditions to-day are in favor of the buyer, and with the prospect that retailers and jobbers will proceed conservatively in their future operations, and cotton will rule high, it is accepted by sellers that a firm market must prevail in so far as values express it.

Fine and fancy cotton goods continue to hold quite a large share of the attention of buyers. They are being ordered for spring and there is nothing now in sight to make agents think that there will be any large surplus of good qualities when the initial bookings are made.

There is still considerable business doing in fall dress goods, and it is apparent that some of the staples are wanted badly by cutters, whose repeat orders on finished goods have been gratifying.

When additions now under operation are completed, Chicago will have warehouse capacity for 350,000,000 pounds of wool, practically the entire crop of the country during a season.

INVENTORS OF TURKEY RED OIL. After a good deal of controversy, it seems to have been settled that the soda oil was discovered in 1876 by Dr. A. Wuth, and the ammonia oil was discovered in the following year by Fritz Storck.

NOVELTIES IN MEN'S WEAR.

FROM ABROAD.

Fancy Worsted Suitings. (Stripe Effect.)

Warp: 4608 ends.

Weave: See Diagram **Fig. 1**; repeat 48 warp threads and 8 picks; 20-harness fancy draw.

Reed: 17½ @ 4 ends per dent; 70 ends per inch; 65⅞ inches wide in reed.

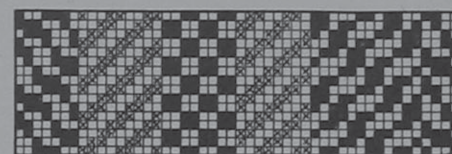


Fig. 1

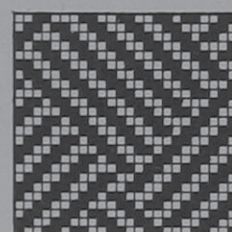


Fig. 2

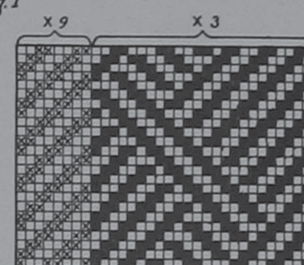


Fig. 6

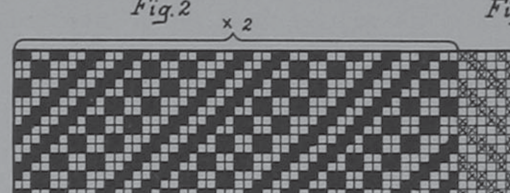


Fig. 3

Fig. 7

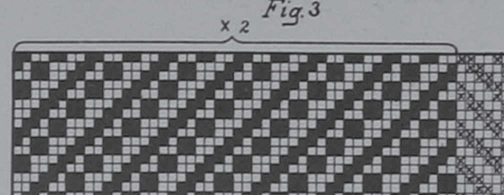


Fig. 4

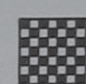


Fig. 8

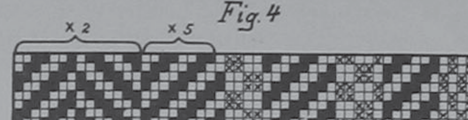


Fig. 5

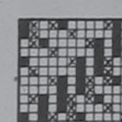


Fig. 9

Dress: 16 ends 2/48's worsted, dark drab and black twist.
2 " " " , black.
4 " " " , black, twisted with 11/13 den. silk, orange.
2 " " " , black.
24 " " " , dark drab and black twist.

48 ends in repeat of pattern.

12 Sections @ 8 patterns, or 384 ends to each section.

Filling: 62 picks per inch, all 2/48's worsted, dark blue, gray mix, or substitute black.

Finish: Worsted finish; 56 inches wide.

SUBSTITUTE FOR ANOTHER WEAVE:

See Diagram **Fig. 2**; repeat 24 warp threads and 24 picks; 24-harness straight draw.

Worsted Suiting. (Silk Stripe.)

Warp: 4080 ends.
Weave: See Diagram **Fig. 3;** repeat 102 warp threads and 16 picks; 18 or 20-harness fancy draw.
Reed: 15½ @ 4 ends per dent; 62 ends per inch; 66 inches wide in reed.
Dress:
1 end 2/30's worsted, black.
1 " 2/52's " , " , and 11/13 den. white silk. } times 19.
1 " 2/30's " , scotch blue.
1 " 2/52's " , black, and 11/13 den. white silk. } times 3.
1 " 2/30's " , black.
1 " 2/52's " , " , and 11/13 den. white silk. } times 3.
1 " 2/30's " , dark green.
1 " 2/52's " , black, and 11/13 den. white silk. } times 3.
1 " 2/30's " , black.
1 " 2/52's " , " , and 11/13 den. white silk. } times 19.
3 ends 2/30's " , black.
1 end 2/52's " , " , and 11/13 den. white silk.
1 " 2/30's " , dark gray mix.
1 " 2/52's " , black, and 11/13 den. white silk.
2 ends 2/30's " , black.

102 ends in pattern.
10 Sections @ 4 patterns, or 408 ends to each section.
Filling: 54 picks per inch, arranged thus:
1 pick 2/52's worsted, black, and 11/13 den. green silk.
1 " 2/30's worsted, black.

2 picks in repeat of pattern.
Finish: Worsted finish; 56 inches wide.

SUBSTITUTE FOR ANOTHER WEAVE:
See Diagram **Fig. 4;** repeat 102 warp threads and 8 picks; 12-harness fancy draw.

SUBSTITUTE FOR ANOTHER FILLING PATTERN:
1 pick 2/52's worsted, black, and 11/13 den. white silk.
1 " 2/30's " , black.

2 picks in repeat of pattern.

Worsted Suiting. (Stripe Effect.)

Warp: 4608 ends.
Weave: See Diagram **Fig. 5;** repeat 96 warp threads and 4 picks; 8-harness fancy draw.
Reed: 17½ @ 4 ends per dent; 70 ends per inch; 65¾ inches wide in reed.
Dress: 1 end 2/48's worsted, black.
3 ends " " , dark olive.
4 " " " , black. } times 4.
3 " " " , olive.
1 end 2/60's " , scotch green.
2 ends 2/48's " , black.
1 end 2/60's " , scotch green.
3 ends 2/48's " , olive.
1 end 2/60's " , blue green.
2 ends 2/48's " , black.
1 end 2/60's " , blue green.
3 ends " " , olive.
1 end 2/60's " , scotch green.
2 ends 2/48's " , black.
1 end 2/60's " , scotch green.
6 ends 2/48's " , olive.
6 " " " , black. } times 3.
6 " " " , olive.
4 " " " , black.

96 ends in repeat of pattern.
12 Sections @ 4 patterns, or 384 ends to each section.
Filling: 60 picks per inch, all 2/48's worsted, plain dark colors, or mixes.
Finish: Worsted finish; 56 inches wide.

Fancy Worsted Suiting. (Novelty Stripe.)

Warp: 4608 ends, all 2/48's worsted.
Weave: See Diagram **Fig. 6;** repeat 144 warp threads and 24 picks; 14-harness fancy draw.
Reed: 17½ @ 4 ends per dent; 70 ends per inch; 65¾ inches wide in reed.
Dress: 1 end olive,
1 " dove gray.
1 " light gray.
1 " dark gray. } twice. } times 9.
1 " light gray.
1 " dark gray. } times 10.
1 " light gray.
1 " light green and black twist (fancy).
1 " light gray.
1 " dark gray. } times 11.
1 " light gray.
1 " cinnamon and green twist (fancy).
1 " light gray.
1 " dark gray. } times 13.

144 ends in repeat of pattern.
16 Sections @ 2 patterns, or 288 ends to each section.
Filling: 62 picks per inch, arranged thus:
1 pick 2/48's worsted, light and dark drab twist.
1 " " " , dark olive.

2 picks in repeat of pattern.
Finish: Worsted finish; 56 inches wide.

Fancy Woolen Trousering.

Warp: 2496 ends, 4 run woolen yarn.
Weave: See Diagram **Fig. 7;** repeat 52 warp threads and 4 picks; 8-harness fancy draw.
Reed: 18 @ 2 ends per dent, 36 ends per inch, 69 inches wide in reed.
Dress: 2 ends dark gray.
3 " white.
3 " medium gray. } twice over.
1 end white.
1 " medium gray. } times 6.
2 ends dark gray.
2 " white.
1 end medium gray. } times 4.
1 " white.
1 " medium gray. } times 6.

52 ends in repeat of pattern.
6 Sections @ 8 patterns, or 416 ends each section.
Filling: 38 picks per inch, arranged thus:
1 pick 4 run woolen yarn, black.
1 " 2-ply, 6 run black and 8 run white, twist.

2 picks in repeat of pattern.
Finish: Scour well, full slightly, clear face on shear, press; 56 inches wide.

Woolen Cheviot Suiting.

Warp: 1596 ends.
Weave: See Diagram **Fig. 8;** repeat 2 warp threads and 2 picks; 4 or 8-harness straight draw.
Reed: 12 @ 2 ends per dent, 24 ends per inch, 66 inches wide in reed.
Dress: 1 end 3 run black.
1 " 2-ply, 5 run black and 8 run white, twist.

2 ends in repeat of pattern.
6 Sections @ 266 ends.
Filling: 20 picks per inch, arranged thus:
1 pick 3 run black.
1 " 2-ply, 5 run black and 8 run white, twist.

2 picks in repeat of pattern.
Finish: Scour well, full slightly, clear face on shear, press; 56 inches wide.

Diagonal Overcoating.

Warp: 2940 ends.
Weave: See Diagram **Fig. 9;** repeat 12 warp threads and 12 picks; 12-harness straight draw.
Reed: 14 @ 3 ends per dent, 42 ends per inch, 70 inches wide in reed.
Dress: 1 end 4½ run woolen yarn, gray mix.
1 " 2-ply, 6 run black and 8 run white, twist.

2 ends in repeat of pattern.
6 Sections @ 490 ends.
Filling: 40 picks per inch, 5 run woolen yarn, dark gray.
Finish: Scour well, full slightly, clip on shear; 56 inches wide.

The Merceranine Process.

Its Employment in Mercerizing and Dyeing of Cotton Yarns and Hosiery.

The *Merceranine* Process originated at the Works of the Swiss Textile Industry Company in Basle, the concern which controls the famous St. Georgen Mercerizing Machine, the Cold-Air Drying Machine and the Merceranine Process. The American Sole Agent for this concern is Mr. A. W. Buhlmann, Textile Engineer, 487 Broadway, New York.

The following description of the process is given by the introducers of the process in this country:

"The merceranine bath omits boiling or moistening, it cleans the fibre from all impurities such as resinus, grease, mineral oils, it dissolves the *cuticula* and transforms the fibre physically and chemically into Alcali-Cellulose, *i. e.,* the cotton is practically *half-mercerized,* or as some mercerizers call it, *mercerized without tension.*

Cotton treated by the merceranine process will absorb at least 20 per cent less caustic soda when afterwards actually mercerized under tension; giving off the caustic in the washing, hence a considerable saving in caustic soda is the direct result.

The cotton also increases in strength and elasticity in the merceranine bath, also shows a much greater affinity for dyes, with the result of a level dyeing, and this even when handling the most difficult shades.

