Weaves Figs. 4, 5, 6 and 7 have for their foundation the 6-harness even-sided twill, showing four different principles of drafting, *viz:*

Fig. 4: Take 3 and skip—uniformly; repeat 18 warp-threads.

Fig. 5: Take 3 and skip, to alternate regularly with take 2 and skip; repeat 10 warp-threads.

Fig. 6: Use plan referred to with Fig. 4, drafting one repeat of the skip twill with its twill running in one direction to alternate with one repeat of the skip twill having its twill running in the opposite direction; repeat 36 warp-threads.

Fig. 7: Use plan referred to with Fig. 5, drafting one and one-half repeat of the skip twill, *i. e.,* 15 warp-threads with twill running from left to right, to exchange with the same combination but using reverse direction of the foundation twill; repeat 30 warp-threads.

Weaves Figs. 8, 9, 10 and 11 show four different patterns, having the $\frac{2}{1}\frac{2}{2}\frac{1}{2}$ 10-harness twill for its foundation.

Fig. 8 shows the weave produced by using uniformly 2 warp-threads and then skipping; repeat 10 warp-threads.

Fig. 9 shows the weave produced by using uniformly 3 warp-threads and then skipping; repeat 30 warp-threads.

Fig. 10 shows the weave produced by using uniformly 4 warp-threads and then skipping; repeat 20 warp-threads.

Fig. 11 shows what we may term a broken fancy skip twill, using alternately 4 and 2 warp-threads for a group; using alternately for 18 warp-threads of this combination twill from left to right, and for the other 18 warp-threads of the combination twill from right to left; repeat 36 warp-threads.

(To be continued.)

POINTS ON JACQUARD DESIGNING.
Planning Point-paper Design for Single Cloth Fabrics.

This subject is readily explained by means of the sketch of an actual fabric structure and its point paper design.

For sake of an example let us consider a worsted dress goods, a class of fabric calling in most every instance for a straight through tie-up; a 400 Jacquard machine is the machine most often met with in connection with these fabrics.

Fig. 1 is a diagram illustrating this straight through tie-up in connection with a 400 machine, explaining at the same time any similar tie-up for any other size of Jacquard machine we may come in contact with.

On top of diagram the bottom board of the Jacquard machine is shown in its perspective, viewed from below, standing in front of the loom.

The first and last row of holes in said bottom board are only shown to simplify diagram to the reader. Numerals 1, 2, 3, 4, 5, 6, 7 and 8 refer to the first row, and numerals 393-400 to the last row.

Three neck cords (see heavy lines) are shown extending down through the bottom board, *viz.:* neck cords connected to hooks 1, 8 and 400, explaining by it the threading of the complete set of neck cords in the machine.

A 400 Jacquard machine is an 8-row deep machine, with 52 rows in its length = 416 hooks and needles in the machine. In our diagram we only used 50 of these rows *i. e.,* 50 × 8 = 400 needles and hooks. The remaining 2 rows (not shown) are what we technically call *reserve* rows, and which are used in some instances in part for the fabric, other times some are used for selvage; again some may be left idle, and when in the latter case, if no prospect for them to be used soon, the respective hooks are then temporarily taken out of the machine until such time as they are needed again, so as to prevent breakage.

To the neck cords, the leashes of the Jacquard harness are attached. By leash we understand the number of individual harness cords attached in unison to one neck cord. The number of these harness cords thus attached to one neck cord depends upon the number of divisions used in the comberboard, and what depends, in every instance, upon the texture and width of fabric under consideration.

In our example we used two harness cords to each leash, showing for this reason two lines diverging from each neck cord. This will simplify explanation of the principle of the tie-up to the reader, since additional divisions only mean additional harness cords to each leash and would mix up diagram. For this reason, if 4800 ends are used in the warp, it will mean 4800 ÷ 400 = 12 divisions in comberboard = 12 harness cords to each leash, in place of the 2 now used.

