those of the mate row or rows, all three rows of balls in turn thus touching every thread of the ribbon equally, *i. e.,* the ribbon will receive a most satisfactory breaking of its texture.

Fig. 45 shows the Spiral Breaker for ribbons, as handled by A. W. Buhlmann of New York, in its perspective view. It has twenty-five spirally fluted rollers and is used for softening and breaking all kinds of fabrics that have been previously sized. It produces an excellent breaking effect and spares the goods as there is no friction between the fabric and the rollers, the latter being driven and moving along with the fabric at the same speed. Every thread of the ribbon is treated equally and without undue tension.

(To be continued.)

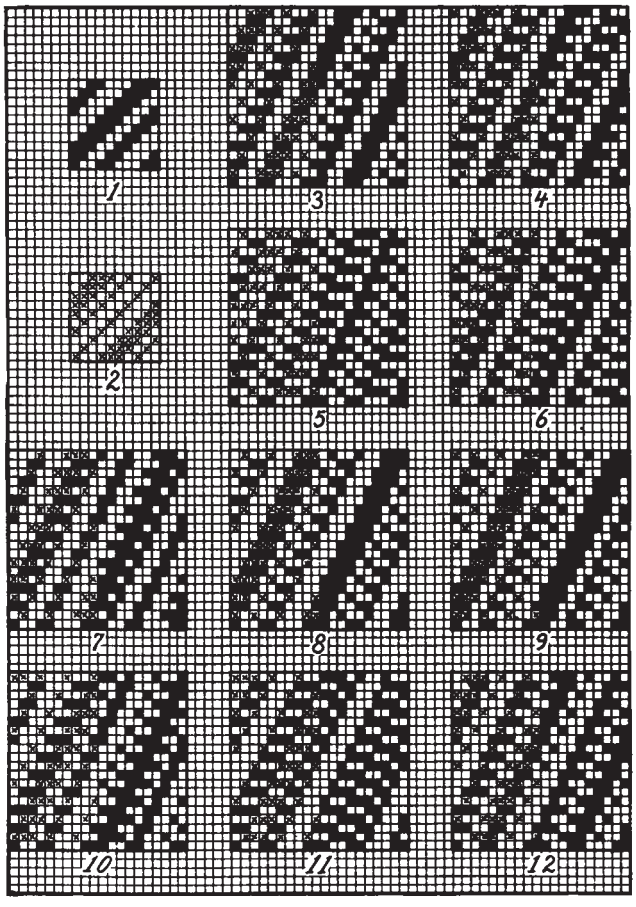
A Study in Weave Formation.

HOW TO CONSTRUCT DIAGONALS.

Filling Drafting.

(Continued from November issue.)

In the same way as we treated in last month's issue one twill, starting in two different positions, for the



formation of a diagonal, we will now explain how to proceed using two different 45 deg. twills in the formation of new diagonals.

As will be readily understood, the two foundation twills must have the same repeat for its warp-threads and picks in order that they will be taken up equally when intersecting them, pick for pick, in the construction of the diagonal. Similar to the foundation weave used in last month's issue, the more broken up the effects of the two foundation twills now used, the more broken up an effect the resulting diagonal will present. For this reason select foundation twills which will have short interlacings between warp and filling, *i. e.,* let 2 or 3 *up,* or *down,* be the main float, using 1 *up* or 1 *down* wherever possible to do so. Twills presenting large floats, like 4, 5, 6 or more *up* or *down,* are not advisable to use, since they would change in many instances the single cloth fabric to a backing structure, with its corresponding lowered filling texture. Using one of these far floating twills in connection with a closely interlacing twill would surely result in the latter evil, whereas using two, far floating twills, would result in an imperfect fabric structure with reference to its appearance of the face.

In connection with the diagonals obtained by means of filling drafting as was explained in the November issue, *i. e.,* using one regular twill as foundation for the diagonal, we found that the number of new diagonals possible to be constructed from any foundation twill is half the number of the repeat of the latter minus one, and which in connection with a 10-harness foundation twill gave four new diagonals possible to be constructed, etc.

This feature differs in connection with the present subdivision of diagonals and where, by changing for example two 10-harness regular twills for foundation pick for pick, we will obtain ten new diagonals, a feature fully explained in connection with the diagrams of weaves accompanying this article.

Fig. 1 shows us the 3 *up* 3 *down,* 2 *up* 2 *down* 10-harness twill, Fig. 2 the 1 *up* 2 *down,* 1 *up* 1 *down,* 3 *up* 2 *down* 10-harness twill. The first weave is shown in *full* type, the latter in *cross* type.

In diagrams 3 to 12 the ten different diagonals possible to be constructed from the two foundations quoted are given, two repeats warp ways, one repeat filling ways.

The first repeat of each weave is shown in two kinds of type in order to show its construction, using *full* type referring to weave Fig. 1 and *cross* type to refer to weave Fig. 2.

The right hand repeat of each diagonal is shown in one kind of type, to clearly show the effect of the interlacings as produced on the face of the fabric.

The first repeat of each of the ten diagonals clearly shows the construction by means of type used, showing that weave Fig. 1 in every one of the ten new diagonals has been used in its original position on every uneven number pick, whereas the commencing of twill Fig. 2 for its diagonal has been changed in every instance, having for this reason started in diagonal 3 with pick 1 of twill Fig. 2. In diagonal 4 we started twill Fig. 2 to begin with pick 2. Continuing in that way and producing every new diagonal by means of starting twill 2 always with the next pick from the one used in the previous example, will give us for diagonal 12 to use Fig. 2 beginning with number 10 pick, to be followed in turn with picks 1, 2, etc.

In the same way as we thus constructed ten new diagonals from two 10-harness foundation twills we will obtain 12 new diagonals by combining the two proper 12-harness regular twills, etc., clearly showing us the endless variety of diagonals possible to be constructed.