The merceranine process can be carried on in combination with any mercerizing machine, there being no special machinery required. The yarn is simply put in a tank over night, and in the morning removed from the merceranine bath, from where it then goes to the skein mercerizing machine. The skeins also can be handled on sticks in a jigger, and in this case remain only for about 20 minutes in the bath.

In warp and in piece goods mercerizing, the merceranine process is also successfully employed, requiring no other machine and resulting in a great saving, besides the advantage of a superior yarn and fabric.

The merceranine process takes place without shrinking, its cost is trifling; the handling of 100 pounds of material means only about 13 cents' worth of drugs required.

The merceranine process is most excellently adopted for low grade American cottons, not only on account of the advantages previously quoted, but also on account of it improving the yarn in appearance and strength.

With reference to the hosiery trade, the merceranine process is used by dyers and manufacturers of world-wide reputation. Besides the advantages mentioned, the merceranine process is also used for the purpose of cleaning hosiery from all mineral oils and greasy substances, so as to obtain a soft feeling and touch, level shades in dyeing, and to prevent streaks.

COTTON SPINNING.

The Ring Frame.

(*Continued from July issue.*)

Another point which greatly confuses the subject as to which number of a traveler to use, is the fact that there is no universal standard for the difference in weight between one number in one make of traveler and the same number in another make.

For example, a 7-0 traveler of one kind weighs 0.7 grains, while a 7-0 of another make weighs 0.65 grains. Comparative tables of the numbers and corresponding weights of their make of travelers are published by the manufacturers of travelers.

The whole subject however seems to lack system —possibly more a rivalry of ideas of manufacturers of travelers as to the best system of altering changes in weight of travelers and system of numbering them —certainly to the disadvantage of simplifying matters to the student.

The only plan at present to ascertain which number or weight of traveler to use, is to experiment in each case within the broad principles laid down, and select the particular kind and weight of traveler which gives the best average results under conditions for the case in hand.

Travelers are usually now numbered in the following way: The heaviest traveler is called No. 73 and weighs 15.8 grains. The lighter numbers are 72, 71, etc., on down to No. 1 which weighs 0.9 grains, which however, is not the lightest traveler. There are others still lighter, which are numbered from 1-0, 2-0, 3-0, etc., up to 25-0, the 25-0 traveler weighing only one-tenth of a grain.

The following table gives the numbers and weights of the *Shaw Victor Travelers,* on which the foregoing data is based. This table refers to both round and square pointed travelers.

Weight of Ten Travelers in Grains

No.	Weight Grains	No.	Weight Grains	No.	Weight Grains	No.	Weight Grains
25-0	1	1½-0	8½	24	60	49	110
24-0	1¼	1-0	9	25	62	50	112
23-0	1½	1	10	26	64	51	114
22-0	1¾	2	11	27	66	52	116
21-0	2	3	12	28	68	53	118
20-0	2¼	4	13	29	70	54	120
19-0	2½	5	14	30	72	55	122
18-0	2¾	6	16	31	74	56	124
17-0	3	7	18	32	76	57	126
16-0	3¼	8	20	33	78	58	128
15-0	3½	9	23	34	80	59	130
14-0	3¾	10	26	35	82	60	132
13-0	4	11	30	36	84	61	134
12-0	4¼	12	33	37	86	62	136
11-0	4½	13	36	38	88	63	138
10-0	4¾	14	39	39	90	64	140
9-0	5	15	42	40	92	65	142
8-0	5¼	16	44	41	94	66	144
7-0	5½	17	46	42	96	67	146
6½-0	5¾	18	48	43	98	68	148
6-0	6	19	50	44	100	69	150
5-0	6½	20	52	45	102	70	152
4-0	7	21	54	46	104	71	154
3-0	7½	22	56	47	106	72	156
2-0	8	23	58	48	108	73	158

As there are several different makes of travelers sold however, which do not correspond in their numbers and weights, a table is here given which shows the trade numbers of several makes of travelers that correspond to given weights. In the last column is given the weight of ten travelers in grains, in the preceding columns are given the numbers of the various travelers which have this weight.

Shaw's Victor Square or Round Pointed	Wilson Round Pointed	Hicks	Shaw and American	National and Chase-Wilson	Weight of 10 Travelers in Grains
25-0	23-0	20-0	25-0	25-0	1
24-0	22-0	19-0	24-0	24-0	1¼
23-0	21-0	18-0	23-0	23-0	1½
22-0	20-0	17-0	22-0	22-0	1¾
21-0	19-0	16-0	21-0	21-0	2
20-0	18-0	15-0	20-0	20-0	2¼
19-0	17-0	14-0	19-0	19-0	2½
18-0	16-0	13-0	18-0	18-0	2¾
17-0	15-0	12-0	17-0	17-0	3
16-0	14-0	11-0	16-0	16-0	3¼
15-0	13-0	10-0	15-0	15-0	3½
14-0	12-0	9-0	14-0	14-0	3¾
13-0	11-0	8-0	13-0	13-0	4
12-0	10½-0	7-0	12-0	12-0	4¼
11-0	10-0	6-0	11-0	11-0	4½
10-0	9½-0	5½-0	10-0	10-0	4¾
9-0	9-0	5-0	9-0	9-0	5
8-0	8½-0	4½-0	8-0	8-0	5¼
7-0	8-0	4-0	7-0	7-0	5½
6½-0	7½-0	3½-0	6½-0	6½-0	5¾
6-0	7-0	3-0	6-0	6-0	6
5-0	6-0	2½-0	5-0	5-0	6½
4-0	5-0	2-0	4-0	4-0	7
3-0	4-0	1½-0	3-0	3-0	7½
2-0	3-0	1-0	2-0	2-0	8
1½-0	2-0	½-0	1½-0	1½-0	8½
1-0	1-0	1	1-0	1-0	9
1	1	1½	1	1	10

It will be noted that numbers from 25-0 to 1 only are given; on numbers heavier than these the weights are the same for all the different makes mentioned.

While it is impracticable to lay down a fixed rule as to the proper weight of traveler to be used with a given sized ring for spinning given numbers of yarn with a given number of revolutions of the spindle, the appended tables may be found serviceable as a general guide in the selection of a suitable traveler for various conditions. These tables, one for warp yarn, the other for filling yarn, indicate the number and weight of the Shaw Victor traveler used with the *Whitin Spinning Frame* for various counts of yarn, also the r. p. m. of the spindles and the diameter of the ring to be employed.

It must be borne in mind that the required sized traveler will vary from this table according to the variations in the speed of the spindle, the quality of the cotton, etc., and that it is given only as a basis to guide in the selection of the proper weight of traveler. The higher the speed of the spindle, the lighter the traveler should be, and vice versa, varying in the proportion of one or two numbers of travelers to each 1000 r. p. m. of spindle. When separators are not used as a rule, a traveler heavier by a few numbers than given in the tables should be used.

WARP YARN

Number of Yarn	Revolutions of Spindles	Diameter of Ring	Number of Traveler	Weight of 10 Travelers in Grs.	Number of Yarn	Revolutions of Spindles	Diameter of Ring	Number of Traveler	Weight of 10 Travelers in Grs.
4	4950	2″	14	39	32	9500	1¾″	7-0	5½
6	5900	2	12	33	34	9600	1¾	9-0	5
8	6700	2	9	23	36	9700	1¾	11-0	4½
10	7250	2	8	20	38	9800	1¾	13-0	4
11	7500	2	7	18	40	9700	1⅝	14-0	3¾
12	7750	2	6	16	45	9700	1½	15-0	3½
13	7950	2	6	16	50	9700	1½	16-0	3¼
14	8100	2	5	14	55	9600	1½	16-0	3¼
15	8300	2	4	13	60	9600	1½	17-0	3
16	8450	2	3	12	65	9600	1½	17-0	3
17	8600	2	2	11	70	9500	1½	18-0	2¾
18	8750	2	1	10	75	9500	1½	18-0	2¾
19	8850	2	1-0	9	80	9300	1½	19-0	2½
20	8900	2	1½-0	8½	85	9100	1½	19-0	2½
21	9050	2	2-0	8	90	9100	1⅜	20-0	2¼
22	9100	2	3-0	7½	95	9000	1⅜	21-0	2
23	9150	2	4-0	7	100	8700	1⅜	22-0	1¾
24	9200	2	5-0	6½	110	8500	1⅜	23-0	1½
28	9500	1¾	6-0	6					

FILLING YARN

Number of Yarn	Revolutions of Spindles	Diameter of Ring	Number of Traveler	Weight of 10 Travelers in Grs.	Number of Yarn	Revolutions of Spindles	Diameter of Ring	Number of Traveler	Weight of 10 Travelers in Grs.
4	4000	1½″	16	44	32	7900	1⅜″	9-0	5
6	4800	1½	13	36	34	7900	1⅜	11-0	4½
8	5450	1½	10	26	36	7900	1⅜	13-0	4
10	5950	1½	8	20	38	7900	1⅜	14-0	3¾
11	6150	1½	7	18	40	7900	1¼	15-0	3½
12	6350	1½	6	16	45	7900	1¼	16-0	3¼
13	6500	1½	5	14	50	7900	1¼	17-0	3
14	6700	1½	4	13	55	7900	1¼	17-0	3
15	6850	1½	3	12	60	7900	1¼	18-0	2¾
16	6950	1½	2	11	65	7800	1¼	18-0	2¾
17	7100	1½	1	10	70	7800	1¼	19-0	2½
18	7200	1½	1-0	9	75	7800	1¼	19-0	2½
19	7300	1½	2-0	8	80	7700	1¼	20-0	2¼
20	7400	1½	4-0	7	85	7600	1¼	20-0	2¼
21	7500	1½	4-0	7	90	7400	1¼	21-0	2
22	7600	1½	5-0	6½	95	7400	1¼	22-0	1¾
23	7700	1½	5-0	6½	100	7200	1¼	23-0	1½
24	7800	1½	6-0	6	110	6900	1¼	24-0	1¼
28	7900	1⅜	7-0	5½					

(To be continued.)

COTTON FINISHING.

GIVING A DESCRIPTION OF THE VARIOUS PROCESSES WITH DETAILS AS TO THE MOST APPROVED MACHINERY.

(Continued from page 4.)

Shearing.

In connection with some classes of cotton fabrics, shearing takes the place of singeing; again, any excess of nap remaining after bleaching, must be removed by shearing, since singeing, on account of it more or less scorching the fibres, imparts to the cloth an undesirable, scorched, brownish tint.

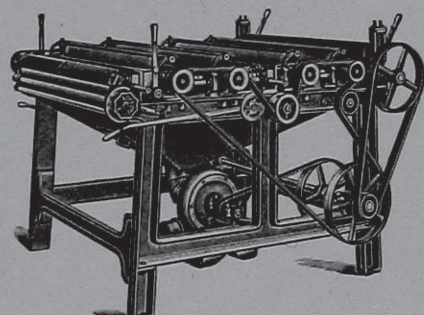


FIG. 9.

At the same time, shearing, in many cases is practised previous to singeing, the shearing in this instance, besides removing dust, acting more or less as a burling process for the cloth.

The amount of shearing, as well as the period of the finishing process at which it is practised, depends upon the kind of cloth under operation.

The working, *i. e.,* cutting device of a shear, consists of a series of very sharp steel blades, set spirally into a roller (technically called *revolver*) which revolves at a very high speed, near and parallel to a stationary blade (technically called the *ledger* blade). Two, three, four, or more of these cutting devices, according to the size of the machine, are used in one shear.