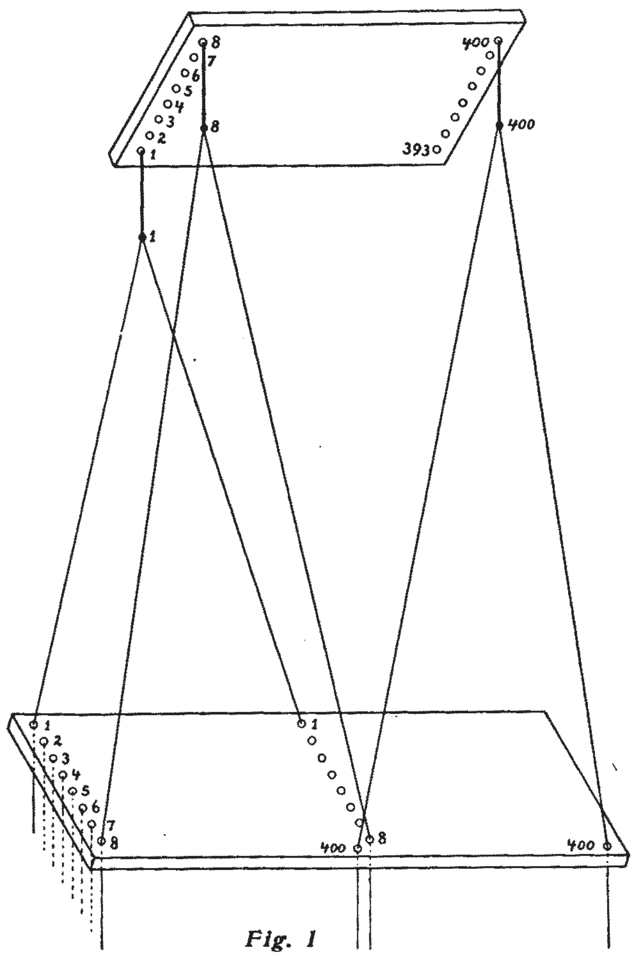

Fig. 1

The comberboard, as shown at the bottom of our diagram, shows the 2 divisions last referred to, *each* division being nothing else but a counterpart of the bottom board of the Jacquard machine, both being connected by its respective harness cords. Numerals in comberboard correspond to those on bottom board and thus in turn explain tie-up at once fully.

Fig. 2 shows one complete repeat of the fabric design, 4.45 by 5.75 inches.

Reed to Use: The same goes hand in hand with the planning of the comberboard, since both must correspond, to permit perfect work on the loom; if they are out of the way, a swinging motion would be imparted to the lingoes at the loom, interfering with

