single lift lever. Briefly then, the same degree of adjustment applied to each lever affects the position of the shuttle boxes twice as much by means of the double lift lever as by the single lift lever.

(*To be continued.*)

Late Improvements in Shuttles and Bobbins.

Daudelin's Automatic Hand Threading Shuttle.

In such shuttles, the thread is drawn into the eye through a threading slot, with the object in view to retain the thread within the eye against the tendency exerted by the ballooning effect in the unwinding of the thread from the bobbin to work back through the threading passages, and thus unthreading the shuttle.

Of the accompanying illustrations, Fig. 1 is a plan view of the threading end of a shuttle of this class. Figs. 2 and 3 are side elevations, and Fig. 4 an end view of the new bushing removed from the shuttle.

Consulting these illustrations, the threading of the shuttle is thus: When the thread is drawn down through the slot 1, it will pass under and rise in the slot 2. As the thread is drawn back beneath the eye it will work up through the slot 3 until it reaches the slot 4 under which it will be again deflected until it emerges through the slot 5, behind the bar 6, which causes it to be lifted clear off the walls of the bushing. In this position, the thread will be suitably and evenly delivered from the shuttle eye without the possibility of its working back through the threading passages.

A Novel Way of Winding Yarn *on the Filling Carrier, for use in Automatic Filling Replenishing Looms.*

In these looms, on the practical or substantial exhaustion of filling in the running shuttle, a new filling carrier with a new supply of filling is automatically supplied to the running shuttle, to take the place of the substantially exhausted filling carrier.

The object of the new wind, patented by the *Crompton & Knowles Loom Works,* is to provide a filling carrier for a filling replenishing loom, adapted to be used in ordinary shuttles, and with which the use of the ordinary filling detecting mechanism is dispensed with.

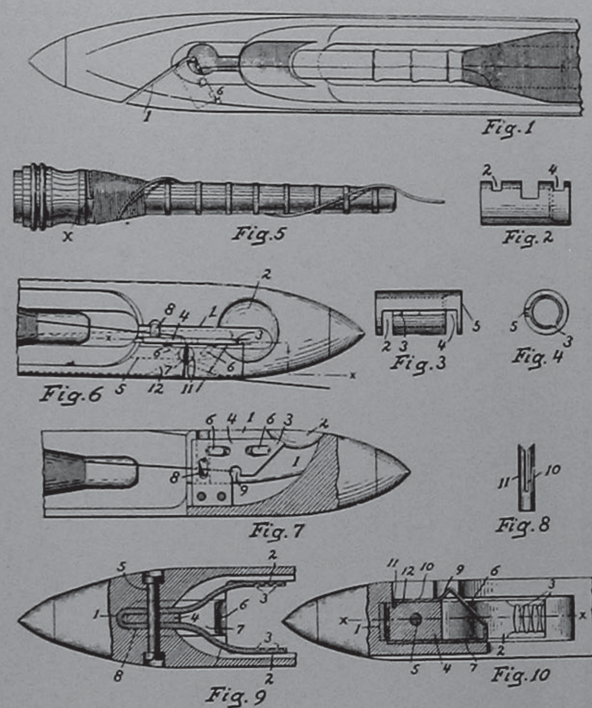
In connection with the new wind, see Fig. 5, the first few winds of the filling, and sufficient for one or more picks, are near the base of the filling carrier, wound in one direction, the rest of the filling on the carrier being wound in a reverse direction (forming then loop *X*) until the bobbin has thereon the required amount of filling.

In connection with the bobbin thus wound, the unwinding of the main body of filling from the bobbin (all wound in one direction) causes the filling to have a circular movement in one direction; and when the filling wound in the reverse direction is reached, then said filling will have a circular movement in the opposite direction, the latter movement operating a mechanism, combined with the shuttle carrying the bobbin (not shown), for severing the filling and putting into operation the filling replenishing mechanism for supplying a fresh filling carrier in place of the substantially or practically exhausted filling carrier in the running shuttle.

Johnston's Hand Threading Shuttle.

This shuttle is best explained in connection with diagrams Figs. 6, 7 and 8, and of which Fig. 6 is a top plan view of the thread delivery end of this shuttle, Fig. 7 a longitudinal sectional view through the delivery end of the shuttle taken on line *x—x* of Fig. 6, and Fig. 8 is a side view of the split pin, forming the guide eye of the shuttle.

In threading up this shuttle, the thread is carried from the bobbin through the slot 1 (as shown in the illustration in light broken lines), then pressed into the depression 2 and brought under the pointed arm 3 of



the threading plate 4 (as shown in heavy dotted lines) then into the space between the threading plate 4 and the wall of the slot 1 through the horizontal groove 5 by the tongue 6 on the arm 3, and under the arm 3, and then through the slit 7 in the shuttle, which brings the thread under the tongue 8 on the plate 4, and out through the opening 9 in the plate 4, the slit 10 in the pin 11 and the recess 12 in the shuttle. The thread is now prevented from returning by the tongues 6 and 8, on the threading plate 4.

Shuttle for Northrop Looms.

This improvement by Messrs. Cunniff & Cookson and assigned to the *Draper Co.,* consists in providing *new means for guiding* the automatically accomplished entering of the bobbin during the running of the loom, into proper position in the shuttle.

The patent consists (1) in the novel construction of the bobbin holding device in the shuttle, and (2) an inclined guide, located between the jaws of said bobbin holding device.

The first is clearly seen by consulting diagram Fig. 9, which is a horizontal sectional view of the bobbin holding end of a shuttle, it being taken on line *x—x* of Fig. 10. The bobbin holding jaws consist of a relatively thin strip of spring metal, folded upon itself between its ends 1 and then out-turned to form the jaws 2, which are grooved vertically on their inner faces at 3, to engage the usual rings on the bobbin head. A spreader 4 is pushed in between the parallel portions of the jaw bases, the latter and the spreader being secured in the shuttle by means of bolt 5.

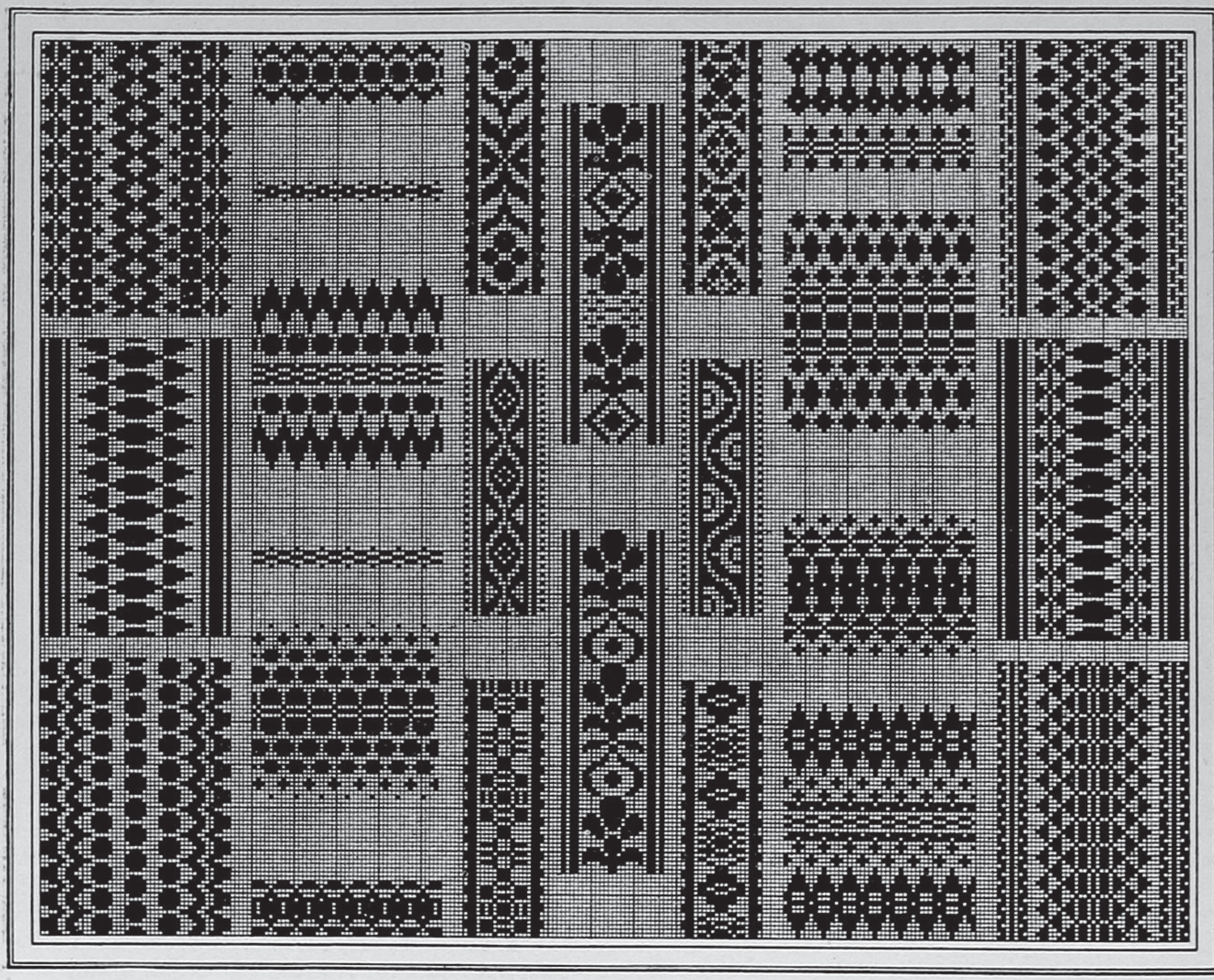
The second device previously referred to, *i. e.*, the inclined guide, is shown at 6, in diagram Fig. 10, and which is a partial longitudinal section of the bobbin holding end of a shuttle. This guide is made of resilient metal, and at its lower end is bent back at 7, to extend between the bottom of the recess 8 and the lower edges of the jaw bases and the spreader 4.

At its upper end the guide is bent down at 9 and then rearwardly extended at 10, upon the tops of the spreader and the jaw bases; the sides of the recess being undercut to receive the edges of the extension 10, the extremity of which is bent to form a downturned transverse lip 11, which enters a notch 12 in the top of the spreader 4, similar notches being formed in the tops of the jaw bases, the engagement of the lip with the notches holding the guide 6 from displacement in the direction of the length of the shuttle.

MOTIVES FOR HARNESS WORK.

(*Continued from page 14.*)

Explanations given on pages 145 and 146 Vol III refer also to this collection of 22 designs, the same calling for from 3 to 10-harness for their execution on the loom, not considering the bordering stripes or edges which only were added so as to more properly separate the various designs in the collection. As will be readily understood the 2nd and the 6th row of stripes, have to be turned 45°, they being shown in their given position to produce a contrast of the designs on the plate.