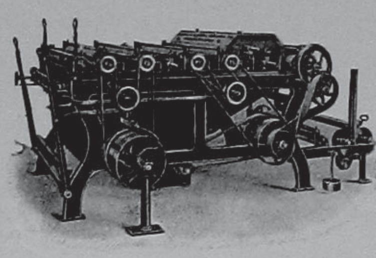


FIG. 10.

The shearing is accomplished by passing the cloth, in its full width, between the stationary and the revolving blades: the operation, in its principle, resembling that of a lawn mower.

These cotton shears are also provided with one, two or more rapidly revolving brushes, for the purpose of removing any loose fuzz and dust collected upon the surface of the cloth, as well as to raise the loose ends of the fibres (technically called *nap*) so that the shear blades can clip them more readily.

Standard Machines for the shearing of cotton fabrics are built by the Parks and Woolson Machine Co., as well as the Curtis and Marble Machine Co.

Fig. 9 shows in its perspective view the shear as built by the first mentioned concern, the same consisting of four shear cylinders and two brushes for the face of the goods. The draft rollers, as are placed on the back of the shear, deliver the cloth either to the singe, calender rollers, or winding rollers, as the case may be. The ledger blades are adjustable from above; the rests, by which the cloth is held to the shearing lines, being adjustable in all directions. They are pivoted, and have lifts to raise the cloth when a seam is passing. A flock exhauster is provided for carrying away all dirt and lint made by the operation of the machine.

Fig. 10 shows the shear as built by the Curtis & Marble Machine Co., in its perspective view; Fig. 11 being a side elevation with parts in section, given to show the location of shear blades, brushes, etc., also the run of the cloth through the machine. This shear is equipped with four sets of shear blades, and three brushes for the face, and one for the back of the goods. The latter is added, since the face and the back of the cloth come against each other when rolled up, and provided dirt or lint is left on the back of the goods, more or less of it is liable to come off on the face when the goods are unrolled, and thus cause trouble in the printing, or any other after processes.

These shearing machines are made with swinging cloth rests and stop motion for the revolvers, so that the cloth rests may be raised or the revolvers stopped when seams pass through.

On machines for shearing only one side of the goods, as illustrated, a cover is generally placed over the back brush and the balance of the machine left open, so that the operator may see the work done by the brushes and cutting devices, whereas in connection with machines built for shearing both sides of the goods, this cover usually extends over the entire top. Underneath the machine is an exhaust fan for taking off dust and lint. Levers are provided, at both sides of the machine, for starting and stopping the same, as well as for lifting the cloth rests or stopping the revolvers when seams pass the cutting device. Spreader bars are attached both on the front and at the delivery end, for taking out wrinkles and turned edges.

Illustrations Figs. 10 and 11, show a horizontal rolling-up attachment for the goods, having two wooden drums, upright standards, brass slides, cams, weights, etc., to give the required amount of pressure to make a smooth, even roll; however, inclined rolling brackets with slides, weights, etc., may be put on (see Fig. 12), or the machine may be run in connection with a singe or a calender rolling machine.

Where both sides of the goods are to be sheared, as is generally the case with grey goods, various cleaning appliances, such as emery rollers, sand rollers, card rollers, beaters, brushes, etc., are used in addition to the shear blades, and since there are usually more threads on the face of the goods than on the back, there are more shear blades put on the machine for the face than for the back of the goods. The most often met with styles of shears have either two sets of shear blades for the face and one set for the back, or three sets of shear blades for the face and one set for the back, or three sets of shear blades for the face and two sets for the back, in connection, of course, with the cleaning appliances already referred to.

The card rollers are covered with tempered steel fillet, having less bend to the teeth than usual, and are run with the bend of the teeth, pointing backward, so as not to raise a nap; they are effective for removing threads, specks, chits, etc.

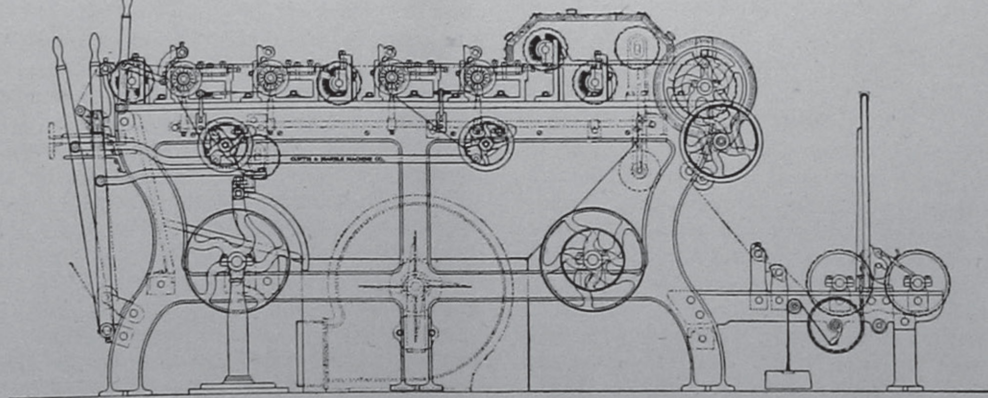


FIG. 11.

Fig. 12 shows such a cotton shearing and brushing machine in its perspective view, the machine being made with one emery roller, one beater, one card roller, two brushes and two sets of shear blades for the face of the goods, and one emery roller, one beater, one card roller, two brushes, and one set of shear blades for the back of the goods. The cover over top and front portion of the machine is shown removed, to show the various parts of the machine previously referred to.

Where emery rollers, sand rollers or beaters are used, they are commonly put on the front of the machine, where the cloth enters, requiring in this way but little additional floor space.

The purpose of these emery rollers is to burl the goods previously to shearing, and they are used especially on medium and heavier classes of goods, such

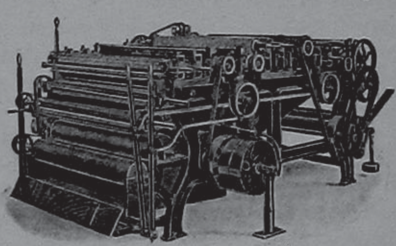


FIG. 12.

as sheetings, shirtings, drills, tickings, ducks, etc. For lighter goods, they may be covered with finer emery than usual, or with sandpaper, as preferred.

The beaters have steel blades with sharp edges, which run against the goods and knock off many of the little knots and nubs which it is difficult to get off in other ways, as well as loosen much of the other dirt so that the card rollers, brushes, etc., which follow, will take it off. These beater blades closely resemble the cleaning devices of the burling machine shown in Fig. 3.

Bleaching.

The fabric, as coming from the shear or the singe, is now ready for bleaching, which has for its object:

(1) To impart a white as nearly perfect as possible.

(2) To preserve, by the process, the original strength of the fabric, to its utmost.

(3) To leave the fabric in its best condition to the touch of the hand, *i. e.*, preserve its quality.

Bleaching appears to be a very simple process, and to a certain extent this is the case; however, in order to insure good results, certain conditions, based upon the nature of the fibre and the chemical structure of its coloring matter, have to be taken into consideration.

Bleaching consists in the complete decolorizing or removal of all its natural and artificial impurities, either for the purpose of being able to sell the goods in their white state, or in order to make them suitable for being dyed light, delicate and brilliant colors.

NATURAL IMPURITIES OF COTTON. By chemical analysis, natural cotton contains approximately the following components and proportions:

Cellulose	91.4%
Moisture	7.0 "
Fat	0.4 "
Aqueous extract	0.5 "
Ash	0.1 "
Cuticular substance	0.6 "
	100.0%

This analysis will show that although the quantities of impurities are small, yet they are present in sufficient quantities to cause trouble, unless removed by a thorough bleaching.

Most of these natural impurities are insoluble in water, but can be removed from the cloth, by using certain acids and alkalies. For instance, if boiling cotton in a clear solution of soda ash, the latter will gradually become of a dark brownish color, and when by adding sulphuric acid, most of the natural impurities the cotton contains will be thrown down as a dark flocculent precipitate.

(*To be continued.*)

SILK FINISHING.

(*Continued from page 12.*)

Lustering; Silk Thread Finishing; Cleaning and Rubbing; Sizing, Drying and Tentering; Breaking the Finish, The Button Breaker, The Knife Breaker; Calendering; Craping, Watering or Moiréing; Moiré Française, Moiré Antique, Moiré Velours; Gauffréing; Cylindering or Ironing; Singeing; Shearing; Sanding; Brushing; Pressing.

Points on Finishing Special Fabrics: Umbrella Silks, Foulards, Silk Gauze, Bolting Cloth, Black Silk Taffetas and Satins, Fancy Colored Satins, Figured Silks, Swivel Silks, Silk Velvets and Plushes, Long Poil, Cotton Back Satins.

Sizing.

As previously mentioned, loosely woven, pure silk fabrics, but more particularly half-silks, in order to impart to them the necessary stiffness, *i. e.,* touch to the hand, must be sized for this purpose, on their back. In all cases be careful that the Size will not penetrate through the structure onto the face of the fabric, since the object of sizing is to only stiffen the back portion of the fabric, without impregnating the latter with the sizing liquid. For this reason, care must be taken that the fabric under operation is dried at once, without giving the threads time to absorb the Size into their body.

According to whether a stiff, soft, rough or mild touch to the hand is required, different sizing materials are used. The selection of the latter also depends on whether a high lustre, lustre, or dull lustre for the face of the fabric is required.

Amongst materials used for this sizing purpose we find glue, gelatine, dextrine, gum arabic and tragacanth, resin and other soaps, resin dissolved in alcohol, glycerine, stearine, paraffine wax, different oils and similar substances; each Finisher having his own preparation, generally imagining that there is no other mixture equal to it. Which sizing material to use depends upon the character of the fabric under operation, *i. e.,* whether a stiff or soft, harsh or mild handle, a lustrous, or a dull face is desired. Either preparation should be well cooked in a porcelain lined, jacketed, steam kettle, and should be made fresh every day and used hot. The desired Size is applied to the back of the goods, while the latter are in a stretched condition, being careful that the sizing compound does not work its way through the cloth and onto its face; the object of the process being to only stiffen the threads as resting on the back of the structure, without impregnating, *i. e.,* soaking them with Size. For this reason drying must closely follow the sizing process, so as not to give the threads a chance to soak up the Size in their body.

For stiffening, the materials mostly used are glue, gum arabic and gum tragacanth, for softening and making them full to the touch of the hand, glycerine, stearine, dextrine, paraffine wax and different oils.

Gum tragacanth, gum arabic and glue are used in the form of watery solutions, the materials being first soaked in water, then boiled up to a perfectly homogeneous mass, containing 1 lb. glue and 2 lbs. gum in 10 gallons. This will be found sufficient for all ordinary purposes.

With half-silks containing a large proportion of cotton on which some lustre is to be obtained by finishing, a good composition is given as:

$3\frac{1}{2}$ lbs. paraffine wax,
1 lb. white wax,
$2\frac{1}{2}$ lbs. castor oil,
2 lbs. soap,
$4\frac{1}{2}$ gallons water,
$\frac{1}{2}$ lb. glue.

