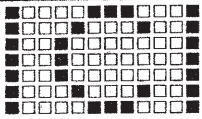


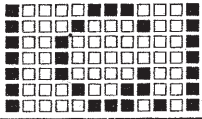
No. 7

1901

# Construction of Weaves



A  
Text Book  
for Use in  
Textile  
Schools



and for  
Designers,  
Overseers,  
Loom Fixers,  
Webdrawers  
and others.

By  
Charles G. Petzold



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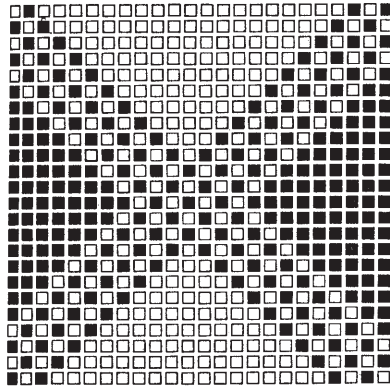


DESIGNED BY HENRY BAUER, LAWRENCE, MASS.

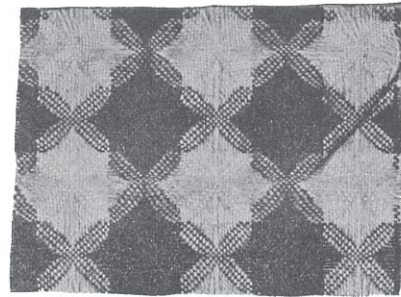
Figure 451 illustrates another honeycomb weave on a foundation of cross twill lines based on twenty-four harnesses and picks.

If made on point or diamond draft, thirteen harnesses are required. Figure 451B represents the cloth made from twenty-four ends and picks in two distinct colors.

451



451B

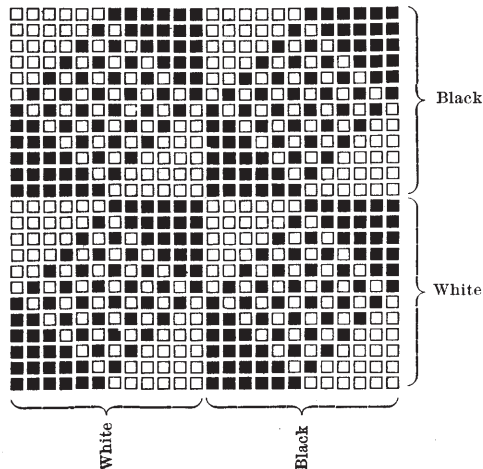


The next class of these weaves are known as star-like honeycomb weaves, and which are constructed on the same principle as the foregoing class, but in a more arbitrary manner. Figure 452 may illustrate the first example of this class, which is constructed on twelve ends and twelve picks with triangular warp and filling effects, filled in with plain weave. If we now use two distinct colors in warp and filling, the effect in the cloth will produce a four-pointed star combined with a plain weave diamond in the centre. Care must be taken to get each color on the proper harnesses and picks.

In our illustration 452 the colors should be used in warp and filling as indicated by brackets.

The design is carried out twice in width and height, but for purpose of illustration only. The number of harnesses and picks required for the point of repeat in the design is twelve. Figure 452B illustrates the cloth.

452



452B

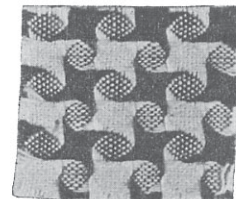




Figure 453 illustrates another honeycomb weave of this class; the design is worked out on thirty-two ends and thirty-two picks. The foundation is a cross twill onto which we have arranged clusters of diamonds formed from warp and filling.

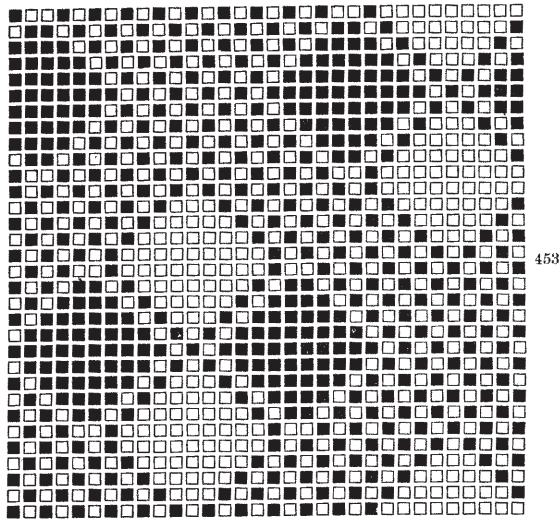


Figure 453B represents the cloth, in which the reader will at once observe the star-like effect that we have aimed after.

453B

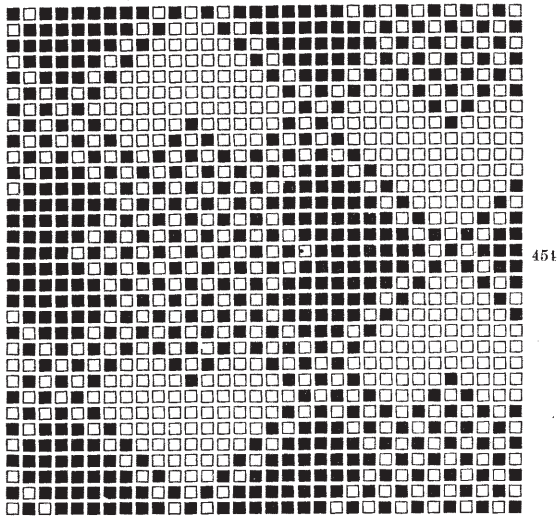
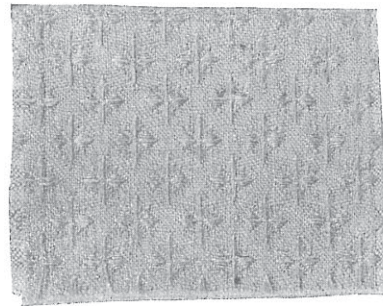


Figure 454 is constructed on a similar principle as the foregoing design. Figure 454B represents the cloth for the same.

454B

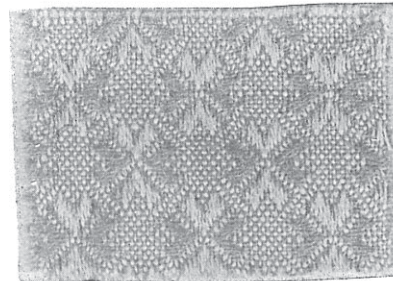
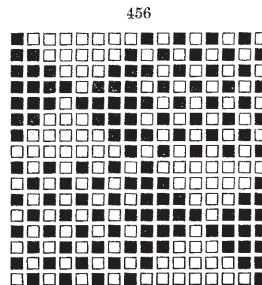
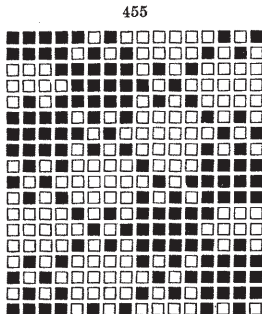
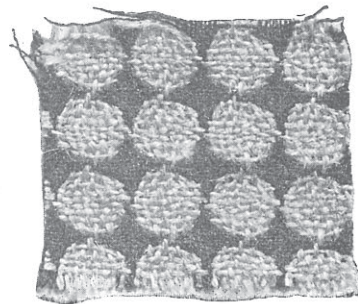


Figure 455 is a sixteen thread by eighteen pick honeycomb weave.

Figure 456 is based on sixteen ends and sixteen picks; figure 456B represents the cloth for the same.



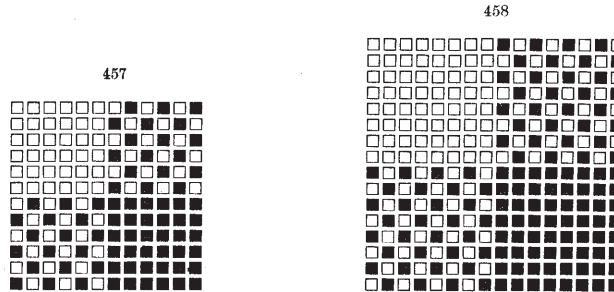
456B



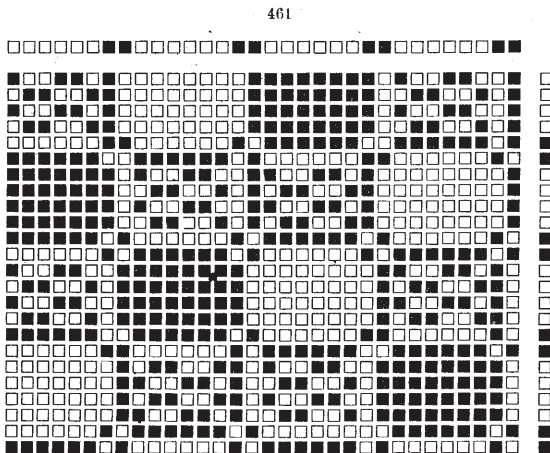
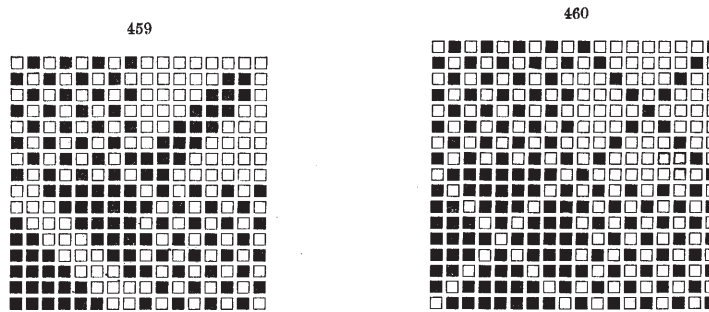
The next class of these weaves differ considerable from our previous chapters relating to honeycomb effects. All of the preceding weaves consisted of either diamond or star-like effects; our present class is constructed from square effects.

The weaves so constructed have also two extreme systems of warp and filling floats combined with plain weave.

Figures 457 and 458 may illustrate two of these designs. Figure 457 is based on twelve ends, and picks, and figure 458 on sixteen ends and picks.



