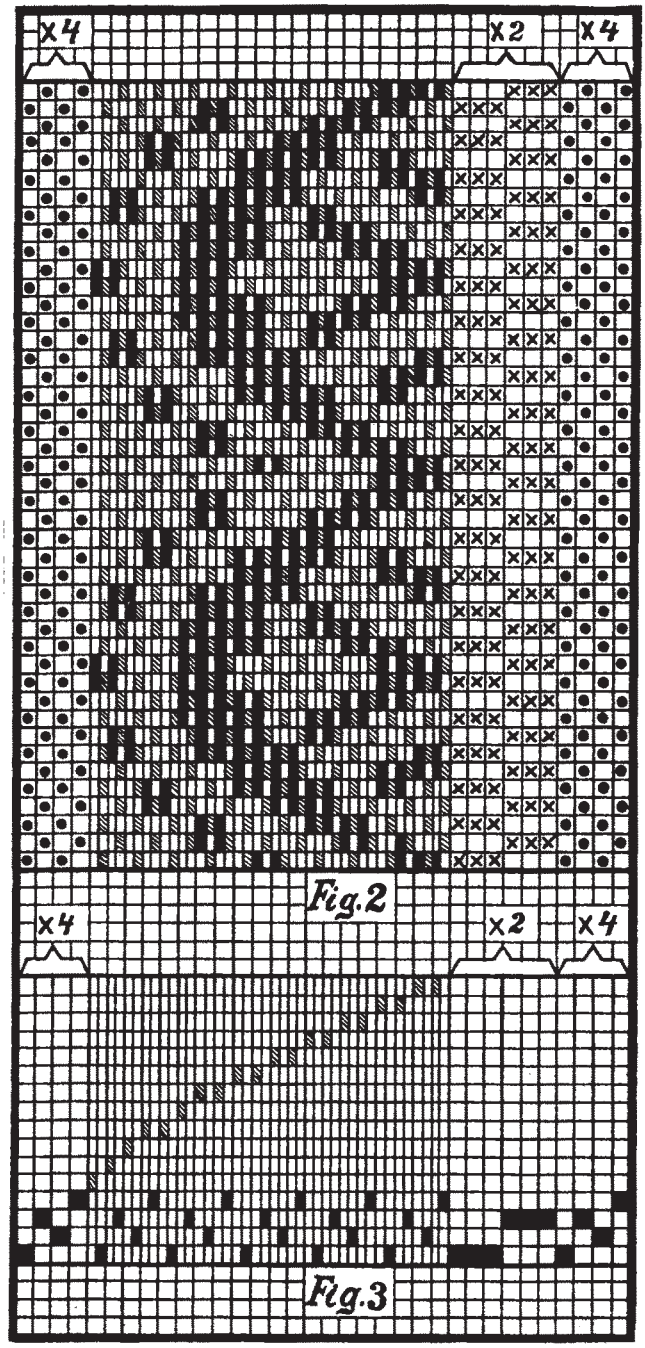
$30 \times 39 =$ 1170 dents
48 ends selvage = 24 "

1194 total number of dents used.

$1194 \div 40 = 29.85$ inches, width of fabric in reed.

No waste to be calculated for warp, the same being bought in the ball.

Filling: 80 picks per inch, 56's white, bleached; allowance of waste 5 per cent.



Ascertain Amount of Material.
Required for 1000 yards of Fabric.

Ground Warp:

$$\frac{2028 \times 1000 \times 105}{840 \times 40 \times 100} = 63.38 \text{ lbs.}$$

Figure Warp:

$$\frac{780 \times 1000 \times 103}{840 \times 40 \times 100} = 23.91 \text{ lbs.}$$

Rib Warp and Selvage:

$$\frac{516 \times 1000 \times 103}{840 \times 20 \times 100} = 31.64 \text{ lbs.}$$

Filling:

$$\frac{29.85 \times 80 \times 1000 \times 105}{840 \times 56 \times 100} = 53.30 \text{ lbs.}$$

Total: 172.23 lbs. of yarn required for producing 1000 yards of fabric.

$\frac{172.23 \times 16}{1000} = 2\frac{3}{4}$ oz. amount of yarn required, in proportion, for one yard of fabric.