The machine on which sizing of goods is done, is known as the *Spraying Machine,* its function, as the name implies, being to spray the goods with one or the other sizing mixture, while the goods pass lengthways, in their open state, under required tension, through the machine. In this process, the goods are rolled from a roller, placed in the framing of the machine at its feeding end, and wound automatically upon another roller at the delivery end of the machine. The cloth, in its full open width, enters the machine, by passing between tension rails, or around tension rollers, in order to impart the necessary tension for the process to the fabric, after which the same comes into contact with the atomizer or spraying device of the machine, and when spray-nozzles are opened from each side, said nozzles discharging horizontally and above the cloth, the prepared sizing in a finely atomized condition, onto the back of the fabric. As a rule, four nozzles are placed on each side, opposite each other, the two sets, however, being placed so that they discharge between each other, in order that the spray will deposit most uniformly all over the surface (the back) of the cloth under operation. These nozzles extend with their lower, *i. e.,* their feeding ends into metal boxes or troughs containing the sizing compound, live steam or compressed air being the means used as the actuating force. Compressed air is preferred in many instances, since, if there is any entrained water in the steam pipes, it is likely to cause the Size to fall on the goods in the form of drops, instead of a fog, and thus cause damage, to the finish of the fabric.

The number of nozzles opened, *i. e.,* used, depends on the character of the fabric under operation, some fabrics requiring more filling-up, *i. e.,* stiffening than others. See that the atomizers are kept in good order, since they and their pipe connections are very subject to leakage. They are preferably made of hard bronze, with steel nozzle tips. A pressure gauge, if provided, will be the means for keeping the spray evenly distributed throughout the entire run of the goods through the machine.

Where a very heavy sizing is required, such goods are filled by passing them between the nip of two rollers, of which the lower one is covered with cloth, or rubber. This lower roller revolves in a trough containing the sizing compound in its properly diluted state, and thus carries it on its surface up to the nip of the two rollers and thus within contact of the fabric. Any surplus Size, as taken up by the feed roller, is brushed off said roller by means of a *doctor* knife and thus only the required amount of Size brought within the nip of the two rollers.

In either case, whether sized with the atomizer (spraying), or the roller (calendering) system, it is not permissible to roll up the thus treated fabric in its damp condition, for which reason there is situated in either machine, a steam heated drying cylinder. Conveniently, there is also located in the machine a roll of *Finishing Paper,* a kind of thick, strong, tough Manila paper. This paper is made to pass round the heated cylinder, getting very hot, after which the same

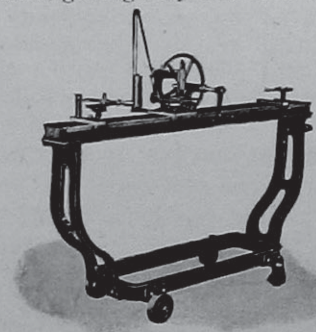


FIG. 7.

as well as the goods that have just been sized, are made to be delivered in unison to a take up roller, and there wound simultaneously in one roll. The consequence of this procedure is that the hot paper dries up the goods, the goods in turn, somewhat dampening the paper. This finishing paper, as will be readily understood, is used over and over again, hence the advisability of using a strong, tough Manila paper, not easily torn, a paper which will last for some time.

As a rule, several pieces of cloth are treated in one *string* (one length) the number depending on the length and thickness of the fabrics, since it would not do to have the roll too heavy and cumbersome to handle. The sewing together of two or more pieces in one string, is conveniently done by what is known as a *Mill Sewing Machine,* where the ends of the two fabrics to be sewed together, are held out by pins, and the machine, turned by hand, travels along the seam, as it sews. Fig. 7, shows us a specimen of such a machine, it being the Portable Hand Power Railway Sewing Machine, as built by the Curtis and Marble Machine Co. By means of the wheels, and which are either iron or rubber, the machine is readily moved about the room to any place desired.

About four hundred yards of fabric, considered in an average, may be handled in one string, the length depending on the weight, width and character of the fabrics. The rolls of finishing papers are provided in suitable lengths, the length used corresponding somewhat in excess to the lengths of the goods handled in the string.

The rollers, containing the goods treated, are from 5 to 6 inches in diameter, and are provided with a square hole in their centre for the convenient inserting and withdrawal of a square iron rod, which acts as a shaft, being of a rounded shape at its outside ends, to fit the bearings of the machine, in which they rest. This makes all the rollers interchangeable, and thus permits a convenient handling. Suitable canvas aprons, *leaders,* are secured at one end to the roller, the other end of the apron being threaded to the fabric, either by sewing or wiring.

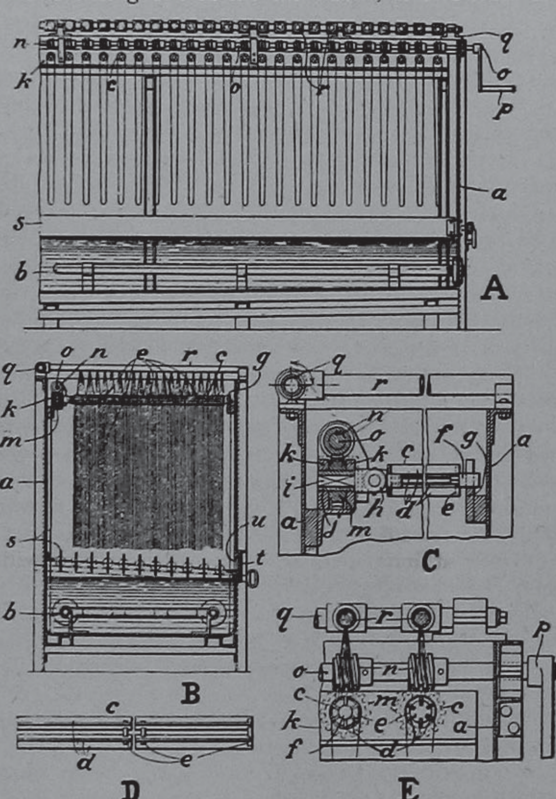
As will be readily understood, Spraying Machines are placed in a separate room, or partitioned off from the rest of the plant, in order to keep the gummy vapor from spreading throughout the room; a ventilating hood being placed over the machine, to carry the loaded air out of the room, so it will not collect and drip onto, and spot fabrics in the room. The flooring of the room should be concrete, provided with suitable drainage, wall and ceiling must be washed frequently with hot water, also the machine itself must be kept clean and freed from Size.

The roll of goods and paper is now put in the framing of another machine, which in turn will rewind fabrics and paper on separate rollers. The latter is then dried, by running it over a heated cylinder, and in turn re-used.

(*To be continued*)

Apparatus for Ungumming Silk.

The object of the new apparatus, and which is a late Swiss invention, is to provide convenient means for treating silk, in hanks, with soap lather, for the purpose of ungumming said silk, the construction of the new apparatus being such as to permit the putting in and taking out of the silk hanks, to and from the



apparatus, in a most simple, convenient way, without the least possible damage to the silk.

The new apparatus is also provided with a spraying tube device serving for the washing of the silk hanks.

Of the accompanying illustrations, Figure *A* is a partial longitudinal section and Fig. *B* a transverse section through the apparatus. Fig. *C* shows the bearings of the silk hank rollers. Fig. *D* illustrates the construction of one of these rollers. Fig. *E* is a partial section, transversely through the rollers.

A description of the construction and operation of the new apparatus is best given by quoting letters of reference accompanying the illustrations, and of which *a* indicates a galvanized sheet iron receptacle, in which the soap liquid is put and which contains in its lower part, galvanized steam coil tubes *b*. The rollers for the reception of the silk hanks are indicated by *c*. They consist of a circular set of longitudinal, galvanized iron rods *d*, held at the requisite distances apart in slots of the disks *e*. The rollers are each provided with a terminal pivot *f* located in an open bearing *g*, being supported at its other end by means of a hinge *h* and an end pivot *i* proceeding from a part thereof on supporting bars *k* which in the interior of the receptacle extend along a side wall thereof, in such a manner as to be capable of being raised or turned upward upon the hinge *h*, for the purpose of placing on or removing the silk hanks.

The end pivots *i* of the rollers *c*, are shaped quadrangular and are inserted in a corresponding opening of a sleeve *j*, which is revoluble in the supporting bars *k*, and possesses between these a worm wheel *m*, which engages with a worm *n*. On the turning of the worm wheels *m*, the rollers *c* are consequently revolved on their own axis, which brings about a continuous turning of the silk hanks in the bath of soap.

The rollers *c* can be lifted up, without thereby causing their connection with the driving wheels *m* to cease. Moreover, they can if desired, be removed from the receptacle *a* because after simply lifting up the rollers, their end pivots *i* can be withdrawn from the sleeves *j*. All the worms *n* are placed upon a common shaft *o*, revolved by a crank handle *p* (an automatic driving device can be substituted).

After treatment of the silk hanks with the soap lather they are then washed. For this, there is provided at the upper edge of the receptacle *a* a spraying tube device, comprising a principal tube *q* and a number of spraying tubes *r*, branching off from the former at right angles and placed parallel and vertically over the rollers *c*, whereby the washing liquid is directed downward in vertical sprays upon the silk hanks already treated with soap lather.

The principal tube *q* of the spraying device is revoluble about its own longitudinal axis, so that the spraying tubes *r* can be turned upward when the rollers *c* are to be raised.

In the lower part of the receptacle *a* there are arranged revoluble paddles *s*, which are placed vertically during the treatment of the silk hanks with the soap lather, in order not to hinder the formation and rise of the latter, but when the silk hanks after the soap bath had been imparted, are to be washed, then the paddles *s* are turned into the position indicated by dotted lines in Fig. *B*, in order that they may overlap one another at the edges and thus form a continuous intermediate bottom, upon which the washing fluid, separated from the lathering fluid which is underneath it, can be collected. *u* is an outlet opening, usually closed by means of a sliding door *t*, in the said receptacle *a*, so that the washing liquid which trickles down upon the intermediate bottom can flow off through the opening *u*. The turning of all the plates *s* can be effected by means of gear wheels engaging with a common rack. After a washing of the hanks, it is only necessary to turn back the plates *s* into their upright position to allow the rise of the soap lather for a duplication of the ungumming process in connection with a new lot of silk hanks.

PRACTICAL POINTS ON GIGGING.

(*Continued from page 15*)

(3) Condition of the Cloth.

As regards this point, there are two different questions that arise. These are the differences between wet and dry gigging.

Where the cloth is gigged damp or wet, the fibres will naturally tend to lie down close to the body of the fabric, and when the piece gets to the shear, the revolver blades pass over them and leave them much as the gig left them, at least so far as the bottom is concerned. The cause of this is found in the nature of the wool fibre, which more readily retains its position when damp. The teasel serves to comb and lay the nap in a certain way, and when the shear gets at it, it is with difficulty that it touches it at all. In cropping, a wire raising brush, run a little faster than the goods, raises the nap perfectly.

The wetting of the goods is accomplished by means of an ordinary sprinkling can, or by a series of perforated pipes, so arranged as to eject a stream of water at the proper time and place.