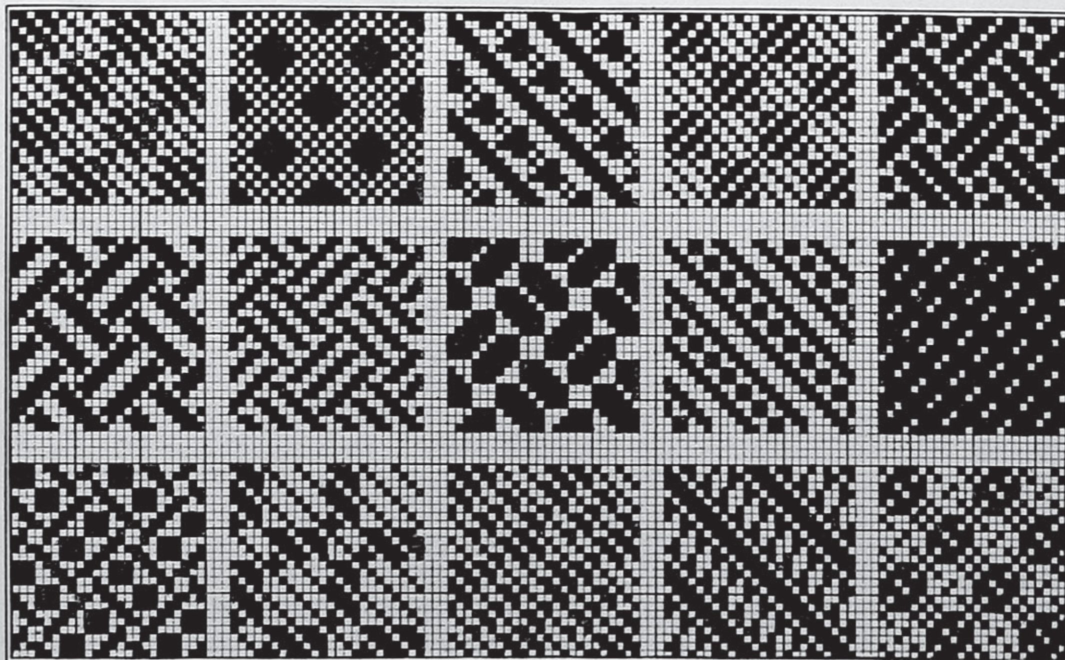


In a bill introduced by Representative Sheppard, of Texas, the Secretary of Agriculture is directed to institute an investigation into the use and substitution of raw cotton for other articles in the various manufactures in the United States and prepare a report which may aid in a campaign for increased consumption of domestic cotton in the United States.

A Massachusetts judge declared that blue bender cotton injures the bleaching possibilities of cloth. Some bleachers say the fault lies in the changed methods of bleaching by which speed is sought.

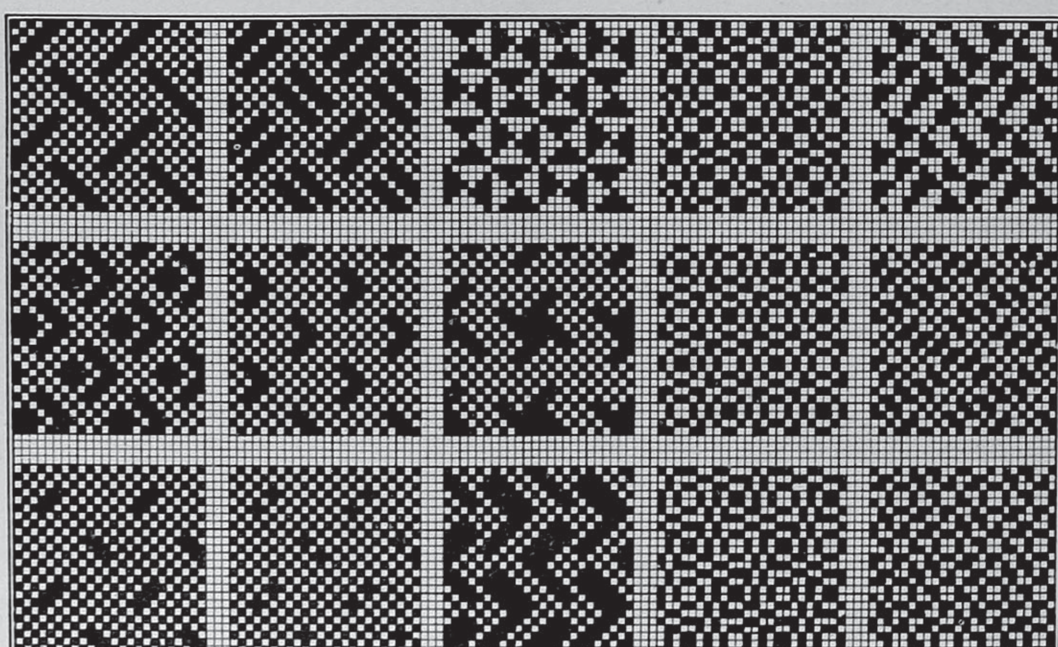
DICTIONARY OF WEAVES.*

TWELVE HARNESS



12 × 12

TWELVE HARNESS



12 × 12

*978 Weaves have thus far appeared in this Dictionary.

FLY FRAMES.

The Process—The "Daly" Differential. The Woonsocket Frame.

The Fly Frames are the machines used in cotton spinning for transforming the sliver, as is obtained from the last process of *Drawing,* into the delicate roving, required by the *Ring Frame* or the *Mule,* to be in either case then transformed into the required yarn.

The process is clearly one of attenuation, doubling being made use of in the several machines only for the purpose of having the resulting roving as uniform and even as possible. This attenuation of the sliver, slubbing or roving, as the strand is variously termed during the process, is obtained by means of roller drafting, the extent to which it has to be carried on depending on the weight per yard of the drawing frame sliver as fed to the first fly frame and the weight per yard of the roving from the last fly frame as is used in the process.

Most often we find three machines used in this process, viz.:

One frame for making *Slubbing,*

A second frame for transforming the latter into *Intermediate Roving,* and

A third frame, for in turn transforming the latter into *Fine roving;* after which, for extra fine counts (additional) a finer roving frame, called a *Jack Frame* is used, whereas in connection with low counts of cheap yarns the intermediate frame is omitted.

The operations required in the production of the roving, whether 2, 3 or 4 machines, frames or processes are used, is the same, *i. e., drawing, twisting* and *winding on bobbins,* each successive machine simply delivering the resulting strand in a more attenuated condition than it received it; thus the weight per yard is less, or what is the same, the number of the roving is higher, *i. e.,* more yards of the roving strand are required to balance one ounce, or one pound.

The name Fly Frames is given to these machines for the reason that *Flyers* form in each machine one of their principal parts; the machines as comprising the set of fly frames used being respectively termed:

(1) Slubber,
(2) Intermediate Frame,
(3) Roving Frame or Fine Frame, and
(4) Jack Frame.

Frames 2, 3 and 4 are also termed *Speeders,* on account of the high speed at which they are run.

Frame 4 is only used in the production of fine yarns, above 60's.

Frame 2 is omitted in connection with cheap, coarse counts of yarns.

All frames used in a set of fly frames are identical in their construction, the only difference being the dimensions, and the systems of gearing; hence any explanations to fly frames given in a general way, refer to all.

The slubber differs principally from the other frames used in the set in the manner of feeding to it. The slivers from the drawing frame, as delivered there into cans, are fed to the slubber from the rear, the cans containing the slivers being placed on the floor behind the machine, one can or sliver to a flyer, *i. e.,* no doubling taking place. The sliver then passes through three pairs of drawing rollers. From the drawing rollers, the sliver (now called slubbing) passes to a revolving flyer, carried upon a vertical spindle, by which it is twisted and the slubbing then wound upon a bobbin revolving loose upon the same spindle. The flyer runs at a constant speed, while the bobbin is driven by means of cones and a differential motion, at a speed varying according to its increasing diameter as the slubbing is wound on. The lifting movement for raising and lowering the bobbin upon the spindle, so as to wind the slubbing in regular coils, is also worked by the same differential motion. The speed of the flyer is from 600 to 800 revolutions per minute. If the slubbing, then for example, is delivered from the drawing roller at 50 feet per minute, and the speed of the spindle, *i. e.,* flyer, is, say, for example, 600 *r. p. m.,* then the number of turn per inch imparted to the roving in this machine is:

$50' = 600''$, and

$600'' : 500\ r.\ p.\ m. :: 1'' : x\ r.\ p.\ m.,$

$= \frac{5}{6}$ths of one turn, per one inch slubbing delivered.

The full bobbins, as made on the slubber, are then placed in the creel on the intermediate frame, the slubbing from two bobbins doubled into one, and thus fed to the machine, being drawn down by the drafting rolls to a finer strand than one of the singles fed, being then in turn twisted and wound onto bobbins for the next frame in the process. The spindles of the intermediate frame run at from 850 to 1100 revolutions per minute, and about $1\frac{1}{4}$ turns of twist per inch are put in the roving.

In the same manner, the full bobbins as made on the intermediate frame are in turn placed in the creel of the roving frame and the roving (doubled) fed to that machine; the same being also true for the jack frame, when it is used.

The roving frame is a duplicate of the intermediate frame, excepting in the arrangement of the rolls and size of its different parts, which are much smaller; the rolls have two ends to a boss or four to the roll. Here the strand of cotton is reduced to such proportions that, under ordinary circumstances, it can easily be drafted in the process of spinning to the required counts. The spindles in this machine run from 1050 to 1250 revolutions per minute, and from 2 to 4 turns of twist per inch are put in the roving according to the hank of roving being made. It is the last process machine in the carding room, unless the fourth or jack frame is used to double and draw the roving finer, in order to reduce the draft to a minimum on the spinning frame or mule, for fine yarns. The spindles in a jack frame run from 1200 to 1800 revolutions per minute.

THE NECESSARY OPERATIONS OF A FLY FRAME ARE:

1st. Attenuation or drafting of the sliver, slubbing or roving.

2nd. Twisting of the slubbing or roving.

3rd.. Winding of the slubbing or roving onto bobbin.

(1) DRAFTING: The same consists in roller drafting, the reduction of the sliver taking place gradually, that is, the draft is made larger in each succeeding frame. The exact amount of the total drafts depends upon the character of the cotton and the counts of the yarn to be spun; the disposal of the total draft among the different frames used in the set being within limits found to be best adapted. The draft on the slubber, when using Mainland cotton is from 4 to 5, for the intermediate frame from 5 to 6, and for the roving frame from 5½ to 6½. When long staple cotton (Sea Island, Egyptian) is used for the production of high counts of yarn, the draft on the slubber is from 5 to 5½, for the intermediate from 5½ to 6½, for the roving frame from 6½ to 8, and for the jack frame, (which would be used in this instance) from 5½ upwards. Variations in the amount of draft on different machines in the set of frames are frequently introduced, in order to obtain the same total draft, the reason for this being easily seen when considering the process as a whole. The three frames through which the cotton must pass, easily allow a variety of divisions in the arrangements of the drafts, which is taken advantage of in making changes only in one or two frames instead of changing all when another hank of roving is to be made, or when one or the other machine falls behind, or is ahead, in production. However, this variation should not be carried too far, the safest plan being to let each frame do its share in the work of making the roving finer.