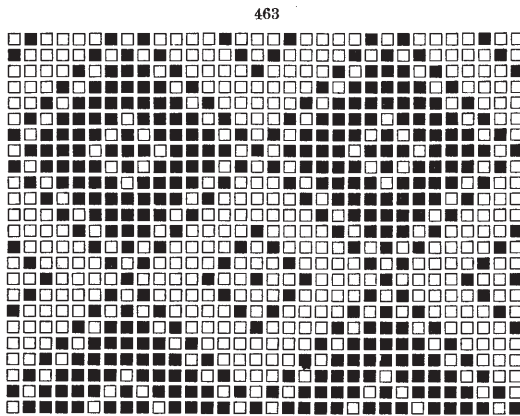
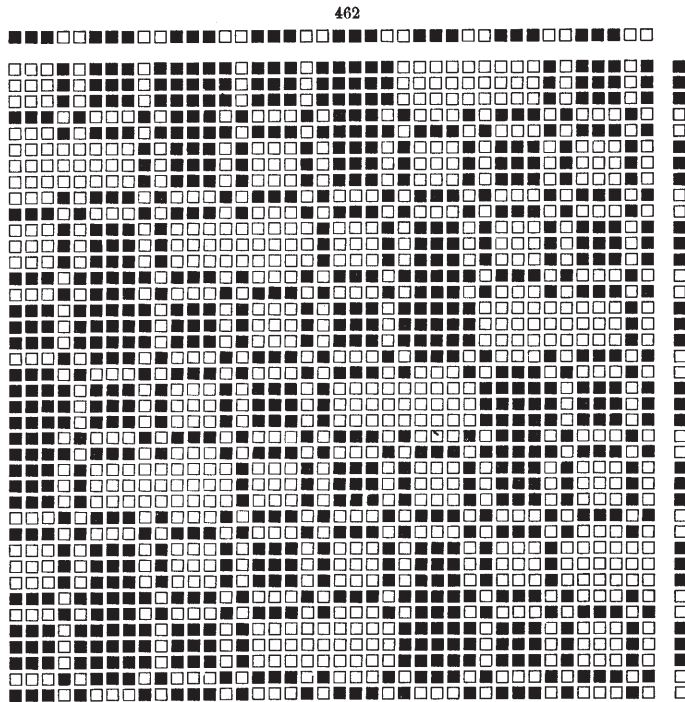
Figures 459 and 460 are two more fancy honeycomb weaves, constructed on a similar principle, but instead of using squares exclusively of warp and filling floats, the squares have been broken by centre lines; the warp squares are broken by filling floats and the filling squares by warp floats. The remainder of the design is plain weave.



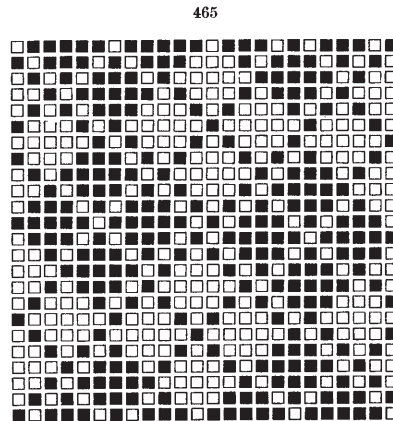
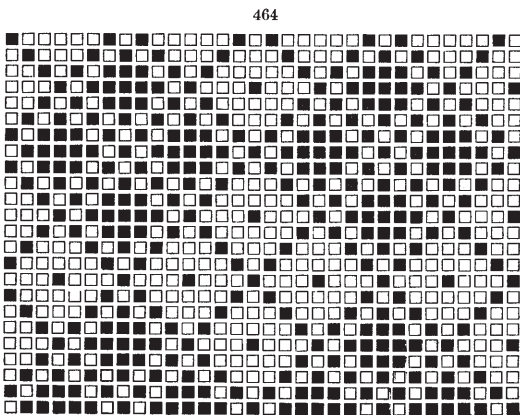
Figures 461 and 462 illustrate another method of constructing honeycomb weaves. Both designs have extreme warp and filling floats combined with other close floating weaves. In figure 461 we have introduced filling rep. If this design is applied to a fabric made with a green and black warp and blue and black filling, very pretty effects can be obtained in the following manner: we use six ends green, two ends black, four picks blue and two picks black. The position of the black in the warp is indicated above and the position of the filling at the right of the design.

Figure 462 is of a similar character as 461.

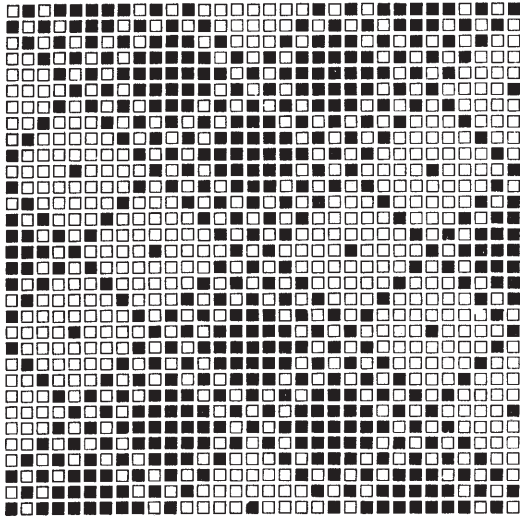
The pattern in warp is formed of three ends green and two ends black and their positions are indicated above the design. The pattern for the filling is three picks of blue and two picks of black and their positions are indicated at the right-hand side of the design.



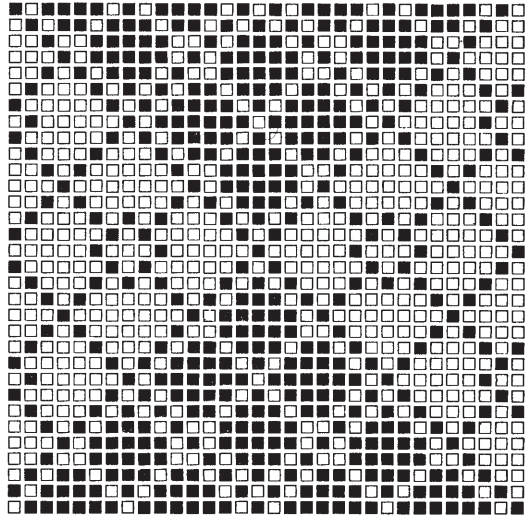
Figures 463, 464, 465, 466, 467, 468 and 469 may illustrate a few more weaves of the honeycomb order, and as their construction is based on the same principle as explained for the preceding designs of this class, it is not necessary to make any further comments. The student will see that an endless variety of honeycomb weaves can be constructed.



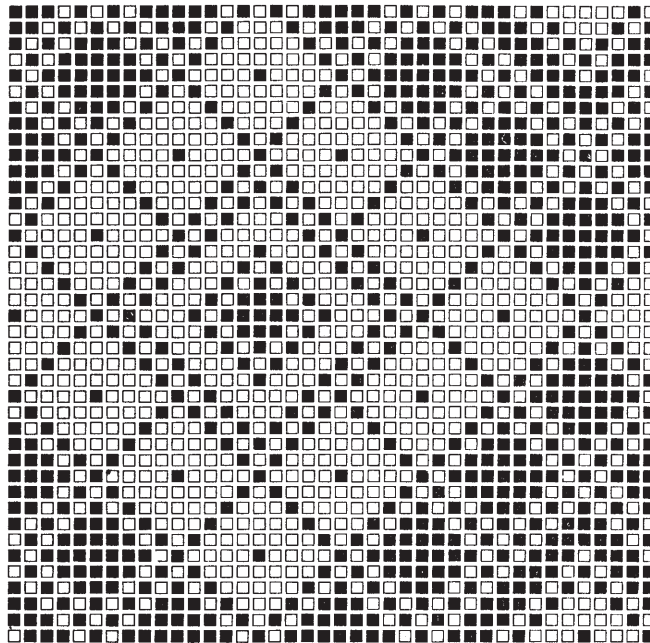
466



467



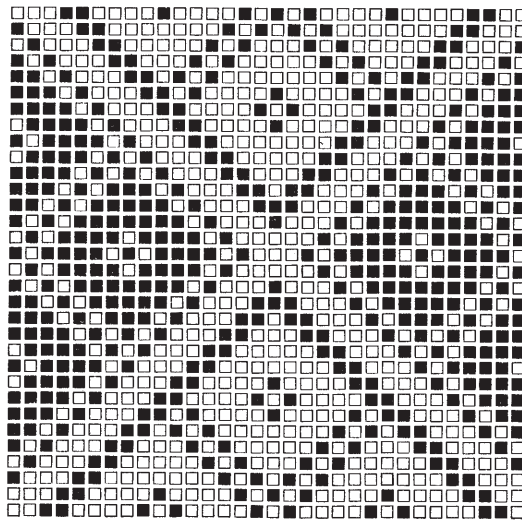
468



Before closing the chapter relating to honeycomb weaves, we wish to state that these weaves can be applied to all kinds of fabrics; they are especially good for silk, cotton and worsted goods, but less desirable for woolens, except cloakings. For the manufacture of quilts no other weaves would show their value to better advantage as the honeycomb class.



469

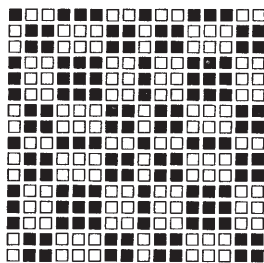


**Granite Weaves.**

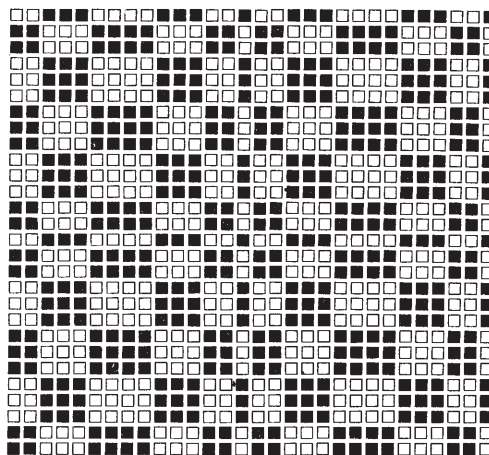
The name "Granite" to the following class of weaves has been applied for the reason that the surface of the cloth made from these weaves resembles granite. The granite on its face shows pebbles of different sizes and irregular forms, and this we strive to imitate in a fabric.

To construct these weaves known as granite, various methods can be applied. For the first example we take for foundation the plain and rep weaves; and by combining these two weaves in a suitable manner we can produce the desired effect. See Figures 470 and 471.