By the other method of gigging, *i. e.*, dry gigging, a different kind of finish entirely is produced. The fibres being dry do not retain the position which they are given by the action of the teasel, but have a tendency to stand up in their natural position, the teasel points get down further into the body of the goods, and thus work up a fuller and richer nap, and leave it in such a condition that the blades of the shear can readily reach most all the fibres. None of the fibres are lying down close to the weave of the goods and there are none of them but what can be brought up into contact with the shears by the use of a hard brush, which every shear contains. The character which this treatment gives to the finish may be described as a close, threadbare or clear face finish, the nap as raised by the gig being in turn cut off short by the shear. Clear face goods, many classes of dress goods, and worsteds and fancy cassimeres, are as a rule finished by means of dry gigging. Dry gigging is also practiced when finishing Blankets, Flannels, and similar fabrics, but then the nap is left on the face of the goods, the same being evened and cut down, to the desired height on the shear.

In both cases, whether wet or dry gigging, care must be taken not to push the cloth too forcibly on to the teasels, or a tender fabric will be the result. The teasels should be started slowly and gradually and with the oldest and softest teasels first, then the sharper may be used as the work progresses. Again there is a certain limit for gigging, to go beyond which is harmful to the strength of the fabric thus treated. To give, therefore, to all pieces of certain style of fabric the same kind of treatment will in a great many instances result in failure, for although some of the pieces will finish perfect, others will be spoiled. Therefore, in order to perform gigging intelligently, it is necessary for the finisher to study the construction of the goods carefully, he must see what kind and amount of gigging each individual piece may need or is able to stand.

(4) Grading of the Slats, *i. e.,* Teasels.

A feature of the greatest importance in connection with gigging is the grading of the slats into sets of different and increasing degrees of sharpness in order to be able to give to fabrics under operation a desired, uniform amount of gigging.

For this grading, the number of slats required to fill the cylinder must be taken into account and this number divided into sets of equal numbers of slats, using in turn that many degrees of sharpness of teasels. However, when dealing with face finish fabrics, it will be advisable to have more degrees of sharpness to slats than could be well made by dividing the slats of one cylinder into sets; in this case, for example, grading the slats in sets of six each and make from eight to ten grades of teasels.

This grading of the teasels is made necessary for the reason that gigging must be started with dull teasels, the sharpness of the teasels used being increased as the progress of gigging demands. If we would start with all, or too much new work, *i. e.,* using all, or a greater number than desired, of slats containing new teasels, technically known as *breakers,* both, the fabrics, as well as the teasels, would suffer. On account of being stiff and sharp, the points of the teasels would, as soon as they come in contact with the cloth, get caught in the felt and tear out the fibres, thus destroying the strength as well as the beauty of finish of the cloth under operation. At the same time the teasel points would become so mutilated that the slat would be of very little use thereafter.

Always remember during gigging, to closely examine how well the felt is becoming raised; as well as how this influences the strength of the cloth under operation, so that no tender fabrics will result. The slats must also be carefully watched, in order that the several grades are kept at a uniform sharpness, as well as to use up the slats, *i. e.,* teasels in the frame, completely. It certainly will be understood, that slats, *i. e.,* teasels as used, correspondingly change in their grade, *i. e.,* gigging properties.

When testing the fabric under operation for its strength, take both of your hands and pass the cloth between the forefinger and thumb of each hand, having the thumb on top, and bring the hands close enough together to have the finger ends touch each other. Hold the cloth tight between the fingers and bring the knuckles of the thumbs together, being careful that the cloth will not slip between the fingers. In this way you will readily ascertain the strength of the cloth under operation. Always test the fabric near the end, in order that if a hole is burst in the cloth, the damage thus done will be at a minimum expense to the mill.

In order to ascertain the amount of gigging given a fabric, insert one of the small blades of a penknife under the nap and lift and lay back the fibres, in this manner exposing the ground. You can then easily tell if all the fibres are raised or if some of them still cling to the body of the structure.

Never take a fabric from the gig until tested with reference to its strength, as well as the amount of nap raised, and there will be no trouble at the shear and goods will not have to be sent back to the wet finishing department, to be re-gigged.

(To be continued.)

WOOL SCOURING AND DRYING.

(Continued from page 18)

The "Proctor" Steel Dryer.

A description of this most prominent Wool Dryer, as built by the Philadelphia Textile Machinery Company, is best given in connection with the accompanying four illustrations, of which

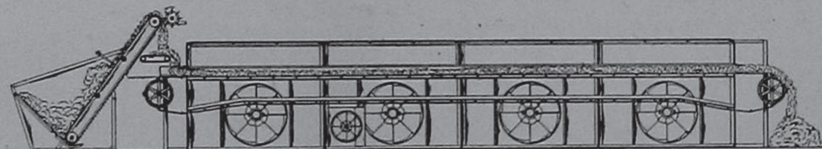


FIG. 14.

Fig. 14 is a section, lengthways, through the automatic feed and four drying compartments (more or less may be used) showing also at the right hand side of the illustration, the delivery of the dried wool. The run of wool, under operation, from the hopper

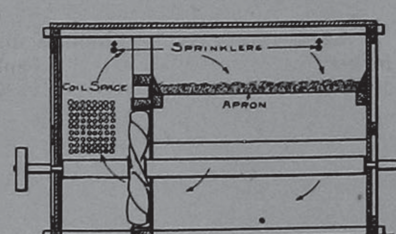


FIG. 15.

of the automatic feed (and which may be connected by an endless feed apron direct to the delivery end of the rinse bowl of the set of scouring bowls) through the four drying compartments, until its delivery outside of the dryer, is shown prominently in the illustration.

Fig. 15 is a cross section through any one compartment of this dryer, showing fans mounted on tube and bearings, arranged on either side, in full view. Section of the endless conveyor or apron with wool on it, location of automatic sprinklers, as well as section of system of heating coils and circulation of heated dry air through the wool under operation, are distinctly shown.

Fig. 16 shows the *Interlocking Chain Conveyor,* separated from the dryer. If the Superintendent of a Woolen or Worsted Mill does not know the loss of

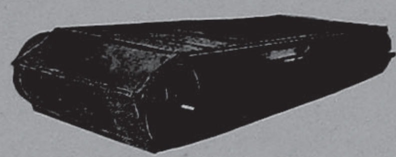


Fig. 16.

time and expense of keeping the endless wire aprons of other makes of compartment dryers in working order, the man who runs the dryer knows. Many forms of aprons have been tried with more or less success, but there has ever been present the knowledge that constant care must be taken and was required to keep them running true, and that sooner or later the constant bending of the wires as they revolve about the drums would wear them out and necessitate the purchase of a new apron. A careful study of the illustration shows that this conveyor operates on the same principle as an ordinary door hinge. The hinge joints on this conveyor have absolutely no other function to perform than to guide the sections of the conveyor about the sprocket wheels. The strain of drawing the conveyor through the dryer is sustained by link chains.

Another great improvement of this conveyor over other aprons, is the fact that any section in the conveyor, when so required, for one reason or the other, can be removed in short order by any person, and a new section added. This feature may sometimes save the purchase of a new apron, entirely aside from the fact that the conveyor has a longer life and requires no watching. This conveyor is built up of interlocking sections of wire mesh or perforated sheet metal, fifteen to thirty inches long and the width of the usual aprons. The sections are hinged together and are carried through the machine by means of endless link chains at either side, joined together at intervals by cross bars, the latter acting as the pin for the hinged joint of the sections. The simple removal of the pin or cross bar, disconnects the section and permits of its being taken out if desired. The wires do not bend as they revolve around the sprockets, the conveyor cannot slip and requires absolutely no adjustment whatever, and therein lies the secret of its success. The guides for carrying the conveyor through the machine consists of steel angle tracks, both for the carrying run and for the return run.

Fig. 17 shows a section of this *Proctor* Steel Dryer, panels removed, to show some of the structural steel members, as well as position of the conveyor in the machine.

In this machine the stock to be dried is either delivered automatically, or thrown roughly, into the hopper of the automatic feeder at the feed end of the machine. This feeder automatically distributes the wet wool on the endless conveyor of the dryer which carries it through the successive compartments or chambers of the machine, said compartments being graded from a moderately high heat at the wet or feed end of the machine, to a low temperature at the delivery end. Heated air in large volumes is recirculated alternately through the wool on the foraminous conveyor and the heater coils, by means of a number of pressure fans. A constant supply of fresh air is admitted at the delivery end of the machine, while a corresponding exhaust of saturated air takes place at the feed end. The process of drying is entirely automatic from the time the stock is thrown into the hopper of the automatic feeder, until it emerges from the delivery end of the machine, thoroughly dried, one passage through the machine drying any grade of wool. In some instances a cooling compartment is added to the delivery end, so that the wool leaves the machine in a perfectly cool state. The frame of the dryer is made entirely of structural steel, those sections which it may at times be desirable to remove, being bolted together and the balance riveted. Every panel in the dryer is removable so that access to the interior is available at all times upon a moment's notice.

Provided the floor space at disposal in a mill is not sufficient to permit the installation of a single conveyor machine, dryers having three conveyors are

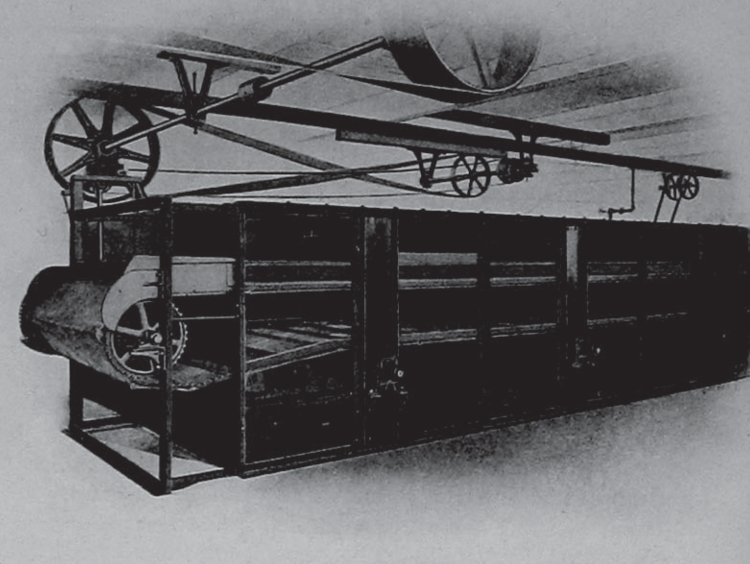


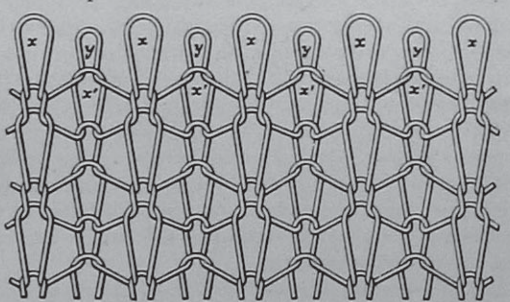
Fig. 17.

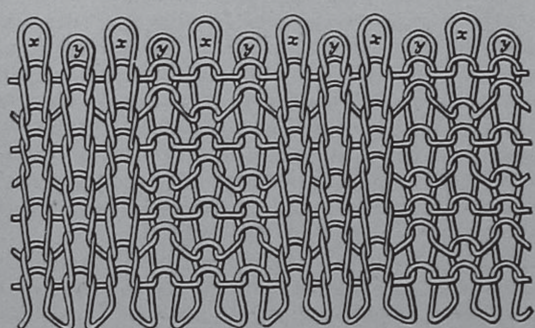
built. They work on the same principle as the Continuous Wool Dyer, shown in Fig. 11, *i. e.,* the wool is turned over twice in the machine during the drying process. As will be readily understood, it refers to a machine of greater height than the single conveyor type machine. Wherever possible, the single conveyor type is preferred to be installed, since it dries the wool in a more scientific manner.

