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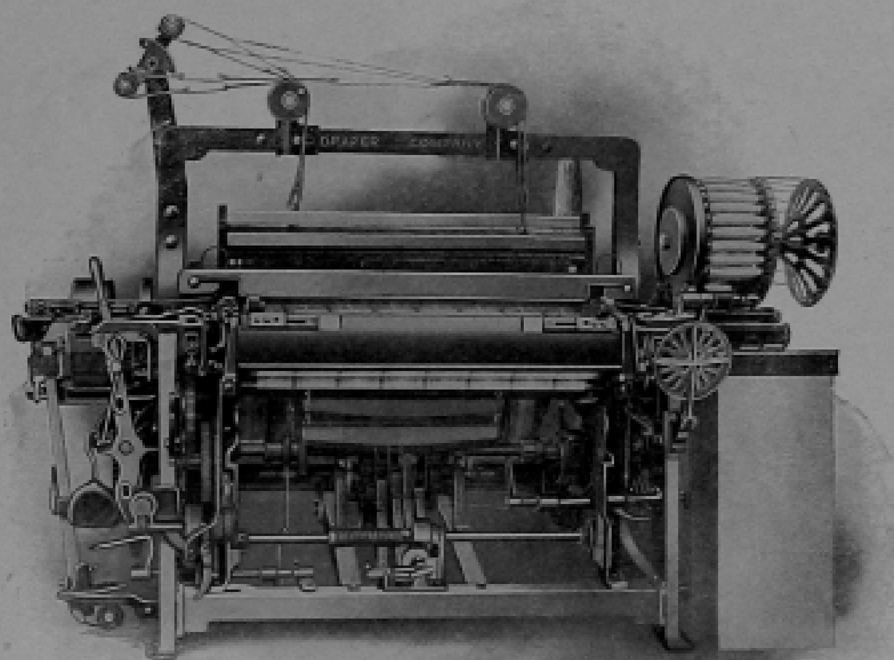

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Posselt's Textile Journal

Vol. II. **January, 1908.** **No. I.**

THE JOURNAL'S TEXTILE SCHOOL.

JACQUARD DESIGNING.

Lesson 4.

In Fig. 13 a fabric sketch illustrating another arrangement of *plain setting* is given, the figure in this instance being turned in four different directions, calling in turn for eight figures for one repeat of the pattern, as clearly shown in left hand lower corner of our sketch, by means of one repeat of the pattern being shown in dotted lines, out-lined by means of square *a, b, c, d.* In the same, the eight heavy lines represented by means of numerals of reference 1 up to and inclusive 8, are imaginary lines (not belonging to the design), given for the purpose of showing the placing of the figure in *four* different positions, for the fact that positions 1 and 3, 2 and 4, 5 and 8, and 6 and 7 are respectively identical to each other.

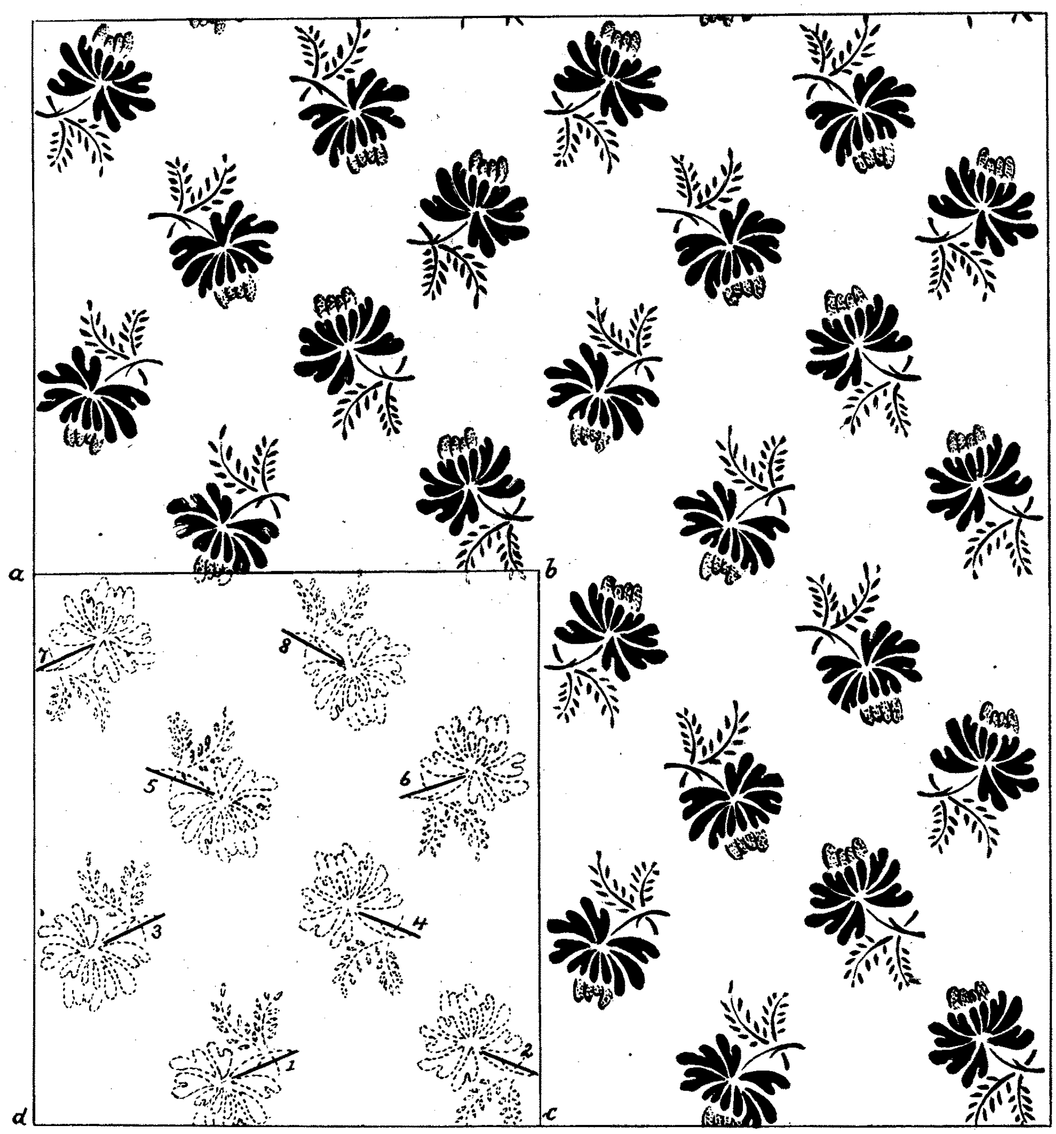


Fig. 13.

Diagram Fig. 14 is given to more clearly illustrate to the student this change of position of the figure, giving in this instance four repeats of the pattern each way by considering:

"Cross type" in diagram 14 to refer to lines 1 and 3 in fabric sketch Fig. 13.

"White dot type" in diagram 14 to refer to lines 2 and 4 in fabric sketch Fig. 13.

"Black dot type" in diagram 14 to refer to lines 5 and 8 in fabric sketch Fig. 13.

"Full black type" in diagram 14 to refer to lines 6 and 7 in fabric sketch Fig. 13.

Considering the setting as given in connection with sketch Fig. 13, it certainly shows the nicest distribution after the plain setting thus far given, the affair to a certain extent resembling an 8-harness satin setting, in fact it will be very hard to distinguish it from the latter in the woven fabric, the only disadvantage in the affair, *i. e.,* in connection with this plain setting as calling for 8 repeats of the figure for one repeat of the pattern, is the fact that it will require

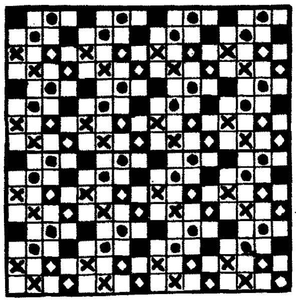


FIG. 14.

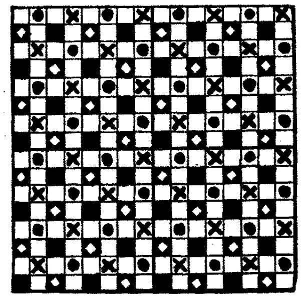


FIG. 15.

twice as large a jacquard machine and twice as many Jacquard cards than compared to using either style or plain setting previous explained in connection with Figs. 8, 9, 10 and 11, however, the result obtained will fully repay the extra expense thus made to the manufacturer.

In connection with diagram Fig. 15, another plan of *plain setting,* using one figure reversed in four different directions is given, the repeat of the pattern calling

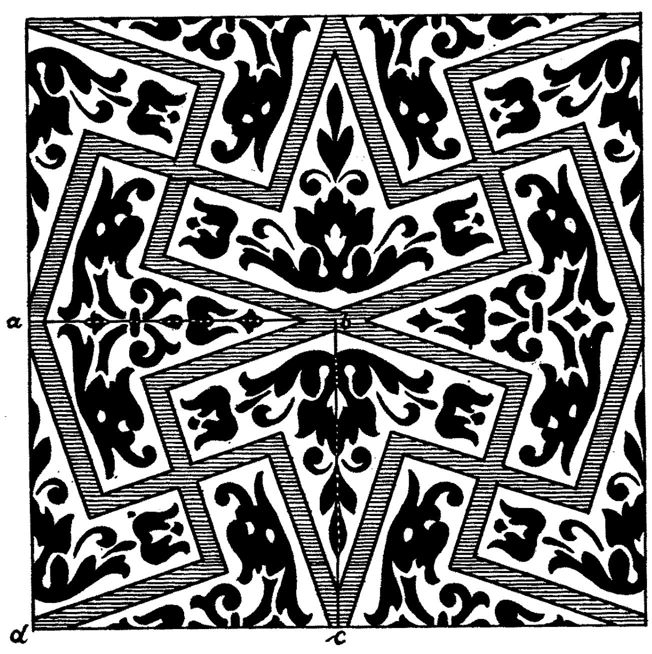


FIG. 16.

for eight figure effects, the same as before; four repeats each way being given in our diagram and in which each kind of type illustrates a different position of the figure. This setting is excellently adapted for use in connection with figures which are badly balanced, it enabling an even distribution of said figures to be readily made.

It will be frequently found that this system of setting after the plain motive, with eight figures to the repeat, can be used for figures too large to be distributed by any one of our satin settings, while at the same time the affair possesses all the advantages of said satin settings.

A careful examination of this setting will readily show us that the figures as are placed in opposite corners, correspond, and for which reason, it may be found only necessary for half of the repeat of the design to be worked out on point paper, obtaining the other half at the piano machine, by cutting the point paper design in two, and reversing the parts.

The *turn over* or *point setting* of figures is one frequently met with, more particular in connection with damask fabrics, carpets, etc., and where large designs, *i. e.,* large repeats are the object desired. With this setting, a great many faults, characteristic to the plain or satin settings can be avoided, besides, the finished design has a greater appearance of complexity, on account of the repeats being alternately reversed, hence, the complete repeat of the pattern less evident to the eye than when set by one or the other setting previously explained.

The method of constructing such a turn over or point pattern will be readily seen by examining illustration Fig. 16, and in which only one complete repeat of the pattern is given, the design representing a 3-ply ingrain carpet pattern, the complete pattern being nothing else than the quarter of the design, outlined by *a, b, c* and *d,* turned over, both horizontally as well as vertically, in order to produce the complete turn over pattern.

These turn over patterns in turn are produced on the jacquard loom, in connection with tying up the harness by means of a *point tie-up,* a feature which in turn will increase the compass of the machine to twice the number of ends in the fabric as compared to a *straight through tie-up,* the affair working on the same principle as a straight and a point drawing-in-draft in connection with the harness loom.

These turn over patterns, *i. e.,* point patterns, besides being used in connection with all-over-patterns as well as centre patterns, at the same time possibly find their most extensive use in connection with borders for damask table cloth, etc., for the fact that in connection with these fabrics, the centre of the design already calls for a great number of the needles of the jacquard machine, and when consequently, if using a straight through tie-up for the border, we then would have to use an extra large jacquard machine, or possibly two machines combined in one, whereas if using this point tie-up for the border, we at once cut down the number of needles required for the border of the fabric to one-half.

For example, let us consider a 600 jacquard machine in connection with a damask table cover: Using 400 needles and hooks, in six repeats or divisions, or $400 \times 6 = 2400$ warp threads for the centre part of the fabric, this will allow us 204 needles and hooks for the point tie-up for the border, *i. e.,* $204 \times 2 = 408$ warp threads for each border or 806 warp threads for both borders. This then will allow us sufficient empty needles still left in our 600 machine, both for margins as well as the selvage of the fabric.

A STUDY IN FIGURING WITH DOUBLE PLAIN.

(*For Harness and Jacquard work.*)

This principle of designing, *i. e.,* cloth structure finds considerable use in the manufacture of textile fabrics for all purposes, in small effects and lines in fancy woolen and worsted Trouserings, then either in its pure state or more frequently intermixed with other systems of weaves; in high counts it is in its pure state well suited for the manufacture of cotton, woolen or worsted Ladies' Dress Goods, as well as with heavier counts of yarns for the manufacture of Cloakings. With reference to figured work it is used in connection with Trimmings, Labels, Hangings, etc. It is also the principle of cloth structure for our well known Two-ply Ingrain Carpets, certain styles or makes of Bed Quilts etc.

The object in every instance is to produce a distinct exchange of colors between the ground and figure of the design, a feature impossible to be obtained by means of single cloth structure, where the colors between ground and figure must always, according to weaves used, more or less intermingle.

This system of designing is properly also known as *Reversibles,* by what is meant that the color which on one side of the fabric produces the figure effect, produces on the other side the ground, and vice versa; the weave used for either structure of the Reversible being the common plain weave.

As mentioned before, this system of cloth structure finds use both for Harness as well as Jacquard work. In connection with the latter, the mounting of the loom is such that all that the designer has to do is to paint in the figure, minus any weave, cardstamping and the tying-up of the loom, as well as the kind of Jacquard machine used, doing the rest, *i. e.,* interlace the fabric in such a way as to produce the required design. It will be readily understood, that for this reason the Jacquard designer, except he has been trained in cloth structure, knows little if any how the actual interlacing of the fabric structure is accomplished, for which reason this article will be of general interest. For the designer for Harness work this article will be interesting, since it deals with a somewhat out of the line of subject, heretofore dealt with only sparingly by textile Journals here, and will consequently remind him of a chance for effects and designs in his vocation.

To explain this system of designing, we have selected a harness loom pattern, since it will not only better illustrate the subject, cover a complete repeat of the pattern, besides illustrations being within compass of the column of the Journal.

Of the diagrams and weaves accompanying this article, Fig. 1 illustrates a sketch for a fabric, *a polka dot, set on the plain,* and when it is required to show these dots in a color or mix, distinct from the color or mix used for the ground work of the fabric. The repeat of this sketch, which for the sake of simplifying it to the student has been painted (enlarged to its appearance in the woven fabric) on point paper, calls for 18 ends, warp and filling ways, for its repeat. On account of dealing with double cloth, every end in our sketch stands for two ends in the fabric (one end ground one end figure) and what consequently calls for ($18 \times 2 =$) 36 ends in repeat of pattern (warp

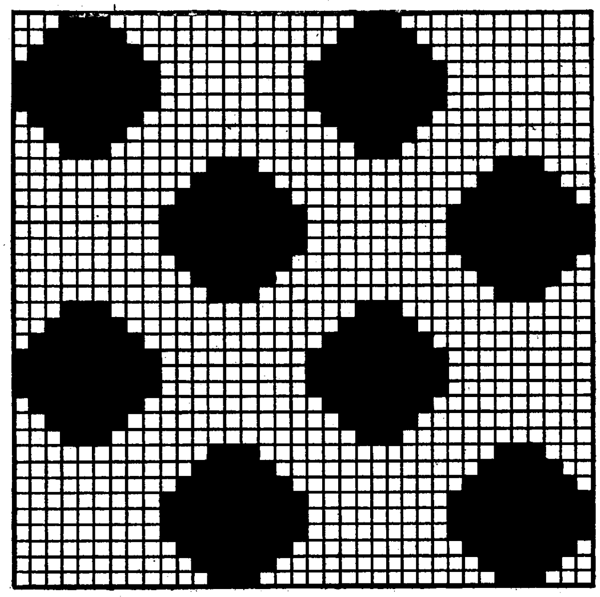


Fig. 1

and filling ways) both in the plan of interlacing as well as the weave.

Diagram Fig. 2 has been designed to illustrate the former. In the same the rows of squares shown shaded on top as well as on the left hand side, indicate

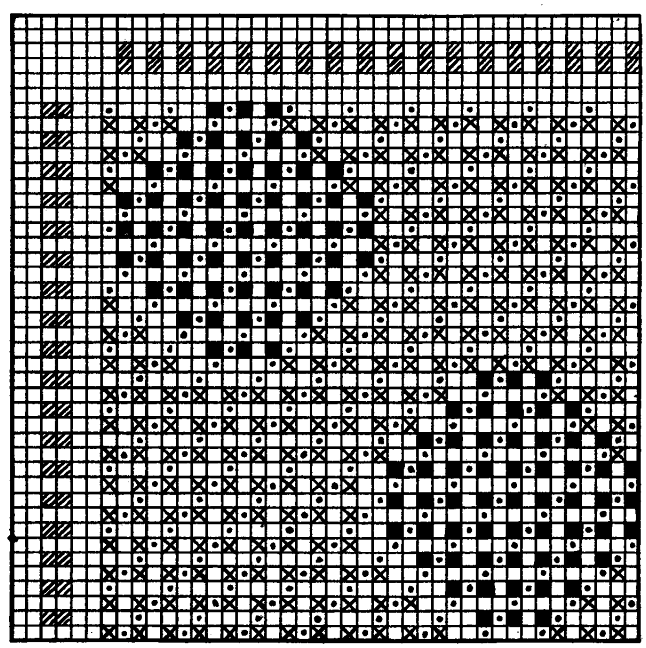


Fig. 2

what is known as the *color scheme, i. e.,* distinguish face and back, or figure and ground threads in warp and filling from each other.

Having thus planned the two systems of threads, warp and filling ways, and considering rows of squares in both directions shown shaded in *color scheme* as figure ends, next transfer figure from sketch upon diagram Fig. 2, considering only the places where figure warp threads and figure picks meet, see full black squares (■) in diagram.

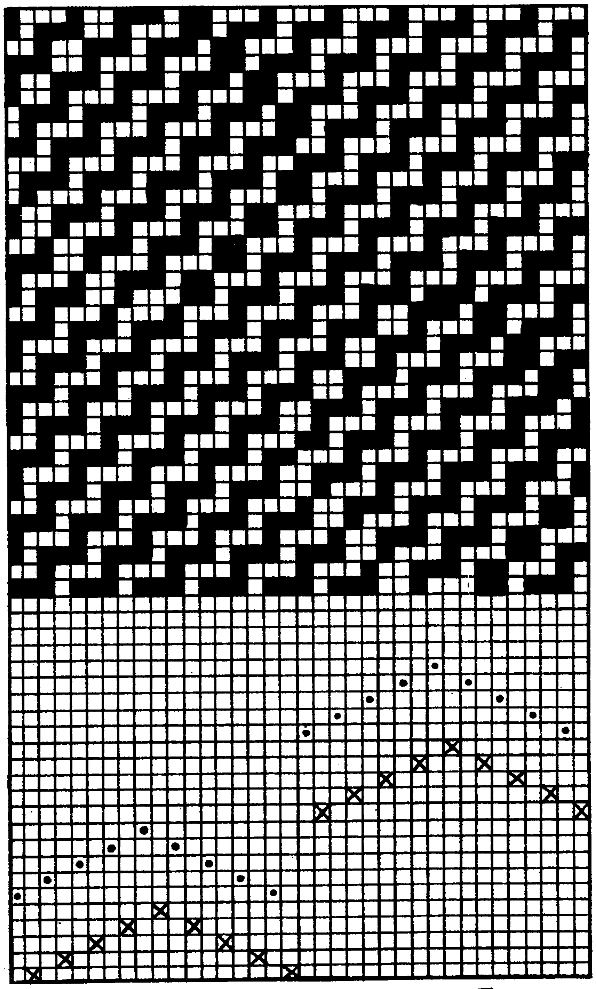


Fig. 3

Now transfer ground from sketch, upon diagram Fig. 2, considering in this instance only the places where ground warp threads and ground picks meet, see cross type (×) in diagram.

Next introduce the four harness twill filling effect, *i. e.,* 1 up 3 down, all over the diagram, see dot type (●) in diagram, and when the plan showing the interlacing of warp and filling—according to sketch Fig. 1—is completed.

Fig. 3 shows by means of full black type (■) one complete repeat of the weave, *i. e.,* diagram of construction Fig. 2 executed in one color, the repeat of which, as previously already referred to is 36 × 36, and which by means of the fancy double draw given below it, requires 20 harness for its execution of the loom.

Having thus given a thorough explanation of the construction of figuring upon the double plain system, we conclude our article, by illustrating a simple stripe effect, executed upon this principle of designing and fabric structure, and of which Fig. 4 is the sketch, Fig. 5 the diagram showing the interlacing and Fig. 6 one repeat of said weave, with drawing-in draft below it, calling for 46 warp threads and 24 picks in pattern in connection with a 20-harness fancy draw. Type used in diagram Fig. 5 corresponds with that used in connection with diagram Fig. 2, and which was fully explained, hence no special explanation will be required for the present diagram. The color scheme for warp and filling has been omitted in the diagram of interlacing of this stripe pattern, since the same will explain itself, besides has been fully dealt with in connection with the polka dot diagram previously explained.

A PRACTICAL TREATISE ON THE KNOWLES FANCY WORSTED LOOM.

By E. P. Woodward.

(*Continued from page 99.*)

Belting and Gearing the Loom.

The reed and its proper lining being the last treated in the previous article, it may be well now to begin at the source of what drives the loom, *i. e.,* the belt and the pulley.

The diameter of driving pulley and the pinion gear on counter shaft of loom are the first things to be considered. Since the makers of the loom should best know what the proper speed of the counter shaft should be to get the best results from their looms, they should be the one to best determine this point. By this is meant, that, from practical tests and experience, the makers of the loom know best what the belt load, *i. e.,* power required to drive this looms is, for which reason they can best give the belt velocity required, which will give the best results for the proper speed of the loom, so far as the actual driving power needed is concerned.

If one stops to think that only the actual power needed to drive the loom through all emergencies is

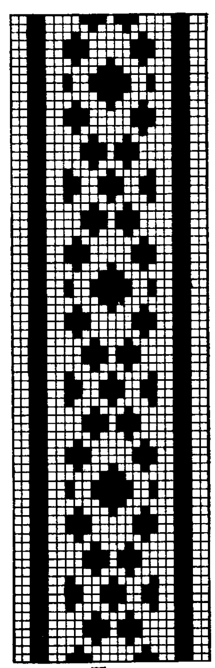


Fig. 4

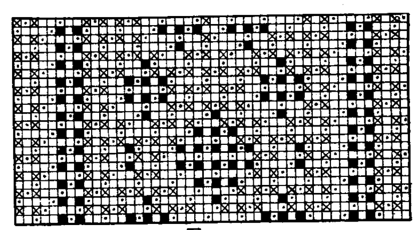


Fig. 5

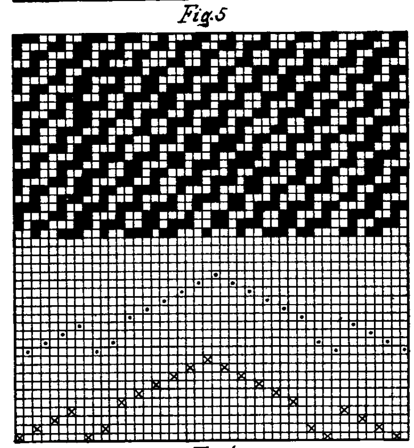


Fig. 6

the ideal transmission, the right theory of power-transmission will be apparent. It would be poor judgment, if the loom should require a single belt to drive it and give ample transmission, to use a heavy double belt which would be capable of transmitting twice the power needed to drive the loom. For instance, suppose that $\frac{3}{4}$ of one horse power is the maximum power needed to give ample driving power per loom, and that the loom is belted and geared to deliver two horse power. Now as long as the loom runs smoothly and nothing happens to cause a sudden stoppage or strain, this extra power which can be transmitted is doing no harm to the loom, because of the fact that as long as no extra resistance is offered, this surplus power is not exerted. But should any part of the loom fail to work, and by so doing cause a sudden stoppage of the loom (as for instance, a picker stick catching) the chances are far greater for breaking parts of the loom, than if only the necessary power was all that could be delivered. This is what would be the result of extra power applied at such a time—2 horse power would be applied directly and naturally would find the weakest part under strain. As the picker stick could not make its stroke it would break (if weak enough), if not, the rocker casting would be next in line, then comes the sweep stick and lug strap, and finally, if none of these parts should give way, the chances are that the shoe bar would be found to be twisted. The result of this would be that the loom would not pick as formerly and would not do so until parts are put back in their former position. Such results, and many much more serious, are met with in many a weave room on account of too much power being transmitted to looms. This is a point to be well considered by all of those in charge of machinery.

The pinion gear on the counter shaft can be changed to get different speeds required, but for the reasons before mentioned it is the better way to let the loom works determine the speed of the counter shaft and at the same time name the gear on pinion shaft which is best suited to mesh with gear on picking shaft, and with these points decided, the speed of the line shaft can be readily ascertained and then the size of the pulley on line shaft.

Since other machinery besides looms may have to be considered in connection with line shafts, we will give no fixed speed of shaft, but simply assume a certain speed for the loom to run, and give a simple rule for solving problems.

Speed of loom required, 105 revolutions of crank shaft per minute.

The loom builders would submit a list of gearing on application as follows:

Speed of counter shaft, 340 revolutions per minute.

Diameter of counter shaft pulley 12 inches.

Speed of line shaft 200 revolutions per minute (not sent by the loom works but assumed by us to solve problem).

Change gears to use for counter shaft would be

Pinion gear cogs 17, 18 or 19 $\times$ 58 cogs on crank shaft and picking shaft, which would give to loom the revolutions of crank shaft as follows:

$340 \times 17 \div 58 = 99.65$
$340 \times 18 \div 58 = 105.51$
$340 \times 19 \div 58 = 111.37$

Speed of loom desired = 105.
Speed of line shaft = 200.
Pulley on counter shaft = 12 inches.

To get diameter of pulley for line shaft, put on 18 cog pinion gear, then multiply speed of counter shaft by diameter of its pulley and divide the result by speed of line shaft, quotient being the required diameter of line shaft pulley.

Example: $340 \times 12 \div 200 = 20.4$ diam. of line shaft pulley.

If required to be more exact, take the thickness of belt and add the same to the diameter of its counter shaft pulley.

Circumferences need not enter in these calculations as they are relatively the same in each instance, and do not affect the result.

The loom now being geared where the builders intended it to be for its speed, the plumbing of loom pulley to line shaft pulley can now be done. This is where line *C* in lesson on lining to position is used again (see page 97) and why it is extended in the floor plan to shaft line instead of stopping at positioning line *B*.

If you set line shaft pulley by the following method, using line *C* to measure from when locating the pulley on the line shaft, all guess work is eliminated and you are not *sighting* or taking the edge of a pulley as a guide.

First from line *C* (see diagram on page 97) measure and locate with rule and level the distance from line *C* to midway of face of loom pulley, now plumb from line shaft pulley, midway of face, to position located on floor as midway of face of loom pulley.

The pulleys now being truly lined, the loom is ready for the belt. As no fixed size of pulleys are given, in all cases the fixer must use his judgment if cutting for a cross belt, and whether cross or straight, he can safely cut a new single belt (on distances which will between shafts measure 12 feet) 4 inches shorter than actual measurement of belt.

To find length of belt needed, take distance between centres of shafts and double it and to this add one half of the circumference of each pulley, minus estimated stretch of belt.

It may be well to add here that no matter how well a shaft may be leveled and two pulleys (driver and driven) may be adjusted to position, a poor belt will not run true on them. The same will also apply, in a similar way, to a good belt poorly cut and laced. The belt should be squarely cut and the crown on the pulleys will do the rest. Before putting the belt on, the friction pulley should be well looked over and all particles of sand removed. This friction pulley should be taken off, of counter shaft, and the holes and chamber for holding the oil well cleaned, and even with this precaution, there is a chance that said friction pulley will heat up and scratch the bearing on which it turns. As this style of friction pulley (McCaffreys) does most of its oiling when the pulley is not in motion, care should be taken to have shaft and pulley well oiled before putting on belt.

The belt on, the loom is now ready to be ***limbered*** up. The fixer now has a chance to see how the different parts work as regards smoothness of action and time. With only lay and picking motion in action, first try loom and see that it will run smoothly, with the belt reasonably tight. In this matter one must use judgment, a single belt must be considered to run tighter than a double belt. A single belt of 3½″ face will transmit more power than the loom requires and while it will wear out much quicker than a double belt, practical tests will show it to be the most economical belt to use on account of its feature of *giving* quicker and farther under sudden strain—it will not break the loom and strain it as a double belt would should anything catch. If a double belt is preferred, it should not be run too tight. Should the lay show a disposition to run in an uneven, jerky manner, try the friction, and see if it will hold the pulley against the belt. If it does not, look then to your friction. Do not set it up so the *shipper* locks hard. Be sure that all the leather surface comes in contact with the iron surface of the friction pulley. When it is doing this you will find no trouble in making the friction hold. When properly set up, the shipper will lock and unlock with very little pressure. Washers or discs of an indurated fibre, or rawhide, will be found at the head of the counter shaft. The thrust of the counter shaft should always come on these washers and on no account should the shoulders of the counter shaft strike the edges of the boxes in which they run, since when they do so, the friction pulley will then not do its work but will slip when under working pressure. In short, never must the rear shoulder on each bearing of the shaft strike the rear end of its respective box. The thrust must always come on the disk, when the shipper is locked.