470

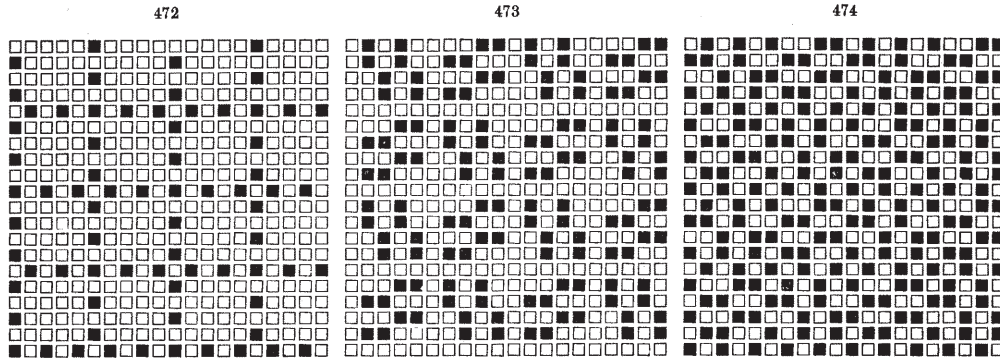


471

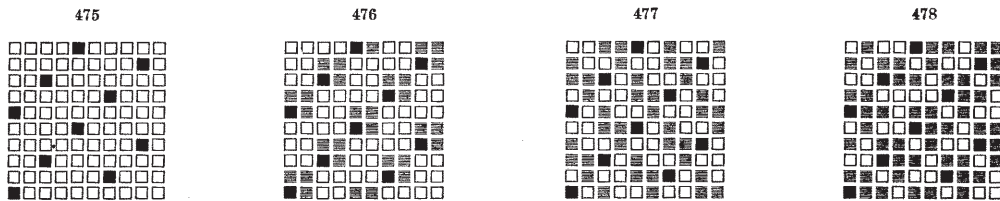


Figures 472, 473 and 474 illustrate another example of constructing granite weaves from plain and rep weaves; for foundation we use figure 472. In this we have placed a plain weave line on every fifth end and pick; that much done, we

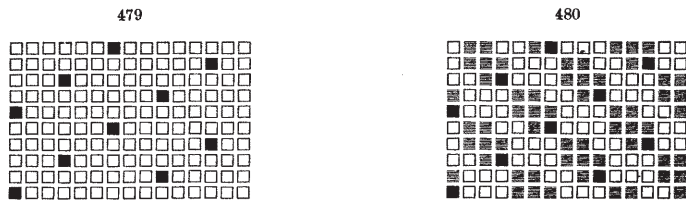
readily see that we have formed squares, and these squares of four ends and four picks each we now fill out with  $2 \times 2$  warp and filling rep. (*For this part see Figure 473*). We now combine figures 472 and 473. The so combined figures 472 and 473 are illustrated with figure 474. 472, 473 and 474 have been carried out twice in width and height.



Granite weaves are also constructed by using for foundation any sateen weave, to which we add additional binders. This method has, however, been thoroughly explained and described in figures 185 to 212 inclusive, but we can extend this principle by placing the original sateen weave on every other line before we add the additional binders. For illustration we have prepared figures 476, 477 and 478, all of which have five-harness sateen weave placed on every other line. *See Figure 475 for foundation.*

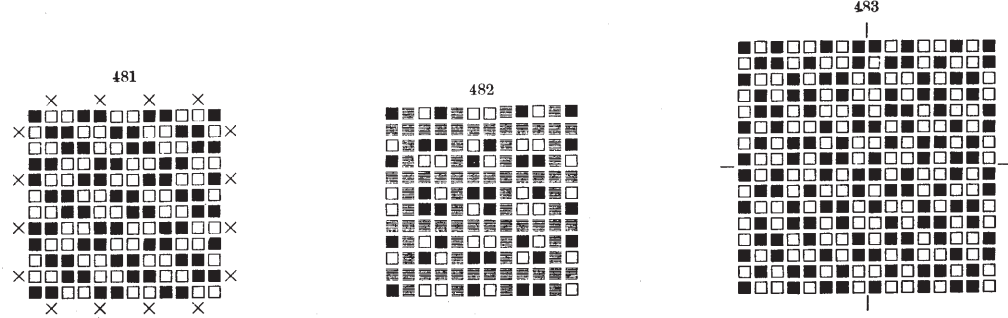


We can still further extend this principle. In figure 479 we have again used five-harness sateen, and the original binder is placed on every third line, requiring in all fifteen lines for the new weave. For a better understanding, the foundation weave 479 and the weave 480 have been carried out twice in height.



Another method of constructing granite weaves is illustrated by figures 481, 482 and 483. For foundation we use figure 481, which is a regular four-harness  $2 \times 2$  cross twill designed on twelve ends and picks. From this we now take out every third end and pick, which is equivalent to the 2nd, 5th, 8th and 11th lines in warp and filling; after this much of the new design is done we close up the remaining blanks and produce figure 483.

The best method for constructing granite weaves of this class consists in working out the design in three colors or three different characters. For example we take figure 481 worked out on cross section paper in ■, then we use black (either ink or paint ■) and cross out the 2nd, 5th, 8th and 11th lines in warp and filling, thus producing figure 482. From figure 482 we now close up the remaining eight lines, indicating the ■ characters and leaving white marks blank, ignoring the ■ characters altogether, and with this procedure we produce figure 483. To give a better idea of the design and the connection of the repeats, design 483 is carried out twice in width and height.

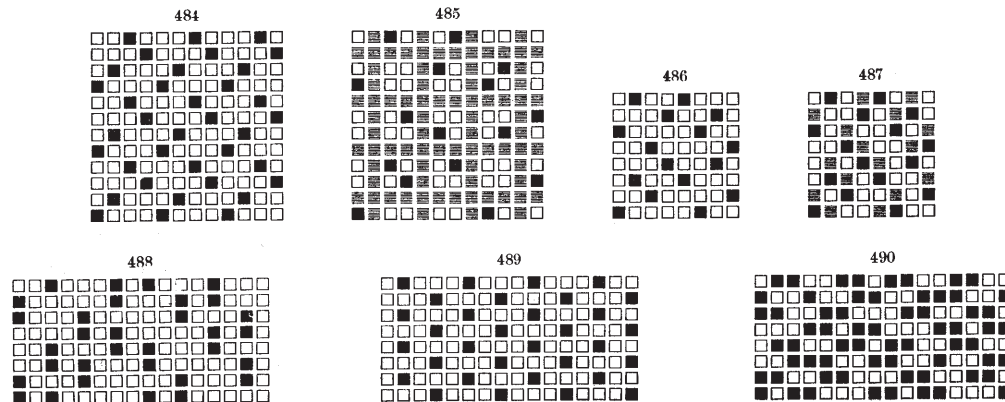


Figures 484, 485 and 486 illustrate another method of this class of granite weaves. For example we take figure 484, which is regular  $\frac{11}{3}$  cross twill carried out on twelve ends and picks; from this we remove the 2nd, 5th, 8th and 11th ends and picks (see Figure 485) and close up the remaining eight ends and picks and thus produce figure 486.

We now take figure 486 and add an additional binder above each original binder and thus produce figure 487; figure 487 we reproduce on every other line and by this procedure we obtain figure 488. In the remaining blank lines of figure 488 we place the plain weave as illustrated in figure 489.

The complete design is shown in figure 490.

Granite weaves constructed on these principles are well adapted for all kinds of fabrics, and as a rule all thus constructed produce pleasing features on a cloth, for the reason that the weave will be entirely free from streaks in warp and filling, and every practician knows that a streaky texture is the main fault in the manufacture of cloth. We would state here that figures 486 and 487 will make good granite weaves as they are.



491 Another method of constructing granite weaves is illustrated with figures 491, 491B, 492, 493 and 494. Figure 491 is a regular four-harness  $\frac{2}{1}$  cross twill and this we use for the motive or the foundation for our new weave. Each character and each blank in figure 491 we enlarge four times, so that each character extends over four ends and four picks. The characters from figure 491 are indicated with ■, thus producing figure 491B:

Over the shaded characters in figure 491B we place a four-harness  $\frac{3}{1}$  warp cross twill and over the blanks we place  $\frac{1}{3}$  filling cross twill, thus producing figure 492.

In figure 492 we now cancel every 3d and 5th line, retaining the 1st, 2nd and 4th line, but since 5 and 16 have as their lowest common multiple 80, it would be necessary to place figure 492 five times next to each other, but this procedure would exceed the space of the book; we therefore write down the numbers 1 to 16 five times and cancel every 3d and 5th number. See column of numbers below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

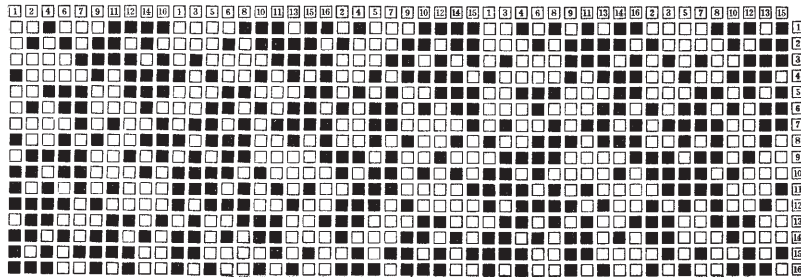
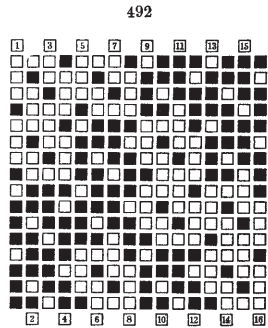
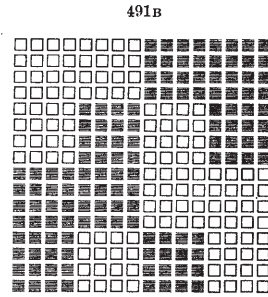
We now place next to each other the lines from figure 492 corresponding to the remaining 48 numbers from our five lines, which now reads as follows:

1	2	4	6	7	9	11	12	14	16
1	3	5	6	8	10	11	13	15	16
2	4	5	7	9	10	12	14	15	
1	3	4	6	8	9	11	13	14	16
2	3	5	7	8	10	12	13	15	