(2) TWIST: Putting twist into the slubbing or roving calls for a rapidly revolving spindle which carries a flyer placed on the top end, said flyer being so constructed that it can be threaded with the slubbing or the roving, as is the case through its axis of rotation at the top, said strand then being guided through a hole situated out of the centre of rotation, so that as the flyer is revolved, the strand is carried around the centre of rotation and consequently receives a twist for each revolution of the spindle; arrangements being made in the frames whereby the amount of twist, as going into the roving, can be easily and accurately regulated. Although the twisting is a necessity for giving cohesion to the fibres during the winding operation, yet the succeeding processes must be kept in view, and the twist arranged so that the effectiveness of any future drawing action required will not be interfered with by said twist.

The number of turns per inch put in the slubbing or roving depends on the ratio of the revolutions made by the flyer, which puts in the twist, to the number of inches delivered by the front pair of drafting rolls, in a given time.

For Example: Suppose the flyer makes 100 revolutions while the front roll is delivering 50 inches roving; then ($100 \div 50$) there would be 2 complete turns put into every inch of the roving delivered.

Another Example: Suppose the flyer makes 500 revolutions per minute, and a 1⅛ inch front roller made 100 revolutions per minute, what would be the twist per inch?

$100 \times 3.1416 \times 1\frac{1}{8} = 353.43$ inches of roving delivered by front roller in one minute, and

$500 \div 353.43 = 1.41$ twist per inch. Ans.

The amount of twist to put in slubbing or roving is determined by its hank, the quality of the stock that is being used, and the speed of the frame; some overseers for this purpose, in order to ascertain the number of turns per inch to give to the slubbing or roving, multiply the square root of the hank by 1.2; whereas others in connection with slubbing, multiply the square root of the hank by 1, in connection with the intermediate by 1.1, and with the roving frame by 1.2. This latter calculation is preferable and approximately correct, however it must be remembered that a better quality of stock or a slow running frame permits the slubbing or roving to be run with less twist than if the reverse is the case.

(3) WINDING: This is the most complicated of the three operations previously mentioned. The roving is wound on the bobbin by placing said bobbin over the spindle and allowing the delivery portion of the flyer to deposit the roving on to the bobbin, the difference in speed between the flyer and bobbin (each being independently driven, but both revolving around a common axis) being just sufficient to allow the bobbin to take up the delivered roving; the constant changing in size of bobbin, as it builds itself up, requiring a correspondingly changing speed for the bobbin and what is accomplished by a pair of Cones working in connection with the Differential Motion.

The relation between the surface speeds of the flyer eye and the surface of the bobbin may be obtained in several ways, but which practically have been narrowed down to only one system, or at most two, *viz.*:

(a) The flyer and bobbin revolving in the same direction, the flyer eye however being made to rotate at a quicker speed than the bobbin in order that the roving may be wound on the surface of the latter; this system of winding being known as *flyer leads.*

(b) The flyer and bobbin revolving again in the same direction, but in this instance the bobbin being revolved at a quicker velocity than that of the flyer, so that said bobbin will draw the roving from the flyer eye and wind it upon its own surface. This system of winding is known as *bobbin leads,* indicating again the leading feature in connection with the operation.

These are the two methods of winding which have been practically employed, but at the present time, for economy in running the frames, only the last, or *bobbin leads,* is used.

The roving is coiled around the bobbin so that the coils lie side by side in one layer, this being obtained by the upward and downward traverse of the bobbin, the traverse becoming shorter after each layer of roving is deposited, in order to make the bobbin cone shaped at each end.

(*To be continued.*)

FROM LAWRENCE, MASS.

E. A. Posselt:—Received your Journal to-day and like it very much and should like to know if it is possible to get back numbers of the same. L. D. 1-18-09.

COTTON SPINNING.

The Ring Frame.

(*Continued from page 20.*)

RING HOLDERS.—Rings are held in place on the ring rail either by cast iron or plate holders.

The cast iron holder is secured to the ring rail by two screws in front and one screw in the rear of the ring, and by loosening one and tightening the other two screws, the ring can be moved a slight distance for setting it in position. The cast iron holder is made with a split so that it can be sprung open slightly to remove the ring. Fig. 261 shows the double flange ring, made by the Draper Co., set in a cast iron holder, showing also a wire traveler cleaner applied, the same lying in the recess formed on the inside of the holder.

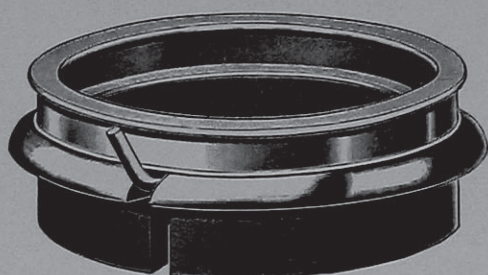


FIG. 261

With the three-screw adjustment, a ring out of round can be brought so nearly into round that the *set* will show it to be practically perfect, and the fact that it will stay where you leave it, is of great value to the spinner.

The plate holder is punched out of a plate of metal, leaving two or three projections for gripping the ring, being also provided with two slots, one on each side, and by which the holder is screwed to the ring rail. These slots permit of adjustment to be made, to centre ring with its mate spindle. Fig. 262 shows us a double flange ring, set in a plate holder, showing also a small ear punched out of the plate and left projecting upwards to serve as a traveler cleaner.

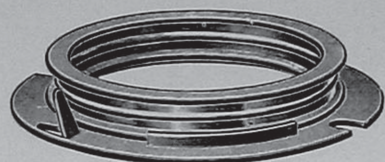


FIG. 262

The advantage claimed for a double flange ring, is that when the top flange becomes worn, the ring can be turned on the holder and its other side used, prolonging in this way the life of the ring. New frames are generally supplied by the builders of the machine, with double flange rings, set either in cast iron or plate holders.

Plate holders are made either round, oval or square. A round holder has been shown in connection with Fig. 262, an oval plate holder with a double flange ring applied to it, as made by the Draper Co., being shown in Fig. 263. This oval holder is provided with two screw slots at *A*, for securing the holder *B* to the ring rail, and two lugs *C* for fastening the ring *D* to the holder *B*. The slots as will be readily understood, are provided for the purpose of centering ring and spindle. *E* is the traveler cleaner as formed by an upturned projection of the plate holder.

A plate holder with a double flange ring applied thereto, made by the Draper Co., is shown in Fig. 264. This holder has also two screw slots *A* for fastening the holder *B* to the ring rail, but has three lugs *C*, for fastening the ring *D* to the holder. *E* indicates the traveler cleaner. Both illustrations (Figs. 263 and 264) are drawn two-third of actual size.

Solid rings are also met with. They are without holders and made to fit the holes in the ring rail with a very slight adjustment by screws, the same as the cast iron holders previously explained. The shoulder on the solid ring or cast iron holder that comes in contact with the ring rail should be wide enough so that when the extreme adjustment is necessary, the shoulder will cover the hole in the rail and leave a smooth finished job.

Plate holders are sometimes made so as to accommodate two sizes of rings of about one-quarter inch difference, the hole in the ring rail then being made to fit the larger size ring, and when then either set of rings, as the case may require, can be used with such plate holders. The size of flange of the plate holder varies, a standard size for use in connection with rings up to $1\frac{3}{4}$ inches in diameter being a $\frac{1}{4}$ inch wide flange, while for larger rings (up to $2\frac{1}{4}$ inches in diameter) a flange $\frac{5}{32}$ of an inch wide is recommended.

SIZE OF RINGS TO USE.—Rings vary in size, running from 1 inch to $2\frac{1}{4}$ inches in diameter, the size to use depending upon the counts and quality of the yarn spun. The larger the ring possible for us to use, the better for production, since the size of ring used regulates the amount of yarn that can be put on the bobbin, and the more yarn possible to put on a bobbin, the less frequent doffing will be required. However, at the same time, we must also take into consideration that the higher the count of the yarn, the smaller the ring used must be, since the higher the count, the lower its breaking strain, *i. e.*, the weaker the yarn. The strain on the yarn during the spinning process is the greatest when winding onto the empty bobbin, and when the difference in size of ring used will be a most important item to be taken into consideration. The yarn in passing between traveler and empty bobbin is there subjected to its greatest strain, and it is then the hardest for the yarn to pull the traveler around. The larger the difference between the diameters of ring and bobbin, the greater the strain then on the yarn under these conditions, whereas the less the difference between these two diameters, the less the strain on the yarn, since in the latter case the yarn then approaches more nearly in a tangent to the ring, and consequently will start the traveler more easily. In the first instance, the pull of the yarn is more of a direct strain on the ring, while in the latter, said pull is more in the direction of the revolution of the traveler, so that the latter instead of being strained against the ring, is then mostly impelled in the direction of its revolution. For this reason, by either decreasing the size of the ring or increasing the size of empty bobbins used, this strain on the yarn can be regulated. This will explain why in connection with filling yarn and which receives less twist than warp yarn, and which consequently is a weaker yarn, smaller rings are used than with warp yarns of the same counts, although the difference in the wind permits smaller rings to be used, on account of the filling bobbins being destined for weaving, *i. e.*, the filled bobbin must fit in a shuttle, and for which reason it must be smaller than a warp bobbin. When using smaller rings, the difference in the angle of pull of the yarn is less, for which reason there is less variation in the stretch of yarn, as well as in the twist, which also slightly varies between starting of bobbin and full bobbin. However, there is a limit as to the smallness of rings to use, on account of loss in production, the same as there is a limit to the largeness of rings permissible to use, on account of the unequal strains and twists, besides the impossibilities of handling such large bobbins in the after processes. The kind of cotton used also influences the size of the rings we have to use. Points given, will explain the fact why warp and filling yarns of the same count require different sizes of rings to use. The proper size of the ring and the length of the traverse to use for any number of yarn, are points requiring practical experience, although there are certain sizes known to be best adapted for use in connection with certain counts of yarns. The finer the yarn, the smaller the ring and at the same time the shorter the traverse.

One of the most important changes in the use of rings has been the recent use of considerably larger rings in spinning the lower counts. The recent improvement in spinning coarse numbers, say from 10's to 30's warp yarn, made it possible to change from a $1\frac{3}{4}$ to $1\frac{5}{8}$ inch ring, as used years ago, to a $2\frac{1}{4}$ to 2 inch ring, changing at the same time a $6\frac{3}{4}$ to a $7\frac{1}{2}$ inch traverse. When this change was first made it was ridiculed, no spinner then believing that a ring as large as 2 inches, nor a traverse as large as 7 inches could be used, whereas now all mills installing new machinery, order the large ring and long traverse; at the same time in cases where the frames are not too old, the large ring and long traverse are substituted. In the same way, twenty years ago it was thought impossible to spin 50's warp yarn on rings larger than $1\frac{1}{4}$ inch and $5\frac{1}{4}$ inch traverse, whereas now $1\frac{5}{8}$ inch rings with a $6\frac{1}{4}$ inch traverse in connection with 50's warp yarn are standard dimensions, while some frames are run with as high as $1\frac{3}{4}$ inch rings and a $6\frac{1}{2}$ to 7 inch traverse. Large rings and long traverse, within the limits thus referred to, not only increase production and consequently reduce cost of spinning, but at the same time do away with a considerable amount of spooler's knots, one of the greatest evils in a cotton mill. At the same time, however, it must be remembered that dimensions quoted mean the limit for counts of yarn quoted, for the reason that when the

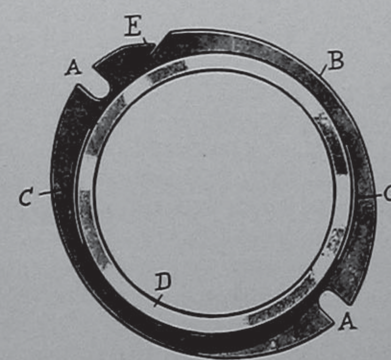


FIG. 263

bobbin is too heavy, and since spoolers are running at a high speed, there is considerable breaking of the ends, hence increase in the amount of spoolers' knots made.

