yarn, and no amount of theory will ever make dextrin suitable for sizing cotton yarn.

It must be apparent to all that it is cheaper to use less flour and tallow in a mixing than to use a large proportion of flour and then subject it to some treatment whereby it is weakened to the strength of a mixing with less flour.

Many methods of modifying starch have been tried in recent years, but all these processes have the same objections, *i. e.*, they reduce the adhesive power of the starch and lessen its strength-giving properties.

If some process for the manufacture of soluble starch could be devised which, while rendering it soluble, would retain its adhesive and strength-giving properties, there would be some advantage gained, and any experiments carried out with this object would be well directed to maize starch, which lends itself more to treatment than any other form of starch.

There is a great field for investigation in the modification of starch on the lines of giving maize starch the characteristics of wheaten starch or farina. Maize is grown in enormous quantities, and it is, in a general way, cheaper than any of the other starches used in sizing and finishing.

Some few years ago, an American starch was placed on the English market for which the properties of wheaten starch were claimed. This product was a mixture of maize starch with about 5 per cent of maize oil, and in this form did not require the addition of tallow as a softening agent. The one great objection to its use was its price. Americans forgot at that time that England had the whole world from which they could draw their supplies of the various starches, whereas America was confined to maize, on account of protection.

Objection was taken to my analysis and reports on the starch. It was claimed that the starch was wheaten starch, but the peculiar process for treating the starch gave it the appearance of maize starch when viewed under the microscope. But if they were capable of making wheaten starch, which is the dearest of the starches, look like maize under the microscope, there was a much greater field for their energies if they would transpose maize, which was the cheapest starch, and make it look like wheaten starch. Such a process would offer the amassing of a mighty fortune in a very short time.

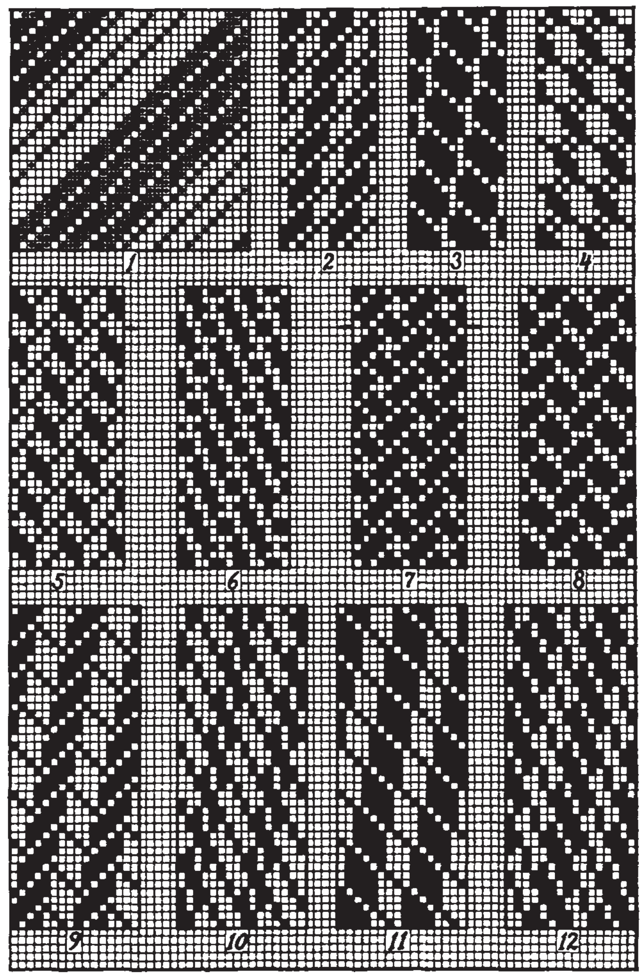
As the results of long practical experience, I have come to the conclusion that any attempts to modify starch for the process of sizing can only be successful if the starch is strengthened as the result of the treatment, and that with the exception of the action of alkalies such as caustic soda and caustic potash, there is no treatment whereby starch is rendered more suitable for sizing purposes, except in very special cases, where some special effect is desired, other than by boiling in a suitable manner and using the variety of starch which is suitable for the particular purpose.