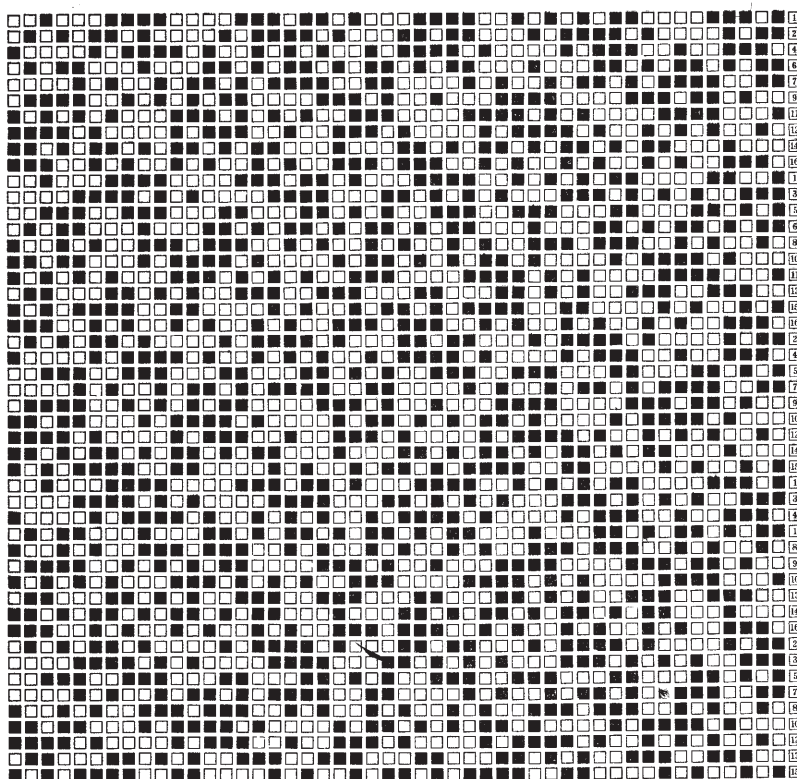
and thus produce figure 493.

We again apply this same method to form figure 494, using figure 493 in a like manner to which we made use of figure 492 to form figure 493. The numbers of the lines in figure 493 are at the left of the design, and we choose the lines of 494 according to the above table of 48 numbers, placing the successive lines however below each other instead of to the right as in figure 493.

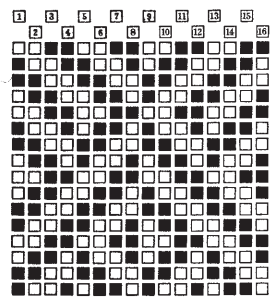
Figure 494 resembles a Jacquard granite, but by the aid of drafting this design can be produced on sixteen-harness.







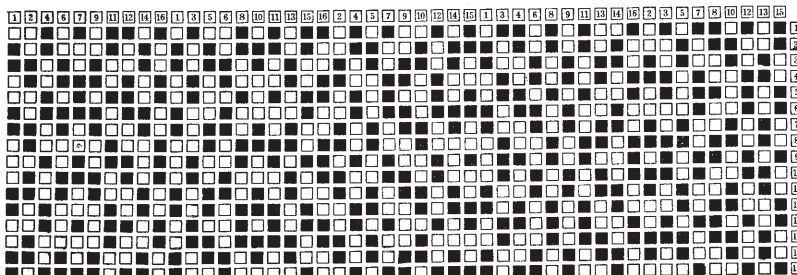
495

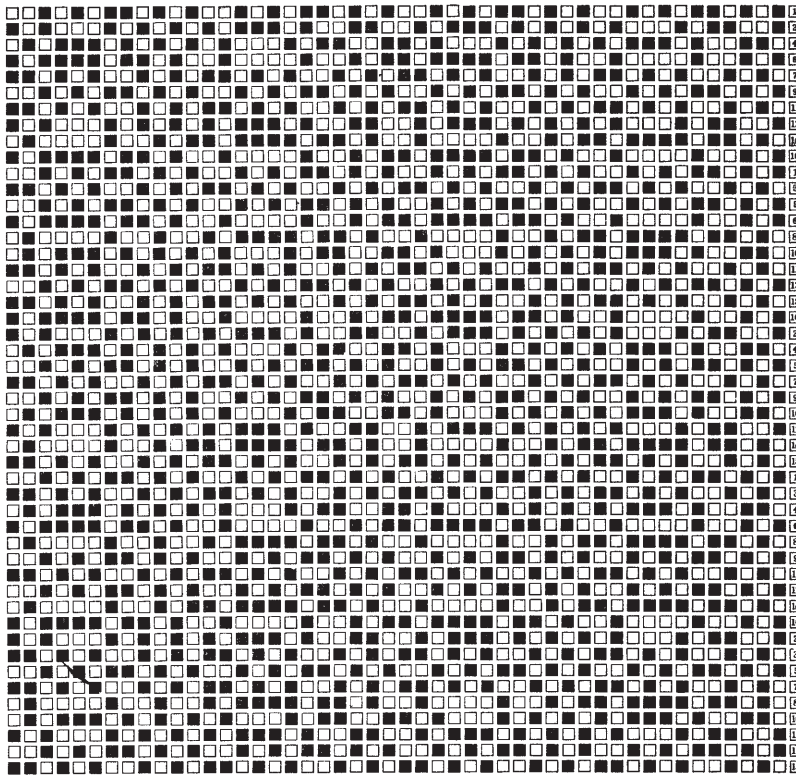


Figures 495, 496 and 497 illustrate another example of this class of granite weaves. For foundation we use a sixteen-harness cross twill. See figure 495.

For a series of numbers we take the same as we have used for the construction of figure 493 and proceed in a like manner as explained for the construction of 493, namely: From figure 495 we place the lines next to each other which correspond to the 48 numbers which remained after the cancellation of two-fifths from the original five columns, thus obtaining figure 496. We now use again the same 48 numbers, proceeding as in the construction of figure 494, placing below each other the corresponding lines from figure 496, thus completing our new weave which is illustrated with figure 497.

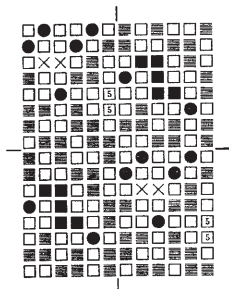
496





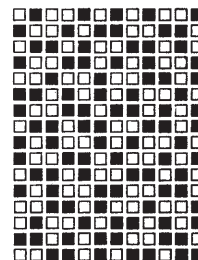
As stated before, granite weaves are constructed to imitate the appearance of granite upon a fabric, and a tedious and complicated way is to construct these weaves from broken twill parts, plain and rep effects. Many useful designs may, however, be obtained from these sources, and if a systematic procedure be followed, the construction of the design becomes less difficult.

498



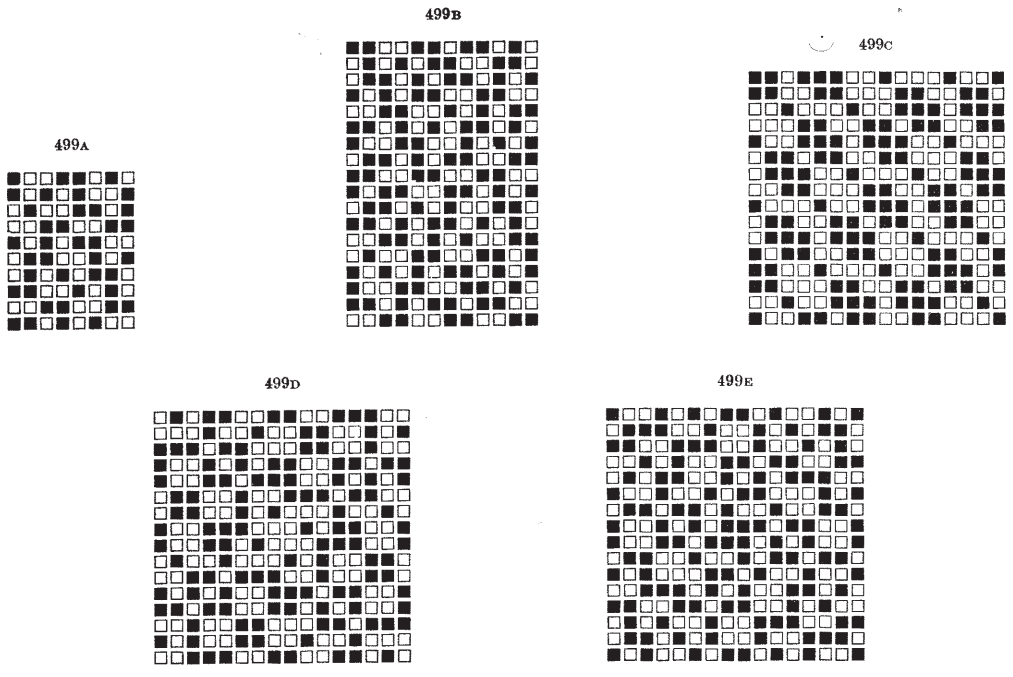
For example we take figure 498 which is extended over twelve ends and sixteen picks. These we divide into four equal sections; in the centre of the first and third we now place a twill part, to this we add two more and keep on adding small twill parts until our four sections are well covered, and then fill in the remaining parts with plain and single dots of warp and filling rep. The original twill parts are indicated with ■, the added twill parts with ▣, the plain with ●, the warp rep with ⊠ and the filling rep with × characters.