Philadelphia, with only one-sixtieth of the population of the Republic, produces one-twentieth of all its manufactures.

Novel Construction of Knitted Fabrics.

These fabric structures, it is claimed by the inventors of the procedure, The General Knit Fabric Company, possess characteristics which distinguish them favorably from other Knit Fabrics.





(1) One of these characteristics is that although the web may be light in weight and present the appearance of being knitted very slack, it possesses stability and resiliency not possessed by ordinary slack knitted webs.

(2) Another characteristic is a mesh construction which, the inventors claim, improves the sanitary qualities of the web, and

(3) Another characteristic is the facility with which the web can be provided on one face with predominating yarn of one material and on the other face with predominating yarn of another material.

In the new web, the eyelet holes or meshes formed by the large stitches *x*, are in zigzag relation to one another, and this peculiar disposition of the meshes imparts the characteristic appearance to the web; while the fact, that both faces of the web are composed in great part of the larger stitches, improves the ventilating and sanitary properties of a garment made from such web.

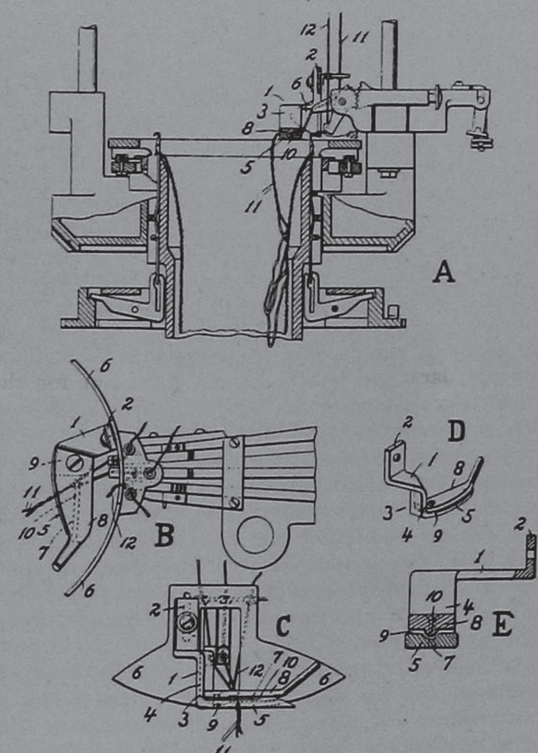
In most cases the large stitches *x* of one face of the web will be of somewhat greater amplitude than those x^1 of the other face (see Top diagram).

In the commercial web, the smaller stitches *y*, will usually be of such size in respect to the larger stitches that the latter will, in great measure, constitute the visible face of the web, and they can be drawn so long or from such fine yarn as to impart to the web an appearance of slack knitting, while at the same time the alternation of these slack stitches with the smaller or closer stitches in each face of the web, will impart to said web characteristics of stability and resiliency the inventors claim, not possessed by an ordinary ribbed web having slack or loosely knitted stitches throughout; therefore being enabled to produce, without sacrifice of such stability or resiliency, a lighter web than usual, the lesser weight of the yarn tending to economical production. This same feature of construction also enables us to produce a web having one face composed mainly of one material and the other face composed mainly of another material; for instance, if one yarn feed supplies cotton yarn and the next feed supplies woolen or worsted yarn, the large and dominating stitches of one face of the web will be of cotton and those of the other face of wool or worsted, thus attaining results in the fabric, which are now attained by resorting to *plating*.

The lower illustration is a view similar to the top one, illustrating another form of ribbed web embodying certain features of the new construction of knit fabrics.

A New Attachment for Circular Knitting Machines.

The object of the new device is to provide efficient means for taking care of the threads out of work in connection with reinforced work, and which threads, remaining attached to the inner side of the tubular fabric, in the continued revolution of the machine, become twisted and entangled, tending to draw the fabric up through the cylinder and thus interfere with the successful work of the needles. They are also liable to draw and distort the loops of the fabric where the threads are attached to it, or to break the thread away from the fabric in the case of dealing with a tender yarn.



Of the accompanying illustrations, Figure *A* is a central, vertical section of a circular knitting machine head, provided with the improved attachment; Fig. *B* is a top plan view of a portion of a cylinder head showing this attachment applied; Fig. *C* is a front elevation thereof; Fig. *D* is a perspective view of the attachment detached; and Fig. *E* a transverse section.

The new attachment is shown secured to the cam cylinder and is rotated therewith in the usual way. The thread feeding device may be of any ordinary form, three threads are shown employed in our illustrations.

The new attachment comprises an L shaped member 1, the arm 2 of which is apertured to receive a fastening screw for securing it to the cam cylinder, and its other arm 3 being bent downwardly to form a depending member 4 which terminates in a lateral extension 5, which receives the thread when applied, whereby the lateral extension 5 is arranged to extend in front of the thread guides 6, and spaced a suitable distance therefrom. Extension 5 is provided with a longitudinally extending groove 7, the free end of which is beveled on its upper face to permit the ready insertion of the threads between it and the complementary member 8.

This member 8 is made of solid unyieldable metal, and is superposed on the extension 5, and is secured on its inner end thereto by a washer 9 arranged therebetween to space said member 8 and the extension 5 slightly apart to provide for insertion of threads.

Member 8 is also provided on its lower face with a rib 10, which extends longitudinally thereof and is designed to co-operate with the groove 7 in the extension 5 and engages the threads, as 11, which pass between them from the guides 6 and prevent the twisting or entangling of said threads at the outer side or side adjacent to the cam cylinder of said attachment.

Threads 11 in Fig. *B* are the floating threads, and 12 the thread in operation for the knitting of the fabric. As the latter feeds down through the cylinder, more yarn is drawn from the bobbins, and the strands 11 are fed between the members 5 and 8, and by the co-operating groove and rib formed on the adjacent faces thereof are held separated as shown in Fig. *B*, and are prevented from twisting on the outer side of the attachment adjacent the cam cylinder.

"Sanitary" or "Health" Underwear.

During the past few years black wools have grown in popular favor, simply because they have found the proper sphere for which nature intended them. Every sheep breeder must know by this, that unlike white wools, black descriptions are used in their natural state —that is, undyed. It is impossible to dye black wool into any other shade than black, the operation simply deepening the color.

But medical science, aided and substantiated by experience, has found out that dyed fabrics, when worn next to the skin, are highly injurious to the wearer, and should never be adopted by any one, and particularly not by a person given to sweating. Take the case of a person troubled with sweaty feet, and who wears, say, black stockings. We cannot conceive of that person doing a more foolish thing, endangering health at every turn, and yet, for all that, it is a very common occurrence. After a life-long experience in handling and seeing wool through every stage of its manufacture, we have long ago discarded the use of all dyed materials next to the skin, confident that the absorption of coloring matters by the pores of the skin is simply the absorption of so much foreign and poisonous matter. It is exactly here that the benefits of black wool come in, and modern manufacturers have at last met the needs of nature by producing the very fabrics that nature requires and which are best fitted for mankind at large.

The production of *sanitary* or *health* flannels or undergarments is now a thing of first importance with underwear manufacturers, and these are the men who compete keenly for black wools. It is no uncommon thing to-day to see a bale of fine black wool sell for considerably more than does the ordinary white wool out of the same flock, simply because black is rather scarce and wanted. When the British Government gave out an order for natural underwear flannels at the beginning of the Boer War, black wool went up tremendously, and it has fallen very little since, it being to-day relatively dearer than white wool.

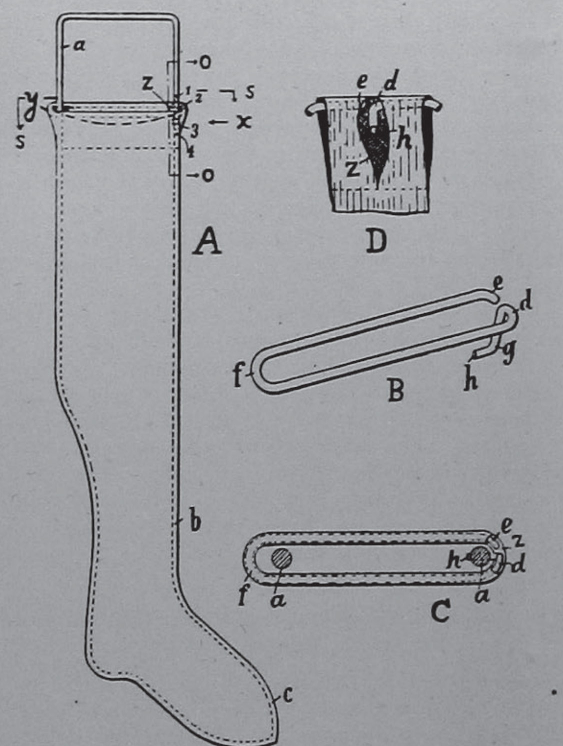
Natural gray flannels or *health* flannels as they are usually called, are the thing for every person, and as under vests, pants, etc., they should be universally worn, containing no wool that has been dyed; the color being gotten by blending together white, and the natural black wool. Scouring of black wool does not alter its shade, the process only removing the grease, etc., from the fibre. In these black wools we have everything a sensible person can possibly require for comfort and appearance, besides wearing capabilities, and the more the hygienic qualities become known, the greater will be the call. (From the Bulletin of the Natl. Ass'n of Wool Manufacturers.)

Mercerising Stockings.

The same is a late German invention and has for its object the construction of an apparatus for tightly stretching and holding hosiery and other knitted goods, while undergoing mercerisation.

In order to give a comprehensive description of the new device, the accompanying four illustrations are given, of which Fig. *A* shows the stocking shape and hoop. Fig. *B* shows the hoop, Fig. *C* is a horizontal section corresponding to the line *s-s* of Fig. *A*, and Fig. *D* is a vertical section corresponding to the line *o-o* of Fig. *A*.

a, b, c is a frame of metal wire doubled back on itself to form a complete loop shaped to the outline of the stocking to be mercerised, so that the stocking can be drawn over it as over an ordinary wooden board shape. The shape comprises a separate hoop, which at the parts *d, e, f*, has the shape of a flattened ring or loop, but is open between the points *e* and *d*, while from *d* to *g* is arranged a vertical limb which terminates in a horizontal bent pin *h*. In the portion of the main frame between the points *a* and *b* of one of its longitudinal members, a number of holes 1, 2, 3, 4 are formed. These holes are so arranged that the pin *h* can be pushed into any one of them in the direction of the arrow *x*, the result of which is that the hoop then remains in position.



The hoop serves to support the upper edge of the stocking, which is worked double, so forming a hollow edge, in the inner wall of which there is formed a hole *z* through which the edge *e* of the hoop can be easily pushed and the hollow edge of the stocking be then readily pulled over the member. When this has been done the whole stocking is pulled over the main shape, and finally the pin *h* of the hoop is caused to engage one of the holes 1, 2, 3, or 4. The stocking is then completely ready for mercerisation.