The "official cotton standards of the United States" represent collectively all American-grown cotton except the Arizona-Egyptian and sea island. The grade names of these standards are as follows: Middling fair; strict good middling; good middling; strict middling; middling; strict low middling; low middling; strict good ordinary; and good ordinary—middling fair being the highest grade and good ordinary the lowest. All of the above standards are legally recognized in the United States as full grades.

A STUDY IN WEAVE FORMATION.

How 80 Deg. Diagonals are Made.

The same are a sub-division of our regular twill weaves, being obtained from the latter weaves by means of drafting from these twills, every fifth warp-thread for the new diagonal which on the point



paper will show a much steeper twill effect than the 75 deg. diagonals, the construction of which was shown and explained in the March issue of the Journal, that is provided the resulting new weave retains its diagonal effect. The latter, in many instances, is lost in the resulting 80 deg. diagonal, the heavy grading producing in many instances small, broken-up granite effects in the new weave, and where its foundation is only noticed upon a closer inspection. The number of good weaves obtained by the present system of drafting is not as numerous as is the case when drafting 63, 70 and 75 deg. diagonals.

Using only every fifth warp-thread of the regular twill for the new diagonal, will indicate to us that with any foundation weave, which is evenly divisible by 5 only one-fifth of the number of harnesses is required for the diagonal than is necessary for the foundation twill. In this way, a 30-harness regular twill will result in a diagonal repeating on 6-harness for the reason that 30 divided by 5 equals 6.

Foundation twills whose repeat is not (or two or more repeats are not) a multiple of 5, do not reduce with reference to harnesses required for its 80 deg. diagonal.

A few practical examples will readily explain the subject, showing how an endless variety of these weaves may be obtained.

Fig. 1 is the $\frac{3}{5}\frac{1}{3}\frac{1}{3}\frac{1}{1}\frac{3}{1}\frac{3}{1}\frac{3}{1}$ 30-harness regular, *i. e.*, 45 deg. twill; the weave being shown in two kinds of type, *i. e.*, every fifth warp-thread is shown in *full* type, the other warp-threads being shown in *dot* type.

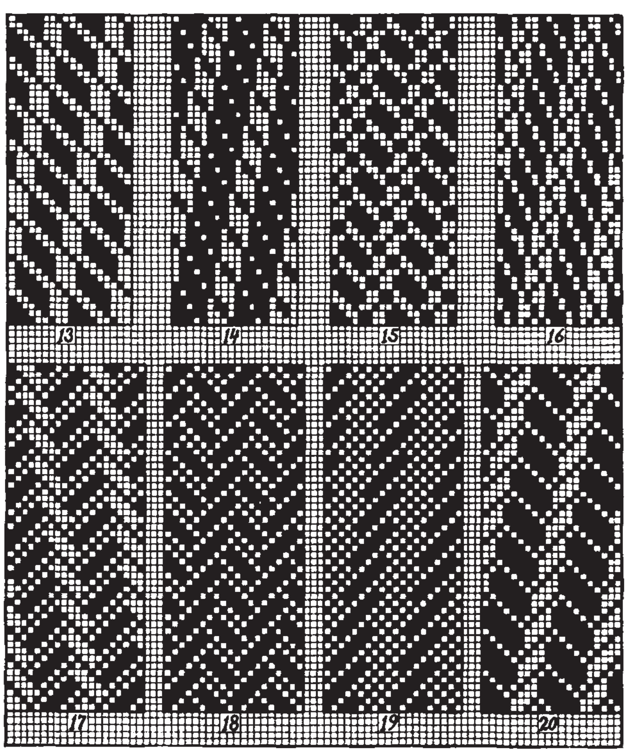
Using warp threads 1, 6, 11, 16, 21 and 26, *i. e.*, warp-threads shown in *full* type taken in rotation, for the construction of a new weave, results in weave Fig. 2, and which is the 80 deg. diagonal, obtained from weave Fig. 1, the diagonal shown in weave Fig. 2 repeating on 6 warp-threads and 30 picks; 2 repeats of the weave widthways are given.