499

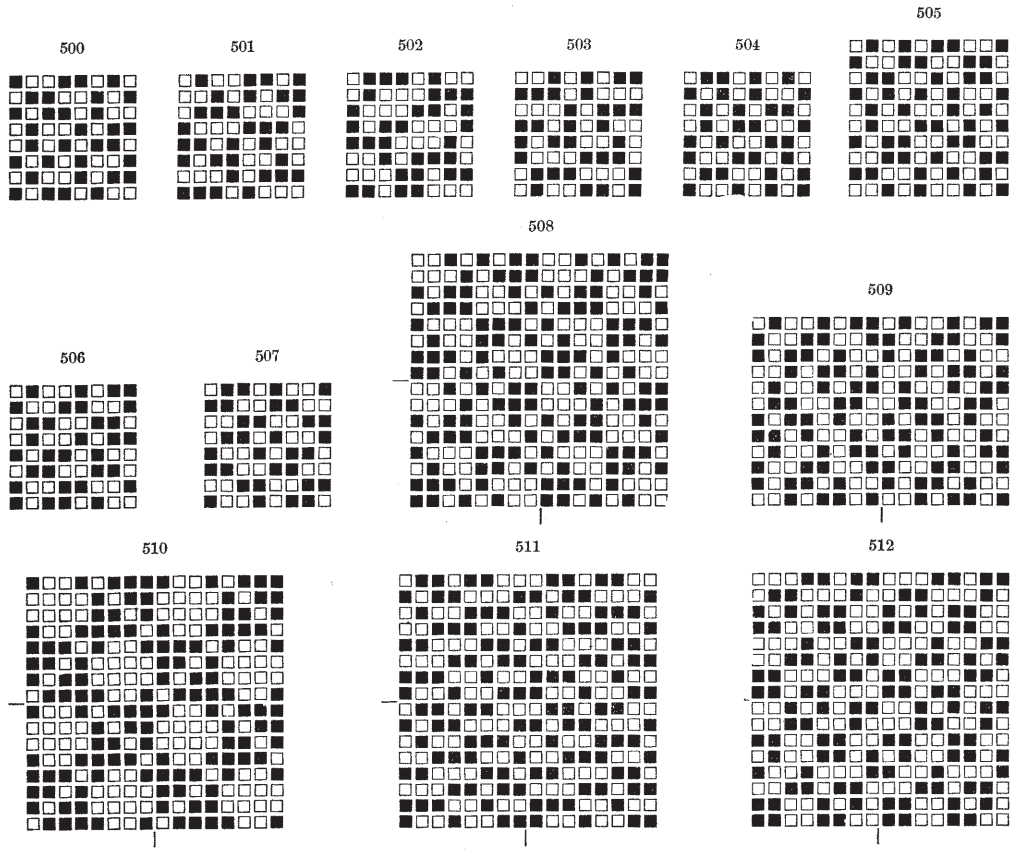


For complete design see Fig. 499.

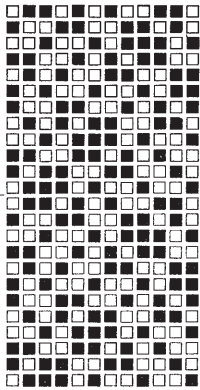
In figures 499A to 499E inclusive are given additional examples of designs formed by above method.



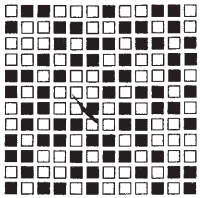
Following figures, 500 to 531 inclusive, may illustrate more of these granites.



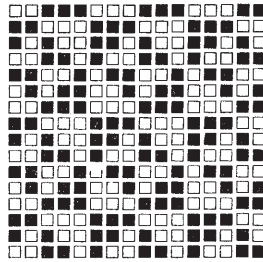
514



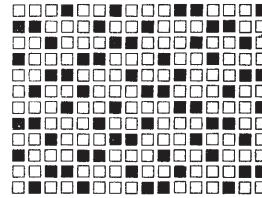
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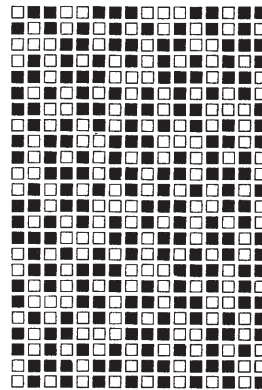
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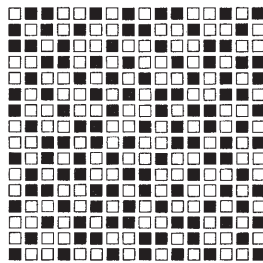
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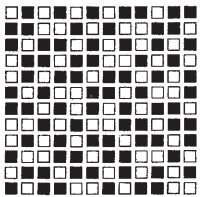
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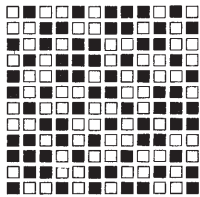
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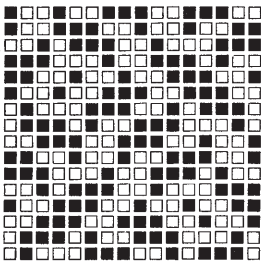
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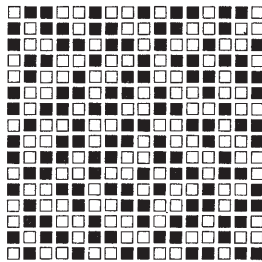
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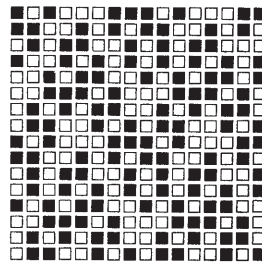
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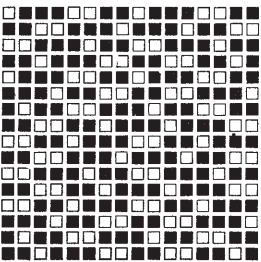
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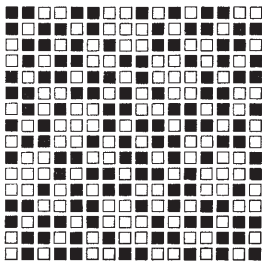
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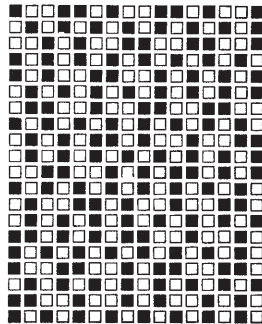
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525

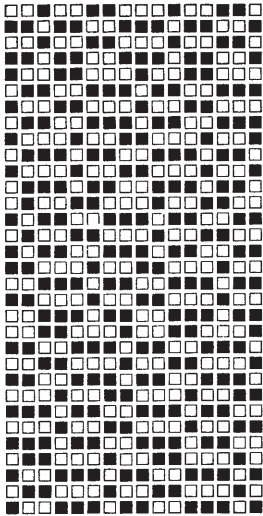


526

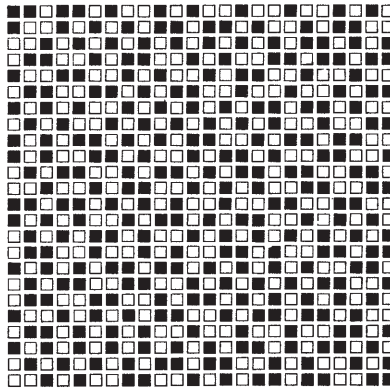




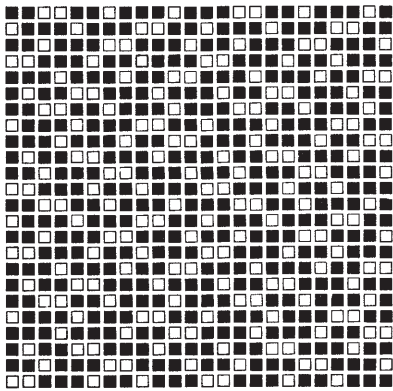
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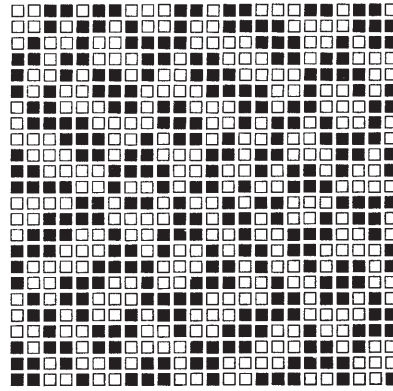
528



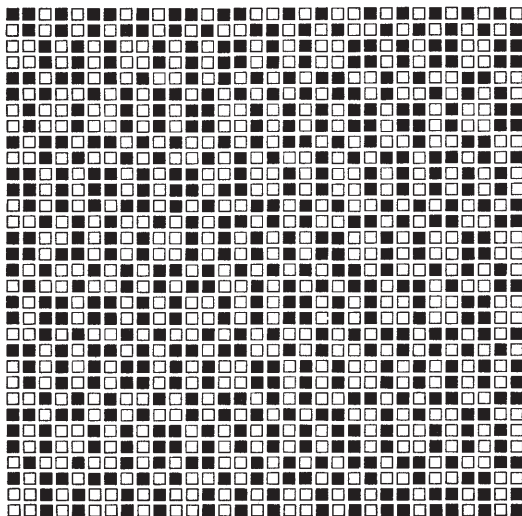
529



530



531



Another very interesting class of granite weaves is known under the name of weaves obtained by four changes.

In the year 1889, while on a tour through Europe, the writer first heard of this new method known as "Mockels" weaves with four changes, and in the year 1894, Mr. Mockel of Aachen (Aix la Chapelle) published a work in the French, English and German languages treating of this procedure in a very extended manner.

**Weaves with Four Changes.**

To construct these weaves we can use for foundation, twill, sateen, corkscrew or fancy weaves. The number of harnesses required in all cases equals twice the number of harnesses necessary for the foundation weave. In our first example we have selected a four-harness cross twill; it therefore requires eight harnesses to produce the new weave. The construction of these weaves is at each operation carried out on the odd fields. For illustration we take a four-harness  $\frac{1}{4}$  cross twill (see fig. 532); from this we produce a negative, which means all the fields left blank in fig. 532 are indicated with × characters. See fig. 533.

We now duplicate these two weaves with new characters.

Figure 532 is duplicated with fig. 534, and fig. 533 is duplicated with fig. 535. These four weaves now are combined into one design in the following manner: We place figures 532, 533, 534 and 535 into eight fields square. For plan see fig. 536.

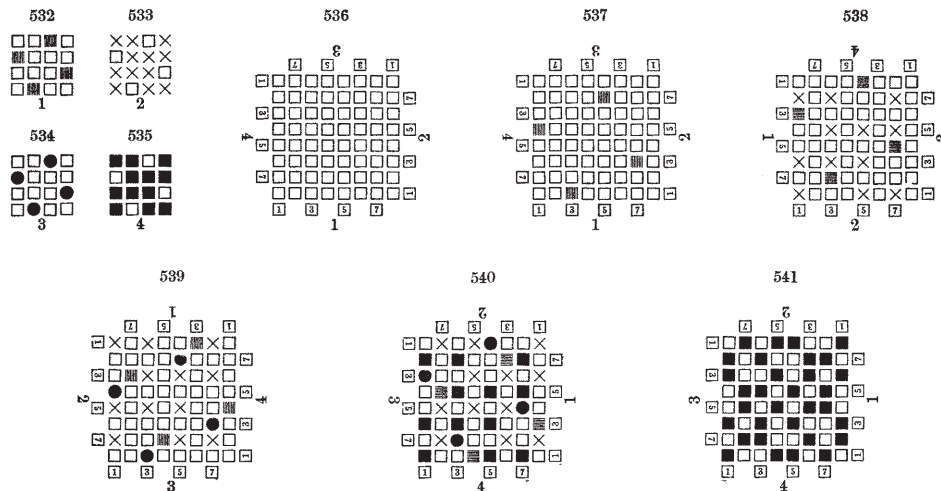
On each side of the same we have indicated the odd lines with 1, 3, 5 and 7. Again each side is indicated with capital figures 1, 2, 3 and 4.