One more point which is apt to be overlooked by the fixer, if the loom is not running smoothly, is the fact that the castings on which friction pulley swivel are mounted, will in many cases on new looms become loose, and as this is something which does not readily show itself, it is for that reason referred to now. When these castings are slightly loose, they are quite often the cause of many so called uneven picks, or a case of a loom throwing a shuttle harder at one time than another.

The matter of friction and belt being disposed of for the present, the loom can now be tested without a load (simply running the picking motion) as to its being up to calculated speed. With bunter boxes stuffed, it is well to let the loom run for a few hours in this manner, at the same time keeping a look out for boxes of crank and picking shaft getting loose, as this may mean a breakage of gears and loss of time and stock in repairing loom. Shoe bar sockets should be watched, since a new casting will wear quickly if not well oiled. Stands for shoe bar, picking shoes and picking rolls are all liable to work loose. Being sure that all the parts are well oiled and tightened, the loom is now in shape to test the throwing of the shuttle, so far as any stiffness of working is concerned.

Lining of Shuttle Boxes. The lining of shuttle boxes to the reed line is the first thing necessary, and this is where it will be shown what is necessary in conjunction with a straight reed line to have a shuttle run *true, i. e.,* keeping close to the reed and not rising from the shuttle race at any point in its traverse. The back of the inside of the shuttle box, against which the back of the shuttle runs, and which has much to do in

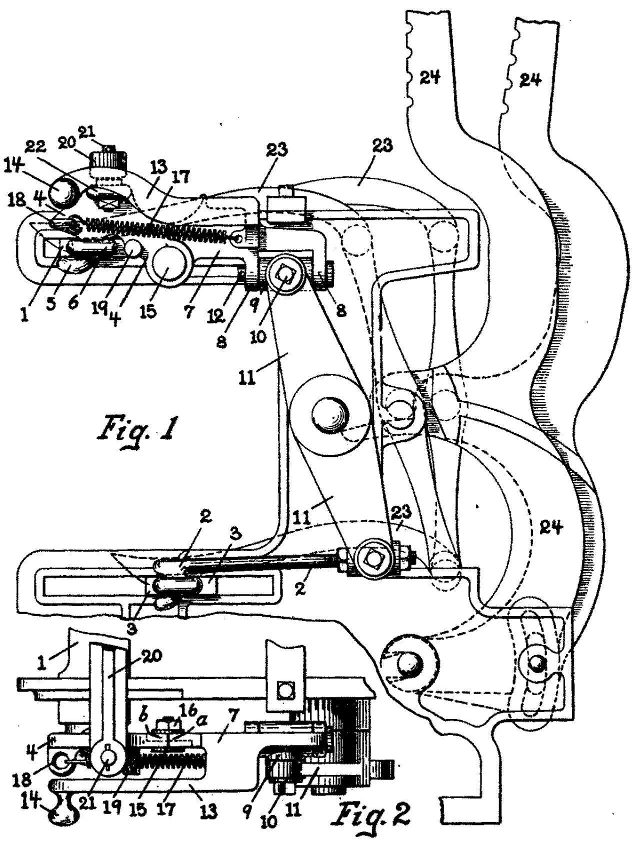


Fig. 1

Fig. 2

keeping the shuttle close to the reed when in its flight, should be tested with a straight edge and care taken that it shows a fairly true line. In the bottom corner of each cell of the shuttle box, that is, the corners formed by the meeting of the back of the box and the top of each shelf, will be found a fillet, which is necessary to strengthen the box; but sometimes there is an excess of this, so that it will force the back of the shuttle away from the back of the shuttle box, acting as a wedge, causing an uneven running and uneven boxing of shuttle, because the latter is not truly thrown, since it is not truly held for the loom to act upon when picking. Only enough of this corner fillet should be filed away to let the shuttle come to its proper position with the back of the shuttle box. At the same time, should the shuttle show a square edge, it can be slightly rounded. After the boxes are lined to reed and race, the shuttle will take its proper flight. To do this, use a straight edge, long enough to reach from lay end to stop-motion. Line shuttle box to reed line in as straight line as possible, allowing only enough to be on the safe side—$\frac{1}{32}$ inch on length of box, being ample. Do this by throwing lay end, if it needs it, *Never* by packing out box guides when they are truly lined to give box a position parallel to picker rod. This finishes the lining of back of boxes to reed line. To pitch boxes to shuttle race line, carry them level with the same margin of safety at the rear ends, as given for lining the reed. At the same time have them stand at same height as shuttle race.

By following the course described, after having followed directions for lining reed (see Lining Loom to Position), you have accomplished the following results:

(1) A straight line for shuttle traverse on reed line from picker to picker.

(2) A straight and level line on shuttle race and box shelves from picker to picker.

(3) Picker rods are true parallels to both reed and shuttle race.

As all shuttle makers of to-day have the shuttle point located where practice has proven it will give best results, this does not need to enter here beyond saying that such a body as a shuttle has been found to maintain a truer flight when pushed from a point other than its exact end centre. Shuttles used in one loom should be of same conformation and weight, and standard shuttles usually are.

(To be continued.)

A New Harness Evener Mechanism for Crompton & Knowles Dobbies.

The object is to provide a harness evener mechanism, by means of which the weaver, when having to pick-out, can even all the harnesses, and thus bring all the warp threads into one plane.

ILLUSTRATIONS.—Fig. 1 is a front view of such portions of a dobby as is necessary to be given to show the application, construction and operation of the new evener mechanism, the latter being shown in the position the same occupies when the loom is running. Fig. 2 is a plan view of the new mechanism and Fig. 3 the mate illustration to Fig. 1, *i. e.*, shows the new evener mechanism in the position which it occupies when set to level the harnesses for the purpose of bringing the warp threads in one plane.

THE IMPROVEMENT consists in that in place of having the hook connector for the upper lift bar 1 similar in shape to that as shown in connection with the hook connector 2 for the lower lift bar 3, said connector for the upper lift bar is a hinged connection made in two parts, consisting of a plate 4 having a hook 5 on its lower edge to engage a ring 6 on the end of the lifter bar 1, and a second plate 7, having two downwardly extending projections 8 at its inner end, forming a yoke to receive the tubular shaped head 9 on the pivot bolt 10 attached to the upper end of the lever 11. A stud 12 extends through the tubular head 9 on the bolt 10, and secures it in the forked end of the bar 7. The latter is provided with an operating handle 13, having a knob 14 thereon.

The two bars 4 and 7, forming the connection between the upper end of the lever 11 and the upper lifter bar 1, are pivotally connected at their inner ends by a bolt 15 and nut 16, to form a hinge joint, the centre of which, when the connection is extended, is in a plane, below the plane of the attached ends of the connection (see Fig. 1).

The inner ends of the bars 4 and 7 are provided with abutting surfaces *a* and *b*, (see Fig. 2) which limit the downward movement of the parts at their hinge joint. A spirally coiled tension spring 17 is attached at one end to the inner end portion of the part 7 and at its other end to an eye 18 on the front portion of the part 4, which when said parts are in their extended position act to hold them extended. A stud 19 extends out from the lower part of the bar 4, below the spring 17 and increases the tension of the latter when the parts 4 and 7 are moved towards each other on their hinge joint (see Fig. 3).

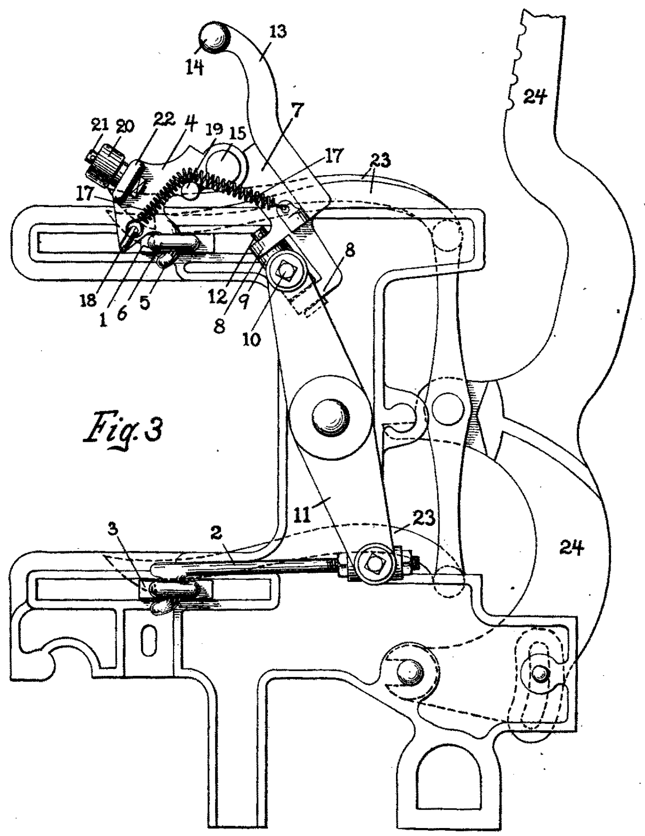


Fig. 3

A similar hinged connection is located at the rear of the dobby (not shown) and connected with the lifter bar 1, and a similar lever 11 (not shown) at the rear of the dobby.

A transversely extending bar 20 extends between the hinged connections, at the front and rear of the dobby, and is pivotally secured at each end on a stud 21, secured in a projection 22 on the bar 4. By means of this bar 20, the two hinged connections are moved simultaneously, permitting at the same time a slight difference in movement of each end of the lifter bar.

THE OPERATION OF THE NEW DEVICE.—When the loom is running, parts 4 and 7, of each hinged connection to the upper lifter bar 1, are in their extended position, as shown in Fig. 1, with the handle 13 in its lowered position.

When it is desired, for the purpose of picking-out or for any other reason, to even the harnesses and bring the warp threads into one plane, the handle 13 on each connection is raised, causing the bars 4 and 7 of each connection to move on their hinge joint towards each other, and the upper lifter bar 1 to be moved inwardly, allowing the hook latches 23, and the upper harness jacks 24 to move inwardly, from the position shown in Fig. 1 to the position shown in Fig. 3, and the harnesses attached to said jacks to be lowered into the same plane as the other harnesses.

When the loom in turn is again started, the parts 4 and 7 are moved downwardly on their hinge point, into their extended position, shown in Fig. 1.

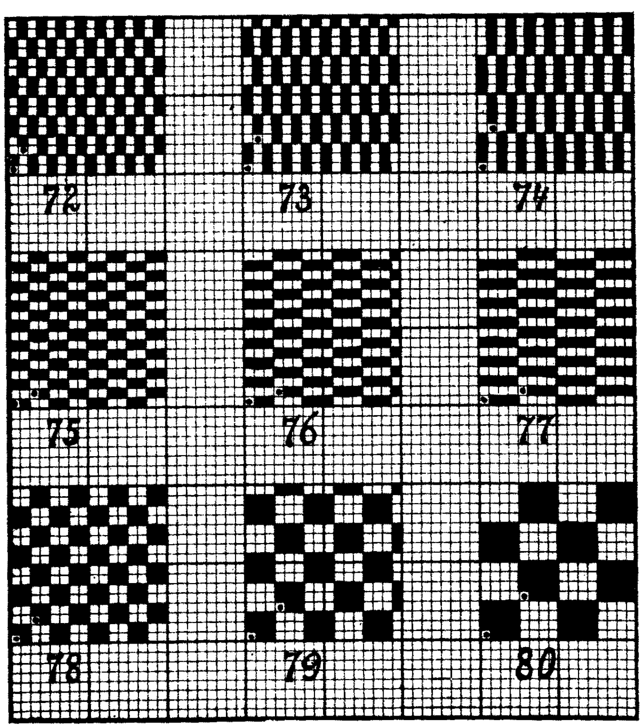
THE JOURNAL'S TEXTILE SCHOOL.

WOOL, COTTON AND SILK DESIGNING AND FABRIC STRUCTURE FOR HARNESS WORK.

Lesson 4.

Having explained in former lessons the construction of our three foundation weaves, *i. e.*, Plain, Twills and Satins, we now will take up their

Derivative weaves, *i. e.*, weaves which have one or the other system of our foundation weaves for their basis, and when in connection with the plain weave we come in contact with



RIB AND BASKET WEAVES.

Rib weaves: This name is derived from the characteristic rib lines these weaves produce in the woven cloth, said rib lines running either in the direction of the filling or the warp, and for which reason we classify our rib weaves respectively in either *warp or filling effect rib weaves*. These are again subdivided into *plain, fancy and figured effects, i. e.*, whether these rib lines are of uniform size, or if different sizes of rib lines are combined in one weave, or if figuring with these rib lines, either in warp effect, or in warp and filling effect combined in one weave.

Plain rib weaves-warp effect: The principle observed in constructing these weaves is to insert more than one pick in either shed of the plain weave. This feature will push the filling in the centre of the structure, the warp forming both the face and the back of the fabric. This will explain that plain rib weaves-warp effect (whether plain, fancy or figured) require a high texture for the warp, since only one half of it shows on the face of the fabric, the other half forming the back of the structure; or in other words the warp threads will slide on the filling towards each other, all the uneven number of threads (for example 1, 3, 5, etc.) joining itself on one side of the fabric structure while at the same spot in the fabric all the even number of threads (2, 4, 6, etc.) join itself closely, side by side, on the other side of the structure. By this is meant, that, for example, if the warp contains 6000 ends, 3000 of it form the face of one of the rib lines, as running filling ways in the fabric, while the other 3000 ends form the back of the same rib line in the fabric.

The first plain rib weave-warp effect, is produced by introducing 2 picks in either shed of the plain weave.

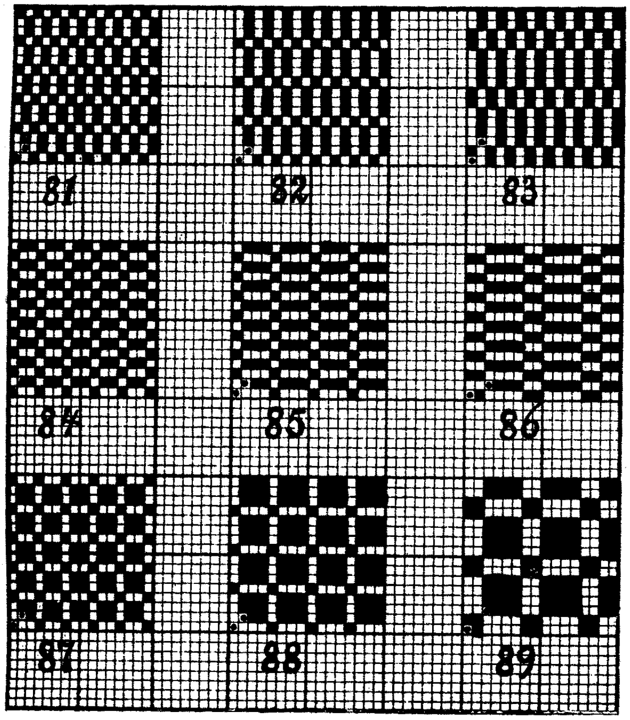
Diagram Fig. 72 is given to illustrate this weave and in which the two spots of *dot-type* clearly show us the foundation, *i. e.*, the plain weave as placed on picks 1 and 3, in connection with warp threads 1 and 2. The repeat of this weave is 2 warp threads × 4 picks, the rib line effect in the fabric occurring between the two break picks, *i. e.*, where all the warp threads exchange position from face to back, or vice versa, as done between picks 2 and 3 and between picks 4 and 5. Eight repeats in the warp and four repeats in the filling of this weave are given in our diagram in order to simplify matters to the student.

Diagram Fig. 73 shows us the similar rib weave produced with 3 picks into each shed of the plain weave—repeat of it 2 × 6.

Diagram Fig. 74 shows us the similar rib weave, produced with 4 picks into each shed of the plain weave—repeat of it being 2 × 8.

In both examples of rib weaves, their foundation, *i. e.*, the plain weave, is shown by *dot-type*. It will be readily understood that the more picks in a shed, considering texture (picks per one inch) alike, the larger are the rib lines produced in the fabric.

Plain rib weaves-filling effect: The principle observed in constructing these weaves is to have two or more warp threads work alike in either pick of the plain weave. This feature will push the picks closely together, half of the filling showing on the face, the other half forming the back, the warp resting embodied between the filling, *i. e.*, in the centre of the structure, acting in this instance more as a guide for the filling only; by what is meant no interlacing of one up one down, as shown on the point paper, will actually occur in the woven fabric, the warp threads, when pulled out of the fabric showing a straight smooth thread, without the wave of interlacing characteristic to other weaves. This will explain why the filling is easy taken up by these weaves, in fact the fell of the cloth has to



be taken away from the reed by means of the take up mentioned, since otherwise too many picks would be introduced into the cloth, although as a rule, fabrics constructed with these filling effect rib weaves will always require a high number of picks, in order to produce a smooth covered rib, which as mentiōned before, is formed only by half the number of picks. By this is meant, that if one hundred picks per inch are introduced, fifty picks only are visible on the face of the fabric in any one of the rib lines, which in this instance runs warp ways in the fabric.

The combinations selected for explaining the subject, *i. e.*, the most frequently met with weaves are the ones corresponding with the warp effects previously explained, *viz.* the change of 2-2, the change of 3-3 and the change of 4-4.

Diagram Fig. 75 shows us the plain rib weave-filling effect, having two warp threads working alike. *Dot-type* shows the foundation, *i. e.*, the plain weave, the rib weave repeating on 4 × 2, four repeats warp ways and eight repeats filling ways being given, in order to more clearly show the formation of the weave to the student.

Diagram Fig. 76 shows us a similar rib weave, having three warp threads working alike for each change, the new weave repeating on 6 × 2.

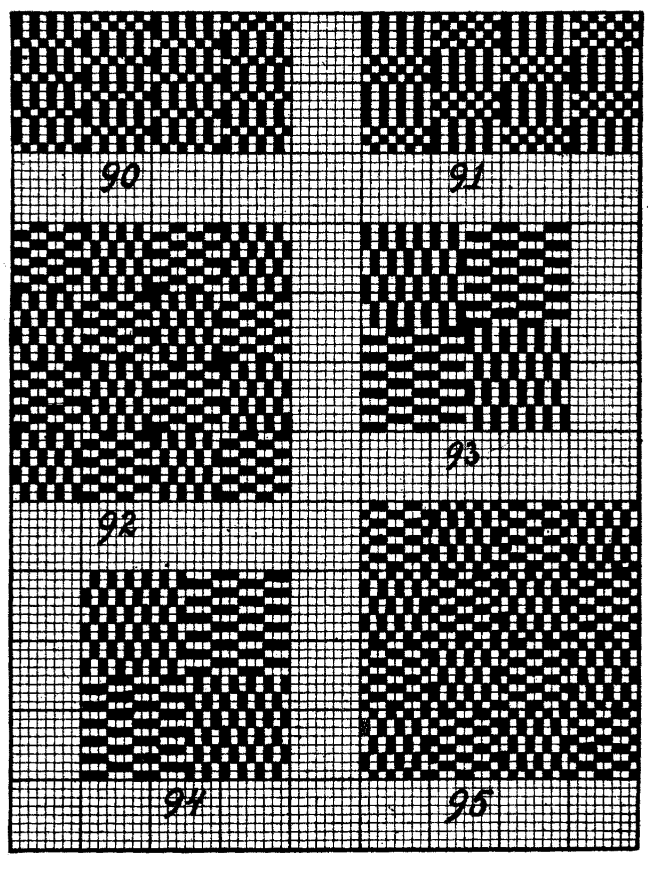
Diagram Fig. 77 shows us the plain rib weave—filling effect, having four warp threads working alike, the weave repeating on 8 × 2.

Basket Weaves: They are obtained from the plain weave by working two or more warp threads and two or more picks alike, or as we may also define it, are the combination of the respective rib weaves, warp and filling effect combined, that is with reference to the construction of the weave on the point paper, whereas in the fabric structure they totally differ from rib weaves, warp and filling in this instance forming the face and back of the structure and not like rib weaves where either one of the systems is seen only on the face and the back, the other system resting in the centre of the structure. Basket weaves are divided into *plain* and *fancy* effects, *i. e.*, whether uniform effects, or different sizes of baskets are used in one repeat of the weave.

PLAIN BASKET WEAVES: As mentioned before, are the combination of plain rib weaves, warp and filling effect with reference to designing these weaves on the point paper, or as we may say, two or more warp threads and two or more picks in the repeat of the weave work alike. This will be readily explained in connection with diagrams Figs. 78, 79 and 80, and which show us the three most often used plain basket weaves.

Diagram Fig. 78 shows us the four harness basket, repeating on 4 × 4, *dot-type*, showing its foundation, *i. e.*, the plain weave considering every other warp thread and every other pick only in the construction of the new weave, and which is the case, since every other warp thread and pick not referred to, works the same as the preceding one, two warp threads in a shed and two picks in a shed.

Diagram Fig. 79 shows the 6 × 6 plain basket, and Diagram Fig. 80 the 8 × 8 plain basket weave.



FANCY RIB WEAVES-WARP EFFECT: They are the result of varying the number of picks in a shed, in turn producing narrow and wider rib lines in the structure.

Weaves Fig. 81 to 83 are given to explain the subject, *i. e.,* are specimens of this sub-division of the rib weaves and of which

Diagram Fig. 81 shows us the combination of 1 and 2 picks in a shed used, *i. e.,* 1 pick in one shed and 2 picks in the other shed of the plain weave, a feature readily explained in diagram, if considering *dot-type,* the plain weave.

Diagram Fig. 82 shows us the combination of 1 and 3, or, a more pronounced difference between the size of the rib lines used, 1 pick of the plain weave getting one pick in a shed, *i. e.,* pure plain weave, the other getting 3 picks in a shed; the complete weaves repeating on 2 × 4.

Diagram Fig. 83 shows us the combination of 2 picks and 4 picks in a shed of the plain weave, the new weave repeating on 2 × 8.

It will be readily understood that any number of these fancy rib weaves could be designed, the few examples given, however, will thoroughly explain the subject to the student of how to design any fancy rib weave called upon to construct.

Fancy rib weaves-filling effect: These are to the fancy warp effect what the plain rib weave-filling effect was to the plain rib weave-warp effect, and are readily explained by means of Figs. 84, 85 and 86 and of which

Diagram Fig. 84 shows us the change of 1-2, *i. e.,* 1 warp thread working by itself on the plain weave to alternate with 2 warp threads drawn on the same harness, or 2 threads working alike, the repeat of the weave being 3 × 2.

Diagram Fig. 85 shows us again a more pronounced effect, *i. e.,* the change of 1-3, or 1 warp thread working on the plain to alternate with 3 warp threads working alike on the plain weave, *i. e.,* drawn on one harness (if necessary) the repeat of the weave being 4 × 2.

Diagram Fig. 86 shows us the combination of 2-4, *i. e.,* 2 warp threads working alike and interlacing with the plain weave to alternate with 4 warp threads working like and interlacing with the plain weave, the complete weave repeating on 6 × 2.

In either example of a fancy rib weave, the *dot-type* will explain the subject, *i. e.,* show the foundation weave, the plain weave.

Fancy basket weaves: With reference to constructing these weaves on the point paper, we again might consider them as the combination of fancy rib weaves, warp and filling effects, although as mentioned before, when dealing with plain basket weaves they are totally different weaves from the rib weaves when considering fabrics produced by them.

Weaves Figs. 87, 88 and 89 are given to explain the subject, and of which Fig. 87 shows us the combination of Figs. 81 and 84, *i. e.,* the change of 1-2, warp and filing ways, or in other words 1 pick in a shed to alternate with 2 picks in a shed, and 1 warp thread working by itself to alternate with 2 warp threads working alike, a feature readily explained in connection with the *dot-type, i. e.,* the foundation weave, the plain weave; the basket weave repeating on 3 × 3.

Diagram Fig. 88 shows us the combination of Figs. 82 and 85 or the combination of 1-3, the basket weave repeating on 4 × 4; the *dot-type* again will show the foundation weave, the plain weave.

Diagram Fig. 89 shows us the combination of Figs. 83 and 86, or the combination of 2-4, the basket weave repeating on 6 × 6, the *dot-type* showing again the foundation for the weave.

The same as with our fancy rib weaves, an endless variety of these basket weaves might be given, which however, would be waste of time; the student can readily construct them from examples given later on, and in this way master the subject more thoroughly.

Figured rib weaves-warp effect: They are produced from our plain or fancy effects, by using either system in sets of threads (4, 6, 8, 10, 12, etc., as the case may require) in different positions, with reference to picks, in turn producing new effects by means of short rib lines showing in different positions, *i. e.,* spots on the face of the fabric. They will be best explained by means of a few practical examples.

Weave Fig. 90 shows the 3-1 rib weave, 8 threads in a set, using 2 sets in two different positions. Repeat 16 × 4.

Weave Fig. 91 shows the 1-1-1-5 fancy rib weave, prepared for the present division of weaves, using 8 threads per set with 2 sets in two different positions. Repeat of weave 16 × 8.

Filling effects of this division of weaves are seldom if ever met with, thus no special reference to them is necessary.

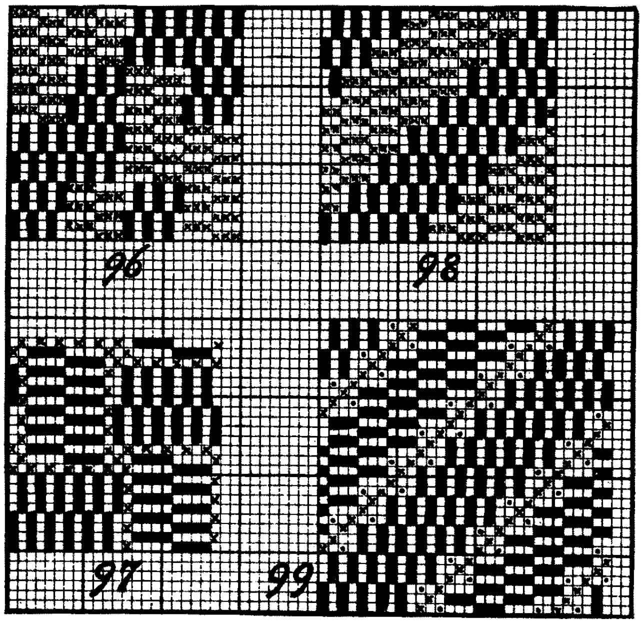
Combination of warp and filling effects: We may select for both effects the same weave or two different weaves, again we may select any motive we choose for exchanging these two effects. Diagrams Figs. 92 to 99 are given to explain the subject to the student.

Diagram Fig. 92, the motive used is the *plain setting,* 8 warp threads and 8 picks, plain rib weave-warp effect, alternating warp and filling ways with 8 warp threads and 8 picks, plain rib weave-filling effect, the plain rib weave used being in either instance the change of 2-2, the repeat of the complete weave being 16 warp threads and 16 picks.

Diagram Fig. 93 shows us again *plain setting,* using alternately 12 warp threads and 12 picks of the 3-3 plain rib weave-warp effect to alternate with 12 warp threads and 12 picks of the 3-3 plain rib weave-filling effect. The combination rib weave repeating on 24 × 24.

Diagram Fig. 94 shows us the combination of two different plain rib weaves, the exchange of warp and filling effect being again after the *plain setting,* or *plain motive,* 12 warp threads and 12 picks of the 2-2 plain rib weave-warp effect, alternating with 12 warp threads and 12 picks of the 3-3 plain rib weave-filling effect, both warp and filling ways, the repeat of the combination rib weave being 24 × 24.

Diagram Fig. 95 shows us again *plain setting,* the combination of weaves being the 2-2 plain rib weave, warp and filling effect, alternating with each other. In this instance, however, the beginning and ending of this weave has been separated, *i. e.,* 1 only is used in either case, and for which reason we might also quote the foundation weave used in the fancy rib weave 1-2-2-2-1, the first and the last threads, however, being identical, or nothing else but a continuation of the plain rib weave 2-2, both in the warp effect as well as in the filling; still breaking them up as we have done in our example gives us a chance to call the foundation weave a fancy rib weave, provided we choose to do so.



Weave Fig. 96 has for its motives the 2 up 2 down, 4-*harness broken twill setting,* using for every riser in this motive 6 warp threads and 6 picks of the 3-3 rib weave-warp effect, and for every sinker in the motive, 6 warp threads and 6 picks of the same rib weave-filling effect, the repeat of the combination rib weave being 24 × 24. To simplify matters to the student, in this instance we have shown the warp effect-rib weave with *black-type,* using *cross-type* for the filling effect-rib weave.

Diagram Fig. 97 has for its foundation 8 warp threads and 12 picks of the 4-4 rib weave-filling effect to alternate with 12 warp threads and 8 picks of the same rib weave, warp effect, both effects being shown by means of *black-type;* and *cross-type* showing the cutting off by means of the plain weave all around where the warp and filling effects meet, this feature introducing a new style of figuring previously not touched.

Diagram Fig. 98 shows us the 3-3 rib weave, warp and filling effect arranged for forming besides their horizontal and vertical warp lines, *a diagonal effect* in the fabric, or in other words, warp and filling effects exchanged in a diagonal direction, the repeat of the weave being 24 × 24. The warp effect is shown in *black-type* and the filling effect in *cross-type.*

Diagram Fig. 99 shows us another example of such a combination rib weave in which warp and filling effect exchange in an *oblique direction,* the repeat of this weave being 30 × 30. In this instance we use a twill line (see *cross-type*) for cutting up the effect, and in which it differs from the previously given example, where no special effort was made to separate warp and filling effect.

Questions:

(1) Construct the fancy rib weave-warp effect 1-2-3-1-2-3, the new weave repeating on 2 × 12.

(2) Construct the fancy rib weave-warp effect, 2-4-1-1, the new weave repeating on 2 × 8.

(3) Construct the fancy rib weave-warp effect, 3-1-1-3-1-1, the new weave repeating on 10 × 10.

(4) Construct the fancy rib weave-warp effect, 1-2-4-2, the new weave repeating on 9 × 9.