Weave Fig. 3 shows us the 80 deg. diagonal obtained from its mate $\frac{5}{1}\frac{3}{1}\frac{3}{1}\frac{5}{1}\frac{5}{5}$ 30-harness regular twill, the new diagonal repeating on 6 warp-threads and 30 picks.

Weave Fig. 4 shows us another 80 deg. diagonal, repeating on 6 warp-threads and 30 picks, the same having for its foundation the $\frac{3}{4}\frac{1}{5}\frac{1}{4}\frac{3}{1}\frac{1}{1}\frac{3}{1}\frac{1}{1}$ 30-harness regular twill.

Reading off the interlacing of the first warp-threads with its picks in any diagonal weave will always give us the reading off of its corresponding foundation twill.

Weave Fig. 5 is an 80 deg. diagonal repeating on 6 warp-threads and 30 picks, five picks more than the repeat of the weave being shown to balance the general appearance of this weave with that of its companion weaves shown next in the collection; heavy dash on the right hand side of the weave indicates its repeat.



Weave Fig. 6 is an 80 deg. diagonal, repeating on 7 warp-threads and 35 picks; one repeat of the weave, filling ways, is given, and two repeats warp ways.

Weave Fig. 7 is an 80 deg. diagonal repeating on 6 warp-threads and 30 picks, five picks more being given again, the same as was done in connection with weave Fig. 5.

Weave Fig. 8 is an 80 deg. diagonal, repeating on 7 warp-threads and 35 picks; one repeat of the weave, filling ways, is given, two repeats warp ways.

Weaves Figs. 9, 10, 11 and 12 are four 80 deg. diagonals, each repeating on 8 warp-threads and 40 picks.

Weaves Figs. 13, 14, 15 and 16 are four 80 deg. diagonals, each repeating on 9 warp-threads and 45 picks.

Weaves Figs. 17, 18, 19 and 20 are four 80 deg. diagonals, each repeating on 10 warp-threads and 50 picks.

From examples given, it will be readily seen that any number of these 80 deg. diagonals can be designed from our regular twills.

Some Useful Rules for Drawing Frames.

Draft in draw frame × Hank carding ÷ Number of ends put up at draw box = *Hank drawing*.

Number of ends put up × Hank drawing required ÷ Hank carding = *Draft required*.

Number of ends put up × Hank drawing ÷ Draft in draw frame = *Hank carding required*.

Number of ends put up × Weight of carding ÷ Draft in frame = *Weight of drawing*.

Number of ends put up × Weight of carding ÷ Intended weight of drawing = *Draft required*.

Weight of drawing × Draft ÷ Number of ends put up = *Weight of carding*.

Required number of grains × Change gear ÷ Number of grains on frame = *Change pinion required* when altering from one *weight* to another.

Hank being made × Pinion on frame ÷ Hank wanted = *Change pinion required* when altering from one part of a *hank* to another.

Crown gear × Back roller gear × Diameter of front roller ÷ Front roller gear × Change pinion × Diameter of back roller = *Draft in drawing frame*.

Front roller gear × Driver of second roller × Diameter of second roller ÷ Gear driven from front roller × Gear on second roller × Diameter of front roller = *Draft between first and second rollers*.

Gear on second roller × Gear driving third roller ÷ Gear driving second roller × Gear on third roller = *Draft between second and third rollers*.

Gear on third roller × Gear driving fourth roller ÷ Gear driving third roller × Gear on fourth roller = *Draft between third and fourth rollers*.

Draft required × Change pinion × Diameter of back roller ÷ Crown gear × Back roller gear × Diameter of front roller = *Front roller gear necessary to give a required draft*.

Front roller gear × Pinion gear × Draft × Diameter of back roller × Back roller gear × Diameter of front roller = *Crown gear for a required draft*.

Front roller gear × Draft ÷ Crown gear × Back roller gear = *Change pinion for a required draft*.

Front roller gear × Change pinion × Draft ÷ Crown gear = *Back roller gear for a required draft*.

To find a Full Set of Gears: Take any two gears for the front roller and crown gear, then divide the crown gear by the front roller gear; and as the quotient stands to the draft, so does the pinion stand to the back roller gear.