The advantage of the shape consists in its capability for rapid and convenient manipulation and the perfect stretching action.

With the shapes as hitherto made for this purpose the stretching has inequalities and the finished goods are therefore inferior. Thus for example it has been proposed to construct shapes with a point of attachment located approximately about where the holes 1, 2, 3, 4 are indicated, in one longitudinal limb of a frame, and the opposite longitudinal limb at about *y* with another point of attachment, but between *y* and 1, 2, 3, 4 the upper edge of the stocking made a deep dependent curve, as indicated by dot and dash lines in the figure. The result of this was diminished tension in the middle of the breadth of the stocking made itself noticeable pretty deep down in the stocking lengths and the lustre after mercerisation was not uniform. To overcome this disadvantage attempts have been made to mercerise a finished stocking without putting it on a shape at all, but on the contrary to subject the yarn previous to being worked and in the hank to a mercerising process. This method, however, has the still greater disadvantage in that the mercerising of yarn in the hank results in inequalities in subsequent dyeing, particularly when dyeing with black, and the finished stockings do not possess a uniform appearance, but on the contrary present transversely ringed differences in color. All these disadvantages, it is claimed, are completely obviated by the new shape.

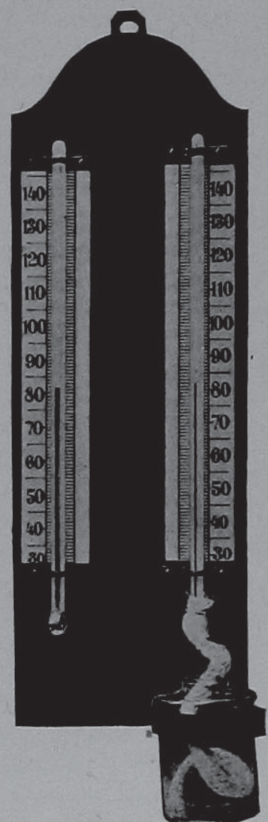
AIR CONDITIONING FOR TEXTILE MILLS, ETC.

(Continued from July issue.)

When entering any well heated room, you may notice that the air is very dry, having a parching effect, although as a matter of fact a cubic foot of air in such a room may contain just as much humidity as in a cubic foot of air outside, and yet we feel different, clearly showing that the actual amount of humidity in the air is not a deciding factor in our estimate of relative humidity. If a shallow dish containing water be placed in a warm room, said water will, by the natural process of evaporation, change into vapor, *i. e.*, evaporate, the capacity of the atmosphere to absorb this water, or really hold it up in this invisible condition, varying according to the temperature in the room. The fundamental law for this evaporating of water is that at 32° F. a cubic foot of air will retain 2.13 grains of aqueous vapor, while at 100° F. it will retain 19.84 grains of aqueous vapor, *i. e.*, about ten times as much. It will hold no more than the amount stated, the air being then saturated, *i. e.*, has its maximum vapor tension or pressure. If the temperature of this saturated air is in turn lowered, if it is compressed into a smaller volume, or if an attempt should be made to add more moisture to this fully saturated air, then the moisture already in it will begin to be deposited in the form of dew, the temperature at which it does this being called the "dew point," which in turn varies according to the temperature of the moisture, *i. e.*, the elastic pressure of the particles of vapor increases as their temperature increases, the air itself having nothing whatever to do with the humidity, it simply being a convenient vehicle for heating the vapor as rising from the surface of the water and in so doing increasing its elastic force and enabling still further evaporation to take place; the application of heat to the water itself causing vapor to be given off, and this rising in the atmosphere, will heat the air and so the same result naturally follows.

From the foregoing, it will be readily understood that the greater the heat of a room, the greater the amount of absolute humidity required in order to reach the same amount of relative humidity.

We will now consider the relative humidity. If air contains a certain amount of moisture, say about one-half of what would cause complete saturation, then the amount of humidity of the air is said to be 50%; so that when we say that air is "dry" we simply mean that the proportion of moisture in the air is little compared with if fully saturated, and for which reason cold air with little moisture in it may be very moist, while warm air with much moisture in it may be very dry; for which reason it will be seen that the expressions "dry air" and "moist air" are only relative terms, and simply express the proportion of aqueous vapor present at the given temperature compared with that which the same volume of air could hold.



It will thus be seen that the point of saturation, *i. e.,* the "dew point" is the foundation of our estimate of "Humidity" or moisture in the air, and for which reason we must know this before the percentage of humidity in a room can be ascertained.

Absolute, Maximum and Relative Humidity.

Absolute humidity means the actual amount of vapor present in a given volume of air.

Maximum humidity means the amount of vapor that could be present in the same volume of air under precisely the same conditions of pressure and temperature.

Relative humidity means the ratio of the absolute humidity to the maximum humidity, and this is the humidity we are mostly concerned about with reference to cotton spinning.

The instrument for measuring the degree of relative humidity, *i. e.,* drying power of the atmosphere, as we may say, is called the psychrometer or wet bulb hygrometer, or hygrometer for short, and consists of two delicate thermometers placed near each other, the bulb of one of which is kept wet, by being covered with a piece of muslin, the end of which (a kind of wick) dips into a small vessel filled with water. The accompanying illustration shows such a hygrometer.

(*To be continued.*)

In the July issue of the Journal we referred to the success of the Hygrosso Humidifiers in connection with two prominent Mills covering Cotton and Silk.

While in New England last week, we noticed that the Fall River Iron Works Co., Fall River, Mass., are making their sixth complete installation of the Hygrosso Humidifiers, since January, 1909.

The Tamarack Company, Pawtucket, R. I., which have just completed a large modern weaving and spooling plant, have awarded contract to John W. Fries, to equip their entire mill with Hygrosso Humidifiers. The installation at the above plant will consist of the direct connected individual motor drive Hygrosso, the same type of apparatus as was recently installed in the new silk mill of the Leader Weaving Co., Central Falls, R. I.

A. G. Turner, Willimantic, Conn., has also made an installation of the Hygrosso Humidifiers.

Messrs. Cheney Bros., the prominent Silk Manufacturers of South Manchester, Conn., are making one complete installation of the Hygrosso Humidifiers.

In the same way as New England picks out the Hygrosso Humidifiers, for their mills, other Textile Centres do the same; for instance the Dunmore Silk Co., of Scranton, Pa., have just made an installation of the Hygrosso Humidifiers.

The Identification of Coloring Matter in Dyed Cotton Fabrics.*

By G. E. Holden, A.M.S.T., F.C.S.

Test for Indigo in Compound Shades.

Indigo, when present alone on the fibre may be easily identified, although the HNO_3 test, which gives a yellow spot surrounded by a green rim, when applied alone, is of no value, as many other coloring matters give a similar reaction. In this connection it is interesting to note that one of the artificial products on the market gives a browner spot than the natural indigo. When indigo is present in small quantities, particularly in the presence of certain coloring matters, some difficulty is experienced in detecting it. Two tests published in the standard book on dyeing, by Knecht, Rawson, and Lowenthal, are:

First: Cotton fabrics dyed with indigo, yield purple colored vapors of indigotin. If a piece of white porcelain be held over the vapors a blue deposit is obtained. This test is of little value when small quantities of indigo are present on the fibre.

Second: The other test for the detection of small quantities of indigo in compound shades is to extract with freshly prepared hydrosulphite of soda and then reoxidise; but the sulphur and new vat dyes have made this test more complicated.

Merchants when ordering cotton to be dyed navies, blued greens, and blacks, in many cases state that the goods must be indigo dyed. The dyer, therefore, is obliged to put indigo on the fibre, and knowing that many of the developed and sulphur colors are equal to

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*Abstract from a Paper read before the Society of Dyers and Colorists; from the Journal of the Society.

indigo, he is not so particular about dyeing as dark an indigo ground as formerly was requisite for fast colors. The methods adopted on cotton warps, cotton piece goods, etc., are first, bottom with indigo, then dye to shade with direct dyes (generally fixed by after-treating with metallic salts, diazotised paranitraniline, or diazotising and developing), mineral dyes, mordant dyes, or sulphur dyes, the latter now being chiefly used. Owing to the fast sulphur and developed dyes being largely used for dyeing to shade, the dyer and chemist find it difficult, quickly to ascertain the presence of indigo.

The following is an accurate and quick method, making use of the well-known solvent property of *chloroform* for indigo. Take a small portion of the pattern to be tested, immerse in chloroform, and warm gently. The solution at once turns blue if indigo is present; if no blue coloration is obtained, indigo is absent.

Direct dyes, direct dyes fixed by after-treatment, sulphur dyes, mineral dyes, and the mordant dyes, are insoluble in chloroform and give no coloration. The test also answers very well if the cotton has been slightly topped with basic colors. If, however, excessive basic topping has been used for shading, it must be removed by boiling in methylated spirits—or, better still, methylated spirits containing a few drops of HCl—washed, and then dried. The dried pattern is then immersed in chloroform as before. The above test I find to be quicker and more definite than any other when small quantities of indigo are present in compound shades.

TEST FOR BLUES.

Blues on cotton are generally dyed with one of the following: Direct blues; direct blues developed; basic blues; sulphur blues; alizarin blue; indigo blue; Ciba blues; Dianisidine blue; Indanthrene Blue R S; Indanthrene Blue R C; Indanthrene Dark Blue B O; Indanthrene Dark Blue B T; Algole Blue 3 G; and Algole Blue C F.

Take a small portion of the pattern to be tested and immerse in cold *chloroform*. Direct blues are insoluble and give no coloration. Direct blues developed are insoluble and give no coloration. Basic blues when fully fixed are insoluble and give no coloration. Sulphur blues are insoluble and give no coloration. Alizarin blue is soluble, giving a blue coloration. Indigo blue is soluble, giving a blue coloration. Ciba blues are very soluble, giving very bright blue solutions. Indanthrene Blue R S is slightly soluble, giving a blue coloration. Dianisidine blue is soluble, giving a characteristic violet coloration. Indanthrene Blue R C is soluble, giving a blue violet fluorescent solution. Indanthrene Dark Blue B O is very slightly soluble, giving a bluish-green coloration with a red fluorescence. Algole Blue 3 G is slightly soluble, giving a blue coloration. Algole Blue C F is slightly soluble, giving a blue coloration.

Several of the above dyestuffs give blue colorations, which cannot be distinguished with certainty; to identify them, treat with boiling titanous chloride. Alizarin blue is reduced to a brownish black, becoming bluer on exposure to the atmosphere. Indigo blue is decolorized, very dark shades leaving an olive-to-blue-tinted fibre. Ciba blues give a green-to-olive shade. Algole Blue 3 G is reduced to a black color. Algole Blue C F is reduced to a grenat shade.

To distinguish between indigo and the Ciba blues, the titanous chloride not being very decisive, spot a portion of the original pattern with strong HNO_3. Ciba blues are slowly acted upon, giving a brown spot which gradually changes to a light dirty blue tint. Indigo blue gives a yellow spot surrounded by a green rim.

The direct blues, direct blues developed, basic blues, and the sulphur blues, which are insoluble and give no colorations, can be identified by: First: Boiling in water, when the direct-dyed pattern bleeds off. Second: Treating with boiling titanous chloride. Developed blues are decolorized; Sulphur blues give off H_2S gas, which can be readily detected by placing a piece of filter paper, moistened with lead acetate, over the mouth of the tube; Basic blues are discharged.