Standard sizes for rings and traverse to use for warp yarn are thus:

10's to 20's	$2\frac{1}{4}$	inch	ring	and	$7\frac{1}{2}$	inch traverse.
20's " 30's	$2\frac{1}{8}$	"	"	"	7	" "
30's " 40's	2	"	"	"	$6\frac{3}{4}$	" "
40's " 50's	$1\frac{3}{4}$	"	"	"	$6\frac{1}{2}$	" "
50's " 60's	$1\frac{5}{8}$	"	"	"	$6\frac{1}{4}$	" "
60's " 70's	$1\frac{1}{2}$	"	"	"	6	" "
70's " 80's	$1\frac{3}{8}$	"	"	"	$5\frac{3}{4}$	" "

The ring on a filling frame should be $\frac{1}{4}$ inch larger than the bottom of the cone on the bobbin. The yarn on a filling bobbin should be wound so that the size

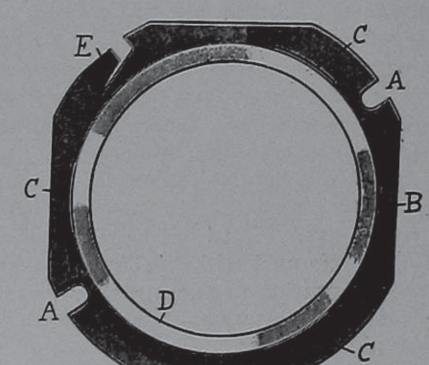


FIG. 264

will be uniform from bottom to top and not larger than the bottom of the cone. A $1\frac{1}{2}$ inch ring is about right for yarn coarser than 30's, and for finer numbers, up to 60's, a $1\frac{3}{8}$ ring gives good results. For still finer yarn, up to 100's use a $1\frac{1}{4}$ inch ring. It goes without saying that a good ring is required, one that is round; try them all and reject those that are not up to the standard.

(To be continued.)

Practical Hints on Fine Cotton Spinning.

Sampling Raw Cotton.

There can be no doubt as to the practical value of the regular testing of the cottons used in cotton spinning mills. Especially is this so where the finer counts of yarn are spun, and consequently more expensive classes of cotton are used. Again, any variation in quality is more seriously felt; and the results, both to the spinner and to the manufacturer, are more acute in the yarns of higher quality and counts. Managers are fully aware of the multitudinous complaints that follow on a period when *bad spinning* has been reported, from discontented spinners on account of increased work and reduced wages, loss of production, and the knowledge that it will take some time before the faulty material can be run out from the creel bobbins; added to which is the fact that in nine cases out of ten complaints from the weave room will follow, caused by weak yarn, irregular strength, slubs, etc. These defects are a few of the results of cotton below the expected quality getting into the mixings. One of the best criterions of the efficient management of the mill at all points from mixings upwards, is the freedom from broken ends at the ring frames or the mules. To see the spinners with all the ends up and taking work easy, is the best gauge of good working and of cotton mixings well up to standard.

Some firms (abroad) consider the sampling of the various mixings and cottons to be of sufficient importance to call for a special sampling plant in the form of a few small machines—card, drawing frame, fly frames, and ring frame. In the case of very large firms, this expenditure will be quite justified by improved spinning results. This answers very well for testing the small *brokers' samples* of new cottons and new crop cottons, as a small amount of raw cotton can be efficiently tested. Such a plant would also enable a comparison of the spinning qualities to be made, and raw cotton may be spun into yarn in about one to two hours without interference with any full size machine in the mill; and, moreover, the test would be quite private, which is sometimes desirable.

Apart from these samples of new cottons, however, there ought to be a reliable test made each week from the regular mixings. First let it be stated that sampling must be performed with intelligence, and ought to have the supervision of the manager to some extent. There is considerable labor and watchfulness necessary, and if trusted to other than responsible officials the tests are often misleading and inaccurate. A good method is to take a sample of 50 or 100 lbs., carefully pulled from the mixing to be tested and pass it through all the machines up to and including the card in this quantity. Care must be exercised to clear the machines of waste before sampling, and to see that no faulty weighing occurs. The same machines ought also to be taken each week for the purposes of comparison of tests. The features to be noted would be:

(1) Loss at each machine.

(2) Net weight of sliver obtained from the 50lb. of raw cotton.

(3) Invisible loss.

The raw material should be allowed to stand for several hours in a warm room in order to expel surplus moisture before the test, and the same treatment in this detail must be adapted at each test, and the loss noted by weighings before and after exposure.

The result of a sample test taken in the manner indicated is given herewith. The test was 100lb. of good Egyptian cotton intended for yarns of average counts of 70's:

	Lbs.	Oz.
Cotton	100	0
Loss in drying	1	0
Weight of finished scutcher laps	95	12
Loss in scutching processes	3	4
Net card sliver	87	9
Card waste accounted for	7	3*
Invisible loss	1	0
Total loss to carding	12	7
*Particulars of Card Waste		
Flat strips	4	6
Taker-in waste	2	0
Stripping brush waste	0	13
Total	7	3

A weekly test such as given, would enable the detection of any falling away in quality of the mixing before the mischief had assumed large proportions. The entrance of cottons below grade would be noticed by the increase in waste shown, and any diminution in the strength of staple would be found by the test of the yarn spun from the sample slivers passed through the usual machines.

Waste Percentage Checking.

It is essential that a constant check be exercised at the different machines to prevent the production of excessive waste, especially when the higher-priced cottons are being used. Cotton-spinning machinery is all liable to increase the waste production as time goes on, if the various settings are not kept up to gauge. The carding engine and the comber are both especially guilty in this respect. An examination of the waste made at these machines, even when the settings have been carefully performed, will show that much good fibre which might go forward and make strong yarn is being thrown out into the waste boxes. It is this fact which has led many spinners to try to use up this waste in some manner, and its extended use by mixing again with the good cotton has been the cause of serious trouble afterwards.

Let us consider the waste production at the three chief waste-makers, *viz.*, pickers and scutchers, cards, and combers.

Picker and Scutcher Waste.—The waste made by these machines depends on the amount of heavy impurities in the cotton; these impurities must be driven out, and if no long fibre is present we can assume the waste made to be essential to clean yarn. There should be no difficulty in regulating this waste when once the machines have been set to suit the cotton, since we do not find a great fluctuation in the percentage of the heavy impurities. If this should occur, the adoption of one or more of the following alterations would be satisfactory:

(1) Alteration of the dirt bar spaces.

(2) Alteration of the speed of beaters.

(3) Alteration of the speed of the machine itself to lessen production per week.

CARD WASTE.—There are several interesting points to notice. There is the question of the proportion of waste taken out at the back or taker-in, which is termed *grid fly*, as compared with *flat strips*. The knives and grid under the taker-in are essential for removing any remaining heavier impurity, such as leaf, motes, sand, etc. The waste at this part therefore cannot sell for a high price, because these impurities will always be mixed with any fibre taken out at this point. It follows, then, that it is more economical to limit this waste to contain only the very shortest of fibre, and to endeavor to put the bulk of the waste material in the flat strips.

The question of the surface speed of the revolving flats is worthy of a few observations. We can have a quickly moving flat and a light waste strip, or a slower flat speed and a heavier strip. A surface speed of 3½ to 4 in. per minute of flats will be found to answer well in carded yarns, but in combed yarns we could reduce this to from 2½ to 3½ in. per minute. A strict eye should be kept on the strips of waste being left by the flats, and any cards which show thick strips should be tested to see if the front stripping plate is set too far from the cylinder surface. A good way is to periodically weigh six or eight strips from various cards and correct the heavy ones by closer setting. There is no doubt that much of the waste taken out by the card at this point would, if a more perfect selection were possible, be quite long enough in staple to pass forward as good material. This fact is clearly shown by the strength of yarns spun from a mixture of flat strip waste and good cotton, thus proving the presence of much good staple in the former.

COMBER WASTE.—It is well known that the combing machine is ever ready to take out a large amount of waste, and it is necessary to keep a careful check on the combers in the mill to prevent this being excessive. The whole of the combers should be tested separately for waste at each head at least once per fortnight. The cause of waste variation will usually be found to be the derangement of some setting screw which is temporarily causing a wrong timing of the top comb, nippers, or feed mechanism. The amount of waste to take out at the combing machine will depend upon the yarn to be produced and the requirements of the customer. A yarn of high quality and strength will require 15 to 18 per cent of waste taking out at the comber, but the poorer qualities would require only from 12 to 15 per cent.

An examination of the waste being thrown into the comber boxes will soon decide whether a reduction might be made in percentage; but assuming previous sampling to have been consistently done, we should be acquainted with any probable effective economies to be attempted at this important stage. If we are to err at all, it ought always to be on the side of maintaining the strengths of the yarn well up to standard, especially so during a time of trade declension.

OTHER SOURCES OF WASTE.—RE-USING OF WASTE.

We might mention three other sources of waste: (1) Roving waste from fly and ring frames or the mules, (2) under-clearer waste from spinning frames; (3) soft cardroom waste.

These three classes of waste have received considerable attention during late years, and as a result many firms have effected a considerable saving by their treatment of such. Up to comparatively recent years the idea that the cotton fibre was much weakened by passing it through the various machines was accepted in an undoubtedly exaggerated degree. No doubt cotton machinery was less perfect thirty years ago than to-day, especially with regard to pickers and scutchers, which perhaps more than other machines are especially severe in their action. The chief loss of strength arises from the fact that the fibres lose some of their natural tendency to twist together, and consequently waste mixings become soft and difficult to spin. Certainly it was the custom to sell to the waste dealer all the waste included under the first and third headings just mentioned; but this method is now becoming obsolete, and all roving waste from the spinning department, and soft waste such as *bobbin waste*, and good cotton from the cards and drawing frames and cardroom processes, are now put back to mixings and respun.

The best way to treat this waste so that it may mix well with the cotton from the bale in a uniform quantity is to employ a waste opener. These are usually some form of porcupine cylinder with a slow feed part and regulator motion. Provided the machine is capable of thoroughly opening the hard twisted roving waste no harm can result. The neatest application of the opener is to couple the outlet pipe to the feed pipe of an exhaust opener, and allow the air current in the latter to draw the fleecy waste regularly and evenly amongst the raw cotton passing along to form the lap.

Some mills prefer to run this waste only into filling lots, as they can do with a softer yarn for this purpose, whereas others pass it equally to all the mixings, and so reduce the proportion at each.

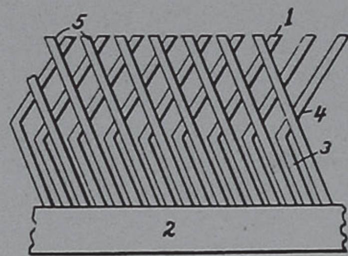
At the present time the waste from the underclearers of the spinning frames is sold to the waste dealer. Though it contains a large amount of good, long staple, the presence of hard lengths of yarn does not permit of its use for re-spinning into yarns of good quality. In conclusion, says Fine Spinner in "The Textile Manufacturer," it ought to be pointed out that even those forms of waste which are now respun at the mill ought to be kept as low in quantity as possible by a continual check at those points where the waste is created.