(5) Construct the four fancy rib weaves, filling effect, to correspond to the previously given four examples of its warp effects.

(6) Construct the fancy basket weaves to correspond to the four fancy rib weaves, warp and filling effect, previously designed.

(7) Construct one example of a combination, warp and filling effect, rib weave.

WHY SIZING OF WOOLEN WARPS IS FREQUENTLY AN ABSOLUTE NECESSITY.

It will be often found necessary to size woolen yarn, no matter what are its counts and quality, previously to weaving, since woolen yarn, on account of its process of carding, has the ends of the fibres, as algamated into the thread, protruding from it all over its surface. In connection with yarns for face finished fabrics, like broadcloth, beavers, doeskins, etc., this velvety appearance of the thread is an absolute necessity (the closer this pile of the yarn the better) since then only can the finisher impart to the face of such fabrics the proper finish without making the fabric tender which would be the case provided a smooth hard twisted yarn was used, on account of excessive gigging then necessary to produce the required nap, and in which even then the finisher may not succeed. This reminds the author, that when some thirty years ago, superintendent of one of our then most prominent woolen mills, we were asked to imitate some special, imported, fine woolen goods in connection with yarns then at our disposal. The finisher, not succeeding, we then obtained samples of the yarn actually used in the foreign make of goods—"give me that velvety yarn," said the finisher, "and you will receive the proper finished goods," *and right he was,* although we could not give him this yarn.

The object of carding is to produce a thread in which the fibres composing the same, lie roughly and crossed in either direction, and the ends of which are seen to stand out (pile), which besides necessary for the proper face finish of the fabric is of special advantage in assisting the felting of the cloth, as they will lay hold of each other and unite the different threads of which the fabric is composed, into a more compact mass.

In this way, the manufacture of woolen yarn differs totally from that of worsted and cotton yarn and when then a smooth even thread is the constant aim of the carder and spinner. Lower grades of woolen yarns

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(*Continued from page 147.*)

are invariably rougher and more irregular than the better grades.

Examining a woolen thread under the miscroscope will reveal this roughness even to the novice, for which reason it will be readily seen that such roughness may be the cause of some difficulty during weaving, on account of the constant friction (chafing) of the ends of the fibres while passing through the harness and reed, a friction which is still further increased by the constant shedding of the warp and the passage of the shuttle through the shed.

Points in favor of sizing woolen yarn are that in connection with warps not sized, the ends will break more frequently, requiring in turn constant tying in of ends during the process of weaving, and consequently are the cause of additional knots in the yarn, a feature which continually will increase the difficulty of weaving such yarns, in fact in many instances will be the cause of a considerable loss to the mill, both on account of less production, imperfect fabrics and endless number of knots in the fabric itself, all of which have to be removed during burling. The difficulty may be driven so far that weavers have to be paid by the day to weave such warps and then make little if any headway, or as sometimes may be the case, the latter may have to be taken out of the loom and this with a consequent heavy loss to the mill.

Another feature against yarn not sized may be found that in consequence of the friction exerted upon it during weaving, a gritty yarn is produced, *i. e.*, bunches of fibres will chafe into lumps on the yarn, and which necessarily must be removed by the weaver before running of the loom can proceed, in order to save such ends from breaking; in fact this difficulty may become so numerous and the warp become so entangled that it may be found advisable, after all, to take the warp out of the loom and have it sized, which as will be readily understood, will not only result in a loss in material to the mill, but at the same time be a loss in production as well as wages. However, one trouble will remain in connection with such imperfect yarn, and that is that this constant rubbing (chafing) of the ends will never make a perfect fabric, its surface will assume an unsightly appearance, which at the best can only be partly corrected in the finishing.

There are certainly any number of woolen yarns that can be woven readily in an unsized state, but they are principally the lower grades, and such as are used in connection with low warp and filling textures. Again, a rather open weave used, may be the cause that a warp has not to be sized, whereas such would have to be done in connection with a closely interlacing weave. For example, a 3 up 3 down 6-harness twill may permit no sizing of the warp, whereas if a 2 up 2 down 4-harness twill was used in its place, the warp then may require sizing. Another item is the principle of the shedding motion of the dobby, *i. e.*, whether an open or a closed shed. These two points (the opening in the shed and the character of the weave) are actually most important factors in deciding the question whether sizing is necessary or not. Exact details can only be given after practical experiments have been made, but if the cost is not a more important item, it is always better to make use of sizing, provided there is the least doubt that the yarn will not work satisfactorily. The glue, *i. e.*, size, imparts strength, firmness and greater resisting power to the yarn, makes the projecting fibres stick to the surface of the yarn, and thus increases its capacity to resist friction and a greater tension. Another advantage of sizing a warp is that a higher texture (more ends per inch) can be used in the loom, as compared to using the same warp yarn not sized, since sized yarn is not interfered with so much in its free motions by the adjoining ends during weaving, *i. e.*, not subjected to so much chafing during its passage through the harnesses and reed, with its shedding and beating up motions.

Examining yarn sized, under the microsope, will show a smooth, compact straight thread, while the same thread unsized is rough and full of projecting fibres. It makes no great difference what material is used for the size, but it must comply with the following conditions: The agent must be capable of imparting to the thread the necessary firmness; it must not attack the colors, and in the final cleansing (scouring before or after fulling) of the cloth it must be easy of removal, neither must it have a disagreeable odor, which cannot afterwards be removed readily. The agent generally used for the purpose is the leather gelatine, obtained by boiling the remnants of hides and skins of tanneries.

The boiling of size is a special occupation, and before the size can be used by the consumer (who receives it as a jelly) it has to be mixed with water, according to its consistency. Glue is also used, and it can be converted into a jelly by boiling it with the leather wastage of kid glove factories. A composition which compiles with every requirement is given thus: Prepare with 35 oz. of the best glue, 7 oz. concentrated glycerine, and 19 quarts water. The glue is steeped in cold water for more than ten hours, after which the glycerine, previously dissolved in 2 quarts of boiling water, is added. The glue prepared in this manner is clean, free from lumps, and is readily washed out when scouring the cloth. The size must neither be used too hot nor too strong, for in sizing the yarn, if the temperature of the bath is too hot—that is, higher than is necessary for practical work—the colors in the yarn are apt to be injured. Again, if the size is too strong, thick, or too cold, the ends will easily glue together, which in turn retards the weaving process; and if the size has a disagreeable odor, the scouring process of the cloth in the construction of which the yarn has been used, must be prolonged until the smell is removed. In connection with yarns requiring only a light sizing, many mills use as a substitute for the glue, the extract from Irish moss dissolved in water, a commonly used recipe in this case being: the extract from 15 pounds of Irish moss and 50 gallons of water.

Using a poor quality of size will be the cause of much trouble to the finisher, since it is an absolute necessity for him to remove all traces of the size from the fabric during the scouring process, and which in many instances may become hard for him to accomplish, in fact he may use for this reason agents which may attack the structure of the fabric, *i. e.*, make the latter tender.

Sizing of the warp is done by machinery known as *Dressing Machines* or for short also called *Dressers.* This machine consists of three main parts—the creel, the sizing and drying apparatus and the section reel. The spools as made on the dresser spooler and which may contain any number of ends, from 24 up to 52, in an average, are in turn put up in the creel of the dresser, the number of spools used depending upon the number of ends used in one section of the warp. It is very important that the spooler tenders are taught to tie good knots, since poorly tied knots are a detriment to production. The overseer should mark the spools, in order that he can detect the girl who ties poor knots, square knots only should be permitted. A knot known as a granny knot should not be permitted to be made, since the same always will cause trouble in weaving. The yarn must be wound on the spools solid and uniform all over its surface, free from holes or low places caused by ends out, since such places produce tight running ends on the dresser and consequently in the loom more strain will come on such ends during weaving, what in turn will be the cause of these ends breaking continually during the weaving, resulting besides in defects in the finished goods, since these tight weaving ends will reveal themselves clearly on the face of the fabric. All spools must be wound with a uniform tension, *i. e.*, must be evenly weighted, in order that a well dressed warp, having all the threads of a uniform tension through its width is the result. From the creel all the ends of the various spools put up in the latter first pass through a pattern reed, from there between a pair of squeeze rolls, the lower one being immersed in the size trough, and from where the then sized ends pass up and between several rolls of coils of steam pipes, in order to dry the warp at once. From there the warp travels through the lease reed, the condense reed and in turn from there on to the section reel, one section being dressed at a time, until the complete warp is dressed.

As a rule, it will be the best policy to always make as few sections as possible, consistent with good work. Some mills may only give the boss dresser the number of ends to use in the warp, in connection with the width on the beam, leaving the rest to his judgment, which however is a poor policy, it being always the best plan for the superintendent or the designer to lay out the number of sections for the dresser, *i. e.*, give the dresser complete orders, since in this way it may be found possible that fewer sections can be used. At the same time it puts a check on the designer, in connection with production in the dressing room. It will compel him to have production in the dressing room continually in his mind when laying out new styles and when then a few ends more or less in the pattern may not be a detriment to the latter and in turn the reason for more economical work in the dressing room.

Previously to closing the article, we will give a memorandum with reference to laying out the dressing for a warp. For example, 3780 ends to be used in the warp. Considering 3780, it will be found that 9 sections is a good plan to use, since 9 is evenly divisible into 3780

$3780 \div 9 = 420$ ends for each section, and

$420 \div 10 = 42$ ends to a spool, *i. e.*, using 10 spools of 42 ends each in the creel with 9 sections of 420 ends for each section = 3780, *i. e.*, the number of ends in the warp wanted.

DICTIONARY OF TECHNICAL TERMS RELATING TO THE TEXTILE INDUSTRY.

(Continued from page 110)

BALLING FINISHER:—A style of gill-box, as used in balling or top making.

BALLING HEAD:—A modification of the common side drawing spool system, used in carding wool on the breaker card, consisting in appliances for winding the sliver in balls under considerable pressure.

BALLING MACHINE:—A machine used in the manufacture of worsted yarn, on which the slivers are wound, producing quite hard balls without imparting any twist, so that when transferred to the creels or racks of the comber, they permit an easy unwinding.

BALMORAL:—A heavy and durable striped woolen fabric, used for making petticoats.

BAN:—A fine fabric woven in the East Indies, from the fibre of the banana leaf stalk.

BANBURY PLUSH:—The name given sometimes to woolen or worsted upholstery-plush.

BANDALA:—Strong coarse Manila hemp, made from the older plants, also fabrics made from such fibres.

BANDANNA:—A handkerchief or calico stuff with spots or figures freed from dye by local pressure in the dyeing process, or by bleaching; generally the figures are left in white or some bright color upon a ground of red or blue. It seems to have been made from time immemorial in India, by binding up firmly with thread those points of the cloth which were to remain white or of some bright color, while the rest of the fabric was subjected to the dyeing process. The fabric is now produced here and abroad in designs which far surpass the oriental patterns.

BANDING OR SPINDLE BANDS:—are twisted strands of cotton yarn used to drive spindles of ring frames, mules, twisters, winding machinery, etc., by passing around the tin cylinder of the machine and the whirl of the spindle.

BANK-CREEL:—A creel for the second breaker of a set of woolen cards. The balls are set up in this creel and from there unwind unto the feed table of the finisher card.

BAR:—A term given to a single strip of colored filling, used as heading or cross border in fabrics.

BARCELONA:—A twilled silk handkerchief, named after Barcelona, where first made.

BAREGE:—A thin fabric used for women's dresses, veils, etc., either made of silk and worsted or cotton and worsted.

BARK:—The term bark is generally used to designate quercitron bark, although the barks from other trees have been used in dyes.

BAR LOOM:—The first practical style of a power loom.

BARRACAN:—A thick water-proof fabric used in the Levant, originally made of camels hair, but now made of wool, silk or cotton, separately or mixed.

BARRACLADE:—A smooth, home-made blanketing, used by the early Dutch settlers of this country.

BARRAS:—A coarse linen fabric made in Holland.

BARRÉ:—Stripes or bars running across the width of a fabric, produced either by using different colors, counts of yarn, or texture, in the filling.

BARRÈGE:—It refers to a structure more open in texture than gauze, originally made with a silk warp and worsted filling. Later imitations were made in all wool, and subsequently cotton warps were used; taking its name from the valley of Barrège where originally made.

BARUTINE:—A silken fabric made in Persia.

BARWOOD:—A red dye-wood which grows in Sierra Leone and Angola, Africa. In commerce it is met with as a rough, red powder produced by rasping the logs. In the mills it is used for dyeing cotton yarns a brilliant orange-red, known as mock turkey red.

BASE:—An oxide or hydroxide of a metal, which when it is soluble in water is known as an alkali.

BASKET CLOTH:—Any fabric woven with a pure or imitation basket weave; used extensively for children's cloaks and dress goods.

BASKET STITCH:—A fancy work stitch used in embroidering imitating basket weaving.

BASKET WEAVE:—A subdivision of the plain weave.

BASSE-LISSE:—The arrangement in a hand tapestry loom by which the warp rests in a horizontal position during weaving, in opposition to the Haute-lisse arrangement, by which the warp runs vertical in this loom.

BASTING MACHINE:—The name given to mill sewing machines as used for basting together any number of pieces of cloth into a continuous piece for convenient handling in bleaching, dyeing, etc.

BAT OR BATT:—The continuous wad of cotton from the batting machine ready for carding.

BATISTE:—A light-weight fabric, of French origin, differing from nainsook in that it is heavier and wider than that fabric. The term batiste is generally adopted by the trade as referring to a light, sheer cloth made from a fine grade of yarn, which will average about 14 to 16 square yards to the pound. Batistes are made from various fibres, and may be bleached, unbleached or colored.

BATTEN, LATHE OR LAY:—The swinging beam in a loom which carries the raceway, the shuttle boxes and the reed; by it and the reed the filling is beaten up into the fell of the cloth.

BATTING:—Cotton or wool prepared in sheets (in a batting machine) for use in making quilts, etc.

BAUDEKIN:—A rich silk cloth now called brocade.

BAVE:—The natural pair of brins composing the silk fibre as spun by the silk worm, surrounded and cemented together by a gelatinous substance called gum, it being the reelable portion of silk in a cocoon.

BAYADÈRE:—A fabric showing stripes, in alternated and brilliant colors or in cords, in the direction of the filling. Any marked effect running in the direction of the filling in the fabric is a bayadère effect. See Barré.

BAYEUX:—Well known tapestries named after the place where first made.

BEADING:—Beaded fabrics, also the name given to narrow fabrics joining the parts of garments, ornamental fabrics, etc.

BEAD LOOM:—A specially constructed hand loom for weaving beaded ornaments, as used for the trimming of dresses, etc.

BEADS:—Lumps formed in yarn when receiving its twist.

BEAM:—Parts of the loom. *The warp beam* is a large, wooden cylinder, with iron flanges, on which the warp is wound, during warping or dressing, previous to weaving; *the cloth beam* is a thinner wooden cylinder on which the cloth is rolled automatically on the loom as it is woven.

BEAMER:—The person who arranges the yarn from cops, spools or warp chains onto loom beams.

BEAMING:—The operation of winding the warp yarn on the loom beam.

BEAMING MACHINE:—The machine for winding the yarn upon the beams of the looms.

BEARD:—The hook of a spring beard needle, as used in knitting, for retaining the yarn at the extremity of the needle in a knitting machine.

BEARSKIN:—A shaggy woolen fabric in imitation of the real article, used for outer wear.

BEATER:—A device used in the preparatory department of cotton spinning for cleaning and opening the cotton previous to carding. The beater is used in connection with the picker and the different scutchers (breaker, intermediate and finisher scutcher) of the preparing department, and is either a 2-wing, 3-wing, or a porcupine beater, or picking cylinder as also termed. In all of these, the cotton is treated by rapid blows from revolving beater arms which fling it against specially prepared surfaces, known as grids. The blow given should be quick and clean, so as to detach the fibres from each other without rupturing them, and the grids against which they are flung must be constructed so as to give the best results by permitting the easy fall of dirt, etc., during the period of arrest of the fibres.

BEATER GUARD:—A device on the first breaker, of a set of woolen cards, which knocks out any burrs or other heavy impurities adhering to the wool to be carded.

BEAUPERS:—A linen fabric which was in use during the 16th and 17th centuries.

BEAVER:—A thick, warm cloth, technically known as a double cloth structure, chiefly used for overcoats and cloakings. The fabric is heavily fulled and *face finished*. The average weight of the fabric met with is about 28 ounces finished.

Also a hat of the shape of a beaver hat, but made of silk or other material, in imitations of fur. The modern stiff silk hat, until recently, was called a beaver.

BEAVER FUSTIAN:—A heavy cotton fabric produced in this country about the close of the 18th century.

BEDFORD CORD:—Bedford cords are what might be technically termed ribbed fabrics, the face of the cloth structure being chiefly produced by the warp, the filling resting (more or less floating) on the back of the structure, in order to produce the characteristic rib or cord effect in the fabric, the ribs running in the direction of the warp. The face of the fabric is generally produced by the plain weave; in connection with higher textures sometimes the 3- or 4-harness twills may be used.

BEER:—20 dents (or splits) in a reed, two ends to each split. Used in Bolton, Bury and vicinity, in England.

BEETLE OR BEETLING MACHINE:—A machine used in the finishing of linen or cotton goods, by hammering them as they are wound over a roller. For the hammering, stamps are used, which are raised in succession and permitted to drop onto the fabric by their own weight.

BEIGE:—A twilled, woolen dress goods made of yarns dyed in the stock; mostly sold in grays and browns, also in mottled or mixed effects.

BELTED PLAID:—The plaid wound like a belt around their bodies by the highlanders when in full military dress.

BELT SPEEDER:—The name sometimes given to the differential motion of fly frames.

BEND:—The surface used to sustain the rollers or flats in the revolving flat card.

BENDERS:—(or Bender cotton) Cotton grown on the fine black alluvial soil of the bends of the Mississippi River.

BENGAL:—A thin fabric of silk and hair, used for women's dresses, originally made in Bengal, from where it derives its name.

Also an imitation of striped ginghams, called *bengal stripes,* and which were first manufactured in Paisley, Scotland.

BENGALINE:—A name for fabrics made with a silk warp and wool filling. For cheaper grades, cotton instead of wool is used for the filling and then such fabrics are sometimes called cotton Bengalines, although cotton is used only for the filling. When silk is the only constituent of the fabric, such are then known as all-silk Bengalines. Weaves producing a corded effect are used for the interlacing of these fabrics.

BENZENE:—A colorless, volatile, inflammable liquid obtained for practical purposes from coal-tar, by fractional distillation. From it aniline is indirectly made. It is a solvent for fats, etc., but rather expensive for practical use.

BENZIN OR BENZINE:—A colorless, inflammable and explosive liquid obtained by fractional distillation and refining, from petroleum. It is an excellent solvent of fats, etc., and is used extensively for cleansing garments, etc.

BERGAMOT:—A coarse tapestry of wool, hair, silk, cotton or hemp.

BERLIN WOOL:—Worsted yarn used for crocheting and knitting work. It is of a harder twist than zephyr wool. Also known as *German wool.*

BERRIES:—*Persian berries, French berries.* There are about seven or eight different qualities, all derived from the same family of shrub. A dyestuff is extracted from those berries.

BERTHA:—A shoulder cape, worn by women. Worn either separate or attached to the blouse of the dress.

BIAS:—A line, cut, or seam, diagonally across the fabric for trimming purposes. Fabrics are frequently cut on the bias.

BIAZ:—A cotton cloth resembling linen, made in central Asia.

BIB:—A waist piece, attached to a woman's apron.

BICEXTINE:—A sizing material made to a dextrin by malting.

BICHROME OF SODA:—A salt of chromic acid, it has an orange-red color, and is used extensively as a mordant.

BIER:—See Beer.

BIGGIN OR BIGGON:—A kind of a skull cap with ears, once in common use for men.

BILIMENT:—An ornamental attire for head or neck for women.

BILLIARD CLOTH:—A fine, green colored cloth, piece dyed, from 72 to 81 inches wide, manufactured from a rather soft spun yarn, heavily fulled, with a short velvet finish; used for covering billiard tables. The plain weave is used for the better grades, the 3-harness twill for others.

BILLY:—The name given to a Slubbing Billy, a slubbing machine.

BINDER WARP:—Extra warp threads added for giving strength to a fabric: if used as an interior warp, it is not visible in the finished fabric.

BINDING:—The securing together in the process of weaving two separate cloths, or extra material used for figuring or other purposes on ordinary single cloth.

BINDING CLOTH:—A muslin, dyed and stamped, used to cover books.

BIRD'S EYE CRAPE:—A thin fabric manufactured specially for the East Indies.

BIRRUS:—A thick, coarse woolen stuff used for making storm coats.

BISETTE:—A narrow, coarse, indented pillow lace, made and worn by the peasants in France.

BISHOP'S LAWN:—A lawn fabric a little heavier than swiss mull and somewhat lighter than india linen; it has a kind of a swiss finish.

BISMARK BROWN:—A coal-tar product used for dyeing cotton, silk and wool in brown shades.

BISTER OR BISTRE:—A brown pigment prepared from wood soot by extracting the latter with water.

(*To be continued.*)

SILK FROM FIBRE TO FABRIC.

True Silk—Silk Throwing—Splitting and Sorting—Soaking — Winding — Cleaning — Doubling—Tram—Organzine—A Typical Silk Spinner—A Silk Doubler and Twister—Defects met with in Thrown Silk—Singles—Reeling—Numbering the Silk—The Denier System of Numbering Silk—Dram System of Numbering Silk—The Ounce System of Numbering Silk—Comparison of Denier and Dram—Denier Constant—Testing Silk as to Counts—Conditioning—Scouring—Boiled-off Silk—Tinting—Souple Silk—Ecru Silk—Bleaching Silk—Soap—Testing Soap—Soap Economy—Water—Weighting—Dyeing—Washing—Lustering—Wild Silk—Spun Silk—Waste Silk—Statistics — Winding — Warping — Drawing-in — Quilling — Weaving—Finishing.

(*Continued from page 123.*)

In the to and fro motion of the pawl *J*, the measuring is accomplished. On the forward motion of said pawl it engages the teeth of the ratchet wheel *L*, shown in Fig. 10, and turns the wheel with it, the teeth slipping past the catch *M*, which prevents any reverse motion. On each forward motion of the pawl *J*, the ratchet wheel *L* is advanced a certain number of teeth, which is governed by the setting of the knob *P*. There are 120 teeth on the ratchet wheel *L*, and it takes one revolution from the ratchet wheel *L*, whether 5,000 or 20,000 yards are reeled. It is apparent that the fewer the teeth moved by the pawl *J* in its forward motion, the longer the time it will take to make one complete revolution of the ratchet wheel *L*. The number of teeth to be moved is regulated by the device shown in Fig. 11 in perspective view, and by letters of reference *N*, *O* and *P* in Figs. 9 and 10. *O* is a projecting piece of setting lever *N*, and which prevents the tooth of the pawl *J* from engaging with the teeth of the ratchet wheel *L*; and since the motion of said pawl is uniform, the number of teeth turned by it on ratchet wheel *L* is governed readily by this attachment.

When the ratchet wheel *L* with its knock-off cam L^1 has revolved far enough to have come in contact with the weighted lever *W*, which hangs perpendicular, the intermittent pulls of the pawl *J* will force the knock-off cam L^1 to raise the weighted end of the lever *W* into the position shown at the left hand in Fig. 10. When the ratchet wheel *L* has turned past this position, the weighted lever *W* slips off the end of the knock-off cam L^1 at *Z*, and the catch *R* which is a part of the

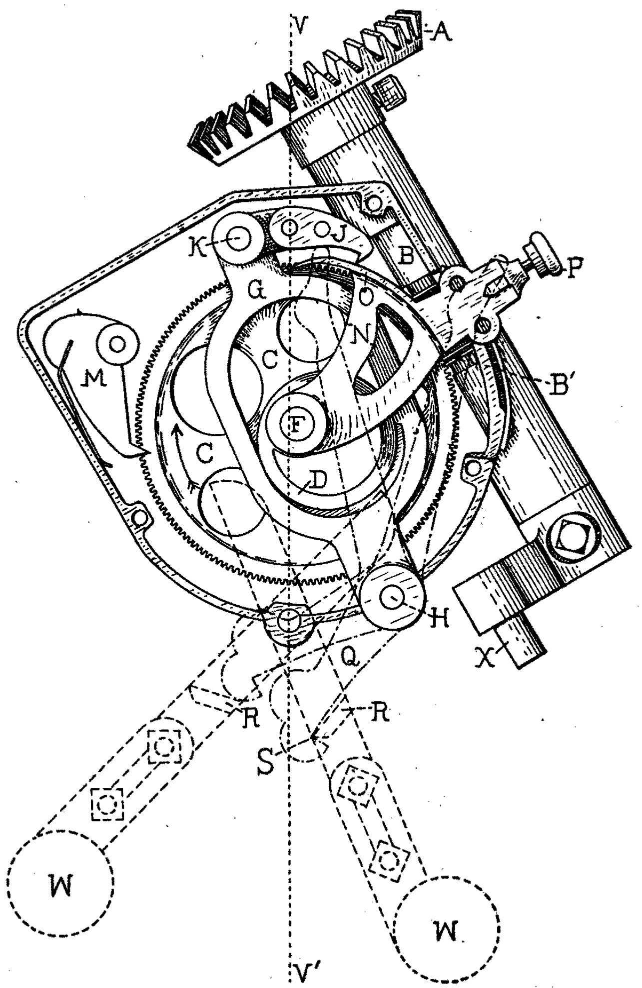


Fig. 9

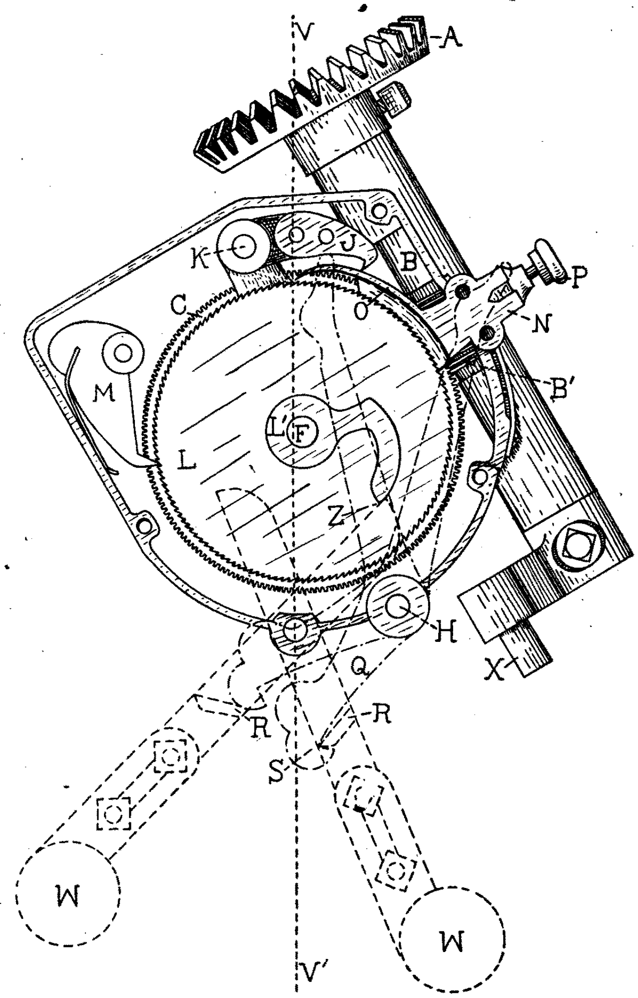


Fig. 10.

weighted lever *W* latches with the tumbling shaft lever *Q*, in the position shown at *S*. This latching of catch *R* on weighted lever *W* with tumbling shaft lever *Q*, automatically stops the rotation of the fly by throwing the tumbling shaft out of balance. To start the fly, all the operator has to do is to release the tumbling shaft lever *Q* from its latched position back to its perpendicular line V-V^1. As will be readily understood, each fly of the reel is equipped with one of these clocks.

The crank *X* on the lower end of the clock or driving shaft *B* engages with a slot, and which is secured to the traverse rod, thus the clock and traverse are made to work in unison.

The ratchet wheel *L* has 120 teeth and for winding 5,000 yards the pawl *J* takes 12 teeth, for 7,500 yards 8 teeth, for 10,000 yards 6 teeth, for 15,000 yards 4 teeth, and for 20,000 yards 3 teeth.

It will be readily understood that the more yards wound on the skein, the larger the traverse of the machine required, in order to permit the formation of perfect skeins, readily handled in the after processes. The wider the skein wound on the fly, the quicker the traverse of the thread must be, in order that there will be less liability of the thread becoming entangled and matted during the scouring and dyeing process, and that in re-reeling such skeins after scouring, dyeing, etc., they will run off more satisfactorily, again, in rewinding for warp purposes, less knots will result on account of the greater length of silk on the skein.

Numbering the silk as to its counts is another work for the throwster, which is done by means of weighing the skeins or hanks of the silk on a fine spring scale, graduated either as to drams or deniers, or both, (one system on each side, in connection with a double, *i. e.*, wide index finger). The spring of the scale is enclosed, so as to protect it from moisture and dust, and thus keep it in proper condition.

Knowing the length as well as the weight of the skein or hank, it then will be easy to ascertain its count, more so when said skeins or hanks are made up in multiples of 1,000 or 500 yards lengths and the dram system used in connection with the numbering of the silk. The dram system is based on the weight of 1,000 yards of silk, expressed in drams, and when consequently, if a skein or hank of 1,000 yards weighs $4\frac{1}{2}$ drams, such silk is known as $4\frac{1}{2}$ dram silk; again, if the skein contains 8,000 yards of silk and weighs 24 drams, such silk is then known as ($8000 \div 1000 = 8$, and $24 \div 8 =$) 3 dram silk, etc.

It will be readily understood that the weights of these skeins or hanks in a lot of silk thrown, will vary, for which reason, for convenience, the average count for it must be figured.