TEST FOR BLACKS.

Blacks are generally dyed with one of the following: Direct blacks; direct blacks diazotised and developed, or coupled; basic blacks on tannin and Sb, or tannin and iron; logwood blacks; sulphur blacks; azophor blacks; aniline and diphenyl blacks; and naphthalene and anthracene mordant dyestuffs on chrome.

Take a small portion of the pattern to be tested and immerse in cold chloroform. Azophor blacks are very soluble, giving red-violet to blue-violet solutions. All the other blacks are insoluble and give no colorations.

To distinguish the rest of the blacks it is necessary to make use of extra chemical reagents:

First: Boil a small portion of the pattern to be tested with dilute hydrochloric acid; if the solution becomes red or orange, and the color is stripped=logwood black.

Second: Treat the black patterns with boiling titanous chloride.

Direct, developed, and coupled blacks are decolorized. Basic blacks give a dull-yellow-to-brown coloration. Sulphur blacks become brown, giving off sulphuretted hydrogen, which can be readily detected. Aniline and diphenyl blacks become brown in color. Chrome mordant dyestuffs are reduced from brown to brownish black.

To distinguish between aniline and diphenyl blacks and the chrome mordant dyestuffs, immerse a portion of the original patterns in bleaching-powder solution, 5° Tw., then add a little acetic acid, allow to stand, pour off the liquid, sour with cold acetic, and wash. Chrome mordant dyestuffs are discharged, leaving a yellow-to-yellowish-brown tinted fibre. To confirm the chrome mordant colors take the discharged pattern and fuse it with a little sodium carbonate and potassium nitrate; if chromium is present the characteristic yellow chromate is obtained. Prussiate aniline blacks give an olive-to-green-colored fibre. Other aniline blacks and diphenyl black become red-brown.

STANDARDS FOR FASTNESS OF COLORS

(Specially written for Posselt's Textile Journal.)

The term *fastness,* as applied to dyed colors, is generally recognized as relative only, and for this reason, if for no other, efforts on the part of those most interested in the subject should be directed to secure some understanding which would make more definite just what is intended, when the term *fastness* is used. To say that any particular color is *fast* or *very fast* does not throw any light upon the subject, because there exists, at this time, no arbitrary or other standard against which any particular color or dyeing may be checked.

Fastness to Light. In comparing dyeings of various kinds against each other, the first test generally made is that of resistance to light, and while it is extremely simple and easy to make, its results are of great importance. However we sometimes find instances where dyeings are subjected to the light test under conditions that would never prevail in practice, and without any regard to the actual uses to which the dyed or colored fabric would be submitted, consequently the results of such a test would be of little value in ascertaining the commercial value of the dyeing in question.

As a rule, most colorists take as the light test standard, Indigo, and this seems to meet all requirements, except that different dyeings of indigo, each originally of the same depth of color, fail to resist the continued action of our summer sunshine at the same rate, which leads to the belief that if indigo is really the ideal light standard color, it should be dyed according to one recognized method upon stock of a previously determined weight and quality, and successive lots tested against the original approved dyeing.

The duration of the exposure *under glass* is a matter of some importance. It has been the writer's practice to expose standard dyeings for successive periods of 7, 14 and 21 days, while some colorists expose for periods of 10, 20 and 30 days. As a matter of fact, it is of little consequence which system is adopted, as long as the results of one are understood by all others.

In making exposure tests, due regard must be had to some colors which are reasonably *fast* in diffused daylight, and which are extremely fugitive to the action of direct sunlight, hence some regard should be paid to the ultimate uses to which a given color is to be put. Take for example two identical shades, one on a soft hat and the other forming an element of a rug — it is manifestly improper to subject both of these shades to the same direct sun exposure and judge them alike.

The recording of exposure tests, and incidentally to determine the relative light-resisting qualities of different dyes, requires the use of some arbitrary scale. On the basis of the 21 day exposure, the following has been used for a number of years (since 1892). It is based upon direct sunlight exposures, during the months of June, July and August, and near the 40th parallel. A dyeing, showing little or no change in shade on the 21st day is designated *Fast* or "100," while shades showing marked changes on the 14th or 7th day are designated respectively *Very Fast* or *Medium Fast.* A shade decidedly weakened on the 3d day is *Fugitive.* In a series of shades exposed, some are found frequently to show evidences of early fading, consequently it is always desirable to inspect daily, for the first few days, and remove those so readily affected; otherwise, if they are allowed to remain until the 2d or 3d week, along with the faster shades, they become so over-burnt, as to be absolutely of no value for comparison.

The most convenient method of making exposure tests is with yarn, wound around a good quality of cardboard, and where several dyeings are to be so tested. They are wound in bands of about one inch each in width. The card may be conveniently 4 inches wide, this allows for the exposure of 1 inch at a time, thus on the completion of a 3 weeks' test, the first inch will have had 3 weeks; the second inch, 2 weeks; the third inch, 1 week, while one inch remains unexposed.

The exposure test is applied to all colors and fabrics, but in forming an opinion, due regard must be had to the uses to which the color, or shade, is to be put, and the class of fabric best suited for the purpose. In preparing dyeings for exposure tests, clean material should be provided and thorough washing insisted upon.

Soap Test. This test is applied equally to colors dyed upon both, wool or cotton, and is intended to show whether a color loses when subjected to washing with a one per cent solution of soap, heated to 170° F. It is usually the practice to allow the dyeing to remain immersed in such a solution for ten minutes, lift, wash well, dry, and compare with the standard sample. Some colorists immerse for five minutes, or other arbitrary periods. The results from such a test can be only one of three things, Good, Medium, or Bad, and hardly need an explanation.

Soda Test. This test is applied to both, wool or cotton, and is to determine the alkali resisting qualities of a dye. A one per cent solution of dry carbonate of soda is used, and heated to 170° F. The dyeing is immersed for ten minutes, lifted, washed, dried, and compared. The result is reported as either Good, Medium, or Bad.

Sulphur Test. This test is adapted to both, wool and cotton. Some colorists who do not have access to a working sulphur house, prefer to employ the alkaline sulphites as the source of their sulphurous acid, but the employment of a miniature sulphur house, easily constructed from a good, sound box of sufficient size, readily duplicates the sulphur-house method. An excess of sulphur should be avoided, as yellow stains will result, due to a fine deposit of sulphur, on account of an insufficiency of oxygen in the box to convert all the sulphur into sulphurous acid. The test is made by suspending the slightly dampened samples in the chamber over night, *i. e.,* 12 hours, washing with water, and drying. Sulphur tests should always be made in the presence of white material, there being some dyes, which, while not visibly affected by sulphur vapors, are caused to bleed into adjacent white material.

(To be continued.)

TESTING OF CHEMICALS AND SUPPLIES IN TEXTILE MILLS AND DYE WORKS.

(Continued from page XIV, June issue.)

General Methods of Testing.

There are certain methods of testing which may be applied to all chemicals.

For example water is determined in practically the same way for all chemicals. The method of procedure is as follows: The chemical to be examined is ground to a very fine powder. A portion of it (one or two grams) is weighed out in a clean porcelain or platinum crucible, which has been previously weighed. The crucible containing the chemical is then placed in a drying oven, the temperature of which is kept at 100° C. or 212° F. The temperature should not be more than two or three degrees above this point, except under certain conditions which will be mentioned later. At the end of an hour the crucible and contents are weighed and the loss in weight noted. The crucible and contents are then placed again in the drying oven for one hour, at the end of which time they are again weighed. In each instance before being weighed, the crucible must be allowed to cool in the desiccator. If the loss in weight, after the second heating, exceeds one milligram (.001 gram) the crucible must be heated for another hour. This is continued until the loss in weight between the two consecutive weighings is less than one milligram. The total loss in weight is the weight of the water which the chemical contained. This method for determining the amount of water in a chemical can be applied to all chemicals with but few exceptions, so that later on, in Part III, when it is stated how to determine the amount of water in any chemical, the above method is used, unless distinct directions are given to the contrary.

Chemicals are often adulterated with other substances. The following is the method used in all cases when the chemical is soluble in water and the adulterant or impurity is not.

A sample of the chemical is taken and ground to a fine powder. A small quantity (one to two grams) is weighed out into a small beaker (one with a capacity of fifty cubic centimetres). Twenty-five cubic centimetres of distilled water are added to the chemical and the beaker is warmed on the sand bath. The chemical may be weighed out on a clean watch crystal and then be transferred to the beaker with a clean dry camel's hair brush, or the chemical may be washed off of the watch crystal with a stream of water from the wash bottle. On warming, the solution should be stirred with a glass rod and the chemical will dissolve. After it is all dissolved, the solution is filtered, the filter paper having been previously weighed. After filtering the solution, the precipitate and the filter paper are washed three or four times with distilled water. One cubic centimetre of the last wash water is placed in a platinum crucible and evaporated to dryness. If any residue remains, the filter paper must be washed until one cubic centimetre of the filtrate when evaporated leaves no residue. After washing, the filter paper is dried in the drying oven at 100° C. or 212° F. (the temperature must not rise above this point) and after allowing it to cool in the desiccator then weigh it. The difference in weight between the clean filter paper and the filter paper with the precipitate, is the weight of the insoluble impurities.

If the impurities are of such a nature that they will not change when subjected to a very high heat, it is not necessary to weigh the filter paper; but instead of drying the filter paper at 212° F., and weighing, it is first dried and then ignited in a weighed porcelain crucible; the difference in weight is equal to the weight of the impurities. The weight of the ash of the paper, need not be considered if it is ignited to a white ash, provided a good filter paper is used, the weight of the ash being considered as 1/100 of a milligram, provided this calculation is necessary.

Some of the impurities in a chemical can be detected by examining it closely. Such impurities are sawdust, iron filing, sand, straw, etc. This may be due to careless packing, but if present in large amounts, they may be considered as adulterations.

If a chemical is soluble in water and its adulterant or impurity is also soluble in water, then chemical tests must be applied to determine the impurities. In technical analysis, the chemical is tested for certain substances which are suspected to be present.

A few characteristic tests will be given:

ALUMINUM SALTS give with caustic soda a precipitate which dissolves in excess of the caustic soda solution, but aluminum hydroxide precipitates out again if the solution is boiled with ammonium chloride.

ARSENIC SALTS are tested for, by adding hydrochloric acid to the solution, and a clean bright strip of copper. The solution is heated to a boiling point for a few minutes; a gray or black film forming on the copper if arsenic is present. Antimony acts in the same way as arsenic.

BARIUM SALTS give a white precipitate with sulphuric acid. Barium salts may also be tested for by moistening a clean platinum wire with hydrochloric acid, and placing the salt on the wire. The wire is inserted into the colorless flame of the Bunsen burner, and when a green color is imparted to the flame by barium compounds.

CALCIUM SALTS, when tested in the Bunsen burner as described under barium, give the flame a yellowish red color. Calcium salts tested with ammonia, and ammonium oxalate, give a white precipitate.

CHROMIUM is usually met with in two forms, as chromates and as chromic salts. Chromic salts are tested for with ammonia, giving a bluish gray precipitate. Chromates are tested for, with lead acetate, and when yellow lead, chromate is precipitated.

COPPER can be tested for, with ammonia. Copper salts with ammonia give a blue solution. Iron if