FROM TRENTON, N. J.

E. A. Posselt:—Please excuse tardiness in meeting the payment of your Journal, which I would hate to be without, and enclosed you will find money for the present year's subscription. H. J. H. 1-24-09.

A New Construction of Card Clothing for Woolen Carding.

This card clothing is intended for covering the stripper rolls of a woolen card, the novelty of the clothing consisting in that its teeth are arranged to pitch in two (opposite) directions, in turn obtaining two results from every stripper roll of the card thus covered with this clothing, viz:

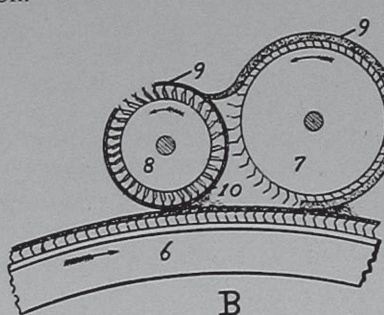


A

(a) Stripping its worker, as it does now if covered with common card clothing as now made, and

(b) an additional carding point between stripper and swift.

To illustrate the subject to the reader, Diagrams *A* and *B* are given, and of which Diagram *A* is a side view (enlarged) of a strip of the new kind of card clothing. Diagram *B* is a working illustration, showing a portion of the swift, one worker and one stripper roller, also showing the carding and stripping of the stock (film) under operation. A piece of this film is shown in one place broken out, in order to reveal the position of the teeth of the carding clothing on the stripper roll.



B

Card clothing as now used, has teeth which are bent towards their points at an angle with the radial lines of the cylinder to which they are attached. When clothing with such teeth is run point to point, as a rule, carding will take place. On the other hand, if the teeth are set with their points in the same direction and the cylinders run at different speeds towards the points of the card clothing teeth, the cylinder with the faster surface speed will strip or brush the film from the other.

The new card clothing as shown in Diagram *A* has certain rows or sets of bent teeth 1 of the ordinary construction. These teeth start backward at a reverse angle from the foundation 2 of the card clothing to form a leg 3, and are bent to pitch forward to form a leg 4. Thereby a sort of hook is formed, the point of which is in advance of its base. The other teeth 5 are straight, pitching backwards substantially in the same direction with leg 3. The rows of straight teeth 5 and of bent teeth 1 may be arranged singly, or a plurality of rows of straight teeth can alternate with a plurality of rows of bent teeth.

The card clothing may be made of staples with two bent legs which alternate in different combinations with staples having two straight legs, or staples may be used having one straight leg 9 and one bent leg.

With reference to Diagram *B*, numerals of references indicate thus: 6 the swift, 7 one of the workers and 8 one of the strippers of a card; the latter being covered with the new style of card clothing. From this diagram it will be seen that the swift 6 travels forward with its teeth pointing forward, workers 7 travel backward with their teeth pointing forward. Carding takes place between the workers and swift, and a certain amount of film 9 is carried over and back by the workers 7, all in the usual manner.

With reference to strippers 8, its new combination card clothing is attached so that the points of the bent teeth 1 point to point with those on swift 6 and those on the workers 7. The workers 7 travel in the opposite direction from the swift 6, at a much slower speed, and their teeth are point to point with those on the swift. Stripper workers 8 travel in the same direction as workers 7, at a much greater speed, but at a considerably less speed than the swift 6.

For example, if the surface speed of the swift 6 is 1000′ *p. m.*, the surface speed of the workers 7 will be 16′ *p. m.*, and that of the stripper workers 8, 250′ *p. m.* This arrangement brings the straight teeth 5 in a proper stripping relationship with the teeth on the workers 7.

From explanations given, it will be readily seen that a carding takes place between the bent teeth 1 of stripper workers 8, and the teeth of the swift 6. The straight teeth 5, on the other hand, have sufficient slant to effectively strip the film 9 from workers 7 carrying it over and back until it again reaches the point of contact with the swift 6. Such stripping would take place to some extent without straight teeth 5, but it would be a brushing or tearing off of flakes, and would not be as smooth and perfect. As stripper worker 8 travels at a much higher surface speed than worker 7, it will be readily seen that the film 9 will be attenuated thereby and that it will be brought in carding contact with the teeth of the swift 6 more frequently than if the stripper worker 8 traveled at a slower speed.

A certain amount of thin film 10 is picked up from swift 6 and is retained on the bent teeth and on the straight teeth of stripper worker 8, and this is carried around and merged with film 9 until properly carded.

The result of using the straight teeth 5 on stripper worker 8, it is claimed, is that they strip in a clean and efficient manner to film 9, which is carried over and back by the worker 7, thus leaving the teeth of worker 7 clean and in good condition to card with the swift. Moreover, straight teeth 9, it is claimed, also hold firmly the thin film 10, which is carried up and back by stripper worker 8. For the last named reason, the film 10 is not ruffed up by the teeth of worker 7, and is not torn off and rolled up and thereby making uneven work.

Points claimed for this card clothing of strippers for woolen cards are:

(1) That a thin film 10 is formed on stripper worker 8 and is firmly held there, but that any excess of stock is carded or is carried forward by the swift.

(2) The film on stripper worker 8 does not sink into the teeth, but is carried firmly by the points thereof, on account of the teeth crossing each other near their points, and thus holding the stock well up.

(3) The constant brushing which the film 10 on stripper worker 8 gets from the smooth backs of the teeth on worker 7, cleans all grease, very short stock and other dirt from it, thus improving its condition. This keeps stripper worker 8 at all times clean and free.

(4) Instead of one carding point, between the worker and swift, we get two, that is we get an extra carding point between the stripper worker 8 and the swift 1, thus utilizing the space ordinarily occupied by the strippers.

A STUDY OF KNITTING.

(Continued from page 155, Vol. III.)

Knee and Ankle Splice.

This attachment to the well known Brinton Rib Top Machine (as described in the July, August and November issues of the Journal) is used principally for making Misses' ribbed stocking legs with reinforcements at the knees and ankles, however, leggins wristers, etc., may also be made on the machine by changing the pattern wheel and length of pattern chain.

In order to make a splice in the fabric, *i. e.*, produce a heavier and stronger section in the fabric, an extra thread is fed to the single yarn carrier of the Rib Top machine at the proper time. After making the splice, said extra thread is withdrawn from feeding.

When this extra thread is fed to the yarn carrier for insertion into the fabric, the rib stitch which is being made must be longer than for a single yarn, as otherwise the fabric would be too tight. For this reason, the movable cylinder cam must be lowered in order to make the slack course stitch during the time of splicing.

The attachment for making the splice is shown in Fig. 27, which is a side view with the parts shown in the position when the extra thread is being run. The attachment is secured on the cam cylinder by screwing the post *A* into the cam cylinder, and by having the piece *B* screwed to the side of said cylinder, thus having the attachment revolve with the cam cylinder, it being placed radially from the hole in the yarn carrier which is also carried by the cam cylinder.

The device consists principally of a pair of jaws *C* and *D* which are pivoted on top of the post *A*, the movement of said jaws being similar to a pair of scissors.

The extra thread to be inserted into the fabric with the regular yarn, is passed between the ends *E* of the jaws *C* and *D*. These ends are held normally in contact with each other by means of a rod *F*, being passed through the jaws *C* and *D* on the opposite side of the pivot from the ends *E*, and having a spring placed on one end of said rod to press these ends toward each other. By having the ends *E* thus in contact with each other, the thread is gripped by them and prevented from being delivered until released. Secured to the piece *B* is a projection *G* in which a lever *H* is centered at *I*, this lever *H* extending up and between the outer ends of the jaws *C* and *D*, and having a portion *J* on each side near the top beveled in order that it may more easily spread the jaws *C* and *D* when pushed in. To also assist in this, the inside surfaces of the jaws are beveled near the ends. The top end of the lever *H* has a thread guide *K* through which the yarn is

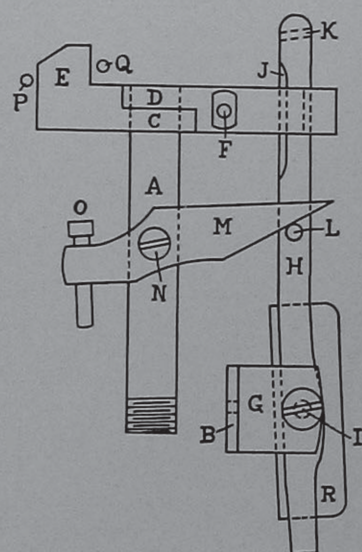


FIG. 27

threaded in its passage to the ends *E*. A pin *L* is situated on the lever *H* about half way down its length, which is directly under a beveled side of a lever *M* as pivoted at *N*, the other end of said lever carrying a screw *O* which presses against the inclined surface plate *G* shown in Fig. 25 of Brinton's Rib Top Machine (see page 154) at the proper time, thus lowering the movable cam *J* in the same figure, in order to make the long stitch for the splice.

The action of the device is as follows: When the splice is called for, a bob pin is struck by the inside surface of the lower end of the lever *H*, thus forcing that end outwardly, which in turn forces the upper end inwardly, causing it to wedge itself between the jaws *C* and *D*, against the action of the spring on the rod *F*, and thus open them, which action also causes the ends *E* to open and free the extra thread. The thread is now allowed to pass along with the regular thread, it being held up in contact with said regular thread by means of a wire *P* and held down on the other side of the ends *E* by a wire *Q*. At the same time, the pin *L* comes against the bevel end of the lever *M* and forces it up and consequently the other end carrying the screw *O* down, thus making the long stitch, as explained.

When the splice has been made a bob pin comes in the path of the outside edge of lever *H* and throws it in and the top end out. The jaws *C* and *D*, thus being freed, come together and the ends *E* grip the thread. The pin *L* is also brought from under the lever *M* and the screw *Q* releases the cam, in this way making the regular stitch again. The bob pins mentioned are controlled by the pattern wheel.

Two rows of holes are provided on the pattern wheel, but on the opposite side from the regular pattern holes, these holes being nearer the centre of the pattern wheel than the regular pattern holes. A screw in the outer row of holes will cause a lever resting on said screw to raise a specially shaped bob pin, as situated on the cam cylinder ring, which will throw the bottom end of the lever *H* out when it comes around and consequently the top end will move in, thus causing a feed of the extra yarn, while a screw in the inner row of holes on the pattern wheel will cause a lever to raise another specially shaped bob pin, which will in turn, as the cam cylinder revolves, throw the lower end of the lever *H* inwardly and the top end out, thus stopping the feed of the extra yarn as explained.

A pressure spring *R* is placed on the bolt at *I*, and presses against the lever *H*, in order to hold it in the desired position when moved by the bob pins.

The cone for the extra yarn is placed directly over the centre of the revolving mechanism and revolves with it, in this manner allowing the feed to cease without tangling and breaking the yarn from the cone.

(*To be continued.*)

Dont Cut Prices Until Profits Vanish.