We now take this plan in position so that the capital figure 1 stands towards the reader, and place fig. 532 on every odd line, leaving the corresponding blanks blank and indicating the corresponding characters (see fig. 537). This rule stands good for every operation. We now turn figure 537 90° to the right, so as to get the capital figure 2 towards the reader, and indicate figure 533 on every odd line. See fig. 538.

Next we turn figure 538 90° to right to get capital figure 3 in a position similar to the preceding case, and indicate for the third change fig. 534. See fig. 539. We now turn fig. 539 90° to right which brings capital fig. 4 towards you and place for the fourth and last change fig. 535. See fig. 540. For complete design, see fig. 541 which is a reproduction of 540 carried out with one kind of characters.

We wish to state here that it will be a great assistance to the student to work out these weaves by either four kinds of characters or four different colors until thoroughly familiar with the idea.

The rule as described above stands for all kinds of weaves belonging to this class.

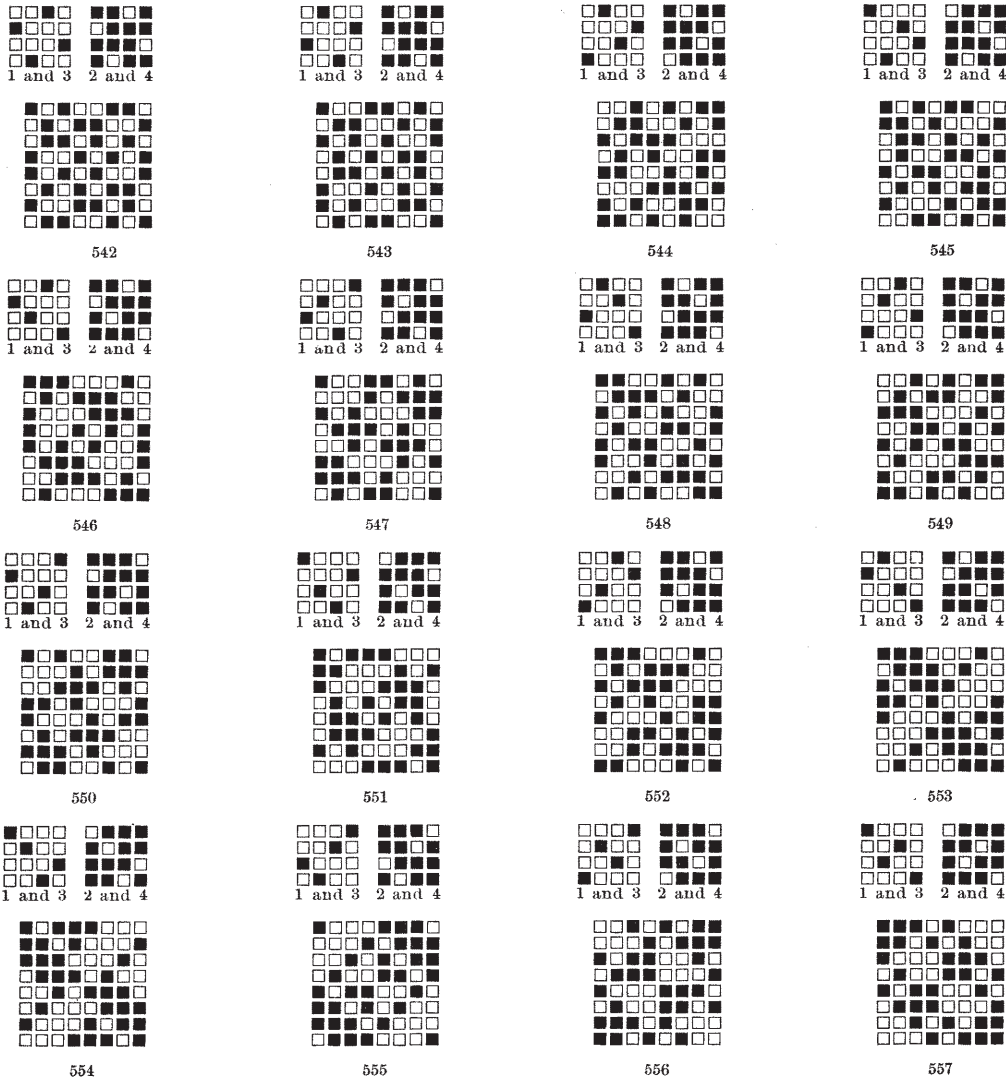


Being thoroughly familiar with the idea of constructing weaves with four changes, the student can work direct from the selected original weave. If the capital figures 1 and 3 on the prepared plan stand toward you, then indicate the characters, and when capital figures 2 and 4 on the plan stand toward you, then indicate the blanks; the result will be precisely the same as we have obtained in working out the new weave with four kinds of characters or colors.

For a complete set of weaves obtained by four changes we have prepared figures 542 to 557 inclusive, and all of them have for foundation four-harness  $\frac{1}{1} \frac{1}{3}$  and  $\frac{3}{1} \frac{1}{1}$  cross twill.

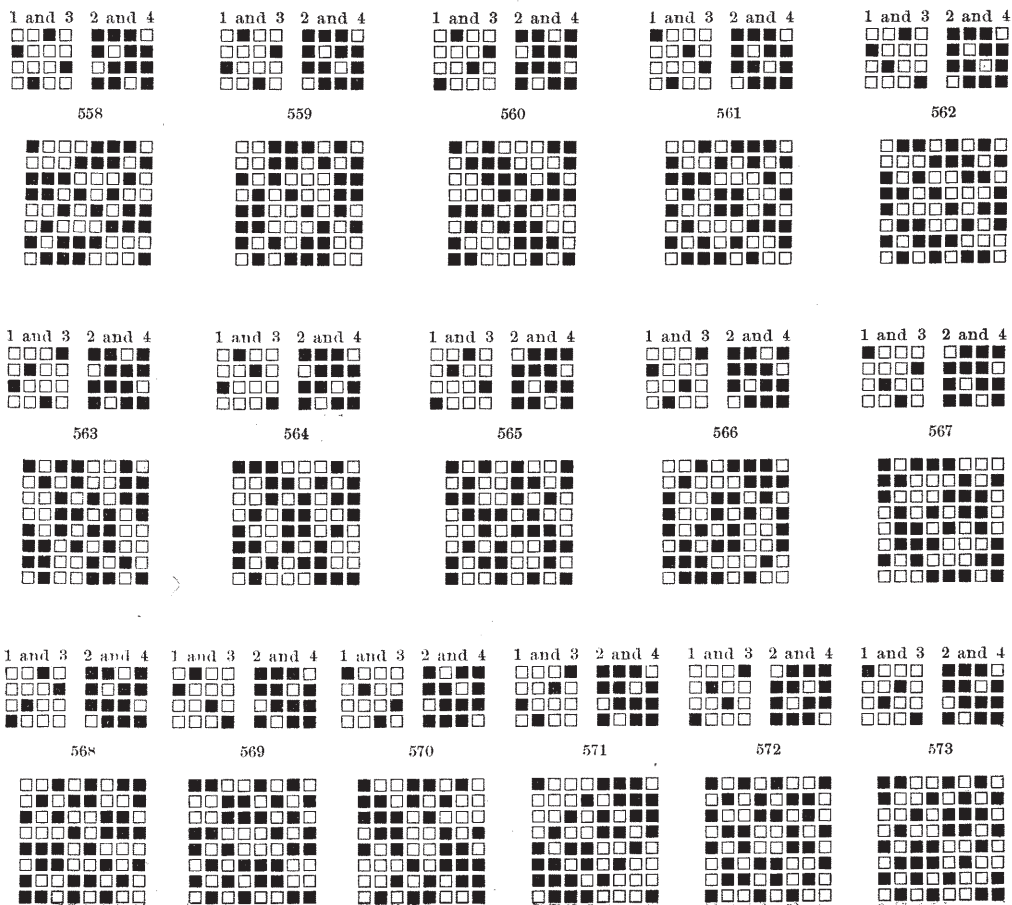
The numbers under the negatives and positives indicate the changes, 1 and 3 stand for the first and third changes, 2 and 4 stand for the second and fourth changes.

There are sixteen possible positions of a four-harness cross twill, and all of these have been made use of in figures 542 to 557 inclusive to illustrate the manifold weaves which can be obtained in constructing weaves with four changes.



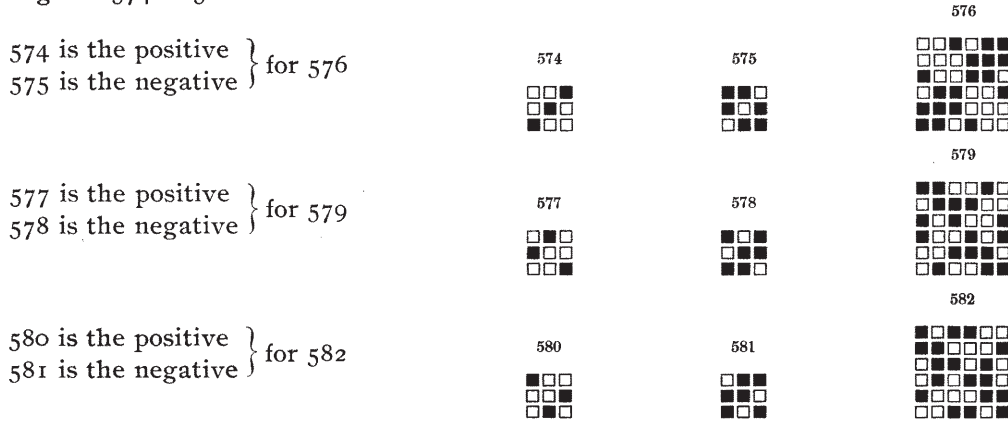
Some of these weaves are duplicates of others in above series and these duplicate weaves would be of no value. But in order to construct sixteen new weaves by our present method, we take the positives in the same rotation as for figures 542 to 557 inclusive, and for the negatives we go about in an arbitrary manner. Figures 558 to 573 may illustrate this procedure.