LAPPET WEAVING.

By Woodhouse and Milne.

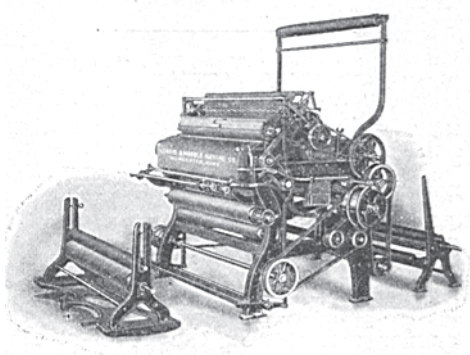
Lappet weaving, or the ornamentation of woven fabrics by means of lappet frames, is executed in the loom simultaneously with the weaving of the foundation texture itself, and produces a type of textile ornament akin to embroidery. This type of figure development may and does produce some striking and varied effects, but it cannot be relied upon for absolute accuracy or for neatness in the development of the figures. While lappet ornament may be applied to many types of woven texture, its application is almost entirely restricted to plain woven muslin textures, or to fabrics of a gauze nature. The ornament itself may be either continuous or intermittent in character; if of the latter type, the loose or floating threads, which connect succeeding spots or small figures, are shorn off in a subsequent finishing process.

Although mechanical processes are not within the scope of this article, it will be necessary to refer briefly to the chief features of a lappet loom in order that our further remarks concerning lappet designs may be rendered intelligible. In addition to the ordinary parts which are essential for the production of the foundation texture—say a plain cloth—a lappet loom is provided, among other items, with the following accessories:

1. A pin frame, situated immediately behind the race of the lay; this frame rises as the lay recedes, and presents its pins close against the race-board so as to form the back support of the shuttle as the latter passes from box to box; the frame falls again, as the lay advances, until the tops of the pins are beneath the warp and the cloth, in order that the reed proper may beat up the filling, and that the needle frame, as well as the whip or ornamenting threads, may be traversed laterally by the lappet wheel through the distance required to form the ornament.

2. One or more needle frames—four being the usual limit—placed between the pin frame and the reed; the latter is supported about three inches behind the race of the lay to provide room for the frames. (The traverse of the lay of a lappet loom is usually about three inches more than that of a similar

loom for plain fabrics.) Each needle frame consists of a wooden bar which is provided with a series of brass or steel needles, each of which is from 3 to 3¼ inches long, pointed at the top for easy entrance between the threads of the warp, and provided with an eye for the passage of the whip or lappet threads. The spacing of the needles in each frame, as well as the number of needles, depends upon the distribution of the pattern and the cloth to be ornamented, but the spacing of the needles, and the traverse of the needle bars, must both be arranged as accurately as possible in multiples of splits or dents of the reed used for the ground texture. Each needle frame may, at will, partake of a rising and falling movement in unison with the pin frame, and also of a short lateral or side to



THE CURTIS & MARBLE SHEAR
For Cutting Floating Threads on Lappet Goods.

side movement; or if desired any frame may remain inoperative both vertically and laterally as determined by the pattern wheel.

3. Extra warp beams or rolls for the whip or lappet threads, one whip roll being usually required for each needle frame. These rolls are supported either under or over the warp beam proper, and the threads from each roll are passed in a zigzag manner through a special tensioning device, one tensioning arrangement being necessary for each roll. Each whip thread is then led loosely between the heddles of the cam shafts, under the reed, up to and through an eye of the needle frame by which it is controlled. In some special cases the whip-threads for the front needle frames pass under the intervening back frames, but in most instances they pass directly from the under side of the groove supporting the reed to the needle eye. As the needle frames rise, they lift their whip-threads to or near the top of the shed, *i. e.*, above the filling; after the passage of the shuttle, the frames fall below the warp line to permit the reed to beat up the filling, and to enable them to be moved laterally to their proper position for forming the pattern. On the succeeding pick the whip-threads are lifted above the filling in a different part of the cloth. It is thus evident that, when the needle frames are mounted below the warp, the lappet figure will be developed on the under side of the fabric, and invisible, unless by mirror reflection, from the weaver's position. Further, it is also evident that a lappet thread is always stitched or bound round a filling-thread, and that there can be no intermediate stitching between the extreme points on the same horizontal whip-line.