A Hosiery subject, for sake of an example:

When strawberries are put on the market early in the season at 50 cents a box, I am tempted to buy a box by way of a treat. I buy two boxes when supplies come in and the price falls to 25 cents. When the inevitable glut comes and the fruit is marked down to two boxes for 10 cents I buy a bushel or so, enough, in fact, to fill me—and "missuses" jam-jars. But strawberries are perishable and stockings are not; one must be sold or it perishes, while stockings will keep. Hence if one finds the toes becoming "looped and windowed" and the heels so transparent that darning is a vain task one replaces them with new ones at, say, 50 cents a pair. If they drop later to 35 cents, I regret I didn't wait a little longer. When some enterprising tradesman marks them down to 25 cents a pair, then, for the sake of economy, four pairs are bought by the thrifty buyers. But the average man, being only an ordinary biped and not a centipede or a freak out of a museum, *does not wear four pairs at once*. They are simply put aside in reserve, and the "cheap" lines sold "at a sacrifice to clear," etc., only serve to keep the other goods—at ordinary and reasonable prices—lying on the shelves. For people will not buy stockings just to look at, or gloat over, and they can't be served up with cream like strawberries.

Why, then, says The Hosiery Trade Journal, should manufacturers, apparently of sound mind, continue to cut and cut and cut prices until profits vanish and their peace of mind—which is of far greater value—disappears too?

China Wool.

Wool, one of the largest exports from the north of China, is an export which goes almost entirely to the United States, we having taken in 1907, 273,909 hundredweight, valued at $2,235,000. The total exports to all countries were but 355,829 hundredweight, at a valuation of $2,938,000. Of the difference, Japan took roughly one-fifth of the amount consumed by the United States, while Great Britain took the balance.

Almost the entire trade originates in the north, Tientsin alone having a practical monopoly of the business. Not another port is of any great importance, with the exception of Chungking, on the upper Yangtze, and Szechuan, on the Tibetan-Turkestan border.

Some 25,000 hundredweight of camel's wool annually go to Great Britain, also through Tientsin, the same country taking from the same port almost all of the goats' wool, about 10,000 hundredweight per annum. Neither of these last two articles find their way to the United States. The Tientsin wools are not from the immediate country about that port to any great extent, but come from the interior.

After obtaining fine prices for China wool for several years, many speculative shipments were made to the United States, when the financial troubles toward the close of 1907 caused a sudden drop in the market. There were reduced demands and declining prices, one of the largest China wool firms failing while others are still holding stocks in New York which they cannot dispose of.

This year's wool will begin to come onto the market soon, but matters, according to the report of Consul E. Vollmer of Tsington, are reported to be looking up a bit and a rise and better business are looked for in the near future.

The great trouble with the northern wools is that they are greasy and often very sandy. To do away with these undesirable elements much of the wool is of a grade that it pays to treat it in China, either by sun drying or dusting, before packing for shipment. The Shanghai wools are moist and greasy and unless sun dried are apt to lose heavily in weight in shipment, sometimes when heated even being liable to a chemical action very damaging to the fibre.

On the whole, China wool is shipped unsorted. With only some of the Tientsin fleeces is it profitable to sort into different staple lengths. The Tientsin wool, being less damp than that of Shanghai, generally loses little weight in shipment unless stowed close to the boilers. Washing has been tried with some of the Tientsin wools, but this is only an experiment.

Quality, on the whole, counts less with China wools than condition, the important feature being to get the sand and grease out and pay less attention to fineness, coarseness, and length of staple.

WOOL SCOURING AND DRYING.

A Description of the Process and Machinery for it.

THE WOOL SCOURING PROCESS.

(*Continued from page 24.*)

There are two entirely distinct processes which may be adopted for wool-scouring, *viz*, the *emulsion* process and the *solution* process.

The former is the one commonly employed and depends for its efficiency upon the properties possessed by certain bodies, especially alkalies, of so acting upon oils and fatty matters that they are mechanically divided into very minute particles which do not again easily coalesce. In this condition the oil forms a milky liquid, and is readily removed from the wool. In the emulsion process a solution of carbonate of soda or other alkali is therefore employed, the wool perspiration being thereby dissolved and the wool fat and added oil emulsified.

The solution process, perhaps better known as scouring by means of volatile liquids, is, theoretically much simpler and more economical than the ordinary process. It has a wider application on the Continent than in this country, and is the process of cleansing the wool by means of light oils—ether, naphtha and benzine being those chiefly used. The volatile nature of these oils is such that any liquor which remains on the wool fibre after scouring soon flies off, leaving the wool free from any ingredients that will be harmful to its spinning properties. These light oils, however, are very dangerous to use, owing to their inflammable nature. They have however one great advantage, and that is, they can be used over and over again, and when carried out properly this is a cheap process.

The Emulsion Process.

SCOURING AGENTS: The following are the alkalies chiefly employed: Carbonate of soda, soap, ammonia, ammonium carbonate, sodium silicate and potassium carbonate are also used to a small extent.

Carbonate of soda is sold in several different forms. *Soda ash* is an impure carbonate containing about 70 to 95 per cent. Na_2CO_3. Among the impurities in this substance caustic soda is of frequent occurrence, and the injurious effect upon wool of even very small amounts of caustic alkali has already been insisted upon. It is therefore very necessary to have a simple means of detecting the presence of caustic soda in carbonate. To do this, dissolve ¼ oz. soda ash in pure water, and add to the solution an excess of a strong solution of barium chloride. This will precipitate all the carbonate present as barium carbonate, and this being removed by filtration, the clear liquid will contain only caustic soda, if present in the original substance, along with sodium chloride, and the excess of barium chloride; and the two latter being neutral salts, caustic alkali is rendered evident by adding some suitable indicator, *i. e.*, phenol phthalein, to the solution.

The test, put as concisely as possible, consists in dissolving the soda ash in water, adding excess of barium chloride, filtering, and adding phenol phthalein. When a pink color is immediately developed caustic soda is present, but the solution remains quite colorless in its absence.

There are several forms of carbonate of soda in the market, which while guaranteed to be absolutely free from caustic alkali, are only slightly more costly than the much more impure soda ash. Such are the so-called *pure alkali*, which is a practically pure and anhydrous carbonate, containing 98 to 99 per cent. Na_2CO_3; *crystal carbonate* or GRAN-CARB-SODA, which is a beautiful preparation of the composition $Na_2CO_3H_2O$, containing 85.40 per cent. of Na_2CO_3; and *washing powder* or *washing soda* which is a mixture of pure alkali and the by-product or sludge from the manufacture of bi-carbonate of soda, containing 42 to 51 per cent. of Na_2CO_3 and 34 to 43 per cent. of $HNaCO_3$ (bi-carbonate). The ordinary preparation, known as *soda crystals* or *sal soda* has the composition Na_2CO_3, 10 H_2O, and thus contains 62 per cent. of its weight of water.

Soaps, both hard and soft, are used as scouring agents. The composition of soap may be explained in a few words. Any combination of an acid, with a base, is termed a salt; thus hydrochloric acid united with sodium produces common salt, which may be prepared according to the following equation:

$$\underset{\text{Caustic Soda.}}{NaOH} + \underset{\text{Hydrochloric Acid.}}{HCl} = \underset{\text{Common Salt.}}{NaCl} + H_2O$$

Soaps are salts containing *fatty acids* (oleic, stearic, etc.); *hard* soaps resulting when *sodium* is the base, while *potassium* gives rise to *soft* soaps, thus:

$$\underset{\text{Caustic Soda.}}{NaOH} + \underset{\text{Fatty Acid.}}{\text{Oleic Acid}} = \underset{\text{Hard Soap.}}{\text{NaOleate}} + H_2O$$

$$\text{and } \underset{\text{Caustic Potash.}}{KOH} + \underset{\text{Fatty Acid.}}{\text{Oleic Acid}} = \underset{\text{Soft Soap.}}{\text{K Oleate}} + H_2O$$

Any soap, when unskilfully made, is liable to contain caustic alkali, but potash soaps are, on account of the method adopted in their manufacture, particularly liable to this defect. It is therefore a great mistake to suppose that soft soap is a less severe scouring agent than hard soap, the exact opposite being usually the case.

A very simple test sufficing to show whether uncombined alkali is present may be here introduced: Pour on to the soap a small quantity of an alcoholic solution of phenol phthalein, when the production of a red color indicates that free alkali exists.

Fatty acids are capable of combining not only with sodium and potassium, but with other metallic bases, such as calcium, magnesium, iron, etc., and the compounds thus formed being insoluble in water and of a sticky nature, are very difficult to remove from wool to which they have once become attached. On this account it is very undesirable that soap should be used as a scouring agent when the water is at all hard, *i. e.*, contains much lime or magnesium, since if these are present a decomposition of the soap ensues with production of the before mentioned insoluble soaps.

Ammonia is a mild scouring agent. The ammonia liquor of commerce of 0.88 sp. gr. contains about 33 per cent. of ammonia, the remainder is water.

WATER: The water at our disposal for wool scouring is a most important item, since it is essential to have a water which will neither injure the wool fibre nor waste the scouring agents.

The impurities in water may be of two kinds, *viz,* those which are merely mechanically mixed with, or suspended in, the water, and those in a state of solution. Water containing suspended impurities will, of course, appear more or less turbid or muddy, while if dissolved impurities only are present it will be quite clear and probably colorless. Suspended impurities are thus visible to the eye, and may be got rid of by mechanical means, whereas dissolved impurities can only be detected by chemical reactions, and require a chemical treatment for their removal.

Mechanical Impurities consist principally of mineral matter, in the form of mud and sand, organic matter from the banks of the stream or the gathering ground, and solid matter turned into the river by works or towns situated higher up the stream. The composition and amount of these is very variable, not only in different places but also at any given place at different times. Generally speaking, however, they do not cause much trouble, unless present in large amount; although, if oxide of iron is found, the water cannot be considered fit for use in scouring operations until the iron has been removed. All suspended impurities may be got rid of by means of settling tanks or reservoirs, or by filtration.

Dissolved Impurities are more important than the suspended matters, and since by far the greater portion of the soluble matter forming the earth's crust consists of salts of lime and magnesium, these are the chief impurities found in solution; in fact, natural waters, almost without exception, contain more or less calcium or magnesium compounds. Other substances, also, are frequently found, and for technical purposes the dissolved impurities may be classified as follows: (1) Lime and magnesium salts; (2) Compounds of iron; (3) Alkaline impurities; (4) Free acids and acid salts.

When soap is one of the scouring agents employed, the use of water containing calcium or magnesium salts in notable amount is very objectionable, because this leads to the formation of sticky insoluble lime or magnesium soaps, which are not only quite useless as detergents, but become fixed upon the wool in such a permanent manner that they cannot be removed by washing with water. This results in a waste of soap corresponding to the amount of metallic salts present, and there is also the probability of trouble in the subsequent dyeing operations. In the case of some dyestuffs, the lime soap acts as a *resist,* preventing the fixation of the dye, and thereby causing light-colored or white spots. With other coloring matters it plays the part of a *mordant,* thus producing darker colored irregularities, *i. e.,* when dyeing with magenta, the *fatty acid* of the lime soap acts as a mordant, while in the case of alizarin the *calcium* or *magnesium* is the combining body.