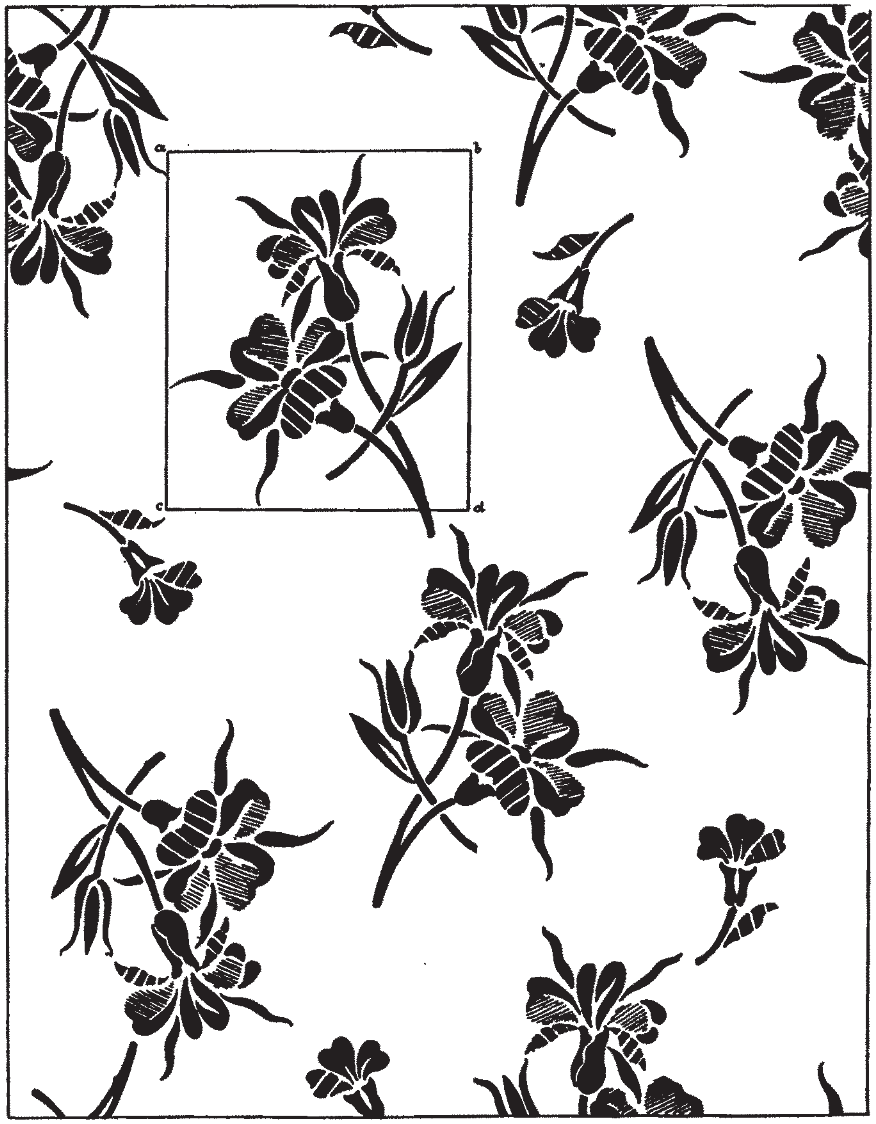

Fig. 2.

The figure in the repeat of the weave is set after the 6 leaf satin, *i. e.*, the crow foot twill, being also placed in a different position in every instance.

We next have to ascertain texture of fabric submitted.

The same to be 90 warp-threads and 112 picks per inch.

Question: Ascertain repeat of pattern, *i. e.*, size of Jacquard machine needed.

$90 \times 4.45 = 400.5$.

Answer: 400 ends in repeat of pattern, or a 400 Jacquard machine is needed for the execution of the fabric on the loom.

Question: Ascertain repeat of pattern filling ways, *i. e.*, number of picks and Jacquard cards needed.

$112 \times 5.75 = 644$.

Answer: 644 picks in repeat of pattern, *i. e.*, Jacquard cards are required to be cut on the Royle Piano machine.

perfect weaving; noticeable differences in this way would make weaving impossible.

Considering for example, 4800 ends in warp (12 divisions @ 400 ends) we then find:

$4800 \div 90 = 53.3$ or practically $53\frac{1}{4}$ inches finished width of fabric.

To this we must allow for take-up in width of fabric in the loom and the finishing, laying for this reason the fabric $58\frac{1}{2}$ inches wide in reed.

Reed: $20\frac{1}{2}$ @ 4 ends = 82 ends per inch.

$4800 \div 82 = 58.53$ or practically $58\frac{1}{2}$ inches, width of fabric in reed.

Point Paper to Use: The same depends upon the finished texture of the fabric, and which in the present instance is 90 by 12. Using on account of the 8 row deep Jacquard machine used, 8 as the basis for the ruling for the warp, we then find the paper proper to use thus:

$90 : 112 :: 8 : x$
$8 \times 112 = 896$ and
$896 \div 90 = 9.95$ or

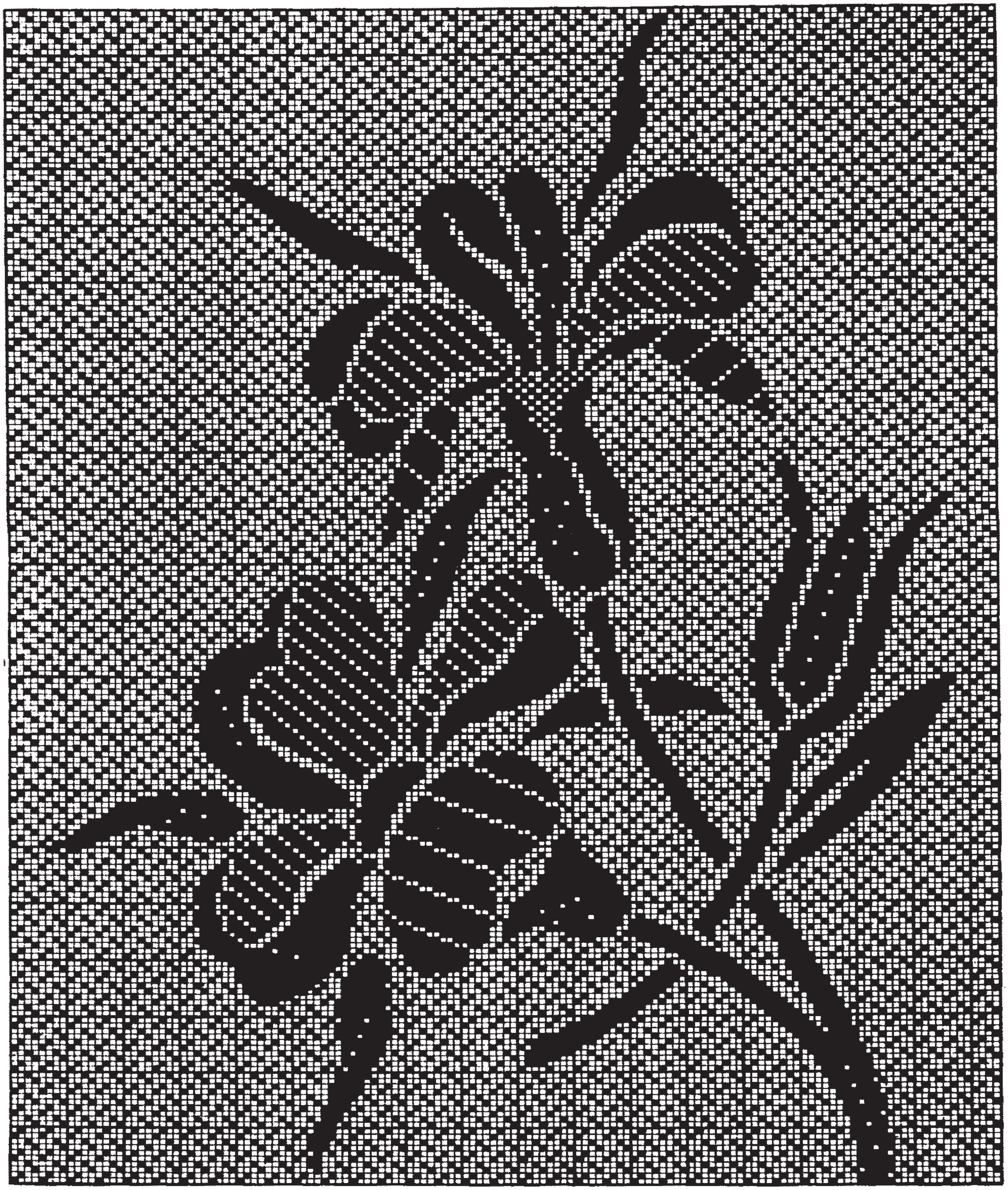

Fig. 3.

8 by 9.96 or practical
8 by 10 is the proper point paper for us to use.

To illustrate the execution of the complete Jacquard design on point paper to the reader—as will be readily understood, would require such an immense reduction of said design, that the same would become useless, considered from a practical as well as educational point of view; for which reason, we will only show a portion of it, the same, however, to cover one of the figures used in the design, complete, and consequently fully explaining the procedure.

Example: Square *a, b, c, d,* on fabric sketch is the portion of the design we now want to show up on point paper.

Warp: *a* to *b* or what is the same *c* to *d* $= 1\frac{5}{9}$

inches, and $1\frac{5}{9} \times 90 = 140$ warp-threads of the design $= (140 \div 8 =)\ 17\frac{1}{2}$ squares, required for this portion of design (warp ways) to be shown on point paper.

Filling: a to c or what is the same b to $d = 1\frac{6}{7}$ inches, and $1\frac{6}{7} \times 112 = 208$ picks of the design $= (208 \div 10 =)$ 20 squares + 8 lines, required for this portion of design (filling ways) to be shown on point paper.

The point paper design, based on explanations thus given (*i. e.*, rectangle *a-b-c-d*—or portion of fabric sketch) is shown in Fig. 3, using for its execution 140 warp-threads and 208 picks, as compared to the complete design, which would call for 400 warp-threads and 644 picks.

This point paper design is executed, as they always are : *Empty squares* for warp up, and *painted squares* for filling on face.

The ground of the design is formed by the warp for face, with *3 up 1 down* 4-harness broken twill for its weave, and the figure of the design is produced by the filling for face, floating said filling irrespective of a regular weave, *i. e.*, stitching the filling at such places where required, on account of detail effects of sketch.