For example, suppose the following seventeen skeins have been weighed:

5	skeins to show silk to be 23	denier count
3	" " " " " " 24	" "
4	" " " " " " 25	" "
5	" " " " " " 27	" "

then:

$$5 \times 23 = 115$$
$$3 \times 24 = 72$$
$$4 \times 25 = 100$$
$$5 \times 27 = 135$$
$$\overline{17} \qquad \overline{422}$$

and $422 \div 17 = 24.82$ will be the average denier count of such silk, and which for practical work would have to be denoted as a 24/26 denier silk. In the same way the throwster will proceed to mark the silk thrown in connection with the "dram" system of grading the counts, if such is the standard used or desired by the mill. However, no matter which method is used, it is an easy matter to calculate either one from the one given.

Silk yarn is either numbered or sized by the "*denier*" or the "*dram*" system, except with very coarse silk, (for other than weaving or knitting purposes) which is graded by the "*ounce*" system.

The Denier System of Numbering Silk. The denier system of numbering silk is based on the weight of a skein of silk of the standard length expressed in units of weight called deniers, thus a 10-denier silk means that a standard skein of this silk weighs ten deniers. The

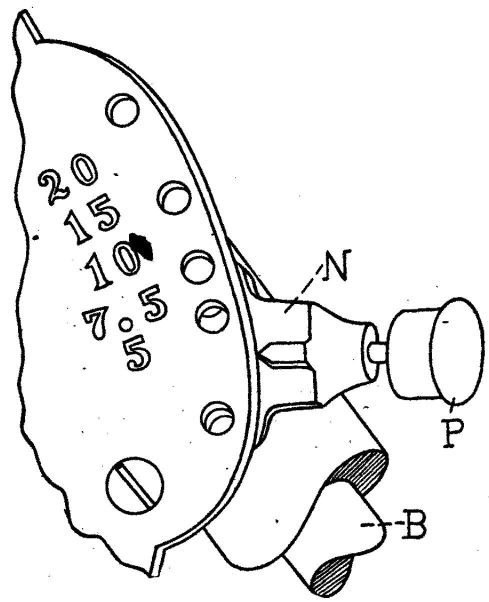


FIG. 11.

length of the standard skein is 476 meters, (about 520 yards, 20 inches) this being the nearest equivalent to the old standard of length, 400 Paris ells or aunes. The unit of weight, the denier, so named from an old Roman coin once used as a weight, is the equivalent of the old Paris grain, once used in France, but now practically obsolete. The Paris grain is lighter than our standard grain, 7000 standard grains (one pound avoirdupois) being equal to 8530.5549 Paris grains, therefore the denier is less than a standard grain, one denier weighing 0.8194 grains (0.0531 grams) or about 533.16 deniers to the avoirdupois ounce. As will be readily understood, the silk of commerce is not made up into skeins of the length just mentioned, or of any uniform lengths, a skein of the standard length (476 meters) is reeled off and used for determining the weight and count of the silk, the number of deniers that this test skein weighs being the count of the silk being tested.

In testing a lot of silk it will usually be found that all of the test skeins of 520 yards and 20 inches (476 meters) do not weigh exactly the same, then the count of the silk is expressed by writing the lowest weight and the highest weight of separate test skeins thus—14/16 deniers. This means that none of the test reelings weigh less than 14 deniers and none weigh more than 16 deniers, or that all of the test skeins will weigh between 14 and 16 deniers, and the silk is called 14/16 denier silk. Considering the average weight of the test skeins as a basis, *i. e.*, 15 deniers, and the weight of the denier being 533.16 to the ounce, we will have

533.16 × 16 = 8530.5549 deniers to the pound avoirdupois, and 8530.5549 ÷ 15 (denier weight of silk) = 569.0366 standard test skeins; counting 520 yards, 20 inches to the skein, we therefore have 520 yards, 20 inches × 569.0366 = 296,215.16 yards, in one pound of 15 denier silk. Comparing this with the table showing "number of yards in silk calculated by the dram system," it is seen that the silk in question is lighter than 1 dram silk. As a matter of fact, nothing finer than 8/10 denier silk occurs in practical work, and this only with extra fine fabric structures.

It may be well to note that with silk the process of numbering the same, *i. e.*, ascertaining its count, is reversed to that of grading Wool, Worsted, Cotton or Linen yarn, when then the number of hanks (or test skeins, as we can consider them) required to balance one pound indicate the count or number of the respective yarn.

Dram System of Numbering Silk. In connection with this system of calculating the count of silk, the 1,000 yard hank forms the basis. If the same weighs 1 dram, such silk is known as 1 dram silk; again, if such a hank of 1,000 yards weighs—for example $2\frac{3}{4}$ drams, such silk is known as $2\frac{3}{4}$ dram silk, etc.

The length of the skeins is 1,000 yards, except in connection with the heavier counts, and where 1,000 yard skeins would be bulky, and cause excessive waste, then such test hanks or skeins are made up in shorter lengths, for example, 500, or only 250 yards in length, and their weight taken in proportion to the 1,000 yards. Thus, if a skein be made up to contain 500 yards weighs 4 drams, the silk then is (4 × 2 =) 8 dram silk; if a skein made up into 250 yards weighs $1\frac{3}{4}$ drams, the silk will be ($1\frac{3}{4}$ × 4 =) 7 dram silk.

The size of yarn, whether graded by the dram or the denier system of numbering, is always given for their "gum" weight; that is, their condition "before boiling-off," in which latter process yarns lose from 15 to 28 %, according to the class of raw silk used, (China and Canton silks losing the most, Japan silk less and Italian silks the least) as well as whether the silk was thrown bright, or was washed, and what quality of soap was used in the latter process.

The following table shows the number of yards to the pound and ounce from 1 dram silk to 20 dram silk (in the gum).

Drams per 1,000 yards	Yards per pound	Yards per ounce
1	256,000	16,000
$1\frac{1}{4}$	204,800	12,800
$1\frac{1}{2}$	170,666	10,667
$1\frac{3}{4}$	146,286	9.143
2	128,000	8,000
$2\frac{1}{4}$	113,777	7,111
$2\frac{1}{2}$	102,400	6,400
$2\frac{3}{4}$	93,091	5,818
3	85,333	5,333
$3\frac{1}{4}$	78,769	4,923
$3\frac{1}{2}$	73 143	4,571
$3\frac{3}{4}$	68,267	4,267
4	64,000	4,000
$4\frac{1}{2}$	56,889	3,556
5	51,200	3,200
$5\frac{1}{2}$	46,545	2,909
6	42,667	2,667
7	36,571	2,286
8	32,000	2,000
9	28,444	1,778
10	25,600	1,600
12	21,333	1,333
14	18,286	1,143
16	16,000	1 000
18	14,222	889
20	12,800	800

Memo.: 16 drams = 1 oz., 16 ozs. = 1 lb., 256 drams = 1 lb.

The Ounce System of Numbering Silk. Another system of grading silk as to their counts is the ounce system, which system however, is only used in connection with trades other than weaving or knitting, and where heavy counts of yarn are used. This system of numbering silk is based upon the weight of 1,000 yard hanks, expressed in ounces. For example: a 1,000 yard hank weighing 2 ounces is called a 2 ounce silk, etc.

Comparison of Denier and Dram. As thrown silk is counted by both the dram system and the denier system, the former being used more in this country and in England, the latter in the other European countries, it will be of interest to make a comparison of the dram and the denier. Comparing the denier system with the dram system will be an easy calculation, from the fact that both are based upon the principle that the grading in either system varies by a given standard length, the counts increasing in number, correspondingly to a thicker yarn.

Denier vice versa Dram. Since the length of one denier is 520 yards and 20 inches, and there are 8530.5549 deniers to the pound avoirdupois, there will be 520 yards, 20 inches ($520\frac{5}{9}$ yards) multiplied by 8530.5549 or 4,440,628 yards (in round numbers) of 1 denier silk in a pound. By the dram system, a 1 dram silk contains 256,000 yards to the pound, therefore, if we divide the number of yards of 1 denier silk in one pound by the number of yards of 1 dram silk in one pound, we will obtain a figure, or *constant*, which will express the relation of the units of the two systems. Thus 4,440,628 divided by 256,000 will give us 17.346, or in round numbers $17\frac{1}{3}$, therefore 1 dram count is equal to $17\frac{1}{3}$ deniers count.

To find the number of deniers count in any given dram count, we multiply the dram count by this constant $17\frac{1}{3}$.

For example, what is the denier count of 3 dram silk? $17\frac{1}{3}$ multiplied by 3 equals 52. Answer 52 deniers count.

DRAM VICE VERSA DENIER. To reduce deniers count to dram count, this constant $17\frac{1}{3}$ will also be used, and since $17\frac{1}{3}$ deniers count equals 1 dram count, to find the dram count from the deniers count, divide the deniers count by $17\frac{1}{3}$.

For example, what will be the dram count of 35 deniers silk? 35 divided by $17\frac{1}{3}$ gives us 2, plus a small fraction, therefore we take the even number 2. Answer 2 drams count.

CONSTANT. The constant here given, $17\frac{1}{3}$ or 17.346, is slightly different from the official constant given by the New York Silk Conditioning House and which is 17.366. This difference is explained by the different values given to the various weights and measures used, the meter being taken here as equalling 39.37 inches. The difference is so small as to be a negligible quantity in practical work, but if desired, the decimal number can be used instead of the number $17\frac{1}{3}$ given.

The average limits within which silk fluctuates in the market is: Raw silk, 9 to 30 deniers, Organzine, 18 to 34 deniers, Tram, 24 to 60 deniers; however, these limits are not fixed, and vary in either direction, depending upon the origin of the silk. Italian silk spins to the finest count, is the most carefully reeled raw silk brought in our market, hence commands the highest price of any silk. Japan comes next in value, the better grades of it being a close competitor to Italian silks. Canton and Chinas are of less value to those quoted, for reasons previously stated.

It is claimed that the individual cocoon filament in raw silk reels about $2\frac{1}{4}$ deniers, consequently the number of deniers in the single thread is somewhat more than double the number of cocoon filaments used in the formation of the thread; thus, if six cocoons are reeled together, a single of ($2\frac{1}{4} \times 6 = 13\frac{1}{2}$) practically 13 deniers will be the resulting silk thread.

Testing Silk as to counts. During the reeling of the cocoon filaments, the latter, for one reason or the other, may run out previously to the reeler starting another cocoon; again, to make up for the filaments that have been left out, the operator may add one or two additional cocoons, so as to balance the previous loss. This however, will make the thread heavier than it should be; again, the reeler may neglect to add the cocoons at the right time. This will explain that it is practically impossible to produce a silk thread absolutely true in count throughout the entire skein; again, variations in a lot of silk under consideration are more likely to be greater if samples are taken from different parts of a bale. On account of this variation in the size of the silk, a better idea of the average count of a lot of silk under consideration is obtained by taking the average of several tests from different parts of the bale or from different parts of the same book or moss. These irregularities in silk are the cause of a variation of from one to two deniers in any lot of silk under consideration, thus for example we meet organzine sold as 24/26, by which is understood that the lot of silk thus designated will reel within the limits indicated, *i. e.*, between 185,000 to 170,000 yards to 1 lb. Pronounced irregularity of silk, however, affects its market value, since for certain fabrics it is absolutely necessary that variations be confined within narrow limits.

When testing for the count in a lot of silk yarn under consideration, it will be advisable to make as many test skeins as possible; rather make up twenty of these test skeins, taken at random from the lot, in place of only making ten skeins, although the same total yards of silk yarn may be tested. By this we mean that, for example, four 500-yard skeins, taken from four different parts of the lot, will give a better average of the count, than two 1000 yards skeins.

(*To be continued.*)

An Ingenious Jacquard Card Wire.

The advantages of the new card wire over the common wire used are:

(1) while possessing in itself means for securing it against endwise play when operatively attached to

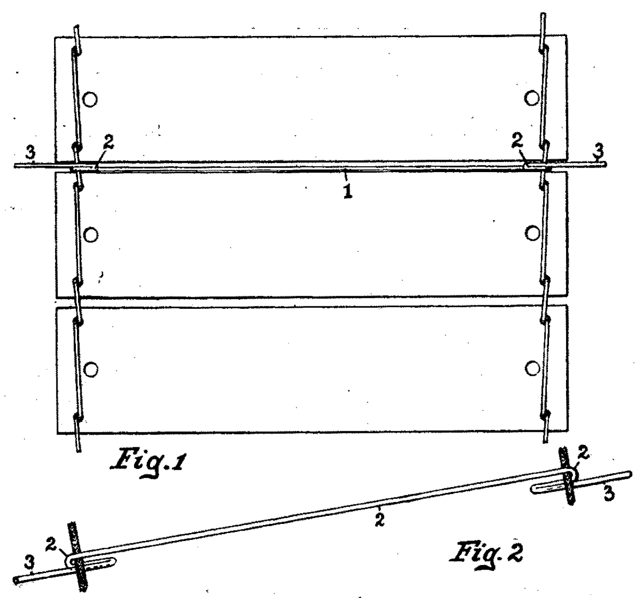


Fig. 1 Fig. 2

a series of cards, it will be comparatively little more, if any more, expense to manufacture than the plain straight card wire now in common use,

(2) it is secure against becoming detached from the cards, and

(3) is capable of being applied to the cards so that either side thereof may be presented to the cylinder.

Of the accompanying illustrations, Fig. 1 shows several cards laced together and one of the new card wires attached thereto; Fig. 2 is a perspective view of the card wire, showing the manner in which it engages the lacing.

1 designates the new card wire, and which is nothing more than a plain piece of wire having its end portions bent so as to form hooks or crotches 2, opening toward each other for the reception of the lacing of the cards, and projections 3 extending beyond said hooks so as to serve to support the wire, and in turn the set of cards on the card rack of the loom.

In assembling the wires and the laced cards, one hook of each wire is slipped over the lacing between cards and then the two cards are bent somewhat, transversely, until the lacings are brought closely together enough so that the other lacing may be in like manner entered into the other hook. The wires may be used indifferently, either side up, *i. e.,* the body-portions above and the projections below the lacings, or vice versa, and whether they are in the one position or the other, the lacings come the same distance from the face of the cylinder as the wires are passing over the latter and the cards engage the pegs on the cylinder at the same elevation. If the projections were arranged in a plane which was further from that of the lacings than the plane of the body-portions of the wires, the wires could not be used either side up without either having to make the pegs of the cylinder unduly long, or having to contend with the slipping of the cards over the pegs of the cylinder, during the running of the loom. The new wire is the invention of Mr. L. Diefenbach.

McNaught's Improved Wool Washing Machine.

The same is shown in Fig. 1 in its side elevation, Fig. 2 being a cross section through the washing trough and outer settling tank and also the side trough which receives the liquid rejected by the squeezing rollers, and which in turn is elevated from this side trough back into the washing trough.

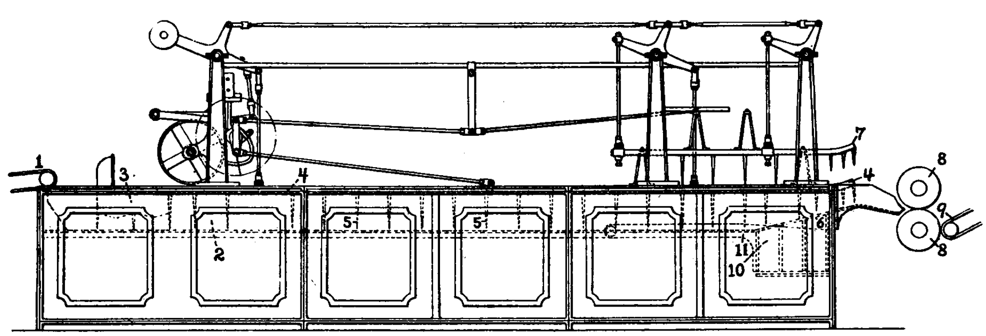


Fig. 1

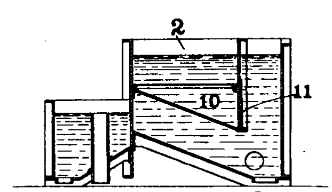


Fig. 2

In operation, the wool to be treated is fed, either by hand or by an automatic hopper feed, upon the endless feeding apron 1, and falling into the trough 2 is caught by the immerser or box like portion 3, on the extremity of the propelling frame 4, as the latter descends; the wool being thereby thrust down into the scouring liquor.

The prongs 5, in turn propel the wool forward for a short distance, and then as the frame 4 rises out of the trough the wool is free to float and its fibres are free to distend or expand, a most important feature in connection with the perfect cleansing of the wool.

On a further descent of the frame 4, the wool is again engaged by the prongs 5 and propelled further on, and so on until it reaches the incline 6, upon which it is rapidly delivered by the action of both frames 4 and 7, and from where it then travels to the squeezing rollers 8 and thence up the conveyer 9.

It will be readily understood from the explanation thus far given, that although the wool is only intermittently propelled through the main part of the washing trough and is intermittently allowed to expand therein and thus give up its impurities to the water or scouring liquor, yet it is being constantly delivered up the incline 6. The latter being perforated and provision being made to prevent surging of the fluid therethrough (as will be explained) it will be noticed that the wool is constantly delivered, resulting finally in a cleansed wool in best possible condition for carding, combing and spinning.

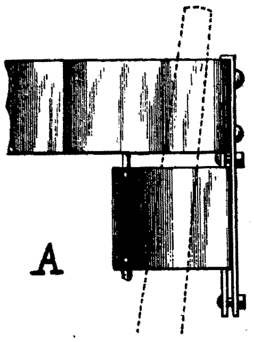
In order to prevent surging of the liquid below the perforated delivery incline 6, a small tank 10 is provided, the same being subdivided by a number of partitions, which prevent the water surging or flowing from one compartment to the other, insuring a quiescent condition of liquid below the incline and thus preventing the wool passing through or choking the perforations of the incline. The bottom of the small tank 10 is sloped or downwardly curved to one side, as clearly shown in Fig. 2, to cause the sediment or impurities, as liberated during scouring from the wool, to settle down to that side. Against this lower settling side, a sluice door 11 is either hinged, pivoted or made to slide, so as to enable the small tank 10 to be cleaned out.

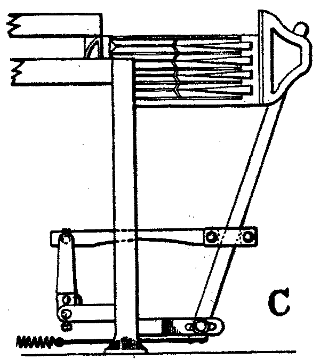
Improvements to Looms.

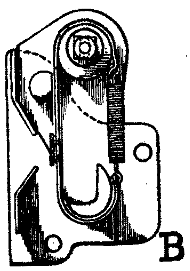
In the accompanying illustration four improvements to looms are shown, the same being the inventions of Mr. William H. Ayer, and of which

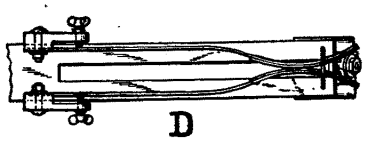
Fig. A shows an *Improved Shuttle-check,* comprising a body having spring wings or cheek pieces, arranged to form a receiving space and a widened entrance thereto, a bracket on which the check is vertically adjustable, and means for clamping the body portion of the check to the bracket.

Fig. B shows a *New Picker-check*. The novelty of this device consists in the combination with an impact strap having an impact surface of harder material, of a pair of spiral springs connecting the ends of the









strap, means for anchoring the central portion of one of the springs, a fixed support for the band having a curved bearing surface, and an adjustable support capable of longitudinal and transverse adjustment.

Fig. C refers to a *Picking-motion* comprising in combination the picker staff, lug stick and picker arm, an aperture near one end of the lug stick, an angular lug on the picker arm for engagement with said opening or aperture; a rock shaft, a slidable block thereon and pivotally connected to said picker arm, and adjusting means on the picker arm adapted to bear in said shaft.

Fig. D shows us another *Shuttle-check*. Examining the illustration we find in combination with the lay of the loom, angular brackets depending therefrom, the brackets having a lateral extension parallel to the lay, flat springs secured to the bracket, set screws carried by the lateral extensions to regulate the springs, the springs having curved converging ends faced with friction material, a guiding loop depending from the lay surrounding the free ends of the springs, and an abutment arranged between the ends of the springs to hold the same spaced apart.

An Improved Filling Beating Up Motion for Looms for Weaving Heavy Goods, as Cane, Duck, etc.

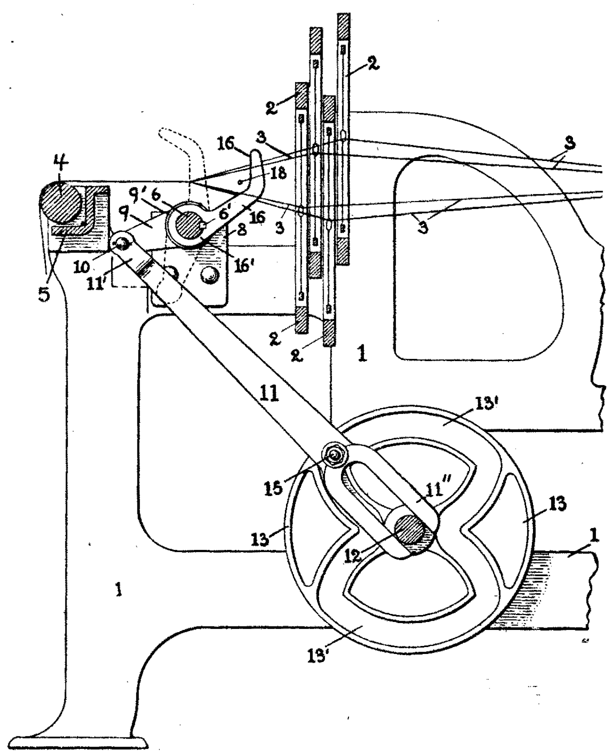
In this motion of the Crompton & Knowles Loom Works, a series of blades are provided for the beating up of the filling in place of a reed, said blades being made separate and provided with hubs, fast on a rock shaft. The warp threads pass between the blades, which act as a reed to separate and guide the warp threads, and also act to beat up the filling, after it is inserted in the shed. The blades are made so that they always extend through and above the warp threads in the upper plane of the shed, when said blades are in their extreme backward position.

Our accompanying illustration shows a detached portion of a loom, with the new filling beating up motion combined therewith.

Numerals in the illustration indicate thus: 1 a portion of the side frame of a loom, 2 the harnesses, 3 the warp threads, which after passing the harnesses, pass over the roll 4 at the front of the breast beam 5.

With reference to the new beating up motion, a rock shaft 6 extends throughout the width of the loom in front of the harnesses, and is mounted at each end in bearings on stands 8 secured to the inner side of the loom frame. The shaft 6 has fast on one end the hub 9′ of an arm 9, which carries a pin 10 with which is pivotally connected the forked end 11′ of a cam lever or arm 11; the other end 11″ of the cam lever or arm 11 being also made forked shaped or slotted to receive a driven shaft 12. The latter has fast thereon a cam 13, having a cam groove 13′ in one face thereof, into which extends a roll on stud 15, carried on the cam lever or arm 11. Through the rotation of the shaft 12 and the cam 13, and the engagement of the roll on stud 15 with the cam groove 13′ in said cam, and the movement of the cam lever 11, a rocking movement is communicated to the shaft 6 at regular predetermined intervals.

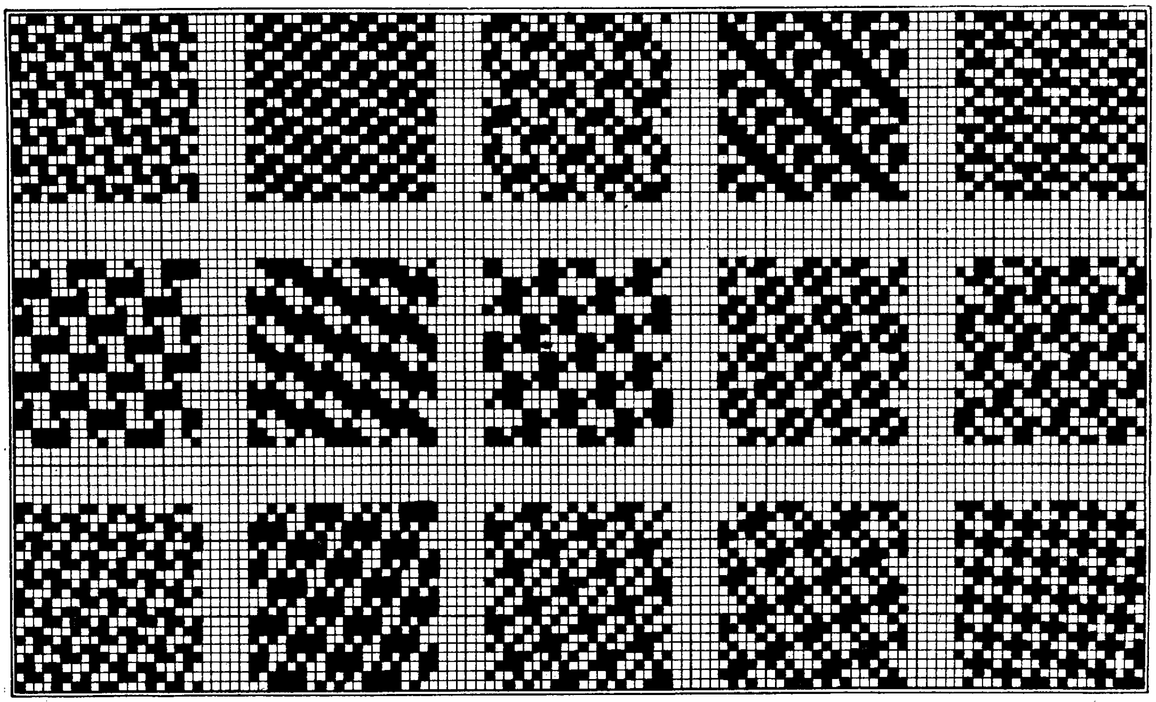
On the rock shaft 6 is mounted a series of blades 16, having hubs 16′. Separate collars are mounted on the shaft 6, between the hubs 16′ of the blades 16,



to hold said blades at a proper distance apart to give a clearance for the warp threads 3 passing between said blades. The hubs 16′ of the blades 16, are fast on the shaft 6, being attached to the latter by a key 6′.

DICTIONARY OF WEAVES.

TEN HARNESS



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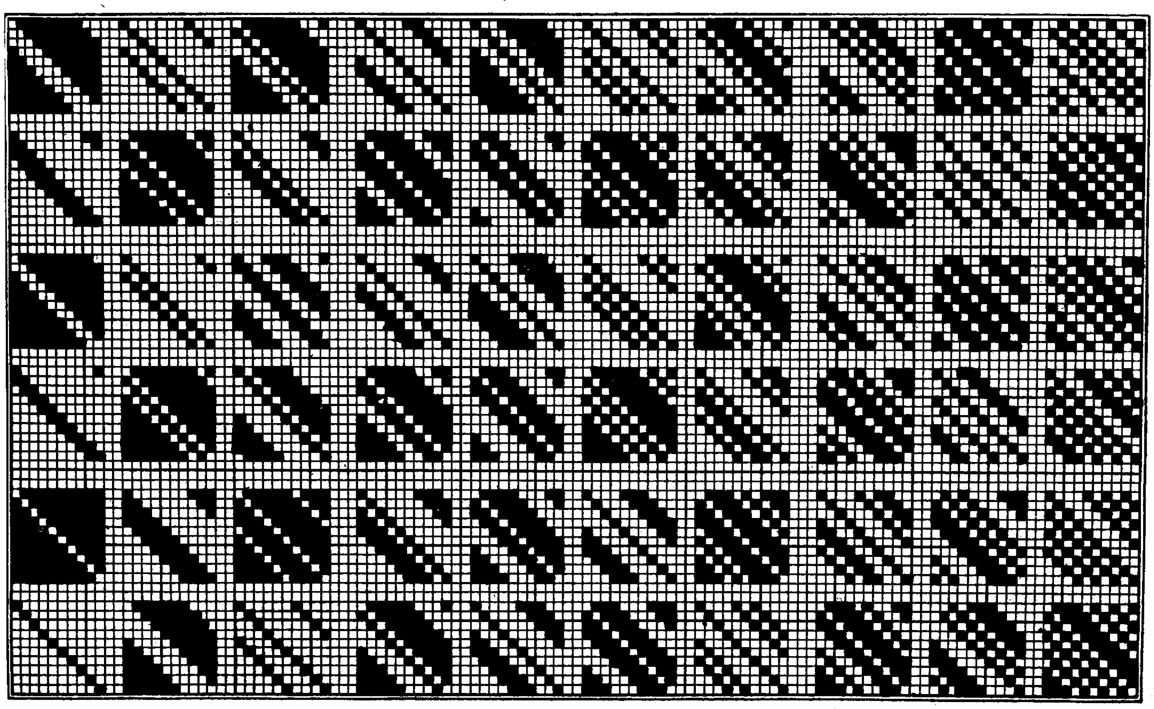
TEN HARNESS



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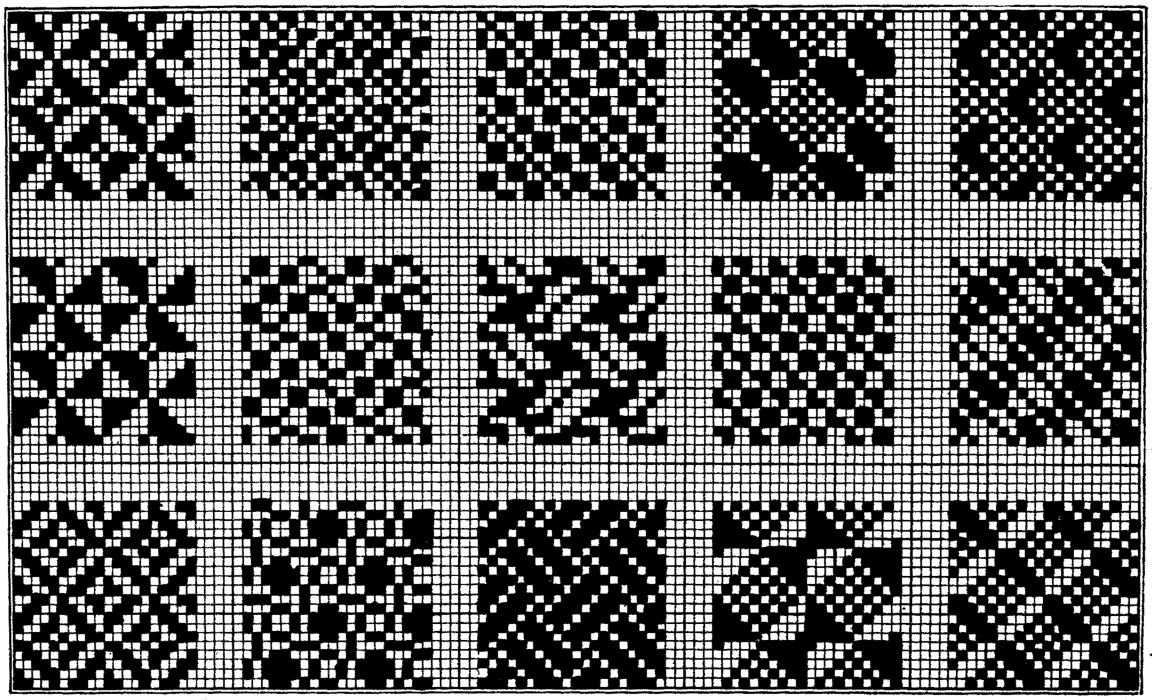
DICTIONARY OF WEAVES.