Iron, lead, or copper salts act in a precisely similar manner in this case to calcium or magnesium; but with iron the defect is greatly accentuated, because the iron soap possesses a brown color, and iron mordant gives dark, dull shades with most coloring matters.

It should be remembered that an amount of soap is destroyed equivalent to the *total* amount of metallic salt present, and not merely an amount corresponding to the carbonates.

Free acid, if present in the water, will also decompose its equivalent of soap, but, since some alkali is usually employed with the soap, no bad effect results.

The presence of free alkali in the water may, of course, be neglected in scouring.

Water serves the double purpose of dissolving the chemicals to be used, thus enabling us to present them to the fibre in a solution of just the strength desired, and also as a carrier for the wool and the impurities removed from it. For this reason it is of the greatest importance to have good, soft water, for if it is hard, the scouring operation is made much more difficult and also more expensive.

The most suitable water for scouring purposes is that which has been distilled or condensed from steam, as it is then free from lime, which, if present, will require more soap to form a suitable scouring liquor than it does if the lime is removed. The saving which is experienced by using this kind of water should not be disregarded by woolen and worsted manufacturers.

Water is generally spoken of as being of so many degrees of hardness, and a degree of hardness implies one grain of carbonate of lime per gallon. Less than six degrees or six grains of mineral substances per gallon constitutes *soft water,* and above six grains *hard water,* and as each degree of hardness is calculated to destroy about one ounce of soap to every 40 gallons of water used, it will be understood that the softer the water is, the more economical will the process of wool scouring become.

The use of hard waters for scouring purposes is always very detrimental, but this is specially the case when soap is employed, either alone or with an alkali. The injurious effect arises from the formation of sticky and insoluble lime and magnesium soaps, which adhere to the fibre, and give rise subsequently to defects; either causing dirty spots to appear upon the finished goods if white, or serving to attract or repel the color during the dyeing process, thus producing unevenly colored goods. This is probably one principal reason why old scouring baths act more efficiently than freshly prepared solutions, as the lime, etc., in the water will have been precipitated when first used. Another cause for the better action of old baths is probably to be found in the fact that being in a state of slight fermentation the liquor more readily emulsifies the fatty matters.

(To be continued.)

FROM a SUPERINTENDENT of a prominent Rhode Island Mill.

E. A. Posselt:—Enclosed, please find $2 in payment of my subscription for your Journal. I have on several occasions introduced the Journal to my associates in the mill with, I believe, the result of making several subscribers for you. I am of the opinion that it is a very helpful publication to anyone engaged in the Textile trade. J. B. 1-24-09.

DECATIZING WOOLENS.

(*Continued from page 28.*)

Fig. 1 shows us in perspective, in outlines, a decatizing apparatus with standing cylinder. In the same numerals of references indicate thus: 1 the decatizing cylinder (shown partway in dotted lines) around which the fabric 2 has been wound and covered with layers of coarse cotton, linen, jute or ramie cloth, as before explained. 3 is the lower hollow stud shaft of the cylinder and which connects tightly with the steam supply pipe 4 of the machine. 5 is the valve for regulating the force and duration of the steam supply. The upper hollow stud shaft of the cylinder is closed by means of screw press covering 6, which can be raised or lowered by the handwheel 7. As will be readily understood, any other system of closing the outlet of the upper hollow stud shaft may be substituted, for example lever weighting. Near to the apparatus and where the steam enters the latter, is situated a steam cleaning apparatus, but which is not shown in our diagram.

The steam used must be a dry steam perfectly clear of slime, soda, etc., since otherwise water spots are easily formed on the fabric under treatment. In connection with light colors the use of steam containing traces of soda must be more particularly prevented.

Opening the valve 5 permits the steam to enter (see arrow) into the interior of cylinder 1 and having no other outlet, naturally finds its way out through the fine holes in the circumference of said cylinder, through the cotton, jute, linen or ramie covering and which thus assures a perfectly clear, dry steam, to enter and penetrate to and through, and in turn out of the fabric, being retained in it for a sufficient time by the outside covering.

This method of decatizing has the disadvantage that no matter how perfect this outside covering is wound on the fabric, it will be impossible to obtain even work, the heat of the steam will vary between the lower part of the cylinder and where the steam enters compared to that of the upper part of said cylinder, and when the temperature must be less. To overcome this trouble, modern built decatizing machinery of this kind is provided with a covering or hood 8, as shown in diagram Fig. 2, and which arrangement is preferred, provided a standing cylinder construction is used.

In connection with this construction of the machine, the decatizing cylinder, having covering, fabric and covering wound on, as previously explained, after automatically raising the hood by means of chain 9, is then placed with its hollow stud shaft fitting tightly upon the supply pipe 10 and the upper hollow stud shaft 11 of the cylinder closed, by means of stopper 12 being screwed in or fastened in any suitable manner. Now hood 8 is lowered until its bottom rests on plate 13 and to which it is secured air tightly by means of a series of clamps 14. Next valve 15 is opened, steam enters the interior of cylinder 1, passing in turn through the fabric. To prevent the condensed water, as will form itself on the inside of the hood, from dropping onto the covering of the fabric and thus onto the latter, the hood is provided with an arched top, said condensed water, from any place of the hood running down on the sides of the hood.

16 is an air valve, which closes itself automatically as soon as steam is entered, in turn opening itself the moment decatizing of the fabric has been accomplished and no steam is under the hood, thus preventing compressing of the hood which is made of common sheet-copper. Next clamps 14 are removed, hood 8 raised by means of chain 10 and when the cylinder 1 with fabric 2 is then removed, the fabric being then ready for the next process.

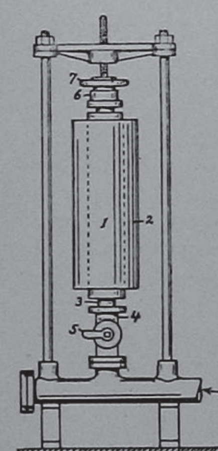


FIG. 1.

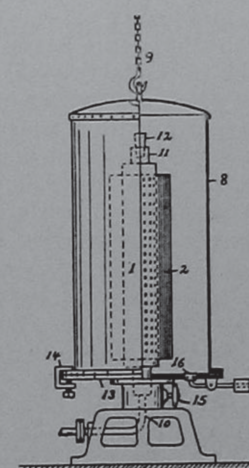


FIG 2.

Besides the two styles of decatizing machines as thus explained, the bulk of them are built with the cylinder being placed in a horizontal position and resting in a tightly closed cylindrical receptacle. This is the preferred construction of a machine, giving in turn the best results.

Steam is then entered in the receptacle and from there passes from the outside to the inside of the roll of cloth through the fabric, the steam pressure exerted onto the fabric in this case pressing the latter solidly onto its copper or brass decatizing cylinder, on which it was wound first, imparting by means of it to the fabric somewhat of a press lustre which is fast, *i. e.*, can not be removed during steaming of the goods, neither is it removed by the tailor's goose. In the interior of the cylinder, as holding the goods, an arrangement is provided to produce a vacuum, permitting the use of low steam pressure, a feature which in connection with certain kinds of fabrics is of great advantage. As will be readily understood, suitable arrangements are provided for the exit of the condensed water without injury to the fabric under process.

The duration of the process only requires a few minutes, some grades of fabrics requiring more, some less time. If not much lustre desired, unwind the fabric from the decatizing cylinder as soon as the process of decatizing is completed, otherwise let the fabric get cool while on the cylinder previously to unwinding the same.

Decatizing machines are also built with a double mantle, *i. e.,* dividing them into two compartments and of which the outside compartment is somewhat of a warming oven, being heated with steam in order to keep the covering of the inner compartment, *i. e.,* the steam chamber proper, at its right temperature and thus reduce condensation of steam in the steam chamber to a minimum.

In some instances we find used in place of a double metal mantle, a single metal mantle, the same being provided with a wooden outside covering, steam pipes being in this case, for heating purposes, introduced in said outside chamber.

Lately, it has been advised to occasionally reverse the direction of passing the steam through the fabric. If this procedure has a beneficial influence upon the finish of the fabric, will remain temporarily a dispute and which any finisher had better answer for himself. It seems to us, that when the nap of the fabric, during the entire process of decatizing rests in the one position in which it is laid permanently by the process, that this should produce more and a better lustre. Reversing the entering of the steam into the fabric must disturb the nap, hence it seems to us that it can not be beneficial to the final finish of the fabric, as compared to not reversing the entering of the steam.

Previously to entering the steam in the steam chamber, see to it that a thorough heating of the latter and that the roll of cloth as on the decatizing cylinder has been accomplished, in order to prevent the steam from having to enter into a cold roll of cloth and thus condensing. After thus heating the chamber and roll of cloth, enter the steam for decatizing purposes, and which in turn will pass through the roll of cloth and from there is permitted to escape, or may be condensed. If using a condenser, a reduction of pressure in the decatizing cylinder will be the result, requiring in turn less pressure in the steam chamber for a quick passage of the steam through the roll of cloth, *i. e.,* for the process of decatizing. Such a condenser however is not universally used, some mills objecting to its extra cost, others who installed them, not using them, claiming them to be provoking steam eaters neither pushing the process nor increasing the decatizing effect on the fabric. Foundation for this claim (condensers to be steam eaters) remains to be understood.

The greatest of care must be exercised when winding the fabric on its decatizing cylinder, a perfect wind being the foundation for a high, perfect lustre, as well as an even treatment of the fabric under operation. Folds and uneven stretchings of the fabric, if not noticed, may become fixed in the process, hard or not possible to be removed thereafter. Be careful that in winding, selvage rests upon selvage, and you will thus prevent chances for lightly decatized places at the sides of the fabric.

In our next issue, besides continuing this most interesting article to any Woolen or Worsted Manufacturer, a description of the construction and operation of the well known Schuchardt & Schütte "Combined Steamer Wet and Damp Steam Dry Decatizing Machine" will be given.

To Make Cotton Cloth Fire-proof.

During the last twenty years a number of attempts have been made by chemists to devise a process by which a permanent fire-proofing can be imparted to the cotton fibre, resisting ordinary wear or the usual domestic wash. All the processes devised however failed to give satisfactory results, until Dr. W. H. Perkin, F.R.S., Professor of Organic Chemistry at the Victoria University, Manchester, took up the subject, and he found that nearly all the metallic oxides or hydrates which are capable of acting as acids will, when fixed in the cotton fibre in a suitable manner, fire-proof it, more or less. He at the same time, found that stannic oxide possesses these fire-proofing properties to a greater degree, perhaps, than any other; it is colorless and consequently does not affect the white or colored portions of the fabric upon which it is used; it is non-poisonous and non-irritant and it makes a permanent, indeed apparently, a true chemical combination with cellulose, and the fabric—owing, no doubt, to the last-mentioned fact—is cosier, softer to the hand, more easily washed and more durable in wear than the untreated stuff, and from the same cause it is rendered perfectly sterile and aseptic. At the same time, the nap or fuz, *i. e.,* the loose fibres protruding from the threads of the fabric, and which are the great source of danger in connection with cotton fabrics catching fire, absorb more of the fire-proofing agent during the process than the body of the material and consequently are more thoroughly fire-proofed.