558	has	for	positive	the	same	as	542,	and	for	negative	the	same	as	547
559	“	“	“	“	“	“	543,	“	“	“	“	“	“	556
560	“	“	“	“	“	“	544,	“	“	“	“	“	“	542
561	“	“	“	“	“	“	545,	“	“	“	“	“	“	556
562	“	“	“	“	“	“	546,	“	“	“	“	“	“	556
563	“	“	“	“	“	“	547,	“	“	“	“	“	“	542
564	“	“	“	“	“	“	548,	“	“	“	“	“	“	550
565	“	“	“	“	“	“	549,	“	“	“	“	“	“	551
566	“	“	“	“	“	“	550,	“	“	“	“	“	“	552
567	“	“	“	“	“	“	551,	“	“	“	“	“	“	552
568	“	“	“	“	“	“	552,	“	“	“	“	“	“	549
569	“	“	“	“	“	“	553,	“	“	“	“	“	“	555
570	“	“	“	“	“	“	554,	“	“	“	“	“	“	548
571	“	“	“	“	“	“	555,	“	“	“	“	“	“	555
572	“	“	“	“	“	“	556,	“	“	“	“	“	“	557
573	“	“	“	“	“	“	557,	“	“	“	“	“	“	555

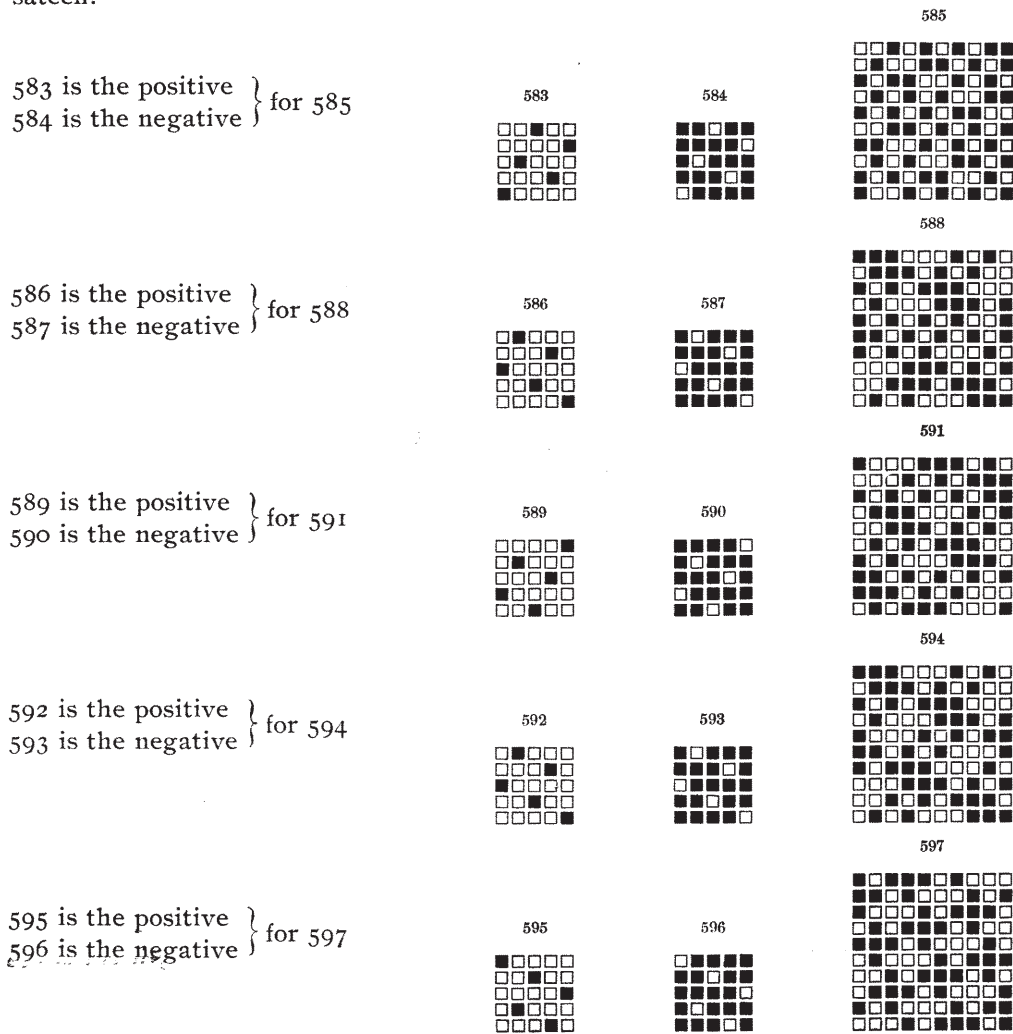




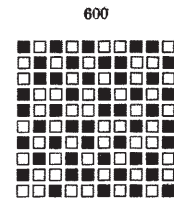
We will now give a series of designs worked out from different weaves. Figures 574 to 582 are constructed from three-harness twills.



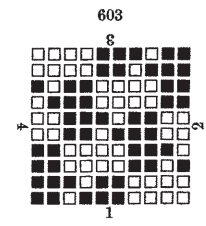
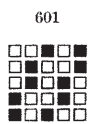
585 to 600 inclusive illustrate weaves in four changes from five-harness sateen.



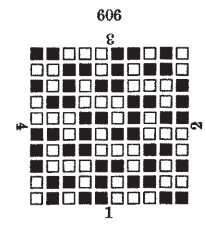
598 is the positive }  
 599 is the negative } for 600



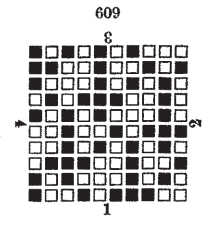
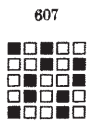
601 is the positive }  
 602 is the negative } for 603



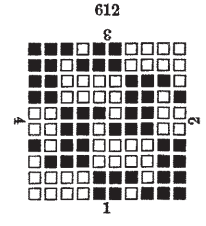
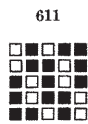
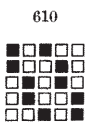
604 is the positive }  
 605 is the negative } for 606



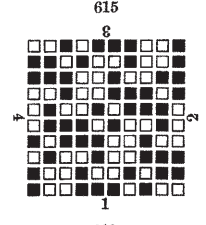
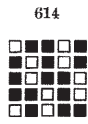
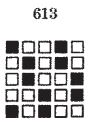
607 is the positive }  
 608 is the negative } for 609



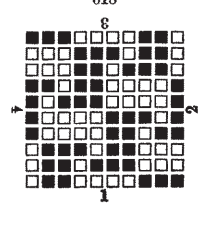
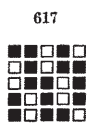
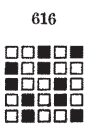
610 is the positive }  
 611 is the negative } for 612



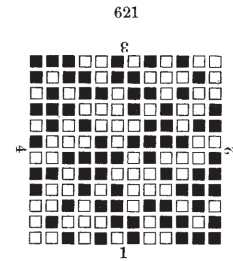
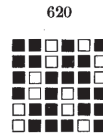
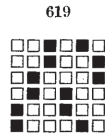
613 is the positive }  
 614 is the negative } for 615



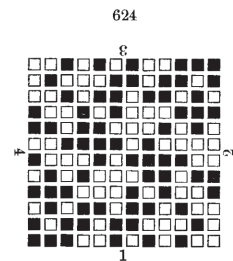
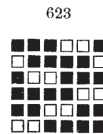
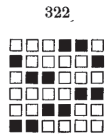
616 is the positive }  
 617 is the negative } for 618



619 is the positive }  
 620 is the negative } for 621



622 is the positive }  
 623 is the negative } for 624



## The Difference of Light and Shade of Differently Twisted Threads upon a Woven Fabric.

It is a well known fact, that a spun thread is composed of a bundle of fibres lying parallel to each other and twisted around their own axis. There are two points to be considered: first, the direction of the twist; second, the number of turns of twist which are put into a certain length of thread.

In regard to the direction of the twist, we classify the regular twist (right hand), and the reversed twist (left hand). If the yarn untwists *from* you, then the yarn has regular twist. If the yarn untwists *towards* you, the yarn has reversed twist.

In producing twofold yarn, the twist should be in opposite direction to that of the single yarn. In producing fancy yarns, however, the above rule is not applied.

The light and shade of regular and reversed twisted yarns made from the same material will illustrate itself to very good advantage in a plain woven fabric. For example, we take twelve warp threads regular and twelve warp threads reversed twist, alternating over the whole width of the fabric; the result will be that after finishing and dyeing the cloth will have a striped appearance.

If we apply this procedure to both systems, warp and filling, then the cloth will show a checked appearance. In forming patterns of irregular numbers of threads in warp and filling, the cloth will have a plaided appearance.

Upon examining a fabric made with two differently twisted yarns, we note an interesting fact: the regular twist, in looking at the cloth from left to right, will show up light colored, for the reason that the rays of light will be with the twist spirals. The reversed twist shows up dark because the light is against the twist spirals and produces shadows in these spirals and therefore the darker shade.

Figure A illustrates regular twist and figure B reversed twist in warp and filling direction.

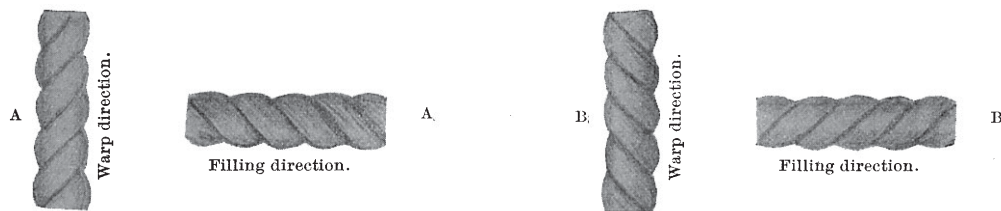


Figure C illustrates a plain woven fabric in which the warp is regular twist and the filling reversed twist, and the observer will readily see that the twist spirals of warp and filling are running in the same direction.