TEN HARNESS



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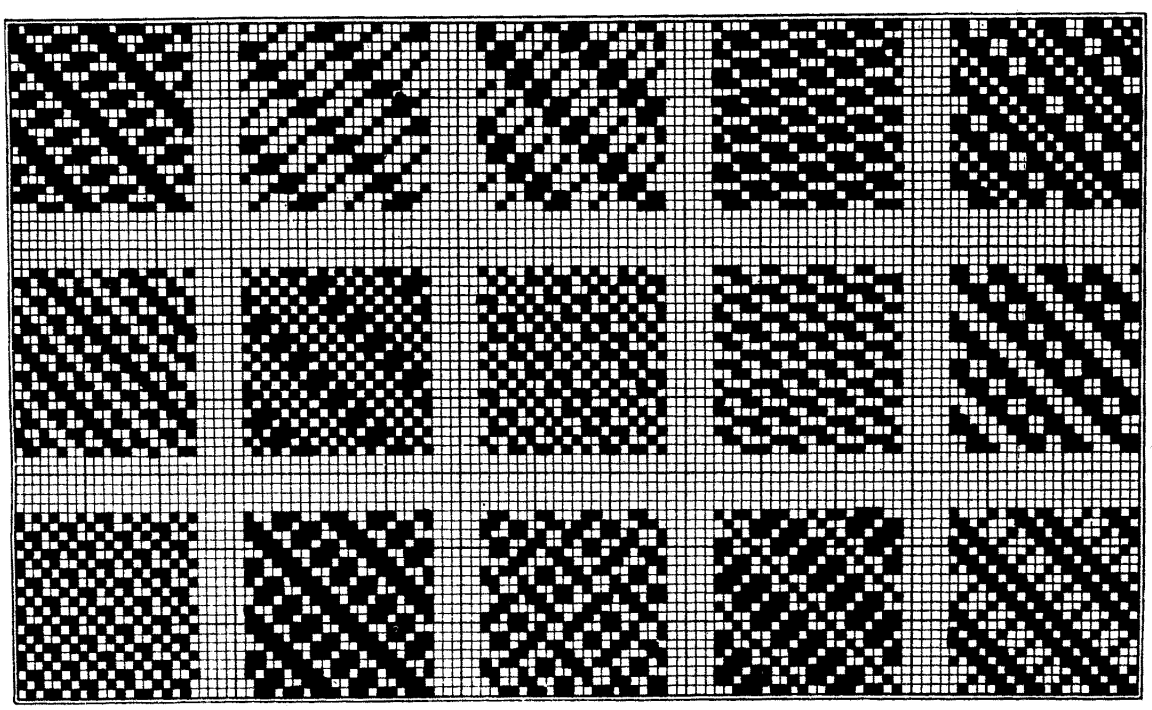
TEN HARNESS



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COTTON SPINNING.

RING SPINNING:—A General Description of the Modern Ring Frame—The Creel—Roll Stands—Weighting Rolls —Top Rolls—Bottom Rolls—Clearers—Care of Rolls and Roll Stands—Faulty Work of Rolls—Thread Boards—Rings—Ring Holders—Size of Ring to Use—Traveler Clearers—Setting Rings—Care of Rings—Finishing of Rings—Ring Travelers—The Action of the Traveler—How Travelers are Made—Weight of Travelers—Spindle Rails—Spindles—Setting Spindles—Lubrication of Spindles—Bobbins—Bobbin Clutches—Banding—Banding Machine—Band Tension Scale—Tin Cylinders—Ballooning and Separators—Winding—Builder Motions—The Warp Builder—How to Set the Builder Motion—The Filling Builder—Spinning Filling on Paper Tubes—The Combination Builder—The Care of Ring Rails and Lifter Rods—Some Causes for Badly Shaped Bobbins—Doffing.

NOTES:—Management of the Spinning Room—Data on Ring Frames—A new Spindle Drive Device—Care of Machines—Oiling—Leveling Frames—Power Tests—Power Consumption—Arrangement of Machinery.

FAULTY YARNS:—Knots and Bunches—Variations in Counts—Uneven Yarn—Thick and Thin Places—Weak Yarn —Kinky Yarn—Dirty Yarn—Kockled, Curled or Knotty Yarn —Slack Twisted Yarn—Hard Twisted Roving—Cut Yarn—Harsh or Wiry Yarn—Badly Wound Yarn—Bobbins Wound too Low—Soft Wound Bobbins—How to Prevent "Double"—Colored Work—Waste—Breaking Strength of Yarn.

CALCULATIONS:—A general Description on the Subject of Draft, Twist, Production and Gearing—Calculating the Draft from the Gearing—To find the Draft—To find a Constant—To Ascertain Draft Change Gear—To Ascertain Hank Roving—To Ascertain Draft—Twist—Standard Twists—Contraction Due to Twist—Notes on Twist—Calculating Twist—To Ascertain Speed of Spindles—Calculating Twist from Gearing—Traverse Gear—Taper—Sizing the Counts—The Grading of Cotton Yarns, Single, Two or More Ply—Production—Programs for Spinning Yarns of Various Counts, from Bale to Spun Thread—Illustrations with Descriptive Matter of the Different Makes of Ring Frames.

The Ring Frame.

(*Continued from page 116.*)

The Pitch of the Roll Stand.—Roll stands are set so that the drafting rolls have an inclination from a horizontal plane of various degrees, ranging generally from an angle as low as 25 degrees to an angle of 35 degrees. This inclination is usually called *pitch*. The angle of pitch at which the drafting rolls should be set is an important factor in spinning, especially so when comparatively weak yarns are spun. In determining the proper angle, the position of the roll stand on the thread board has to be considered also, as this affects the amount of pitch to be given. If the roll stand is set further back on the thread board than is usual, it should be given less pitch than when ordinarily placed; if set further forward than usual, more pitch should be given. The normal pitch is that given the roll stand when ordinarily set on the thread board.

Reference to Fig. 234 will make clear the meaning of pitch. In this illustration the lower rolls only are given, the roll stand shown here is inclined to an angle of 30 degrees from the horizontal (indicated by *A-C*) the line *A B* shows a pitch of 25 degrees, and line *A D* a pitch of 35 degrees. Roll stands that can be adjusted to any desired angle are also made.

A pitch of 25 degrees is commonly used for spinning warp or hard twisted yarns, and a pitch of 35 degrees for filling or soft twisted yarn. Sometimes a common pitch of 30 degrees is employed for spinning both warp and filling yarn. In general, it may be said that where plenty of twist is being put into the yarn for its particular use later, the angle of pitch does not make much difference, similarly in the use of a long staple cotton. In spinning slack twisted or weak yarns, however, a considerable angle of pitch is very necessary, as is also required for short staple cotton.

The reason for the inclination of the drafting rolls is easily shown; reference to Fig. 234 will aid in its understanding. When the yarn leaves the bite of the front rolls it passes to the thread guide at such an angle that it must pass over a portion of the surface of the lower roll before it is clear, and while in contact with the roll the twist cannot be effectually given to the yarn. That length of yarn which is between the bite of the front rolls and the point where it leaves the lower roll will therefore receive little or no twist and being weaker than other parts will be more affected by the strain on the yarn. This strain is due to the rapid revolution of the spindle and the tension caused by dragging the traveler around its ring and with soft twisted yarns often causes frequent breaking if the pitch is too low. Consequently, if the roll stand be inclined at an angle away from the horizontal, the yarn will come in contact with less of the lower roll after it leaves the bite of the front rolls and therefore the twist will pass up the thread almost to the latter point, where it is held by the grip of the rolls and is free to receive twist.

Weighting Rolls.—As before stated, the top rolls are both lever-weighted and self-weighted. The lever weighting systems will be considered first as they are the most generally used. Fig. 230, already referred to, shows the common system of lever weighting, in which two saddles are used. In spinning very fine yarns, we may meet with only one saddle, the weight being then applied to the front and middle rolls only, the back roll being self-weighted.

By reference to Fig. 230, it will be seen that the back saddle *L* rests on the bearings of the back and middle top rolls *F* and *G*, and that the front saddle *M* rests partly on the back saddle *L* and partly on the bearings of the front top roll *E*. This top saddle has a notch cut into its upper side, in which the stirrup *N* rests, the latter extending downwards at an angle, between the front and middle sets of rolls, and is attached to the weighting lever *O* near its fulcrum *P*. The end, or nose, of the weight-lever *O* is fastened to the lever screw *P* by means of a nut or bolt so that it may be swung up or down if necessary, ordinarily this lever is held horizontal. The lever screw is attached to the thread board *T* and acts as a fulcrum for the lever. In the upper edges of the lever are notches for carrying the weight hook *R* which supports the weight *S*, the position of which on the lever can be changed as needed. These notches in the lever are placed so that the weight hook can be shifted and the weight suspended from a point nearer to or further from the fulcrum, to increase or decrease the pressure on the rolls from the weight. For single boss rolls, the weight used is from two to three pounds, for double boss rolls about six pounds. It should be borne in mind that a similar set of saddles, lever weight, etc., is carried on the opposite side of the roll stand, the top rolls having pressure, from weighting, applied at each end bearing, for uniform operation. By this arrangement, weight can be applied to the front, middle and back rolls, as may be required by the class of work in hand. The total weight on the rolls can be varied by using heavier or lighter weights, by moving the weight hook (and weight) to different notches on the lever or by combining both methods. The weight can be divided differentially between the rolls, as desired, by using saddles with the bearing point of the weight, *i. e.,* the notch for the stirrup placed nearer to or further from the front of the top saddle.

Various materials have been used for making saddles, wood, iron, bronze, raw-hide, etc., but cast iron is preferred. They are provided with oil chambers at the top into which the oil is placed. Holes are run from the oil chambers to the roll bearings, and woolen yarns are drawn through these holes, the ends just touching the bearings of the rolls. The yarn will absorb the oil and deliver it as needed on the bearings. The front saddle reaches nearly to the back roll, resting on a raised surface on the back saddle very near the back roll. The back saddle extends over the back and middle roll. The weight of the front saddle is applied at a point nearer to the back roll than to the middle roll, hence the larger proportion of the weight is thrown on the back roll.

Various modifications in this system of lever weighting are employed. Fig. 235 shows what is known as Dixon's Top Roll Saddle, in which the weighting can be adjusted by means of a screw in the top saddle, bearing on the upper part of the stirrup, allowing the latter to be shifted on the top saddle.

The details of the arrangement are shown in the illustration, which is a side view, showing the front and rear top roll saddles, bearing on the journals of the top drawing rolls; and the front saddle provided with an adjusting screw, against which the stirrup bears. In the illustration, 1 indicates the top front roll saddle, having its front end resting on the front roll 2, and its back end on a pivot point on the rear saddle 3, the latter resting with its front end on the middle roll 4, and its back end on the back roll 5. The front saddle 1, is provided with a vertical slot 6, in which the stirrup 7 hangs, the latter being provided at its top end with a widened part 8 which acts to hold it up. Projecting into the slot 6, from the front end of the saddle 1, is a screw 9 and against the end of which the stirrup 7 always rests, owing to the slanting position of the saddle 1, which causes said stirrup 7 to slide down until it comes in contact with the end of the screw 9. By means of this screw, the resting position of the stirrup may be changed with a screw-driver, thus changing the amount of weight bearing on the front roll to suit the requirements of the yarn being spun. The change may be made while the frame is running and the results immediately seen, thus making the proper regulation easier.

Instead of using a rigid lever for carrying the weight, one having a certain amount of flexibility has been suggested, for preventing uneven pressure from being exerted on the rolls by vibration of the weight. Such a device is shown in Fig. 236, which

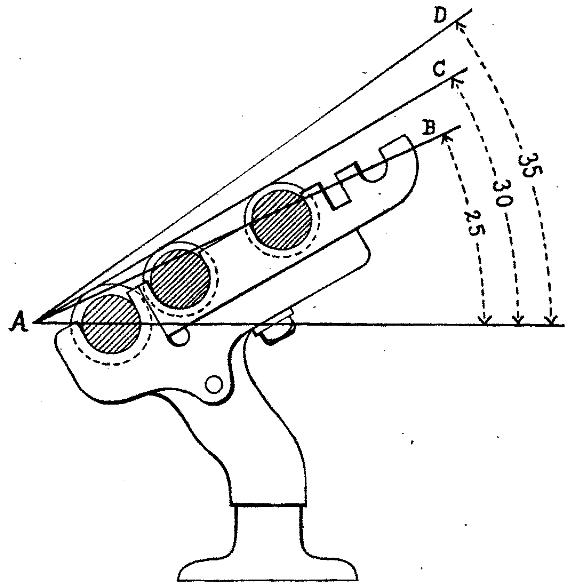


FIG. 234.

is a vertical transverse section of a set of drawing rolls provided with this weighting mechanism. Mounted on the necks 1 of the three pairs of drawing rolls is shown a pair of equalizing levers 2 and 3, forming the saddle for the rolls. The stirrup 4, as connected to lever 2, receives at its lower end the hooked end 5 of a spring fulcrum lever 6, the upper arm 7 of which also extends through the opening in the stirrup 4, and in turn, by means of its hooked portion 8, bears upwardly on a fulcrum piece 9. In a notch 10 of this spring lever 6, is hung, on a suspender 11, the weight 12.

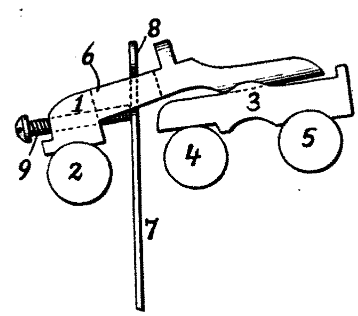


FIG. 235.

Another modification of the usual weighting system is the use of an adjustable fulcrum for each weight lever in the machine, whereby the weights can be readily adjusted vertically and the stirrup straps adjusted forwardly or rearwardly, as the case may require, this adjustable fulcrum being locked in turn in its adjusted position by means of a lock nut provided to each fulcrum.

In order to be able to explain the construction and action of this adjustable fulcrum, the accompanying illustration Fig. 237 is given, and of which diagram *A* is a sectional view of those parts of a spinning frame to which this adjustable weight lever fulcrum more particularly refers to, the latter being shown in connection with it. Diagram *B* is an enlarged (compared to diagram *A*) view of the ad-

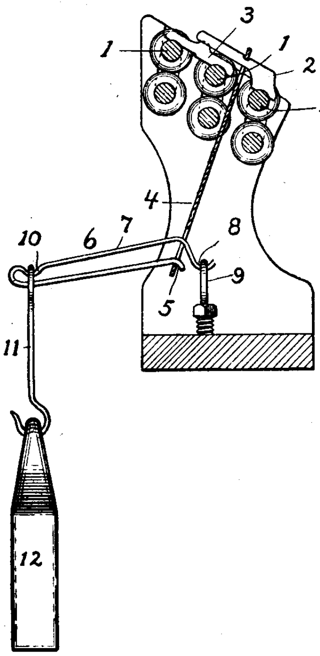


FIG. 236.

justable fulcrum removed from the front rail of the spinning frame. Diagram *C* is a vertical sectional view of the fulcrum, taken on line *x-x* of diagram

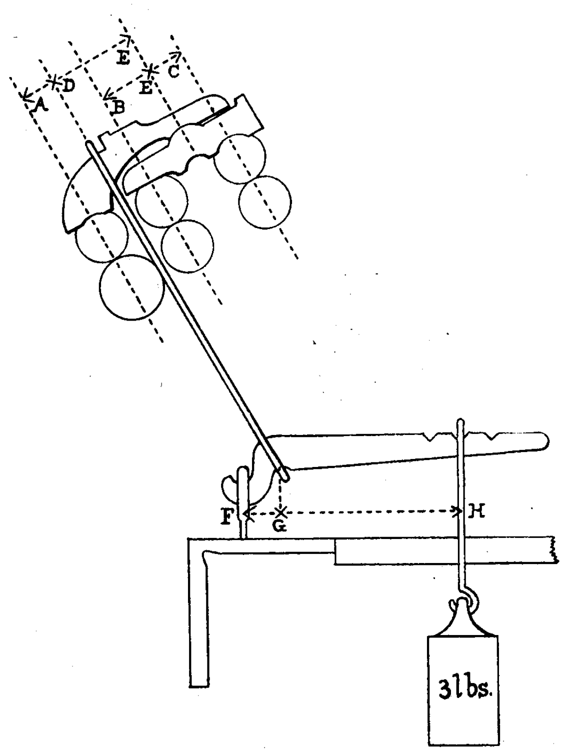


FIG. 238.

B, showing the yoke and link in the extreme forward position in full lines and in the extreme rearward position in broken lines. Diagram *D* is a transverse sectional view taken on line *y-y* of diagram *B*, looking at the under side of the yoke.

Examining illustrations, and more particular in this instance diagram *A*, we find the front rail of the spinning frame indicated by letter of reference *a*; the weight lever by *b*, its hooked shaped fulcrum end by *b'*; the weight (its upper portion only being shown) by *c*, its connecting wire by *c'*; the stirrup

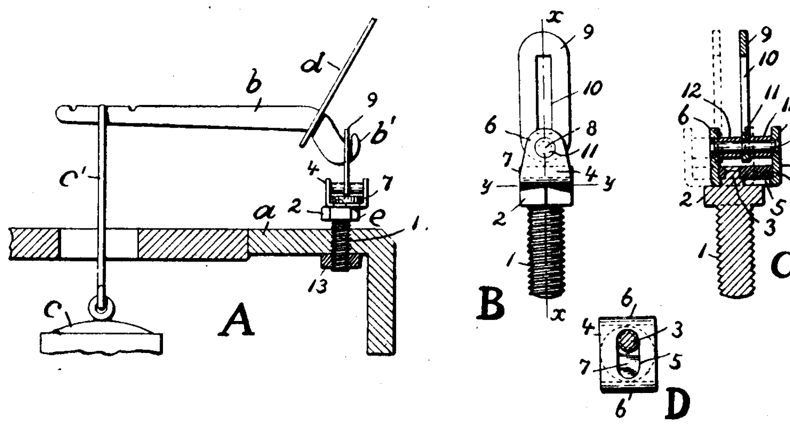


FIG. 237.

strap as holding the lever *b* movable to the top roll saddle (not shown) by *d*, and finally the new adjustable fulcrum, for lever *b*, by letter of reference *e*.

The latter consists of a screw-threaded stem 1, having a polygonal head 2, extending in the central stud 3, a yoke 4 being provided, having a slot 5 in its base for the stud 3 and the upwardly extending arms 6. A cam-disk 7 is secured off center to the stud 3 in the yoke 4, by riveting the end of the stud 3 through a hole in the disk 7, a cross pin 8 extending through the arms 6 of the yoke 4, being secured in position by riveting its ends in the arms 6. Link 9 has the customary long slot 10, for holding the hook shaped fulcrum end *b'* of lever *b*, being provided at its bottom with a hole 11 for its pivotal connection to pin 8, which is provided with sleeves 12 intermediate the arms 6 and link 9, in order to hold the latter centrally on pin 8. 13 shows us the lock nut, already previously mentioned, for locking the device in position onto the front rail *a* of the spinning frame, as shown in connection with diagram *A*.

Having given until now a description of the construction of the new adjustable fulcrum, we will in turn explain its working, *i. e.*, its adjustment: In inserting the adjustable fulcrum to the frame, its stem 1 is screwed through a hole in the front rail *a* in a position to permit the hook-shaped end *b'* of the weight lever *b* to enter the slot 10 in the link 9 of the fulcrum, as clearly shown in connection with diagram Fig. *A*. The weight *c* is then adjusted vertically by turning the stem 1, *i. e.*, raise or lower it in the front rail *a*. The stirrup strap *d*, in turn is adjusted forwardly or rearwardly between the drafting rolls (not shown) by turning the stem 1, what through the cam disk 7, acting on the arms 6 of the yoke 4, moves said yoke 4 and the link 9 into the extreme forward position, as shown in full lines in diagram *C* or into any immediate position and locked in the adjusted position by tightening the lock nut 13. These movements of the link 9 move the weight lever *b* and with it the stirrup strap *d*, however, a half revolution or less of the stem 1 will not appreciably influence the position of the weight *c*.

The method for calculating the distribution of weight on the different rolls is similar to that used for the drafting rolls on fly frames, and the reader is referred to Part 2 of this work for further details. For convenience, a brief re-statement will be given here, in connection with the diagram Fig. 238, which illustrates the principles of calculating the weights and positions for lever weighting. The following lettering is used: A—Front drafting roll, B—Middle drafting roll, C—Back drafting roll, D—Top saddle, E—Back saddle, F—Lever fulcrum, G—Leverage and H—Weight.

Rule 1: To find the weight expressed in pounds upon the top saddle, multiply the given weight by the distance *F* to *H* (in inches) and divide the product by the distance *F* to *G* (in inches).

Example: Weight = 3 pounds, *F-H* = $3\frac{1}{2}$ inches, *F-G* = $\frac{1}{2}$ inch.

$3 \times 3\frac{1}{2} \div \frac{1}{2} = 21$ pounds. Ans.

Rule 2: To find the weight in pounds upon the front drafting roll, multiply the weight upon the top saddle by the distance *E* to *D* (in inches) and divide this product by the distance *E* to *A* (in inches).

Example: Weight (on top saddle) = 21 pounds, *E-D* = $1\frac{1}{4}$ inches, *E-A* = $1\frac{3}{4}$ inches.

$21 \times 1\frac{1}{4} \div 1\frac{3}{4} = 15$ pounds. Ans.

Rule 3: To find the weight in pounds upon the back saddle, subtract the weight that rests upon the front roll from the weight that rests upon the top saddle.

Example: Weight on front roll = 21 pounds, Weight on top saddle = 15 pounds.

$21 - 15 = 6$ pounds. Ans.

Rule 4: To find the weight in pounds upon the back roll, multiply the weight upon the back saddle by the distance *E* to *C* (in inches) and divide the product by the distance *B* to *C* (in inches).

Example: Weight on back saddle = 6 pounds, *E-C* = $\frac{1}{2}$ inch. *B-C* = $1\frac{1}{4}$ inches.

$6 \times \frac{1}{2} \div 1\frac{1}{4} = 2\frac{2}{5}$ pounds. Ans.

Rule 5: To find the weight in pounds upon the middle roll, subtract the weight upon the back roll from the weight resting on the back saddle.

Example: Weight on back saddle = 6 pounds, Weight on back roll = $2\frac{2}{5}$ pounds.

$6 - 2\frac{2}{5} = 3\frac{3}{5}$ pounds. Ans.

(*To be continued.*)

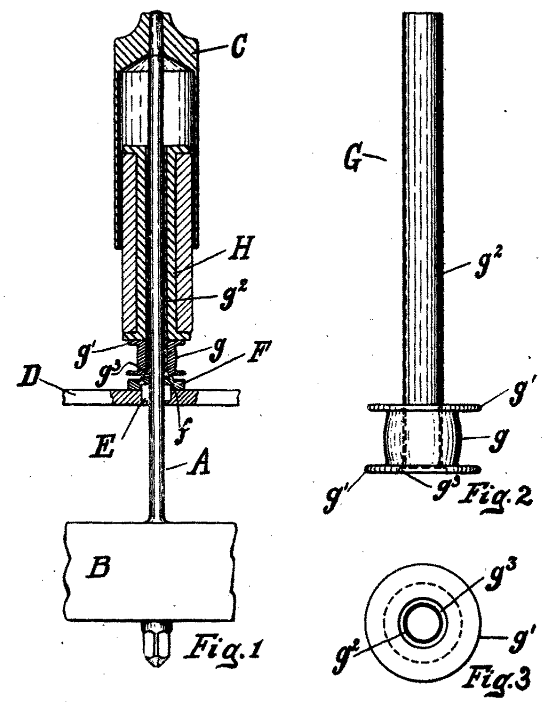
The rule for ascertaining length of filleting required to cover cylinder or doffer is:—Multiply diameter by 3.1416 and product by the width of clothing on cylinder; divide result by width of filleting, add to this the circumference of cylinder or doffer for tail end and waste and divide in turn by 12 (inches in one foot).

A New Whirl for Cap Spinning Frames.

The object aimed at in the construction of the new whirl is, that a structure is obtained which shall be light, present a minimum of frictional bearing surface to the supporting disk or cap, and which shall possess capacity for lubrication, in short to attain a maximum of work with a minimum of power.

Illustrations: Figure 1 is vertical central section of the new whirl showing also those parts of a cap spinning frame, to which the improvement more particularly refers to. Fig. 2, a side elevation of the whirl, and Fig. 3, a plan of the base of the same.

A description of the new whirl is best given by quoting letters of reference accompanying illustrations, and of which *A*, represents the spindle fixed in the frame *B*, and supports the cap *C*.



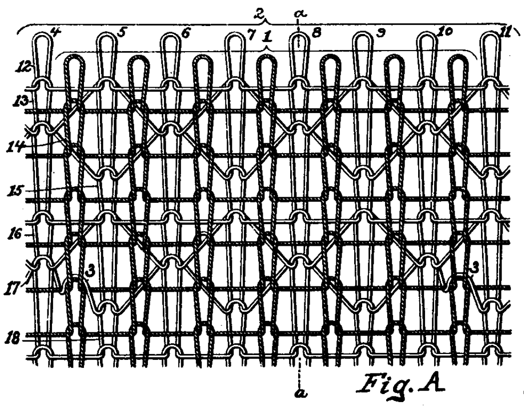
The sliding rail *D* is provided with the lubricating chamber *E* for the spindle *A*. The disk *E* has its upper portion circularly recessed at *F*. Resting upon this disk is the new whirl *G*, supporting spool *H*.

The new whirl *G*, comprises the head *g*, provided with the belt flanges g^1, in which is mounted the spindle sleeve g^2. The lower or bearing face of the head is provided with a circular recess concentric with the opening for the spindle, whereby is formed an annular recess g^3 in the base of the body and below the lower extremity of the spindle tube. The recess g^3 of the whirl body furnishes a receptacle for lubricating material.

In operation, lint naturally accumulates intermediate the disk and whirl body which may be advantageously saturated with oil and form an admirable lubricant for the parts. If the natural accumulations are insufficient for this purpose, an additional supply of lint or other absorbent material may be added within the recess. Oiling of the parts is necessary only at great intervals. The new whirl is the invention of Mr. A. A. Sack.

An Improved Construction of a Knitted Fabric.

The new structure is patented by Messrs. Scott and Williams, and refers to an improvement of a similar structure of theirs, patented some five years ago, the object aimed at in the new structure being



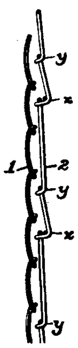
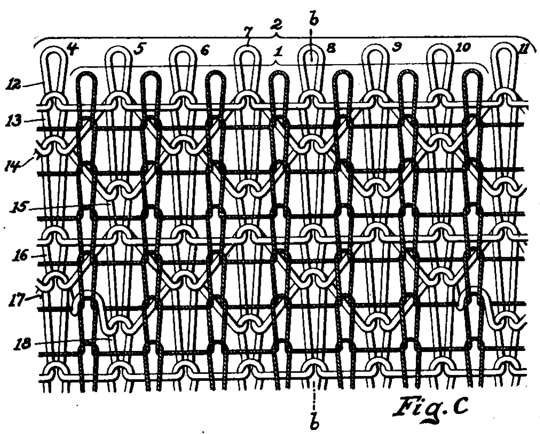


Fig. A *Fig. B*



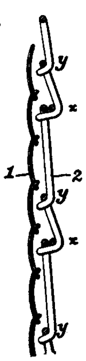


Fig. C *Fig. D*

to produce a backing web which is better adapted for permitting the raising of a nap, than is the backing web of the former structure; at the same time effecting the tying together of a fine face web and a coarser backing web without marring the appearance of the face web.

ILLUSTRATIONS: Fig. *A* is an enlarged representation of the new fabric structure, looking at the face side of the same; Fig. *B* is a section on the line *a-a*, Fig. *A*. Fig. *C* is a view similar to Fig. *A* but illustrating the backing fabric made with a coarser or heavier yarn than the face fabric, and Fig. *D* is a section on the line *b-b*, Fig. *C*.