In the same manner as thus explaining the construction, sketch and working design, on a low texture (90 × 112), we proceed with higher textures for cotton or silk fabrics, remembering that the higher the texture of the fabric you design for, the easier it will be found to bring up any details of the sketch, for the fact that then more warp and filling ends, in proportion, are at your disposal for thus working out any detail work of a figure or part of the design.

WINDING AND BEAMING.

By Ibzan Sagar.

It is now over fifty years since tape sizing, or slashing, of cotton threads was introduced, but from observations made at various mills during the last twenty years, I am convinced that on account of the great laxity in regard to the manipulation of cotton threads the best condition for manufacturing purposes has not been secured. There exist at the present time (especially with spinners who have taken over the department of back-beam making since the introduction of ring-spun yarns) theoretical conclusions which are entirely contrary to the economical and practical methods. This results in the production of beams, the unwinding of which causes great loss and disorganization in the sizing room and weave shed; and where bad beaming is responsible for more of the hard work, bad material, and loss suffered by those who have to manipulate it afterwards, than any mistakes made in other departments.

Seeing that perfect beaming cannot be obtained without good winding, perhaps a few comments on the preparation of the yarn before it reaches the beaming frame will not be out of place. It is acknowledged that no yarn is fit to go into work unless its strength stands the Lea pulls of the acknowledged dividend, *viz.*, 1800 divided by the counts, giving the strength in pounds, adding 5 per cent for Egyptian cotton. If the test is lower, then it is the forerunner of trouble unless extra care is taken by a reduction of speed.

All yarns should be conditioned with water to about 8 per cent over actual dryness; the temperature to be not less than 65 deg. after it has left the spinning room. Any excess over this makes bad skewering, and a straining drag both in winding and beaming is set up. If under-conditioned, the fibres are liable to break away from their foundations by the necessary drag in the winding, and friction in the beaming. It is essential that the yarn in cops should be handed to the winding department in as little disturbed a state as possible, to ensure easy working and little waste. The adjustment of the drag between cop and bobbin is an important factor, and should not by any means be neglected. Too little thought is given to this matter by the trade, and it will pay the spinner to give better attention to it.

So far I have not been able to find a basis for adjusting this drag proportionately to the counts which it demands, but as a basis, medium counts, say 40's, should be unwound at the rate of 120yds., finishing at the rate of 170yds. per min. on the front spindles, and when transferred to the back spindles the speed should be the same. It is found in some mills that the spindles are timed to take 120yds. per min. at the start, but finish up on the back spindles at the rate of 200 to 250yds. per min. When, however, a thread travels beyond 170yds., a weakening in the thread takes place proportionate to the velocity, and more so if the drag is tightened up by a wide knee-board wrapped with coarse flannel, and a close woven stiff travice brush. In the past the trade has been set going by machine-makers who cannot have given any thought to proportioning the speed of the front to the back spindles, when only one-sixth of the speed of the back is reduced to make up for the larger circumference of the bobbin. There is still plenty of room for greater technical knowledge in this respect, for example, to ascertain when the right tension on the thread is produced, as it very often happens that too little tension is given at the beginning and too great at the finish in the filling of the bobbin. In many cases good and well-spun yarn has been divested of its strength and elasticity by a rough knee-board and too great velocity in winding.

The trade has now generally adopted backbeams 54in. wide by 21in. flanges as the best for production; but it has not adopted a correct size of bobbin adjustable to the various counts to be treated. Very great laxity is observed in some of the newly erected mills, in that they try to make one large size of bobbin do for both fine and coarse yarns, only distinguishing the counts by colors. On the stretch, coarse counts go along productively, while fine counts are unproductive through the heavy bobbin overbalancing the calculated strength of the yarn. It has never been thought out that the stretch in the unwinding is twice as great at the beginning as it is at the finish, and I am surprised that a standard is not used for various counts. I should fix that standard of bobbin when it is full at 20,000yds., this being not too heavy to stand momentum in operation. It should not be overlooked that a bobbin works at its best when filled with a little over the length required on the beam. I very much prefer the bobbin which is filled barrel shape to that of the straight lift, as the former is easier to work and makes less waste.

If an ideal bobbin is adopted, there is still care to be exercised in adjusting the drag from the cop or hank to the bobbin in the winding frame, so that the