4. A pattern wheel (unless the lag and peg motion is used) mounted upon and oscillating with the lay, and employed to control the lateral position of the needle frames, or the extent of their movement, and to determine whether they shall operate vertically or remain inoperative. The usual form of pattern wheel, termed the *Scotch* lappet wheel, is made from a solid piece of well seasoned, close grained, wood—plane tree or sycamore. A number of ratchet teeth—a measure or a multiple of the picks in a repeat of the pattern—are cut on its periphery: thus, if the wheel is advanced one tooth every two picks, the number of teeth may be half that of the picks; it may be the same number, or it may be a multiple of half the picks. When the wheel is moved one tooth per pick, it is clear that the number of teeth must be equal to, or some multiple of, the number of picks. One concentric groove for each needle frame is then formed in the face of the wheel in accordance with the pattern to be developed. A projection or peck, attached to a lateral extension of the corresponding needle frame, enters into this groove, and by it is laterally controlled. On the opposite face of the wheel, parts may be fixed to determine when the frame or frames shall be inoperative as regards vertical movement. Accurate cutting and forming of the grooves in the pattern wheel are essential to secure accuracy in the development of the pattern.

Pattern wheels are of two general kinds, termed *common wheels* and *presser wheels;* they are distinguished as follows: In a common wheel each ratchet tooth, and therefore each corresponding radial division of the wheel, serves for two picks; and, since the needle frames for this type of wheel are automatically, but negatively, moved from left to right, and from right to left, on alternate picks, in regular succession, both sides of the groove must be carefully formed. Each side of the groove limits the movement of the frame, and is therefore employed for forming the pattern. In this case the groove in the pattern wheel does not move the needle frame, but simply limits its movement; other parts move the frames negatively to left and to right continuously.

Wheels of this type are necessarily somewhat limited in their application, since they cannot advance a lappet thread in the same direction on successive picks. Notwithstanding this limitation, however, they are used for a wide range of patterns, and are more generally utilized than the presser wheels. In the latter, each ratchet tooth and each radial division serves for a single pick only. These wheels press or pull a needle frame positively in one direction by the form of the groove, while a spiral spring returns the frame when permitted to do so by the contour off the groove. Both in advancing and returning the frame, the same side of the groove is in action. One side only, therefore—the outside—requires to be carefully cut; the other side is just arranged to follow the general contour of the pattern while leaving room for

the free movement of the peck. It will be obvious, however, that with the presser wheel there is no restriction as to the direction of movement of the frames, other than that of the pattern wheel and the working limits of movement—say about 3½ inches—of the frames themselves. In both systems, the outer pattern grooves control the needle frames nearest the pin frame, and the inner grooves control the frames further back. When the pattern is suitable, it is possible to combine the leading features of both systems in one wheel.

Each order of interlacing requires a separate needle frame and groove in the pattern wheel, and, in general, each pattern requires its own pattern wheel. It is possible, however, by altering the spacing of the needles in the various frames, to obtain different combinations of the individual orders of working on the cloth, and so produce varied effects from one wheel. Colored yarns may also be used, with considerable effect, for developing the patterns. The dimensions of the pattern wheels vary between 8 or 10 inches as a minimum to 24 inches maximum outside diameter, and are determined, among other considerations, by the following: The number of picks in a repeat of the lappet figure must be accommodated; the pitch of the ratchet teeth must not be too fine, otherwise the action will not be reliable; the arc, or rather the circular space between two adjacent radial lines near the centre of the wheel must not be too small for the diameter—say ¼″ to ⅜″—of a feeler or peck; space must also be provided for a groove for each frame to be employed. A wheel 12 inches diameter over the points of the teeth would give a circumferential space for practically 38 teeth (12″ × 3.1416 = 37.7 teeth) of one inch pitch, and at a radius of 2¼″ we should have

$$\frac{2.25'' \times 2 \times 3.1416}{38 \text{ teeth}} = \frac{3}{19}''$$

or practically ⅜″ space between each pair of radial lines at this distance. 38 teeth × 2 picks per tooth = 76 picks in a repeat of the pattern for a common wheel. This number could be doubled by increasing the diameter of the wheel to 24 inches; and it could then be further increased by reducing the pitch of the teeth, say, to ¾ inch. Thus:—

$$\frac{24'' \times 3.1416}{0.75'' \text{ pitch}} \times 2 \text{ picks per tooth} = 201, \text{ say } 200 \text{ picks.}$$

If the pitch of the teeth be further reduced to ½ inch, giving approximately 150 teeth or 300 picks in a revolution, the arc between two radial lines, at 6 inches from the centre of the wheel, would measure only a quarter of an inch. This would require a peck of not more than ¼″ diameter.