The former structure previously referred to, comprised two webs, one overlying the other and united at intervals by a loop of the yarn of one web engaging the other web.

The new structure is of a similar character, numeral of reference 1, in our illustrations, representing the face web and 2 the back web, the stitches of the face web being shown shaded to more clearly distinguish them from the stitches of the back web, which are shown in outlines.

These two webs are connected at intervals by loops 3 of the yarn of the backing web engaging with wales of the face web.

THE GIST OF THE IMPROVEMENT in the new structure consists in the formation of the backing web with tuck stitches, the back web, as shown in the illustrations, having the stitches tucked in courses 13 and 16 in wales 5, 7, 9 and 11, and in courses 14 and 17 in wales 4, 6, 8 and 10, or with a single tuck in alternate wales.

The purpose of this tucking of the stitches of the back web is to effect greater projection of the engaging stitches on the exposed face of said back web than would be possible in the absence of the tuck, as will be understood on reference to Figs. *B* and *C*, and when it will be seen that the stitches *x*, which engage the double yarns where the tucking takes place, are caused to project to a greater extent on the exposed face of the web than the stitches *y* which engage the single yarns, the effect of this projection being to produce a surface which is best adapted for the production of a fleece by brushing or napping, compared to a relatively flat or uniform surface such as that presented by the back web of the fabric of former construction, previously referred to. This is especially true when the back web is composed of heavier, or coarser yarn than the face web, as shown in Figs. *B* and *C*.

Improvement in Machines for Folding and Simultaneously Stitching the Folded Portion of the Fabric to the Body Portion of the Fabric Folded.

The object is to provide a device whereby a flat fold may be formed irrespective of whether the edge of the fabric as being folded, is straight or curved.

ILLUSTRATIONS: Figure 1 is a top plan view of a presser foot of a sewing machine with the new folder applied thereto, showing also the ruffling blade of a ruffling mechanism in operative position. Fig. 2 is a view similar to Fig. 1 with the ruffling blade out of action. Fig. 3 is a sectional view of the parts shown in Fig. 1. Fig. 4 is a perspective view of the parts shown in Fig. 1.

Examining our illustrations, we find the presser foot 1 of the sewing machine provided with a folder 2, carried by an arm 3 formed with the presser foot. The presser foot is also provided with a stripper blade 5, located within folder, and has its inner edge 6 located close to the vertical portion 7 of the folder, and which extends underneath the stripper blade, up across the inner edge of said stripper blade, and over the top of the same. This stripper blade extends forward to a position closely adjacent the needle.

The strip of the fabric to be folded, is inserted underneath the stripper blade 5 and the folded edge is carried up over on top of the stripper blade. It will thus be seen that as the folded strip passes to the stitching mechanism, the folded edge is separate from the body portion of the fabric folded in front and up to the point of stitching, and said folded edge will lie flat upon the stationary stripper blade with its edge unturned and in contact with the edge guide formed by the boss 2′ on the upper side of the stripper blade and the projecting portion of 1′ of the presser foot to which said boss is secured.

The mechanism thus described will fold the edge of a piece of fabric and the same will be stitched to the body portion of the same by a line of stitching which passes through the extreme edge of the fold.

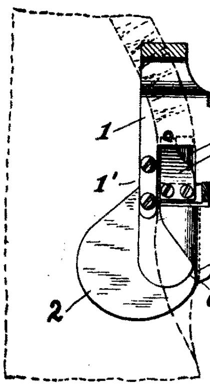


Fig. 1

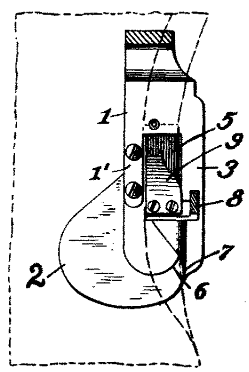


Fig. 2

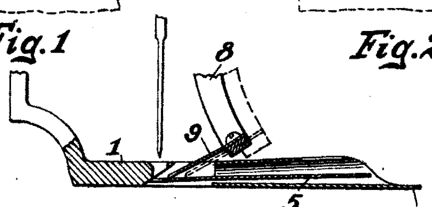


Fig. 3

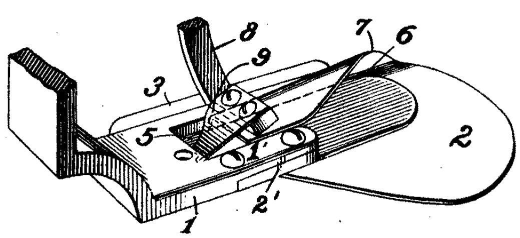


Fig. 4

When, however, it is desired to stitch a curved edge, in order that said edge may be laid flat and smooth, it is necessary to gather the extreme edge of the fold on the convex portions of the curve and to stretch the extreme edge of the concave portions of the fold. To accomplish the gathering of the extreme edge of the fold when desired, a mechanism is provided which may be thrown into and out of operation when desired, so that when the convex portion of a curve is to be stitched, the ruffling mechanism is thrown into operation, and when the convex portion has passed, the ruffling mechanism is thrown out of operation.

Portions of a ruffling mechanism shown in connection with our illustrations, comprises an arm 8 which carries a ruffling blade 9 at its lower end. This arm 8 is pivotally supported by a stud carried by a bracket formed as a part of the presser foot 1 of the machine. This ruffling mechanism forms no part of the improvement, except as it is one element of the new combination and arrangement of parts brought together to secure the desired result.

From description given it will be seen, that when a strip has passed through the folder and over the stripper blade, that said stripper will be folded and stitched near the edge of the fold to the body portion of the fabric being folded. When the convex portion of the fold is reached, the ruffler is thrown into operation which will gather the extreme inner edge of the fold only as the ruffler is made narrow at its forward end and arranged in line with the needle of the machine. Simultaneously with the gathering of this edge of the fold, the same is stitched to the body portion of the fabric. After the convexed portion of the curve is passed, the ruffler is thrown out of action and the straight portion, if that should follow, is folded and stitched to the body portion of the fabric. When a concave curved portion, in the edge to be folded, reaches the stitching mechanism, the free edge of the fold is raised by the operator into contact with the upper edge of the folder, as shown in Fig. 2, and a slight tension placed thereby on said edge. The result of this tension on the edge which is being folded, is to stretch the same so that a flat fold is laid and stitched to the body portion of the fabric, notwithstanding the fact that the edge being folded is concave. The new mechanism is the invention of Mr. J. A. Shufelt.

Tuck, Press-off, Horizontal Stripe and Open Lace Work on Circular Frames.

An explanation of these processes of knitting is given under Framework Knitting & Hosiery Manufacture Examination, in the Hosiery Trade Journal, and from which we quote:

Tuck work is made on bearded-needle circular frames by the aid of toothed discs so cut into teeth and spaces as to form pattern desired. Thus a 1×1 tuck presser has alternately one tooth and one space round its circumference. One-feeder frames, if required to make 1×1 tuck work, must have an odd number of needles so that the needles tucked at one revolution will be knitted upon at the next. With multiple feeder frames the pressers may be so placed that the even needles are tucked at one feeder and the odd ones at the next, or additional plain pressers may be used, in which case the tuck pressers may be allowed to tuck exactly the needles desired. Special methods must be adopted in fancy tuck designs.

On latch-needle circular frames tucking is effected by the raising of the needle sufficiently high to receive its thread but not high enough to free the finished loop from the latch, thus both new and old loops remain in the hook when the needle descends instead of the old one being cast off. The mechanism required to produce this is either a movable lifting cam or a cut wheel replacing the lifting cam, which raises the needles to the tucking or knitting height according to design.

Press-off work is made on bearded-needle circular frames by the aid of tuck pressers. The method of making is to design the pattern and cut the presser for one feeder only and then to cut the presser-wheel at the next feeder in an exactly inverse manner, so that the needles tucked at the one feeder may be pressed at the other and *vice-versa.* To prevent any long loops which will necessarily occur when several adjacent loops are pressed off, the loops should be made smaller and the knocking-over wheel adjusted so as to cause the knitted loops to rob some of the thread from the pressed off loops, leaving the latter as a straight thread at the back of the fabric.

The method of making this fabric on latch-needle circular frames is to (1) have a double camway and two lengths of jacks in which the needles are soldered. In this case each set of needles knit at alternate feeders only. (2) Have differently shaped butts on the jacks and movable lifter-cams so that the one shaped jack is raised at the one feeder and the other shaped jack at the next. (3) Have independent needle-lifters which take the place of the lifting cams, these are set out round the circumference of a wheel in set design and if in position raise the needle. At the next feeder these are placed in the inverse order and thus raise the needles previously kept out of action.

Horizontal stripe work is made on both bearded and latch-needle circular frames by one of the two following principles:

(a) On single feeder frames by special striping mechanism for changing the thread at any desired course.

(b) On feeder frames by using different colors at the different feeders.

In the first case the threads are supplied through different thread guides, each of which has two positions, one in which the thread is laid on the needles in such position as to be knitted by the same, and one in which the guide brings the thread clear of the needles and out of knitting position. When not in position the thread is cut off and held in such a position that it may again be placed in knitting position. The position of the thread guide and the opening and closing of the trapper to cut and hold the thread is determined by studs on a design chain or other patterning mechanism.

Horizontal striped work made on the second principle requires no extra mechanism, the colors being supplied to the feeders in the order required. The stripes, however, are not truly horizontal but rise, according to the number of feeders the frame possesses, in a spirally twisted fashion, and if the number of feeders is great the fabric is only fit for low grade cut up goods.

Open lace work is made on bearded-needle circular frames by either actually transferring the loops from one needle to the next by means of points placed in the sinker-wheel or by means of special cut wheels and additional cams. The latter method is generally adopted and is as follows:—The loops, when finished, lie underneath the beard at the head of the needle. At this point a toothed wheel, cut according to design, gears with the needles and pushes certain needles underneath the adjoining ones. This causes the head of the upper needle to be slightly in front of the lower one. A cam then pushes back the loops with the result that the loop of the upper needle is pushed back and hangs on both needles. Thus one needle has one-and-a-half loops and the other one only half-a-loop. The half loop is then pressed off by an ordinary toothed presser cut to the same design as the other wheel and then the transference is complete. This may occur at one or more feeders of the same frame, the patterns being designed by special methods.

On latch-needle circular frames open work is imitated by the aid of dummy needles or needles with long or short latches, on the principle of tucking; the loops, however, are not actually transferred.

English v. American Circular Latch-needle Frames: The main differences between English and American systems of circular latch-needle frames for the making of rib fabrics, is given thus:

The rib attachment to the English latch-needle circular frame consists of a rib cylinder and dial which is revolved at the same speed from the frame cylinder. The rib needles work horizontally in the tricks of the dial and are soldered to swing jacks which are fulcrumed at the top of the cylinder. The whole of the revolving cylinder and dial is rotated round a centre axle supported from the rear of the frame. The cams consist of plates, part of which are secured on the inside of the jacks and part on the outside, or in some cases, where the jack has a projecting portion containing a slot, all the cams are placed outside. The jacks are steadied by working in tricks cut in two rings of the cylinder. The action to the needles requisite for knitting is obtained from *(a)* the inner cam which pushes forward the jacks to enable the needles to free the loop from the latch and at the same time receive its thread; *(b)* the outer knitting cam which is adjustable for the length of loop and which takes the jacks backwards to enable the needles to draw their loops and to cast off the old ones. The rib needles work between the frame needles and receive the same thread but by reason of their position knock over in an opposite direction, when not knitting the loop is generally kept securely in the hook with closed latch.

The rib attachment to the American system of latch-needle circular is much simpler than the foregoing and differs from it in the following respects:—*(a)* The needles have butts and are acted upon directly by the cams. *(b)* The cams revolve and the needles are stationary except for the necessary knitting movement in direction of their length. In this principle of machine the rib attachment is carried by an arm which is secured to the cam cylinder. The dial and cam plates hold a position around a centre pin and the dial is prevented rotating by a lug on its underside coming in contact with a fixed but adjustable post. The rib needles work between the frame needles being pushed forward by an inner cam and pulled inwards to draw their loop by an adjustable outer knitting cam. When not knitting they are in their backward position with the loops in the hooks of the needles and in this respect occupy a similar position to those in the English system of rib circular frames. The cams can be prevented from rotating by the simple removal of a pin which holds them to the ribber arm, this again being an advantage over the English system.

The Cause and Prevention of Weakening Fibres in Dyeing Cotton Goods with Sulphur Blacks.

Because its fastness to light, washing, fulling and acids is in general very good, sulphur blacks, after overcoming the prejudice against them, soon were adapted in practical work. When first used in dyeing cotton goods, many complaints were heard that the goods thus treated became weakened after some time. In this way the application of sulphur blacks received a temporary set back, which on account of its good properties, it did not merit. Numerous chemical investigations were made, which showed that the weakening or tendering of the fibres was caused by the changing of the dye, brought about by the subsequent treatment of the dyed goods with chrome potash and copper sulphate, and which oxidized the sulphur in the dye to sulphuric acid. It was the sulphuric acid thus produced, which caused the fibres to become tender. Up to the present time it was impossible to prove that this view was correct.

However, frequently weakening of the fibre was shown, when in half woolen goods constructed with a black cotton warp, the wool is acidified and over colored. In this case, sulphuric acid was brought directly onto the fibre, and when the goods were not properly rinsed at the conclusion of the dyeing operation and were not introduced into a bath of sodium acetate in order to convert the free acid present into a (harmless) sodium salt of that acid, this then was the reason of the goods becoming tender.

Experience has shown that when immersing the goods after dyeing in a bath of sodium acetate, no weakening of the fibres occurs. In order to obtain the best results in dyeing cotton goods with sulphur blacks, these goods should be subjected to an after treatment with a metallic salt. If the bath reacts alkaline, while the goods are being dyed, the result aimed at is not obtained. Acetic acid is added to make the dye solution acid, however, to cheapen the procedure sometimes sulphuric acid was used as a substitute for it, and when then an insufficient rinsing of the goods was the cause of the fibres being weakened, since in this case free sulphuric acid was also brought directly onto the fibres.

In order to prevent weakening of the fibre, the dyer must know the required amount of sodium sulphide necessary for the dye solution, a slight excess is not harmful. The directions for the process given by the makers of these sulphur black dyes must be followed exactly, in order to obtain good results. If dealing with Katigen-black S W or T G, for a deep jet black; and 2 B and B N extra, for a blue black; both of which were used by the author in practical work for all kinds of cotton goods as a substitute for Anilin-Oxydation black, no tender goods have resulted, although in some instances the finest of mousselins were handled. However, the following precautions must be observed. The goods must not be simply immersed in the dye solution, but must be dyed on a jigger, and the submerged goods are then steeped by boiling them a few hours under pressure or by allowing them to soak for about twelve hours in water at 104° F. Then the goods are washed, stretched out, squeezed between rolls, rolled up, and if desired, mercerized; the goods must then be rinsed well to free them from the last traces of acid.

A solution for deep black dye is prepared by dissolving 3 kg. of calcined soda in 550 litres of water. Forty or fifty litres of this boiling solution are taken and 7 kg. of Katigen Black S W and 6.5 kg. of sodium sulphide are dissolved in it, and the solution is then returned to the jigger and allowed to boil. Fifteen kilograms of calcined Glauber's salt are added, the steam is shut off and when the foam disappears the goods are entered. This solution will dye 45 kg. of mousselin. To each end of the goods an apron about 4 to 5 metres long must be sewed on, or the ends of the goods will be darker than the rest of the piece and besides will have a bronze appearance. After the goods have passed through the dye liquor five times, a deep black is produced. The goods, after all excess of dye liquor is pressed out, are then taken to another jigger and there run through water. After each passage of the goods, the jigger is filled with fresh water and which is allowed to run continually while the goods pass through the jigger. After thus passing through fresh water five times, the rinsing is ended. The goods are now introduced into a bath containing ½ kg. of monpolseife, *i. e.*, monopol-soap (a special brand of a German soap) to every 100 litres of water, or into a bath containing 2 litres of Turkish red oil to every 100 litres of water. This solution is heated to a temperature of 122° F. After passing through this solution twice, the goods are squeezed out and dried or finished on a stretching machine.

The Turkish red oil will remove the bronze tint from the goods, and changes the red black to a beautiful deep black and prevents the formation of free sulphuric acid, which weakens the cotton fibres when the goods are heated in the calendering machine, as they often are when given a silk finish.

The thus referred to process of dyeing is carried out on ordinary jiggers and not under the surface of the solution and satisfactory results are obtained. Remarks apply to the first bath used for mercerized goods; for the second and following baths, half the amount of sodium sulphide and dye and one-fourth the amount of soda and Glauber's salt being sufficient. Goods not mercerized require one-third more dye. Goods dyed black in this way are particularly fast and give as good a shade as oxidation black.

If for any reason a subsequent treatment is necessary, then only three rinse waters are necessary. 2½ per cent. of potassium chromate, 2½ per cent. of copper sulphate and 5 per cent. of acetic acid is sufficient. The goods are passed twice through the solution which is heated to a temperature of from 176 to 212° F. The goods are then passed through two or three rinse waters and finally through a solution of

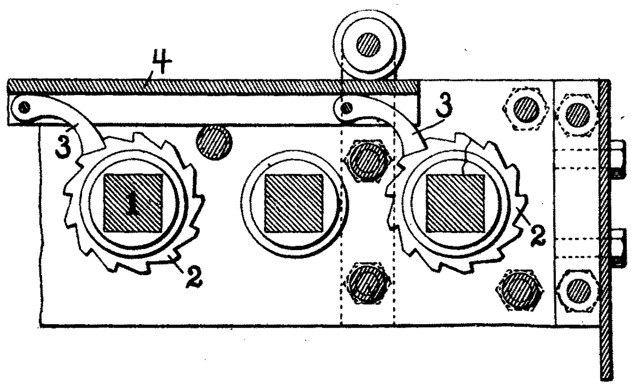
Turkish red oil. If possible, after rinsing, allow the goods to lay a few hours, since then a deeper black will result.

For a deep blue black 2 B, S W, B N extra, made by the Farbenfabricken of Elberfeld, are recommended by the author.

The baths used for a blue black, according to shade desired, varies from 4 to 6 kg. of Katigen black 2 B, 4 to 6 kg. of sodium sulphide, 1½-2 kg. of calcined soda and 10 kg. of rock salt. The manner of dyeing corresponds with that outlined for dyeing a jet black. (Translated specially for Posselt's Textile Journal from Färber Zeitung.)

An Improvement to Dyeing Machines.

The same is the invention of Mr. D. F. Waters and is an improvement to dyeing machines invented by him about two years ago, comprising in its main feature a series of rotary yarn sticks upon which yarn may be suspended while immersed in the dye liquor.



The improvement relates more particularly to the frames which carry the rotary sticks and to the means whereby said sticks are rotated to progress the yarn hung thereon.

In the improved construction of this dyeing machine all of the yarn sticks are mounted to rotate in parallel relations, but alternate sticks upon which the skeins of yarn to be dyed are hung are connected for rotation in two distinct series.

To simplify explanations, the accompanying diagram is given, and which shows us an end view of a portion of one of the side rails of the frame of the dyeing machine, and parts connected therewith. From this illustration it will be seen that each of the dye-sticks 1 is provided with a ratchet wheel 2, but that the ratchet wheels of the respective series are upon respectively opposite sides of the machine, and there engaged by series of pawls 3 corresponding with the respective ratchets and carried by respective reciprocatory bars 4. Said bars are provided with means (not shown) whereby they may be manually reciprocated independently of each other, so that either of said series of dye sticks 1 may be rotated independently of the other.

The commercial value of any dyeing machine depends upon their capacity to treat maximum loads of yarn in each vat, with the minimum number of operators; the described arrangement, whereby each load of yarn is divided upon yarn sticks arranged in alternate series which can be rotated independently, is of special advantage in that it enables a single operator to manipulate in a single machine, a maximum load of yarn which required two operators to manipulate in a single machine constructed according to the patent granted to Mr. Waters about 2 years ago, and to which we previously alluded to already.

The Bleaching of Silk.

Of the many methods which have from time to time been suggested, and which have been accorded the favor indicative of some degree of success, says the Textile Recorder and from which we quote, that of stoving and subjecting the silk to be bleached to the influence of sulphurous fumes is still, taken altogether, the method finding most general appreciation. For bleaching silks the use of sulphur, while still very prevalent, is also the oldest method, as it has been in use for centuries. Familiarity with the procedure followed out in sulphurising silks precludes any necessity for a detailed description, other than stating that it is carried out in the way followed when treating wools, and that the silk requires to contain moisture to fulfil the conditions making for good and uniform results.

It is usually found necessary to allow the wet silk to remain in the wet sulphur chamber from 24 to 36 hours, and to maintain during that time a continuous supply of sulphurous fumes. This process is followed by a thorough washing in water, preferably free from lime; although to overcome the brittleness which would be imparted in this way to some varieties, the silk is worked (without washing) in a hot solution of cream of tartar, and then washed in lukewarm water. With the object of avoiding the many disadvantages connected with the operation of stoving, silks are often submitted to the action of sulphurous acid, in a different manner, in its solution in water. By this process a solution is made in water of sodium hydrosulphite to a density of about 5 deg. Tw., and the sulphurous acid is liberated by the addition, just before use, of 1 per cent. of acetic acid. Bleaching on some kinds of silk is accomplished in this way in about six hours' time. It is afterwards soaped or soured to remove every trace of the sulphurous acid.

As, however, the whites obtained by this and the former method are not of a permanent nature (having a tendency to turn yellowish), another process is largely used, which does not offer this disadvantage to the same extent. This process consists in using a mixture of nitric and hydrochloric acids, known in Germany as Königswasser. A bath is prepared containing five parts of hydrochloric acid to one part of nitric acid, and made with water to a strength of about 6 deg. Tw. The silks are steeped and worked in such a bath for about 15 minutes, no longer; otherwise the fibre will acquire a yellowish stain, which is very difficult to remove. Some silks at first acquire by this treatment a greenish coloration, which pales somewhat later; they are then well washed and sulphured, either by stoving or working in the sulphurous acid bath. The action of the nitrosyl chloride formed by the mixture of the two acids is only little understood, although it is certain that very good results are obtained by this treatment. Sulphurising is followed by a bath of cream of tartar, washing, and drying. To produce a very good white these processes have occasionally to be repeated, if required, for some of the darker colored silks. It has been the custom, in some instances, to submit some silks to a series of operations, commencing with sulphurising—after boiling, of course—then Königswasser, washing, soaping, sulphurising; washing, soaping; washing, sulphurising, and washing.

Hydrogen peroxide was proposed over 20 years ago, although the same results are obtained now, more cheaply, by using its sodium compound, and which is used to a considerable extent on tussahs and schappes, on which supplemented with other treatment, good results are obtained. For these and wild silks the treatment often consists of first souring them with hydrochloric acid, washing, soaping, washing, steeping for a day in hypochlorite of ammonia 1 deg. Tw. souring with hydrochloric acid, washing steeping in *sodium peroxide* and finally washing.

Moreover, so difficult is the process of bleaching some of these varieties to a good white that it is often necessary to repeat the operations just detailed. In some circumstances the treatment with peroxide is combined with sulphuring.

A New Way of Bleaching Cotton in the Shape of Laps.

The machine required for this new process is shown in the accompanying illustrations, of which Fig. 1 is a plan of the complete apparatus; Fig. 2 showing a detail of the spray pipes and squeezing rollers (shown enlarged as compared to Fig. 1).

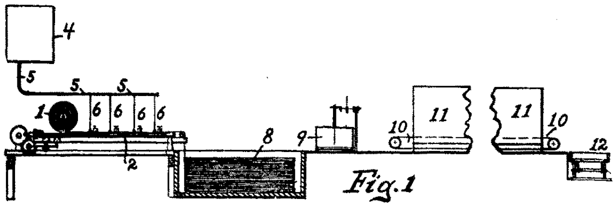


Fig. 1

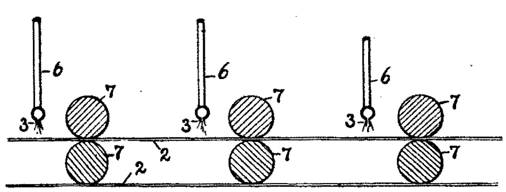


Fig. 2

The cotton to be bleached is delivered in the shape of a lap 1 to an endless apron 2 of the machine, and there subjected to successive sprays 3 of a bleaching medium, such as a solution of sodium or potassium hypochlorite containing from 0.2 to 1% up to 2% of available chlorin, held in tank 4, and delivered onto the lap through connecting pipe arrangement 5, 6. Between the repeated operations of spraying, the fibres are conducted through squeezing-rollers 7, the operation of spraying and squeezing being repeated until a uniform and complete saturation of the fibres is obtained, after which the latter are then delivered automatically from the apron in superposed layers into a tank 8 by moving the apron 2 to and fro over this tank. The impregnated fibres are then permitted to stand for about two hours or longer in the tank, until the bleaching operation is completed, which can be lengthened or shortened according to the material to be treated. When the action of the bleaching medium on the fibres in the tank is completed, water at ordinary temperature is let into the tank from the bottom and made to pass upwardly through all the layers of laps in the tank so that the bleaching medium is thoroughly washed out of the fibres. After the washing is completed, the water is drawn off from the tank and the lap of fibres taken from the tank 8 to an hydro-extractor 9, so as to remove the superfluous water. The lap then is removed from the hydro-extractor and placed on the endless apron 10, and in this way carried through the heated drier 11. After thus effectively dried, the lap is delivered automatically upon a truck 12, the thus bleached fibres then being ready for carding and spining by the usual processes. Mr. René Van Buggenhoudt is the inventor of this new process of bleaching.

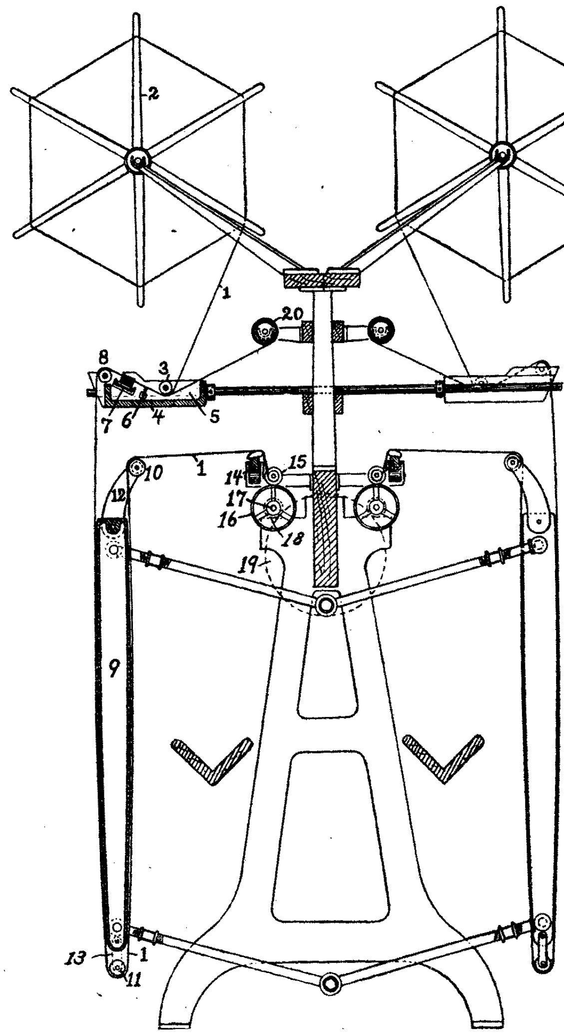
A Novel Machine for Winding, Lustring and Finishing Silk.

The gist of the improvement, as the heading of this article indicates, consists in providing a machine that winds, lustres, and finishes the threads in one continuous operation. During the process, the silk thread is drawn from the skein, immersed in and drawn through a suitable liquid bath, after which the surplus moisture is removed therefrom by first scraping and brushing the threads and in turn drawing them over a heated surface, spooling or winding the thread afterwards on a suitable receiver.

If it is desired to redraw the thread to improve the material for future processes of manufacture, the new machine will permit of the redrawing, finishing and lustring of certain threads and the winding, finishing and lustring of certain other threads at the same time, for which reason the new machine can take the place of a winding frame, a redrawing-frame and a finishing and lustring machine with its consequent saving and economy to the manufacturer.

The accompanying illustration is a cross section of the new machine, and which is the invention of Mr. W. C. Keyworth. Numerals of reference in the illustration indicate thus: 1 shows us the thread as coming from the skein as previously placed on the swift 2, entering the machine proper by passing under a roller 3 removably mounted in grooves in the basin 4 and when thus the thread is immersed in the liquid 5, drawn in turn over a knife 6 and brush 7 (in order to remove the surplus moisture) and removable roller 8 on to the curved heated surface 9, over which it is carried and then in turn around the adjustable tension rollers 10 and 11, on lever arms 12 and 13 respectively. From there the thread then passes to the guide in the traverse bar 14 and in turn onto bobbin 15 which is driven by friction pulley 16 on shaft 17 mounted on the frame part of the machine. The shaft 17 is driven by belt, pulley and bevel gears, not shown in the illustration.

The pinion 18 on the end of shaft 17, meshes with and turns the gear 19 and a cam (not shown) which



reciprocates the traverse bar 14 and distributes the finished and lustred thread in proper layers on the bobbin 15.

If desired, the thread, in place of coming from the skein on swift 2, may be fed to the process wound upon a bobbin 20; again the bath tray 4 may be removed and the thread simply wound from the swift onto the bobbin 15.

TESTING OF CHEMICALS AND SUPPLIES IN TEXTILE MILLS AND DYEWORKS.

(*Continued from page 133.*)

In the list of chemicals given for the students' guidance, the approximate quantities needed for beginning work are set opposite each item. The quantities noted will be sufficient for doing a good deal of work; some of the articles used in large quantities will require frequent renewal, others will last a long time.