Dr. Perkin's process is as follows: As in the case of most of the bodies alluded to, an alkaline salt containing the metallic oxide as the acid radicle is best to use. The material is treated with the solution—varying in strength according to the amount of fire-proofing required—of an alkaline stannate, and afterwards dried, preferably, where the material will allow of it, by steam heated cylinders. It is at this point that the chemical combination of the cellulose with stannic oxide and a small amount of alkali takes place; the fabric becoming so tender that the most careful handling is required. After lying a few hours, however, it becomes strong enough to be treated with the fixing solution—a salt of ammonium, usually the chloride or sulphate being employed—the strength so proportioned to the first bath that the material is left slightly alkaline. At this point it is as strong as, or even stronger than before treatment. It is then dried, and afterwards washed to remove any excess of alkali, stannate, or ammonium salt and also the alkali sulphate formed during the process. (It may be noted in passing that the ammonium salt is not used for its property of rendering fabrics incombustible, but simply as a fixing agent for the actual proofing body.) The process, as before stated, is capable of being applied either to raw cotton, to yarns, or to any of the various textiles made from cotton, whether unbleached, white, dyed, printed or knit. The well-known *Nonflam* sheetings, lace curtains and flannelettes are all treated by Dr. Perkin's process, and the cost of doing so is hardly more than nominal, the heaviest flannelette, for instance, of ordinary width being treated at a price not exceeding 2 cents per yard.—Hosiery Trade Journal.

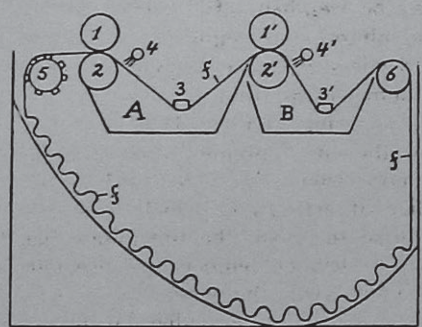
Water-proofing Fabrics.

A New Machine for the Process.

Translated for the Journal from "Oesterreichs Wollen and Leinen Industrie."

The process of water-proofing consists in producing an alumina or lime soap upon the material, which, as a rule, is accomplished by passing the goods, first, through a solution of acetate of alumina and alum, or of a lime salt, and then through a soap bath.

Better results are obtained if the goods pass through the metallic bath a second time; *i. e.*, direct from the soap bath, since in this way more of the metallic soap is deposited into the interstices of the fabric under operation.



This suggested, that it would be a good plan to pass the goods through the metallic solution and through the soap bath several times alternately; the accompanying illustration being a sectional diagram of a machine used for this purpose. The results have fully justified anticipation.

Description of the Machine and the Process: Two vats *A* and *B* are required, one for the lime or alumina solution, and the other for the soap, which shows that the usual guiding and wringing rollers are provided, the latter returning the solutions to the vats. 1, 2 and 1′ and 2′ are two sets of squeeze rollers, the same being lever-weighted. The lower ones, 2 and 2′ have a copper, and the upper 1 and 1′ an indiarubber sheathing. An expanding device 3, 3′ is also provided near the bottom of each vat for keeping the goods stretched out their full width during the process. The supply of the vats is maintained by the perforated pipes 4, 4′.

The perforations in these pipes must be disposed in such an arrangement so as to prevent streaks in the finished goods; that is, they must be placed in such a way as to distribute the liquid perfectly uniformly over the whole width of the fabric under operation. In proportion, as fresh liquor is run into each vat, the used liquor runs out, and the supply and overflow are so adjusted that the level of the liquid in the vat remains constant. 5 and 6 are guide rolls and *f* indicates the run of the fabric through the machine.

With reference to the soap solution to use, the same is best made by dissolving white Marseilles soap and potash water-glass in water in the proportion of 25 lb. of soap and about 14 lb. of water-glass to 20 gallons of water. Acetate of alumina is used at 1° Tw., and alum dissolved in from 150 to 200 times its weight of water.

Be sure that the last passage of the goods should be through the metallic salt.

Take care that the squeeze rollers exert sufficient pressure to ensure complete penetration throughout the entire thickness of the fabric under operation.

To Impart Lustre and Scroop to Woolen Yarn.

The oldest known process to accomplish this is to chlorinate the wool, but as this gives it a yellowish tinge it prevents the dyeing of wool thus prepared, for light shades, or its use as natural white.

The chlorinating process is still by far the best for imparting a silk imitation to the wool, and the drawback referred to being got rid of by a subsequent treatment with bisulphite, which removes the yellowish tinge. The complete lustring and bleaching requires three baths:—

The first bath consists of from five to ten grammes of concentrated sulphuric acid per litre. The wool is worked in this for from fifteen to thirty minutes at the ordinary temperature, wrung or hydro extracted, and put into the next bath without rinsing.

This bath is a clear solution of bleaching powder, containing from five to fifteen grammes of bleaching powder per litre of water. The wool is worked in this for from twenty to thirty minutes at 120° F. After rinsing the wool will be a pure white, and will have the lustre but not the scroop. To obtain the latter, it undergoes a further treatment in two baths. The first contains from five to ten grammes of Marseilles or oleine soap per litre of water, and is used at about 120° F., for from twenty to thirty minutes. The wool is then wrung but not rinsed, and entered into the second bath which consists of a solution of from five to ten grammes of concentrated sulphuric acid per litre of water. After from fifteen to twenty minutes in this, the wool is very thoroughly rinsed and dried.

If the wool is to be dyed, any dye fast to soaping and dilute acid can be added to the scrooping baths, so that the scroop and color are given in one and the same operation. Care, however, must then be taken to keep down the temperature and to hasten the process as much as possible, or the lustre and scroop will both suffer. The best plan, however, is to dye after lustring and before scrooping.

Unless some care is taken with the bleaching powder bath, the yellow color will not be uniform, and the darker places will be difficult to get rid of in the bisulphite bath. If they occur, the goods should pass through baths Nos. 1 and 2 again, as the dark places if left will make any subsequent dyeing unlevel. It is a good plan to add a little hydrosulphite to the first rinse on leaving the bleaching powder bath, so as to get rid of the chlorine more quickly and with less water.

Another process is to prepare a bath by dissolving 480 grammes of soap in forty litres of water and then adding three litres of sodium hydrosulphite solution at twelve degrees Tw. The woolen yarn is worked one hour in this, centrifuged and scoured in a cold bath containing from five to ten grammes of sulphuric acid per litre of water. The yarn is then completely rinsed and dried.—"Dyer and Calico Printer."

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

(Continued from page 188, Vol. III.)

(4) Operations Requiring Heat.

There are several analytical operations which require heat. The most important of these is evaporation. When, in the course of analysis, substances which are capable of assuming the vaporous state at a more or less elevated temperature, are to be separated from others which are fixed, under the same circumstances, it is often convenient to effect their separation in this manner.

When the fixed and volatile substances are in the state of physical intermixture, and it is not necessary to save the latter, as in the separation of water and some dissolved substances, the operation is called *evaporation,* and is conducted in shallow porcelain or metal dishes, over a gas flame. The necessity for evaporating liquids, for the purpose either of concentration or of obtaining dissolved substances in a dry state, is a very frequent occurrence in analysis. The most convenient method for evaporating a solution, is to place it in a porcelain evaporating dish, then place the dish in the sand bath and apply a flame to the sand bath. The heat is more evenly distributed by the sand bath and the danger of breaking the dish greatly lessened.

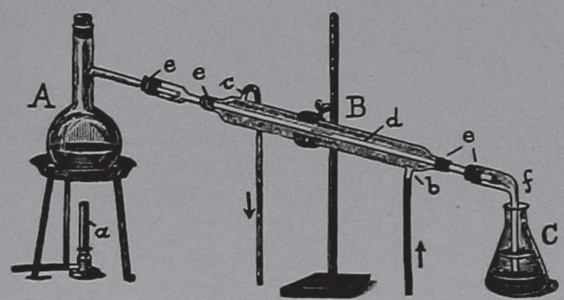


Fig. 3.

When the volatile substance is to be collected, the operation is conducted in a closed vessel, either a retort, flask, or tube, and the vapor passed into another vessel, where it is condensed. The operation is termed *distillation* when the substance to be separated is a liquid; *sublimation* when it is a solid.

The general form of apparatus used for distillation upon a small scale is shown in Fig. 3. The same consists of three parts: *A* the glass vessel which contains the liquid to be distilled, *B* the condenser and *C* the receiving vessel. The liquid to be distilled, is heated in a glass vessel *A* by means of a Bunsen burner *a,* the vapor rising in the flask, and in turn entering condenser *B,* where they are cooled by a continual flow of cold water, entering at *b* and leaving at *c,* the cold water continually surrounding the inner glass tube *d,* the outer covering of the condenser being closed at both ends by cork or rubber fittings *e.* The thus condensed vapor in turn drops through the connecting tube *f* into the receiving vessel *C.* Slight modifications which may be requisite to meet particular cases, and will naturally suggest themselves to the operator.

Drying, Ignition, etc. When in quantitative analysis, precipitates or other substances are to be weighed, it is essential not only that all adherent, soluble substances should be washed out, but likewise that they should be perfectly dry.

Moreover, as most substances are more or less hygroscopic, while others contain water in a state of loose chemical combination, it is generally advisable, before weighing any substance for analysis, to ensure either the total absence of moisture, or a definite state of hydration of the substance in question. This may be effected in various ways according to circumstances.

Precipitates may be weighed in two different ways. When precipitates have been collected by filtration, they may be weighed, after perfect drying, together with the filters, the weight of which, on an equal state of dryness, has been previously ascertained. Results of sufficient accuracy for some purposes may be obtained by using another dried filter as a counterpoise for the one containing the precipitate; but the method more usually adopted, which involves the least probability of error, and which must necessarily be had recourse to, when the precipitate has to be exposed to an elevated temperature previous to weighing, is to burn away the paper.

Water which is merely adherent, may generally be removed by exposing the substances in a confined space to air, dried by contact with a large surface of concentrated sulphuric acid, which absorbs with avidity the water suspended in the air.

When water is chemically combined, and when it is in that state intermediate between chemical and mere physical mixture, as in deliquescent salts, the influence of a more or less elevated temperature and a full current of air is requisite for the perfect separation of water. For this purpose the hot air-chamber is used, and a temperature of 212° F. is in the greater number of instances quite sufficient to ensure at least a definite state of hydration.

The drying oven consists of a rectangular copper box supported on four legs. The front is closed by a door. The interior has a shelf on which crucibles, dishes, or watch crystals may be placed. The top has two circular holes. One is for inserting a cork which has a thermometer in it, the other hole is covered with a piece of filter paper, so that moisture can get out, but no dust can get in. The drying oven is heated from below by a gas or alcohol lamp.

Fusing. Sometimes it is necessary to melt a substance, either alone or with another substance, to analyze it. This operation is called fusing. Fusing is carried on in crucibles. Porcelain and platinum crucibles are used more frequently than any others, but silver and nickel crucibles are sometimes used. The choice of the kind of crucible to be used depends upon the nature of the substance to be fused. Some substances attack one kind of crucible when fused, while they do not act upon another. For example, no alkaline substances such as sodium carbonate, caustic soda, caustic potash should be fused in a porcelain crucible, although, as a rule, nearly every other substance may be fused in a porcelain crucible.