(To be continued.)

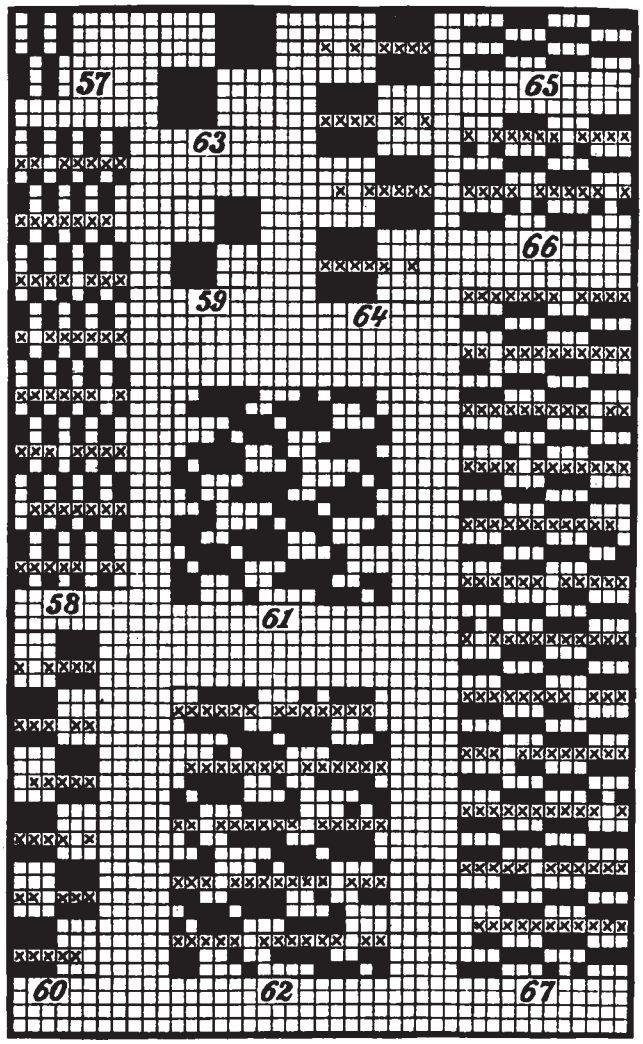
The latest styles in silken scarfs show impressive shadowy designs in rose, blue and mauve. Some of them are silk crepé, some silk cashmere, some silk gauze and some softest satin. The plain-colored satin borderings give a kimono effect when the scarf is draped over the shoulders, and falls softly down the front.

TO INCREASE WEIGHT AND BULK OF FABRIC BY MEANS OF BACK FILLING.

(Continued from page 32.)

Arrangement 3 picks Face : 1 pick Back.

Provided 2 face : 1 back filling will produce too much bulk to the fabric structure, or that an extra heavy count of back filling has to be used, we may arrange the combination of face and back to be 3 : 1, or in extreme cases 4 : 1.



The accompanying plate of weaves has been designed to explain the subject in connection with details given.

Fig. 57 is the 2 by 6 rib weave, warp effect, which is shown in weave Fig. 58 arranged 3 : 1 for a back filling. The connection of the latter to the face structure is done by means of the 8-leaf satin; repeat of weave 8 by 32.

Fig. 59 is the 6-harness basket weave, shown arranged 3 : 1 for a back filling in Fig. 60, the latter being stitched to the face structure by the 6-leaf satin; repeat of weave 6 by 24.

Fig. 61 is a 15-harness granite weave, shown arranged 3 : 1 for a back filling in Fig. 62. Every third warp-thread is, in this instance, not used for stitching the back filling; repeat of weave 15 by 20.