It will be found most satisfactory and economical to order the entire laboratory outfit, apparatus and chemicals, from a reliable dealer at one time, as lower prices can be thus obtained. Once again, attention is called to the imperative necessity of specifying that no other chemicals except those of guaranteed purity and quality be furnished by the dealer. The average quality of so-called "chemically pure" articles is so low that they are not fit for use in operations demanding accuracy. Do not buy chemicals at the drug store, as these are seldom pure enough for analytical work, especially the acids and ammonia salts.

LIST OF CHEMICALS, ETC. REQUIRED AND AMOUNTS.

Name.	Quantity.
Acid Citric	1 oz.
Acid Hydrochloric	5 lbs.
Acid Boric	1 oz.
Acid Acetic, Glacial	4 oz.
Acid Nitric	3 lbs.
Acid Oxalic	1 lb.
Acid Sulphuric	5 lbs.
Acid Tartaric	2 oz.
Ammon. Hydrate	2 lbs.
Ammon. Carbonate	1 lb.
Ammon. Chloride	1 lb.
Ammon. Molybdate	2 oz.
Ammon. Nitrate	4 oz.
Ammon. Oxalate	4 oz.
Ammon. Sulphide	1 lb.
Ammon. Sulphocyanate	4 oz.
Antimony and Potass. Tart.	1 oz.
Calcium Chloride	4 oz.
Chlorinated Lime	1 lb.
Bromine	4 oz.
Barium Chloride	8 oz.
Barium Nitrate	2 oz.
Borax (Sod. Borate)	8 oz.
Copper Sulphate	8 oz.
Ferrous Sulphate	8 oz.
Ferrous and Ammon. Alum	2 oz.
Ferrous Sulphide	1 lb.
Ferric Chloride	2 oz.
Lead Acetate	8 oz.
Iodine	2 oz.
Mercurous Nitrate	1 oz.
Mercuric Chloride	1 oz.
Magnesium Sulphate	4 oz.
Platinic Chloride	1/8 oz.
Potass. Hydrate	2 lbs.
Potass. Carbonate	8 oz.
Potass. Chromate	1 oz.
Potass. Bichromate	8 oz.
Potass. Iodide	4 oz.
Potass. Nitrate	4 oz.
Potass. and Alum. Sulphate	1 oz.
Potass. Bromide	2 oz.
Potass. Bitartrate	2 oz.
Potass. Ferricyanide	2 oz.
Potass. Oleate	1 oz.
Potass. Ferrocyanide	2 oz.
Potass. Sulphate	1 oz.
Potass. Cyanide	1 lb.
Potass. Permanganate	4 oz.
Silver Nitrate	1 oz.
Stannous Chloride	1 oz.
Sodium Hydrate	2 lbs.
Sodium Carbonate	1 lb.
Sodium Sulphide, crystal	4 oz.
Sodium Acetate	8 oz.
Sodium Sulphite	4 oz.
Sodium Chloride	4 oz.
Sodium Phosphate	4 oz.
Sodium Thiosulphate	8 oz.
Sodium Peroxide	4 oz.
Sodium Nitrite	1 oz.
Strontium Nitrate	1 oz.
Tin, granular	1 oz.
Zinc Sulphate	1 oz.
Zinc, granular	4 oz.
Uranium Nitrate	2 oz.

In addition to the chemicals named in the preceding list, there will be required the following articles, in the approximate quantities stated here.

Article.	Quantity.
Alcohol	1 qt.
Ether	8 oz.
Chloroform	8 oz.
Hydrogen Peroxide	1 lb.
Distilled Water	10 to 5 gal.
Litmus Paper, blue and red	1 pack each.
Methyl Orange	1/8 oz.
Phenolphthalein	1/8 oz.
Hæmatoxyllin	1/8 oz.
Litmus	1/8 oz.
Diphenylamine	1/8 oz.

In ordering these chemicals, be sure to specify that the nitric, hydrochloric, oxalic and sulphuric acids be reagents of the highest degree of purity, also the potassium and sodium hydroxides, as the grade called "chemically pure" is not fit for use in analytical work. A full line of chemicals for analytical work of guaranteed purity is made by Merck and Co., of New York, and it is suggested that it be specified that Merck's guaranteed reagents be the chemicals supplied on the order.

Distilled water only can be used for making up the test and volumetric solutions, ordinary tap water has too many impurities to be fit for use in the laboratory except for washing apparatus. Burettes, measuring jars and flasks, etc., must be well rinsed out with distilled water after being washed with tap water. Some arrangement should be made to have a constant supply of distilled water.

Test Solutions. The test solutions to be used in qualitative analysis will be kept in the glass-lettered reagent bottles. Solutions of solid chemicals are made up by dissolving 10% of the chemical, by weight, in sufficient water to fill the bottle, 10 grams of solid to 100 cubic centimeters of distilled water is a good proportion to use. It is of advantage to have all the test solutions of a uniform strength, as less will be wasted when using them with each other in testing. The solutions of acids, or dilute acids, as they are called, should be made about 20% strength, *i. e.*, one part of acid to be added to four parts of water. Use the reagent bottles for the dilute acids and so mark them. Volumetric test solutions must be made with great exactness in their appropriate strength. Directions for making all the standard volumetric solutions will be given later. They should be kept in amber glass bottles.

(*To be continued.*)

THERMOMETERS.

In ordinary thermometers two fixed points are taken, viz., those respectively at which water freezes and boils. In graduating an instrument, after exhausting the tube, filling with mercury and sealing, the height at which the column of mercury stands at these temperatures is determined by experiment. The space on the tube between these two fixed points is then divided into equal parts; the number of parts being 80, 100 or 180, according to the particular scale employed; and in order to extend the scale below the freezing point, and above the boiling point of water, the equal divisions are continued as far as necessary beyond the fixed points in both directions.

There are three thermometers in use, viz., Fahrenheit (F.), Reaumur (R.) and Centrigrade or Celsius (C.), the relationship of which is as follows:

Freezing point or 32° in F. = Zero in C. or R.

Boiling point or 212° in F. = 100° in C. or 80° in R.

How to Change Degrees of Centigrade, Reaumur, and Fahrenheit, from one to the other.

To change degrees CENTIGRADE given INTO FAHRENHEIT: Multiply °C. given by 9, and divide the product by 5, and then add to the quotient 32.

Example.—Find degrees F. for 40° C.

40×9=360÷5=72+32=104.

Answer.—40° C=104° F.

To change degrees REAUMUR given into FAHRENHEIT: Multiply °R. given by 9, and divide the product by 4, and add 32 to the quotient.

Example.—Find degrees F. for 32° R.

32×9=288÷4=72+32=104.

Answer.—32° R=104° F.

To change degrees FAHRENHEIT given into CENTIGRADE: Subtract 32 from °F. given, and multiply the difference by 5, and divide the product by 9.

Example.—Find degrees C. for 104 F.

5×(104 — 32) 72=360÷9=40.

Answer.—104° F=40° C.

To change degrees FAHRENHEIT given into REAUMUR: Subtract 32 from °F. given and multiply the difference by 4, and divide the product by 9.

Example.—Find degrees R. for 104° C.

104 — 32=72×4=288÷9=32.

Answer.—104° C=32° F.

To change degrees REAUMUR given into CENTIGRADE: Multiply °R. given by 5, and divide the product by 4.

Example.—Find degrees C. for 32° R.

5×32=160÷4=40.

Answer.—32° R=40° C.

To change degrees CENTIGRADE given into REAUMUR: Multiply °C. given by 4, and divide the product by 5.

Example.—Find degrees R. for 40° C.

4×40=160÷5=32.

Answer.—40° C=32° R.

NEW DYES.

Diamineral Blue B. This is a new member of the series of Diamineral Blues of the Cassella Color Co., somewhat bluer in shade than their Diamineral Blue R. It is, in direct dyeing, very fast to washing and light, but the fastness in both respects is materially improved by an after-treatment with bluestone and bichromate of potash. Diamineral Blue B produces a shade similar to Indigo and it can also be easily discharged to a perfect white with Hyraldite.

Another new color of theirs is

Diamine Fast Black X, which is distinguished by excellent fastness to light and at the same time is of a beautiful blue black shade. It is not only suitable for blacks, but also for grays.

Immedial Olive GG. This new brand of the Cassella Color Co. stands in shade between their well-known Immedial Olive B and 3G, possessing the same excellent properties of fastness as these older brands; its prominent fastness to washing deserves special mention.

Immedial Olive GG may be dyed in combination with any of the other Immedial Colors, and be used, especially in combination with Immedial Yellow Olive, for the production of a great variety of novelties in shades. It is likewise very well suited for machine-dyeing and for the dyeing of effect threads fast to cross-dyeing in an acid bath. Full directions, with dyed samples in Loose Cotton, Cotton Yarns, Piece Goods and Machine-Dyeing, are given in their Supplement 31, as furnished upon application to their New York office, 182 Front St.

Diamine Fast Scarlet GG, 4BN, 6BS and 8BN, are four new products of the Cassella Color Co., possessing equally excellent fastness and other properties as the older brands of their Diamine Fast Scarlet, over which they have the advantage of yielding brighter shades and of exhausting better.

They are particularly of interest for the production of dyeings fast to *perspiration and acids* on cotton yarn, cotton cloth and loose material, and also for machine-dyeing.

When dyeing half-wool and half-silk goods, the new brands have the property of going almost exclusively on to the cotton and of but slightly staining the wool or silk, by reason of which property they are useful also for producing two-colored effects.

Being very easily dischargeable, they are further well suited for the production of discharge styles.

Sixteen (16) samples (four of each brand of dyed loose cotton, yarn, and fabrics, with full directions for dyeing, are given in their Supplement 28, just issued and as furnished upon application to their New York Office, 128 Front St.

An Improved Method of Preparing the Dyestuff from Logwood. Vegetable coloring matter extracted from logwood and commonly designated as *hematoxylin* has been, in practice, sufficiently oxidized by bringing atmospheric air into contact with a solution thereof, the resulting product being well known as *hematin*. This process for producing hematin imparts thereto, however, the inventor of the new process, Mr. Francis J. Oakes, claims, an acid character, which is not, in all cases, desirable, as for instance in the process of therewith dyeing skein silk black in a soap bath, in which case the said acidity of the hematin may unduly decompose the soap, thereby undesirably setting free fatty acids, which results in what is known in the art as *breaking the soap*. Mr. Oakes claims that by his new process this acid condition of the hematin may be largely, if not entirely, overcome and a practicable neutrality imparted by adding to the hematin at the conclusion of the said oxidation process a sufficient quantity of an alkaline nitrite, either in the form of a dry salt, or preferably in a watery solution, which combining with the acid, results in the production of the practically neutral hematin desired for the specific purpose referred to.

THE NEW PROCESS IS PERFORMED AS FOLLOWS: First produce in any convenient manner a solution of the hematoxylin. Into this inject oxygen, as contained in atmospheric air, until the hematoxylin has been changed by the consequent reactions into hematin. Then add to this solution of hematin alkaline nitrite until said hematin has become neutral.

A New Brown Vat-Dye. The same is the product of the Farbwerke of Höchst-on-the-Main, Germany (H. A. Metz & Co., New York) and has the formula:

$$NH_2(3)C_6H_3 \begin{matrix} ^{(6)CO} \\ _{(1)\ S} \end{matrix} > C \cdot C < \begin{matrix} ^{CO(6)} \\ _{S\ (1)} \end{matrix} C_6H_3(3)NH_2$$

which is a brown powder, insoluble in water, alkalies, dilute acids, soluble in concentrated sulfuric acid with a blue color, soluble with great difficulty in hot nitrobenzene with an orange brown color; it is reduced by alkaline reducing agents, for instance, an alkaline hydrosulfite solution to a leuco compound and dyes from this solution cotton and wool in brown shades.

Green-Black Vat-Dye. This is another new product of the "Farbwerke," having the formula:

$$NH_2(4)CH_3 < \begin{matrix} ^{(6)CO} \\ _{(1)\ S} \end{matrix} > C \cdot C < \begin{matrix} ^{CO(6)} \\ _{S\ (1)} \end{matrix} > C_6H_3(4)NH_2$$

being a black powder, insoluble in water, alkalihydrates, dilute acids, alcohol, ether, benzene, soluble in concentrated sulfuric acid with a greenish dark blue color, yielding with alkaline hydrosulfite solution a yellowish-greenish vat from which wool and cotton are dyed greenish black tints.

Mixed Chlorobromo Derivatives of Indigo and Process of Making Same, is one of the latest inventions in Dyestuffs by the Society of Chemical Industry of Basle (A. Klipstein, N. Y.).

Mixed chlorobromo derivatives of indigo can be obtained by brominating the known mono- and dichloro derivatives of indigo, whereby according to the chosen starting material and to the quantity of bromin employed monochlorodibromindigo, monochlorotribromindigo, dichloromonobromindigo or dichlorodibromindigo is obtained. Relatively to their chemical and tinctorial behavior these new chlorobromo derivatives of indigo show a great resemblance with the tribromo- and tetrabromo derivatives of indigo. By treatment with alkaline reducing agents, the new mixed chlorobromo derivatives of indigo yield a vat wherein unmordanted cotton is dyed bright violet to blue tints of excellent fastness.

One of the methods of making this dye is given by the Chemical Society thus: 10 parts of monochlorindigo are suspended in 100 parts of nitrobenzene and mixed with 11 parts (about 4 atomic proportions) of bromin, and the whole is heated, in the course of about 1½ hours, in a reflux apparatus, in an oil bath, to a temperature of 226° C. this being the temperature of the bath. The temperature is maintained at 226-228° C. for about 1½ hours, during which time much hydrogen bromid is evolved. After cooling and filtering, the solid matter is washed with alcohol and dried. A mixed chloro-bromo-derivative of indigo is thus obtained, with very good yield, as a crystalline blue powder having a composition corresponding with that of a dibrom-monochlorindigo, $C_{16}H_7O_2N_2ClBr_2$. This compound dissolves in concentrated sulfuric acid to a blue solution tending slightly to green; addition of water to solution precipitates the dyestuff as blue flocks. Fuming sulfuric acid dissolves to a pure blue solution. Nitrobenzene and anilin dissolve it with difficulty when cold, but comparatively easily when hot, to a pure blue solution. When treated with the usual alkaline reducing agents in a vat, particularly with caustic soda (soda lye) and sodium hydrosulfite, the dyestuff yields a clear yellow liquor dyeing cotton bright blue tints which may be further increased in brightness by a short soaping at 90° C., such as by a bath containing 5 grams of soap and 5 grams of sodium carbonate per liter. The soaped dyeings are distinguished by an extraordinary fastness to washing, to chlorin and to light. Two more processes for obtaining these dyestuffs are quoted by the Chemical Society in connection with their new product.

They have further found that in an analogous manner mixed dihalogenderivatives of indigo, that is to say, monochloromonobromoderivatives of indigo can be obtained by brominating the known monochloroderivatives of indigo (resulting from the reaction of chlorin on indigo) with 2 atomic proportions of bromin in presence of a suitable indifferent diluent or solvent. The manufacture of these new monochloromonobromo derivatives of indigo is illustrated by the following

Example: 10 parts of monochlorindigo (prepared for instance by chlorinating indigo in nitrobenzene) are suspended in 100 parts of nitrobenzene and 5, 4 to 6 parts (the theoretical quantity for 2 atomic proportions is 5, 4 parts) of bromin and the whole is heated for about 2 hours in a reflux apparatus, on an oil bath, to a temperature of 226° C., this being the temperature of the oil bath. After cooling and filtering, the solid matter is washed with alcohol and dried, there being obtained a good yield of monochlormonobromindigo in the form of a blue crystalline powder. It dissolves in concentrated sulfuric acid to a yellowish-green solution, which passes in the course of the time to a bluish green. Fuming sulfuric acid dissolves the dyestuff with a blue coloration; it is nearly insoluble in alcohol and benzene even when hot, sufficiently soluble in hot anilin with greenish-blue coloration and in hot nitrobenzene with pure blue coloration. By its treatment with alkaline reducing agents particularly with soda lye and sodium hydrosulfite, the dyestuff yields a limpid, clear yellow vat, dyeing cotton vivid reddish blue tints of an excellent fastness to washing, chlorin and light.

A New Green Vat-Dye. It is known that the dyestuff designated beta-naphth-indigo dyes cotton without a mordant in an alkaline vat green tints. On account of the want of fastness of these tints to washing and their poor degree of fastness to chlorin, beta-naphth-indigo presents no tinctorial interest. The S. of C. I. now discovered and patented that the tinctorial properties of beta-naphth-indigo can be considerably improved by introducing a halogen into the molecule. This change can, for example, be effected by first subjecting beta-napththisatin to the action of a halogen or of a substance yielding a halogen, best in presence of an indifferent solvent or diluent and then treating the halogenized derivatives of beta-naphthisatin thus obtained, preferably after transforming them into corresponding chlorids, with suitable reducing agents. There are thus obtained halogen substitution derivatives of beta-naphthindigo which constitute products of very great value, since they dye cotton without a mordant in an alkaline vat vivid green tints of excellent fastness to washing and good fastness to chlorin.

Milling Yellow Ga, is the latest new dyestuff introduced into the market by the Berlin Aniline Works. It is a wool dye which in a weakly acid bath, without any after-treatment, yields *very bright pure yellow* dyeings of excellent fastness to washing and remarkable resistance against fulling. The fastness to washing and fulling can be further increased by an after-treatment with bichromate of potash, which however, makes the shades somewhat duller. As the dyestuff is not sensitive to chrome, it can be dyed together with other Chroming Dyes as well as in combination with the Metachrome Colors of the Berlin Aniline Works. It dyes well on mordanted wool and can therefore also be employed together with Mordant Dyes and dyewoods.

ITS USE. It is specially recommended for the dyeing of yarns for knitting and hosiery purposes, as well as loose wool, slubbing, carded and worsted yarns, although it is also of interest for piece-goods, on account of its excellent fastness to light and the property of not staining cotton threads. This dye is readily taken up by the wool fibre in a neutral Glaubersalt bath and therefore comes into question for union dyeing in one bath. In mixed wool and silk fabrics, the silk is dyed lighter than the wool. It is a very useful dye, both for unweighted and weighted silk, chappe silk and tussah; the dyeings possess good fastness to water.

DYEING PROCESS: Dye with an addition of
10% Glaubersalt cryst. and
3% acetic acid (30%) or 0.8 formic acid (95%) enter the goods at about 120° F., raise to the boil in ½—¾ hour, boil for ½ hour; then add
2% acetic acid (30%) or 0.5% formic acid (95%) and boil for ½ hour longer.

The bath is exhausted.

Samples of yarn and fabrics dyed with this dye can be obtained by addressing the Berlin Aniline Works, 213 Water St., New York.

THE ELECTRIC DRIVE FOR TEXTILE MILLS.

(*Continued from page 56.*)

Induction motors have been used, but they are not inherently adapted to this work and it is not economical to use them for such purposes.

The types of motors just referred to are those used for street railway cars, electric cranes, hoists, etc. Their special use for the mill would be for operating passenger and freight elevators, hoists, etc., or small trolley cars used for carrying goods or material from one building to another, or from one part of the mill to another part. The best type motor for elevator service is the newly developed single-phase induction motor. When compound motors are used for elevators, they must be of a special type, as the racing of the series motor would be likely to cause accidents. Elevators cars are almost always counterweighted, which must be remembered.

3. Service requiring a torque (turning moment) which increases with the speed.

For this service, the compound motor, with a small amount of speed control by means of an adjustment of the resistance in the shunt field, is the most satisfactory.

The special use for these motors in the mill will be for fans and blowers, used for ventilation or for carrying the cotton or wool from the picker room to the scutchers in the preparatory department, etc. In general, the amount of power required for fans and blowers increases rapidly with their speed, so care is necessary in selecting motors for this work, they should be strongly built and not liable to sparking.

4. Service requiring torque (turning moment) that remains constant.

Series winding is valuable for this kind of service on account of its steadying effect on the power mains in case there is a large fluctuation in torque in passing through the different phases of the cycle. For this same reason, a fly-wheel on the motor is an advantage. Compound motors may also be used. If the torque is to be kept constant through a wide range of speed, some sort of voltage control is necessary, the one described later being advisable on account of its effectiveness.

These motors are suitable for use in running pumps, air compressors, etc. They may be applied to the small pumps used for carrying oils to the several stories of the mill when a system of oil storage is employed, or they may be used to operate large pumps in the dye-house or bleachery. Air compressors may sometimes be very useful in a mill, so it is well to know that the same motor that operates the pumps can also be used for the air compressor.

5. Service requiring approximately the same maximum output through a wide range of speed, with close speed regulation on any notch of the speed controller.

Either shunt or compound motors may be used for this work. Whatever type of motor is used, it is necessary to add to it some system for controlling the speed. There are three systems of speed control that will be mentioned and described later.

The service here referred to will be required chiefly, in connection with the operation of tentering machines, drying cans, etc., and of the tools in the repair shop. Modern high speed tools are most successfully operated with electric motors, and if any sort of a repair shop is erected, tools should be run by electric drive. An efficient electrically operated repair shop will not cost much to install, will cost nothing when not in use and it may be made to save considerable expense.

6. Service requiring approximately constant speed with a load that will vary very little but which will require a very slow speed to "make ready," as in operating a printing press.

Shunt or compound motors with a rheostatic control may be used for this service, though there are a number of special types that have been developed for this special purpose.

The only service coming under this classification in a textile mill probably would be for the operation of the printing machines used in connection with print goods. For operating calico printing machines the electric drive is superior to all other methods, the control and the "register" being nearly perfect.

An important consideration with motors of any type is their method or means of speed control, as this is necessary in almost every use to which they are put. The speed control used should be as simple as possible and one that will not get out of order easily, must be reliable, effective and economical in its effect on consumption of current. There are three prominent types of speed control which are suitable to the needs of a textile mill:—

Rheostatic control; Field control; Voltage control.

Rheostatic Control is obtained by inserting a resistance coil or bar in series with the armature of the motor to cut down its speed. Its advantages are simplicity and cheapness. Its disadvantages are that it is wasteful of power and that when the resistance is set at any fixed point its control is not perfect, because the speed of the motor, in spite of this, will vary greatly with variations in the load on the motor.

Field Control is obtained by putting a resistance in series with the shunt winding of a shunt or compound motor. The disadvantages are that the field of the motor is thereby weakened and the motor runs at a proportionately higher speed. Its advantage is that by its use a wide range of speed control is secured (of ten to one), for instance, a change from 120 revolutions a minute to 1200 revolutions a minute, with specially designed motors. Ordinarily, a speed control of three to one is used.

Voltage Control consists of using special devices, to give a range of voltages, which are applied to the armature of the motor, such as an auxiliary generator. This system works through the application of varying voltages to the motor; its field strength being constant, its speed will vary in direct proportion to the voltages that are applied to the armature. The disadvantages of this system are its complexity and the extra cost of the special devices necessary. Its advantages are: Sparkless operation of the motor at all speeds; wide speed range; constant maximum torque throughout speed range; good speed regulation and high efficiency.

The study of the data set forth here will show that the requirements of practical operations demand a wide range of styles and types of electric motors. There is a type of motor for each requirement, that has been developed and perfected with just that particular service in view, so that motors can be selected for any special operation that will perform the work required with the maximum efficiency, which is something that cannot be said for any other power system or engines. Therein lies the real economy of the electric drive, motors can be selected to conform to the work, the work does not have to conform to the limits and possibilities of the engine or power source, as is the case with steam engines or water power.

(*To be continued.*)

HUMIDIFICATION, ITS RELATION TO THE VENTILATION TO TEXTILE MILLS.

(*Continued from page 96.*)

The chief defect of the many humidifying devices on the market, at present, is that they do not provide any means for getting rid of the hot air of the room and attempt to lower its temperature by the evaporation of water. Now, the air is heated up by the machinery a great deal faster than it can be cooled by the absorption of its heat by the limited amounts of water that is permissible to use in the mill rooms, the consequence of this is that moisture must be continuously supplied to the air to keep it at the requisite degree of relative humidity, as its saturation point rises with the rise in temperature. Then, if there should be a sudden, or even gradual, cooling of the air from the stoppage of the machinery or the opening of a window, there will be a deposition of moisture in the form of water on both machines and material, a common fault in this type of humidifier. Another drawback to them is, as said before, they only lower the temperature of the room in a small degree, so that on a hot summer day the doors and windows must be kept open to have any comfort at all, and this is likely to cause air currents that will make matters worse from the operators' standpoint. They are, at the best, only makeshifts, and their use cannot be recommended unless it is impossible to obtain anything else, as even the best of them cannot regulate the humidity of the air except by adding moisture to it as it becomes heated. The best of these devices are those in which the moisture is given off to the air in fine spray or in the form of vapor, the water being vaporized by air from a fan or under pressure. These do actually supply a little fresh air to the room, but it is too small in amount to have much effect, since to force a large volume of air through the water-spray would throw too much water in the room.

Another method for conditioning the air in the mill that has been tried with great expectations, but with mighty poor results, is a combination of humidifiers in the room and a system of ducts and blowers by which air is forced into the room. The theory is that the humidifiers will supply the necessary moisture and the blowers will furnish the necessary fresh air, the two working together will maintain the room in a satisfactory condition. The theory does not work out in practice, however, for the very good reason that the two devices are working against one another. The air forced into the room is usually hot and dry, naturally in summer and made so artificially in winter, consequently, the effect of a constant stream of hot, dry air is added to the effect of the machinery, (in heating air) and the humidifier has double work to do when it can scarcely take care of either condition alone.

If this system were combined with an exhaust fan working to remove the heated air as it rises to the upper parts of the room, it might then work fairly well, without an exhaust for the heated air, it cannot work well. Where it is desired to economize in cost or where there is not enough space to install humidifying chambers for humidifying the air before it enters the mill, it is possible that fair results might be obtained from a humidifier in the room combined with both supply and exhaust fans, but such a system is not nearly as efficient as the one previously mentioned, the combination system, in which the air is treated before it enters the rooms of the mill. It must be understood, in this connection, that the writer does not declare everything else to be worthless, only far inferior, and his aim is to point out the best, not to suggest makeshifts.

Before closing this article, there is one point in connection with all systems of artificial ventilation and humidification that deserves mention, this is that to be efficient, the doors and windows of the rooms should be kept closed, the tighter the better. This is obvious when we consider that the object of the system is to maintain an artificial condition of the atmosphere in the mill, therefore, the more effectually it is isolated from outside atmospheric conditions, the more easily can this object be attained. If doors and windows are kept open, we cannot prevent the air from outside coming in or the air from inside leaking out, either of these contingencies interfering with the effect produced by our system, it may be the hot dry air of summer or the cold damp air of winter. Besides, opening windows will set up air currents near them, a thing that is to be avoided as far as possible, which will continually change atmospheric conditions in those parts of the room nearby.

Of course, with the plenum system used alone some openings must be provided to allow the escape of the excess of air forced into the room, but these openings should not be arranged hap-ha[illegible] or dependence placed on windows alone. The outlets should be located in the upper parts of the room, so that the heated air will escape from them as it rises. These openings should communicate with short air-ducts through which the heated air can be carried away from the rooms, and these should be provided with shut-

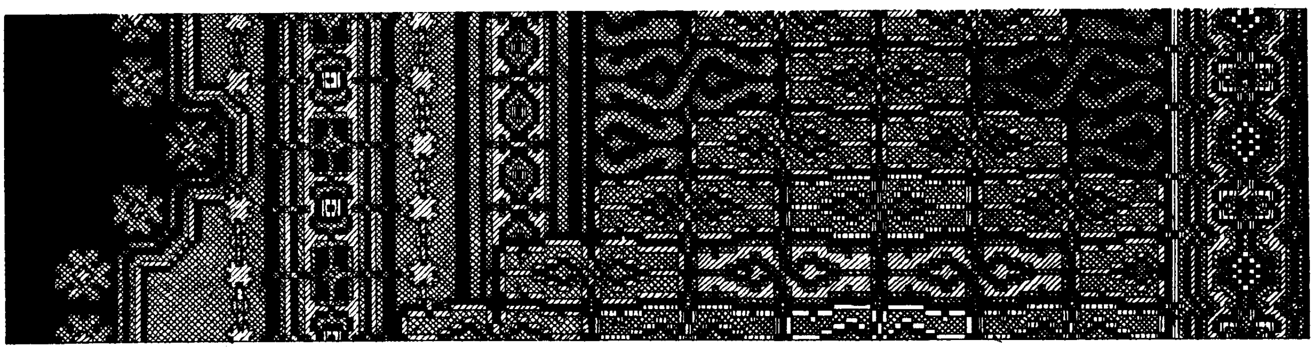


FIG. 1.

ters, or dampers, so that the rate of escape can be regulated to suit conditions. Naturally, the air inlets should be located near the floor of the room, so that the air will rise as it is heated and displace the vitiated air.

It will be said by those who have not made a study of the problems of artificial ventilation that the system just described is both complicated and expensive to install and to operate. Well, it is not as cheap as the many self-styled humidifying devices on the market, that do very little good, and it costs more to install the combination system than the single system, but here the comparison ends. The first-named devices are nothing but makeshifts that may possibly make things a little bit better than nothing at all, and the latter system is not thoroughly efficient even when working under the best conditions. The combination system, of course, costs more to install, but, when once installed, its operation costs less, proportionately, than the single system, and its results are certain. Smaller fans and less power are required when both supply and exhaust fans are used than it is possible to use with either alone.

Of course if the mill cannot afford even the single system, then some sort of humidifier is necessary, but these are so clumsy in their work and are so uncertain in action and results that it is poor economy to spend money on them when a little more will pay for fans, ducts, etc. It need not necessarily be very expensive to put in a system of air-ducts and the two (or more) fans required, the ducts can be run along the side of walls or under the ceiling or alongside columns, the fans can be put in boxes in the basement and attic or in separate small rooms outside. A small mill that runs on spinning yarns exclusively can have a combination system put in, at a reasonable cost, with very little cutting of walls and floors, and, as soon as it is in place and in working order, the mill can very soon earn its entire first cost by turning out more and better yarns.

New Designs.

Figs. 1 and 2 show two new, original and ornamental designs for carpet fabrics, designed and patented by Mr. G. Hawkins of Philadelphia; Figs. 3 and 4 showing two similar designs for Ribbons, designed and patented by Mr. E. M. Corbett of Paterson.

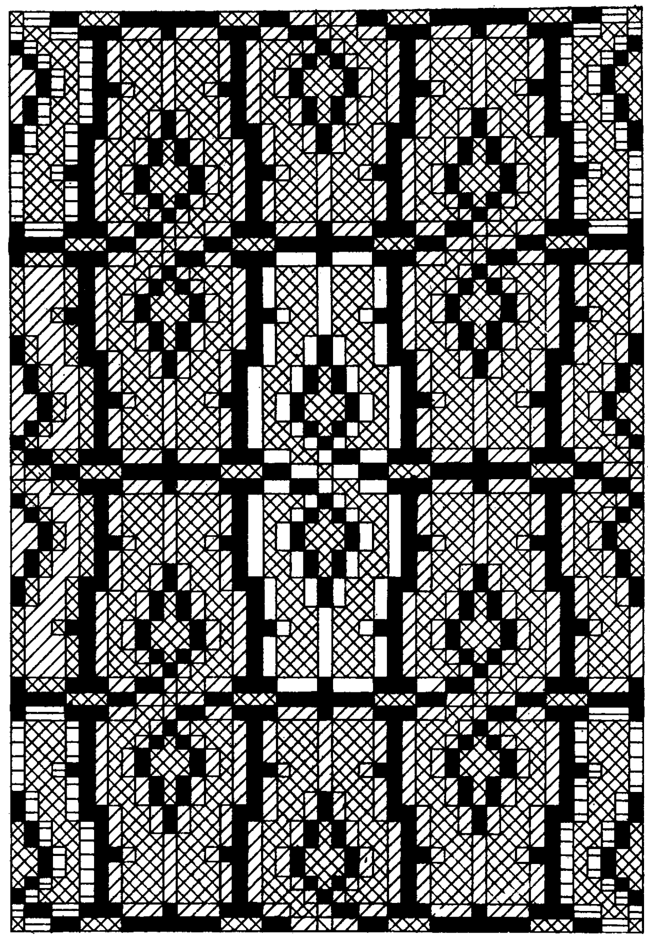


FIG. 2.

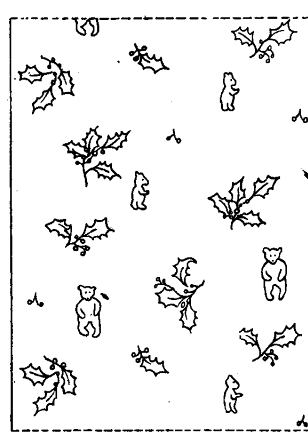


FIG. 3.

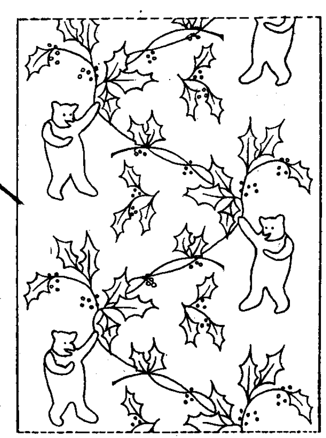


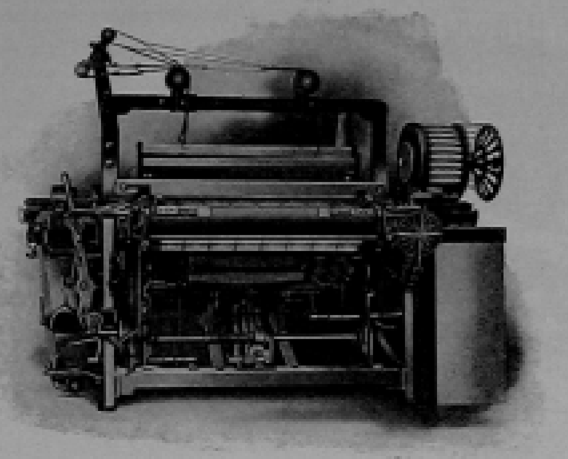
FIG. 4.

BUYERS' INDEX—Continued

ITEMS OF INTEREST

The E-Model Northrop Loom.

After many experiments with various models of this loom for the various classes of fabrics this loom is designed for, this model is still the one recommended for general use, since it represents the best points of other models in its construction.



Our illustration shows this loom, the same being equipped with 5-harness harnesses, feeler, double fork and loom seat, the three part square corner arch, the new iron filling box top, etc. Although the Draper Company builds heavier looms for heavy weaves and lighter looms for light weaves, still the majority of mills prefer this *E-Model* loom to a lighter style for any light goods and many mills find it sufficiently heavy for any general weaving.

On page XIV of the December issue, we referred to the use of the Northrop loom for cop spun yarns, and for yarns finer than 50's, which certainly speaks well for this loom.

Double Fork Attachment. The Draper Company are also the introducers of looms with double forks. This new loom attachment is sold at only $5.- per loom (a fact we have to mention, since some manufacturers who heard of this new attachment were under the impression that it means an increase of 25 % in price of loom) to cover the extra cost of making the loom two inches wider and attaching this extra mechanism. This double fork attachment to the Northrop loom has been greatly simplified in its natural evolution since its introduction in the market, and is giving the very best of satisfaction.

The Japanese Silk Market.

Mr. Crowe, Commercial Attache of England at Tokio, has forwarded some very interesting information regarding the condition of the Japanese Silk market: "There are three kinds of raw silk exported from Japan, namely, filatures, re-reels, and kakedas. Filatures, as their name shows, are machine-reeled; re-reels are first of all hand-reeled and then machine-reeled, while kakedas are hand-reeled. The proportion in which they are exported is roughly: Filatures, 80 per cent.; re-reels, 13 per cent.; and kakedas, 7 per cent. Now, although one would naturally suppose that filatures would always fetch a higher price than re-reels of a similar grade, such does not appear to be the case, the latter having gradually increased in value from a position of 24 cents gold per lb. *less* than filatures in 1896-97 to 12½ cents gold per lb. *more* than filatures of the same grade in 1905-06. The reason for this is that the supply is limited and that the American buyers prefer the re-reels, especially from selected cocoons, because by careful manipulation in the process of re-reeling they pass through a severe test as to their strength and nerve, and are therefore considered in America to be more dependable than ordinary filature silk. The price of re-reels has now fallen con-

siderably and is again less than that of filatures, the main reason for it being that owing to their high price for several seasons consumers have been tempted to look elsewhere for a substitute.

It is now necessary to say a word of explanation with regard to the Yokohama raw silk market. Since the first days when foreigners began to export raw silk, the custom of the trade has been that all raw silk should be brought to Yokohama and be purchased there by the foreign buyer from a Japanese intermediary or *toiya*. These Japanese middlemen charge a small commission, but, apart from their business as middlemen, it must be remembered that they also occupy a position of quasi-bankers, and that they finance most of the filature proprietors who require large sums of money with which to buy their cocoons. It will be seen then that, thanks to the power which the middlemen thus obtain over the raw silk producers, they are an extremely important force. They form a corporation known as the *Japanese Silk Guild*, which is so powerful that it would be most difficult for a foreign firm to oppose them and buy direct from the producer in order to avoid paying them any commission.

This system of pledging the crops in advance to middlemen is one which has existed in Japan for some centuries and, judging by results, in the case of raw silk at least, it has been very successful. It has been instrumental in establishing the present arrangement by which the foreign buyers instead of having to bear the cost of establishing agencies in all the producing districts in order to enter into direct dealings with the sericulturists, know that their market is limited to Yokohama, and that all the silk for export must find its way there. In other words, buying expenses are reduced to a minimum.

In the silk piece-goods trade the conditions are quite different, since it is a newer trade and the middlemen are not so powerful as to hold the weavers in the hollow of their hand, and therefore the foreigner can buy direct from the producer. This, however, does not appear to be an advantage, for it means that he must go to the additional expense of large staffs, more agencies, more telegraphic expenditure, etc., as he has to be ready to buy in any part of the producing districts.

The raw silk trade therefore may be said to be based on the custom of buying on the Yokohama market through the Japanese middleman, and the experts say that it is because of this custom that the trade has flourished so exceedingly and that Yokohama has acquired its dominating position. But some of the Japanese producers have now broken through this trade usage and in doing so have considerably interfered with the trade of the foreign exporters. These latter have therefore decided to boycott them.

The details shortly put are as follow: Three of the most important re-reel factories, namely, the *Usuisha*, *Kanransha*, and *Shimonita*, which turn out between them about 60 per cent. of the total re-reel production (which amounts roughly to 1,000,000 lb.), have made arrangements to sell a portion of their produce direct to the two leading Japanese silk-exporting firms, the *Mitsui Bussan Kaisha* and the *Kiito Gomei Kaisha* without the intervention of the Yokohama (Japanese) middlemen, thus saving the commission and enabling these two Japanese firms to compete more successfully with the foreigner, while giving him no chance to compete in the purchase.

The Foreign Raw and Waste Silk Association, therefore, dreading that this might be the thin end of the wedge, in self-defense determined to take strong measures, and in August they decided unanimously to abstain from buying the chops of the three offending factories until further notice. This, the foreign exporters hope, will compel the factories concerned to return to the old arrangement, because, by forcing them to dispose of their silks through one channel only, the value of their goods must necessarily depreciate. The latest report has it that there is no sign of either party giving way."

Cotton Yarn Mills Predicament.

The recent drop in cotton yarn prices and the consequent restriction of production, calls attention to the rapid increase in yarn mills of late, and the possible necessity for finding a market for their surplus product. Here in the North, says Mr. *George Otis Draper*, the Secretary of the Draper Company, in Cotton Chats, "we have had four large new yarn mills quite recently added in New Bedford, and another large mill in Fitchburg. A new thread mill is also starting up in Fall River. North Carolina has added appreciably to its quota of spinning mills. The Northern mills are fairly well assured of a market for their product, by reason of the fineness of the numbers of some, and the facilities for placing product controlled by others; but it is somewhat questionable as to whether the Southern yarn industry will not find itself in an uncomfortable predicament, if something is not done promptly to relieve the situation.

A very sensible plan for our Southern mills would be to build modern weave sheds, adjacent to many of the modern spinning mills, equip them with modern looms, and weave their yarn into cloth."

A New Filling Bobbin Winder.

We illustrate this month a new filling bobbin winder which has just been put on the market by the Universal Winding Company, of Providence, R. I. The new machine is designed to wind filling bobbins for broad loom shuttles, and shows remarkable improvement over present methods of winding filling. This Company manufactures the well-known Universal cone and tube winders, which have been generally adopted for handling yarns in doubling, twisting, and for other transferring processes, as well as for supplies for knitting machines.

THE ADVENT OF THIS NEW MACHINE marks an important advance in the weaving industry; for the new bobbin gives a remarkable gain of from two to three times the amount of yarn in the shuttle. This increase means running the loom from two to three times as long without stopping to replenish filling, and, with the

other advantages referred to later, results in a substantial saving in cost of production on all kinds of woven goods.

THE MACHINE COMPRISES a main frame, consisting of six oil-tight compartments enclosing the driving mechanism, from which project 20 spindles, ten on each side. The machine is self-oiling like the well-known No. 50 Universal Winder, all gears and engaging parts being enclosed to exclude dust and lint, and running constantly in oil, so that wear is reduced to nil.

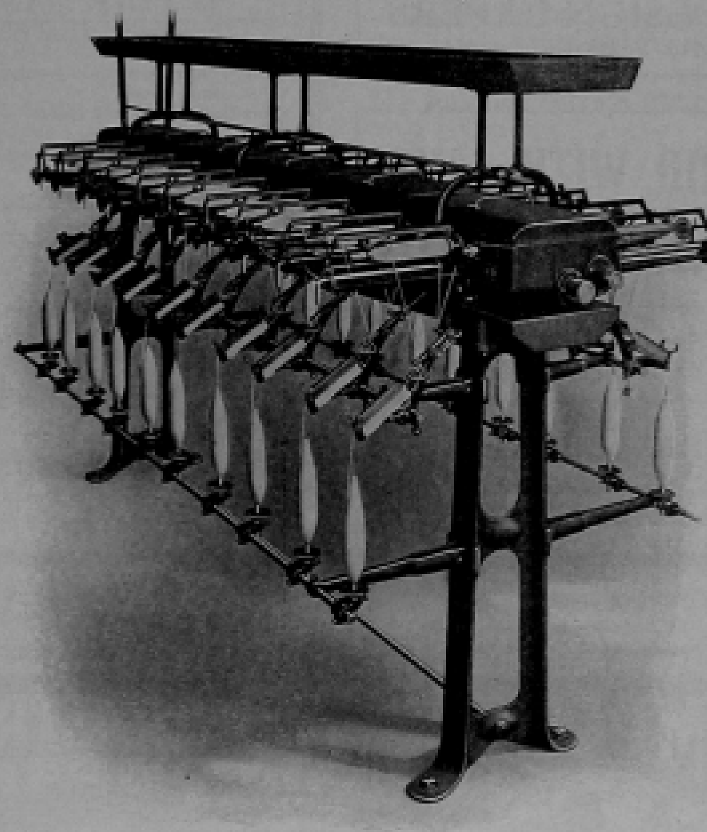
THE MECHANISM is exceedingly simple, and is adapted to operate at high speed, giving a maximum production per spindle and per operator. It occupies a space three feet by seven feet, including all overhang.

SAMPLES OF THE BOBBINS PRODUCED on this machine show that the yarn is wound very compactly, as indeed it must be to give such an increase in the amount; but it is a remarkable fact that the yarn is not pulled down or weakened the least bit in winding. This is because very little tension is applied to the thread in winding, the hardness and density of the yarn mass being the result of the systematic, regular laying of the coils and of the pressure applied to the traverse guide rather than to extreme tension.

THE MACHINE WINDS SO EVENLY and regularly that the bobbin is completely filled, and is of uniform diameter throughout its length. All of the available space in the shuttle is therefore utilized, while, with the ordinary bobbin, the winding is so irregular that much valuable space is wasted.

A VERY IMPORTANT FEATURE is the improvement in the delivery of the yarn from the shuttle. The tension is uniform from start to finish of unwinding, and the yarn will not slough off or catch on the nose of the bobbin, nor will it deliver too freely. In making tests with the new bobbin, it has been found that this improvement shows a corresponding improvement in the the quality of the cloth, and owing to the elimination of breaks in the filling, the use of this new bobbin greatly reduces the number of seconds.

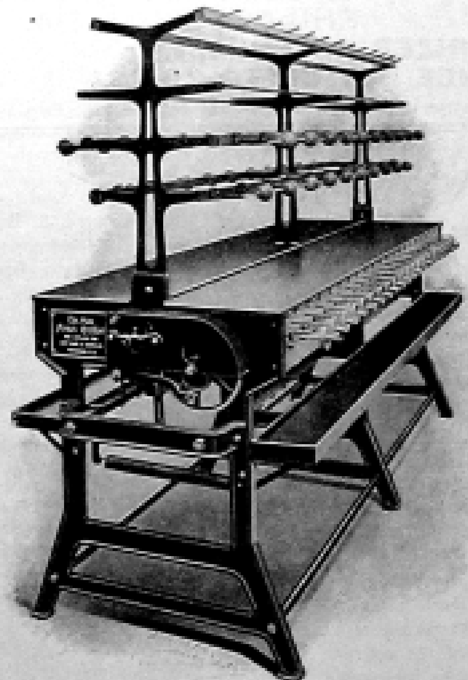
THE TENSIONS on the new winder act to clean the yarn of slubs and bunches, so that pick-outs in weaving on this account are eliminated. The yarn is smoothed and ironed out to such an extent in winding that no conditioning is required. There is a great saving in waste on account of the reduction in the number of pick-outs from ends, and also from the fact that the new bobbin delivers every inch of yarn in the shuttle.



The New No. 90 Universal Filling Bobbin Winder.

Before putting the machine on the market, the manufacturers tested its product in eighty New England weaving mills, on all grades of yarns and in all varieties of shuttles. In every instance the new bobbin showed such advantages that enthusiastic commendation was received from the various mill superintendents.

The new machine may be seen on exhibition at the factory, 99 Stewart street, Providence, R. I., and the manufacturers will be glad to furnish further information upon request.



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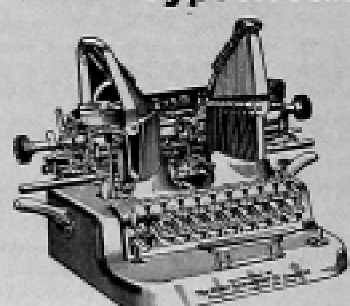

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Posselt's Textile Journal,
2028 Berks Street, Philadelphia, Pa.

Boss Weaver with 6 years' experience in Philadelphia mills, would like position in New England, Rhode Island preferred. Best of references. L. S., Textile Workers' Bureau.

Boss Weaver wanted for Western mill, must have experience on leno work with reference to hammocks. A good chance for the right man. Hammock, Textile Workers' Bureau.

Boss Weaver, 10 years' experience in a prominent Maine Woolen Mill and 2 years in Philadelphia, wants position, no objection to go West. S. H., Textile Workers' Bureau.

Designer and Superintendent understanding warp dressing, weaving and finishing silk velvets, plush, mohair, cotton plush, pile fabrics and dress goods; Crompton and Knowles Looms. Age 32, married, willing to go anywhere. H. R. S., Textile Workkers' Bureau.

Designer for Woolen and Worsteds, Graduate from Posselt's Textile School, with two years' practical experience in New England mills, is open for position either as designer or assistant to superintendent. H. B., Textile Workers' Bureau.

Boss Dyer, 3 years' experience as overseer on wool, yarn, piece-goods and mixes. Age 25, German, best of references. S. K., Textile Workers' Bureau.

Consulting Chemist, Graduate of University of Pennsylvania, with practical experience in Dyeing, Chemicals and Dyestuffs, will furnish at a nominal cost information regarding matters along this line. Can give part time service. L. Feldstein, Chemist, POSSELT'S TEXTILE JOURNAL.

MILL NEWS

Middle States

Philadelphia. The Prudential Worsted Company, Wayne Junction, Geo. Kritler, Proprietor, has increased its production about forty per cent. by the addition of forty-four looms. Mr. Kritler is numbered among the most progressive and enterprising textile manufacturers of this locality.

Philadelphia. The firm of Booth & Bro., Roseglen Mill, Gladwyne, manufactures yarns for velvet, Axminster carpets and rugs, has been incorporated with a capital stock of $50,000.

York, Pa. The mills of the York Silk Company have resumed work after a suspension of three weeks. Work was started with only a part of the operatives, but the number will be increased daily, until full forces are employed.

Camden, N. J. Ballinger & Perrot, of Philadelphia, have prepared plans for the erection of a one-story boiler house for the Highland Worsted Mills.

New York. Arnstaedt & Co., of New York, dealers in silks and woolen goods, with a capital of $600,000, have filed a certificate of incorporation with the Secretary of State.

Olean, N. Y. The new factory of the Feder Silk Throwing Company will soon begin operations. About 100 hands will find employment.

New England States

Facts regarding the Draper Looms worth while to be known. An abstract of a letter from a practical man on this loom will not only be of interest to our readers, but at the same time of value to many a boss weaver and superintendent of the mill: "I have been thinking of dropping you a few lines to let you know what I am doing with your loom. We are making 68 reed, 72 pick, 4.75 yds. to lb., 30s warp, 40s filling, and I am getting 93 per cent. with 1 per cent. seconds, and I have got the best running work in this part of the country. This loom is giving perfect satisfaction. I have been working on the Draper loom for ten years, and I think I know something about them. I have worked for overseers that knew nothing about the Draper loom, and they were always kicking about something (that has had some effect), but not as much now as some time back."

Pawtucket, R. I. The American Machine Co., Ltd., Howard & Bullough, manufacturers of cotton machinery, have adopted a schedule of forty hours per week. Several hundred hands are affected.

Pawtucket, R. I. George E. Double & Co. are expected to have their plant in operation by the first of the year. The equipment consists of one hundred and fifteen looms for the manufacture of dress goods.

Spencer, Mass. It is expected that the Priscilla Woolen Company will soon begin the manufacture of woolen suitings, the work of making samples having been in process for some time. The new company is capitalized at $100,000, and will start with $25,000 working capital. The new enterprise is occupying the White Mill, which is being thoroughly overhauled and when in full operation will employ 100 hands.

Fall River, Mass. The Tecumseh Mills declared an extra of 3½ per cent. quarterly dividend besides its regular of 1½ per cent. The Osborn Mills declared a regular dividend of 1½ per cent.

New Bedford, Mass. Statistics just compiled show that the dividends paid to stockholders of New Bedford cotton mills in 1907 have been the largest in the history of the city. The total dividend of eighteen corporations is $2,578,250 on a capital stock of $18,770,000, an average of 13.73 per cent. Last year the average rate was 8.92 per cent., in 1905 it was 6.6 and in 1904 the percentage was 5.2.

Fall River, Mass. The Bourne Mills paid its thirty-sixth consecutive profit-sharing dividend to its employees. The rate was 3 per cent. for each operative in steady employment from June 10 to December 7. The paying of these dividends were instituted by the late George A. Chace, treasurer of the Bourne Mills, in 1889, and have been a regular feature since. The directors have voted to continue the dividend for another six months.

Dover, N. H. The Cocheco Mfg. Co. will erect a five-story structure, 150 x 90 feet, to be used for the manufacture as well as the printing and finishing of cotton cloth.

(*Continued on page xvi.*)

Camden, Maine. The Knox Woolen Mills are building a new engine room to their present plant, 18 x 45 feet. A new 250 horse-power engine will be installed in the near future.

Southern States

Ten hours a day's work for S. C. Last July, by virtue of the agreement entered into among the mills themselves, the hours constituting a week's work were reduced to 62. After the 1st of January a week's work will consist of but 60 hours, or ten hours per day. The law will affect all cotton and woolen mills in South Carolina.

Mount Airy, N. C. J. L. Brown, proprietor of the Laurel Bluff Cotton Mills, contemplates installing about 2,000 new spindles to take the place of the old type equipment now in operation. It is estimated that about $60,000 will be spent in this direction.

Fairmont, S. C. It is reported that the Tyger Cotton Mills will erect, about two miles below the present plant, a new cotton factory with a new water power, electric plant. At the present plant there are 8,100 spindles and 250 looms, producing cotton sheeting.

Augusta, Ga. A. J. Lovelady has succeeded in organizing the Ball Ground Cotton Mills, F. A. Abbot general manager. The erection of the plant includes a main structure, two stories in height, 75 x 320 feet; picker room, 32 x 75 feet; dye house, 75 x 90 feet; engine and boiler rooms, 40 x 40 feet each, has begun. The machinery will consist of 10,000 spindles and 300 looms for the production of denims, drills or eight-ounce duck. It is estimated that 275 operatives will be employed.

Columbia, S. C. The Seminole Manufacturing Company will soon start its plant at Clearwater with 20,000 spindles and 512 looms running on drills and wide sheeting. The old Clearwater Bleachery plant was taken over and has been remodeled.

Greenville, S. C. The McGee Manufacturing Company's plant is now in full operation. They manufacture woolen blankets, cassimeres and dress goods. The main building is 275 x 62 feet and two stories high. The dyeing and finishing plant is 40 x 60 feet. Both are of brick construction. Two 125 horse-power boilers and a 150 horse-power engine furnish the power together with an auxiliary engine of 55 horse-power used for generating power for dynamos and the motive power in the machine shop.

Lincolnton, N. C. Operations have begun in the plant of the Rhodes Manufacturing Company. The equipment consists of 5,000 spindles and 150 looms, manufacturing heavy cloth.

Weldon, N. C. The Shaw Cotton Mills are making arrangements for the construction of a plant for spinning 2-24 up to 2-36s cotton yarns. A two-story brick building, 50 x 150 feet, is to be erected and an equipment of 5,129 frame spindles will be installed.

Atlanta, Ga. Operations will soon commence in the plant of the National Duck Mills of this city. A plant has been purchased and about eighty looms have been put in position for the manufacture of duck ranging from 27 to 114 inches wide. Between 100 and 150 operatives will be employed and about 6,000 pounds will be produced daily. This concern was incorporated some time ago with a $500,000 capital stock.

Jacksonville, Ala. The additional 25,000-spindle plant of the Ide Cotton Mills of this city is expected to be ready to operate early in 1908.

Huntsville, Ala. Several hundred looms and other machinery, at a cost of about $60,000, have been added by the Merrimack Mfg. Co. to their present plant, which has been operating 92,262 spindles and 2,758 looms, manufacturing prints, organdies and percales. The erection of twenty cottages for their help has also been completed.

Roanoke, Va. It is rumored that the Roanoke Knitting Mills will establish a branch mill at Martinsville. The plant at Roanoke operates 150 knitting machines besides a dyeing and finishing plant, and the new plant will probably be about the same size. This concern operates a number of branches throughout the South.

Radford, Va. The Radford Knitting Mills, incorporated last September, have installed 100 knitting machines for the manufacture of cotton hosiery; intending to add another 50 machines in the near future.

Zanesville, O. Judge Sater, sitting in the United States District Court in Columbus, gave an order for the private sale for the stock of the Kapner Bros. and Duga Hosiery Company. The stock has been appraised at $17,000. An order was also handed down for the receivers to continue the business if they find it profitable.

Improvements to Southern Cotton Mill Machinery: The Rob. Schaellibaum Co. have recently made complete installation of their Patent Grid for openers and lappers in the following Southern Mills: Arkwright Mills, Spartanburg, S. C.; Aetna Mills, Union, S. C.; Globe Mills, Gaffney, S. C.; Southern Mfg. Co., Athens, Ga.; Ide Cotton Mills, Jacksonville, Ala.; Opelika Cotton Mills, Opelika Ala.; and Talladega Cotton Factory, Talladega, Ala.

EXPLANATIONS FOR THE CHART OF WEAVES ON

"Textile Designing Simplified."

The object of this chart is to show how easy weaves for all classes of Textile Fabrics can be constructed; it will be a search light in the misty matters in the field of designing Textile Fabrics. Keep this chart of weaves for reference. Millions of new weaves can be obtained by it.

All weaves for Textile Fabrics have their foundation in Plain Twills and Satins.

PLAIN.—This weave and its sub divisions are explained on the chart in the top row by 16 weaves, the sub divisions covering common, fancy and figured Rib and Basket weaves.

TWILLS.—The foundation of constructing regular (45°) twills is shown by rows 2 and 3 with twenty six weaves, covering twill weaves all the way from 3 harness up to 13 harness. The sub divisions of twills are quoted next on the chart, being Broken twills, Skip twills, Corkscrews, Double twills, Drafting twills, Curved twills, Combination twills warp drafting Combination twills filling drafting, 63° twills, 70° twills, Wide wale twills, Entwining twills, Checker-board twills, Pointed twills, Fancy twills, thus covering every sub division of twill weaves possible to be made.

SATINS are next shown, giving also their sub divisions, viz: Double satins and Granites.

HOW TO PUT A BACK FILLING ON single cloth is shown below the satins by two examples, and at its right hand is quoted the principle of

HOW TO PUT A BACK WARP ON single cloth.

On the bottom line are given the four steps for :—

THE CONSTRUCTION OF DOUBLE CLOTH, 2 @ 1; and above the same one example, with the arrangement 1 @ 1.

THREE PLY CLOTH is shown by one example.

HOW TO BACK SINGLE CLOTH WITH ITS OWN WARP is shown by two examples.

WEAVES FOR SPECIAL FABRICS are quoted: Tricots (warp, filling and Jersey effects), Rib fabrics, Honeycombs, Imitation Gauze, Velveteen, Corduroy, Chinchillas, Quilts, Plush, Double-plush, Tapestry, Crape, Terry, Worsted coating stitching, Hucks, and Bedford cords

HOW TO WORK THIS CHART OF WEAVES.

CAPITAL LETTERS of references refer to the plain weave and its sub-divisions.

SMALL LETTERS of references refer to twills and their sub-divisions.

NUMERALS of references refer to satins and their sub-divisions.

Example.—How to ascertain the construction of the weave at the right hand top corner of the chart; being the figured rib weave marked C C'? These two letters of reference mean that said figured rib weave is nothing else but the combination of the 2-harness 6 picks common rib weave warp effect C, and the 6 harness 2 picks common rib weave filling effect C'.

Example.—The letter of reference *c*, underneath the first broken twill indicates that the same is obtained from the $\frac{1}{3}$ 4 harness twill *c*, (third weave on the second row); in other words, letter of references below each weave of any of the various sub divisions refer always to the corresponding foundation weave.

Example.—Twills *q*, and *o*, are the foundation for the eight combination twills filling drafting, said common twills are drafted 1 @ 1, the different designs being obtained by means of different starting.

Example.—The wide wale twill *t' w'*, has for its foundation the 63° twills, marked also respectively *t'* and *w'*, the latter two weaves have again for their foundation respectively the common twills marked *t* and *w*.

Example.—Granites marked 8 have for their foundation the 8-leaf satin, such as marked 12 the 12-leaf satin.

Example.—Backed by filling *e* 8, means the common $\frac{2}{2}$ 4-harness twill *e*, (fifth weave on second row) and the 8-leaf satin is used in the construction of this weave.

Example.—The complete design of double cloth, marked *e* 8 A, means that the common $\frac{2}{2}$ 4-harness twill (*e*), the common plain (A) and the 8-leaf satin (8) are used in the construction.

Example.—Rib fabric A, indicates that the plain weave forms the foundation.

It will be easy to substitute different foundations in constructing weaves for heavy weights.

In reference to single cloth weaves we only want to indicate that by following rules shown in the chart, millions of new weaves can be made up from it.

Keep this chart on hand for reference. Only 144 weaves are given, yet they will guide you to make millions of new weaves.