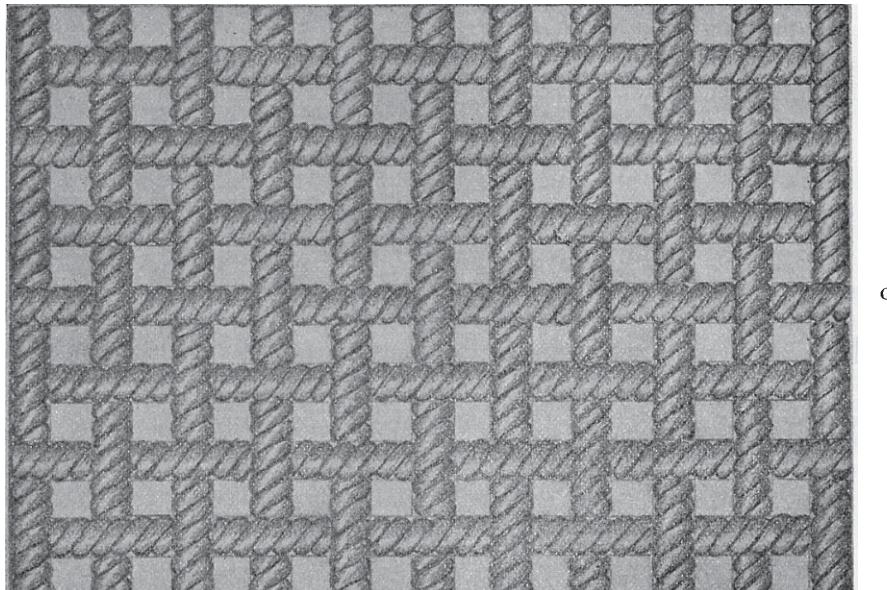
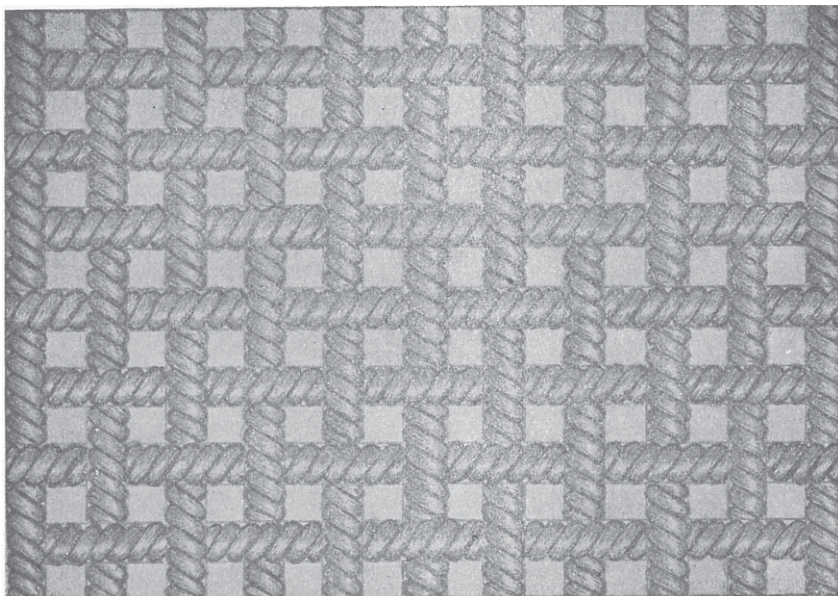


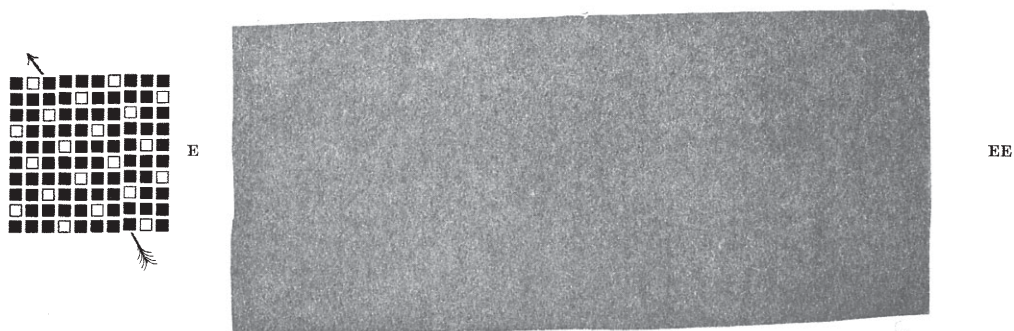
Figure D is constructed in warp and filling from reversed twist, and you will notice that the warp spirals are running from right to left and the filling spirals from left to right.





D

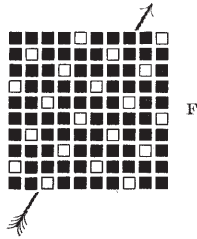
A more marked difference will be noticeable on warp face goods. For purpose of illustration we have prepared a cloth from regular twist in which the twist spirals are running from left to right. Figure EE represents the weave, which is a five-harness warp sateen, the sateen running from right to left or in opposite direction to the warp yarn spirals.



EE

Figure FF illustrates the same construction and color of cloth as figure EE but for weave we have made use of figure F which is a five-harness warp sateen running from left to right which runs in the same direction as the warp yarn spirals. In comparing EE and FF you will notice that EE has a clean and clear appearance, while figure FF produces a cloudy and fibrous appearing fabric.



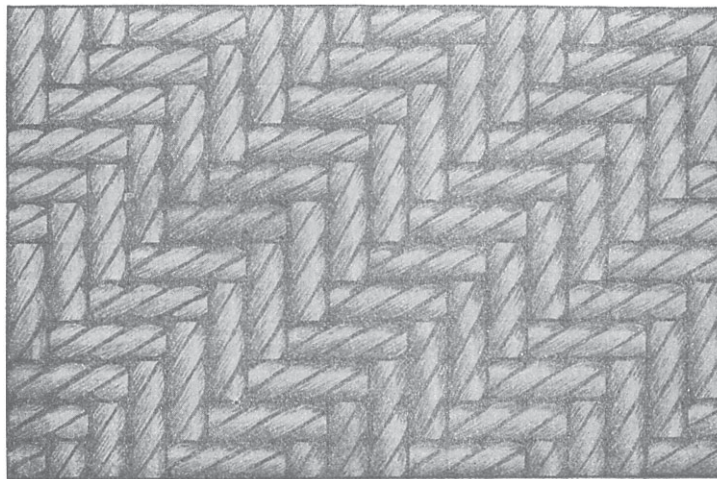


It may be well to state here that if a cloth is wanted which should show the twill lines clear and distinct in either regular twill, sateen or diagonal, the weave must be in opposite direction of the warp twist spirals. If it is desirable to produce a cloth where the twill lines of the fabric should be subdued, then the weave should run in the same direction as the twist spirals. The yarn used in figures EE and FF was regular twist; the twist spirals therefore run from left to right.

The twill lines in the weave for figure EE run in the opposite direction (*see figure E*) and therefore the twill lines in the cloth show plain and distinct. In the diagram FF we have used figure F for weave where the twill runs in the same direction as the twist spirals in the yarn, and it will be noticed that the face of the fabric produces a cloudy and fibrous appearance.

For purpose of further illustrating the influence of the twist in the yarn upon a fabric, we have prepared the following diagrams: figures G, H, I, K, L, M and N.

In all these diagrams we have taken for weave regular  $\frac{3}{3}$  twill. In figure G

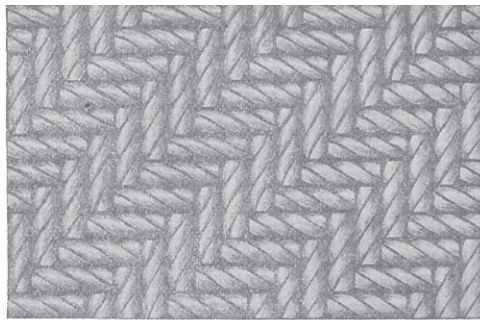
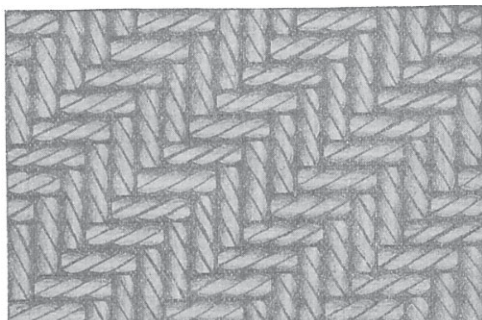


the warp is regular and the filling reversed twist. In figure H warp and filling are reversed twist. In figure I warp and filling are regular twist. In figure K the warp is one end reversed and one end regular twist; the filling is one pick reversed and one pick regular twist. In figure L the warp is two ends reversed and two ends regular twist; the filling is two picks reversed and two picks regular twist. In figure M the warp is three ends reversed and three ends regular twist; the filling is one pick reversed and one pick regular twist. In figure N the warp is one end reversed and one end regular twist; the filling is three picks reversed and three picks regular twist.

On examining the diagrams annexed to this chapter, we find that the light and shade by the use of the different twisted yarns on the same weave and construction of the fabric produce entirely different appearance and would show as marked a difference in the fabric as they do in the diagrams.

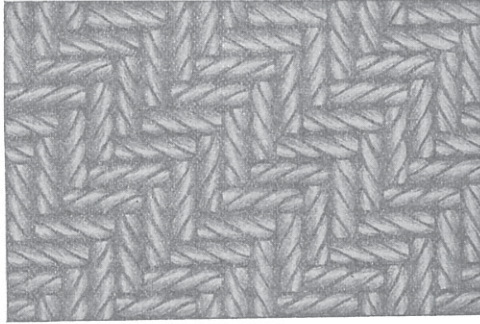
H

I



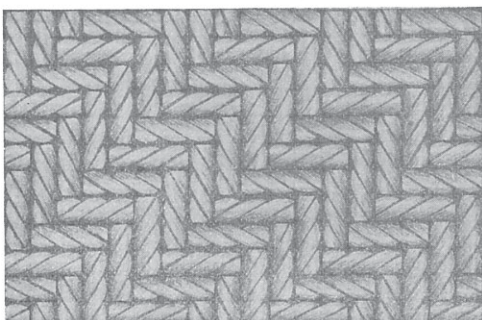
K

L



M

N



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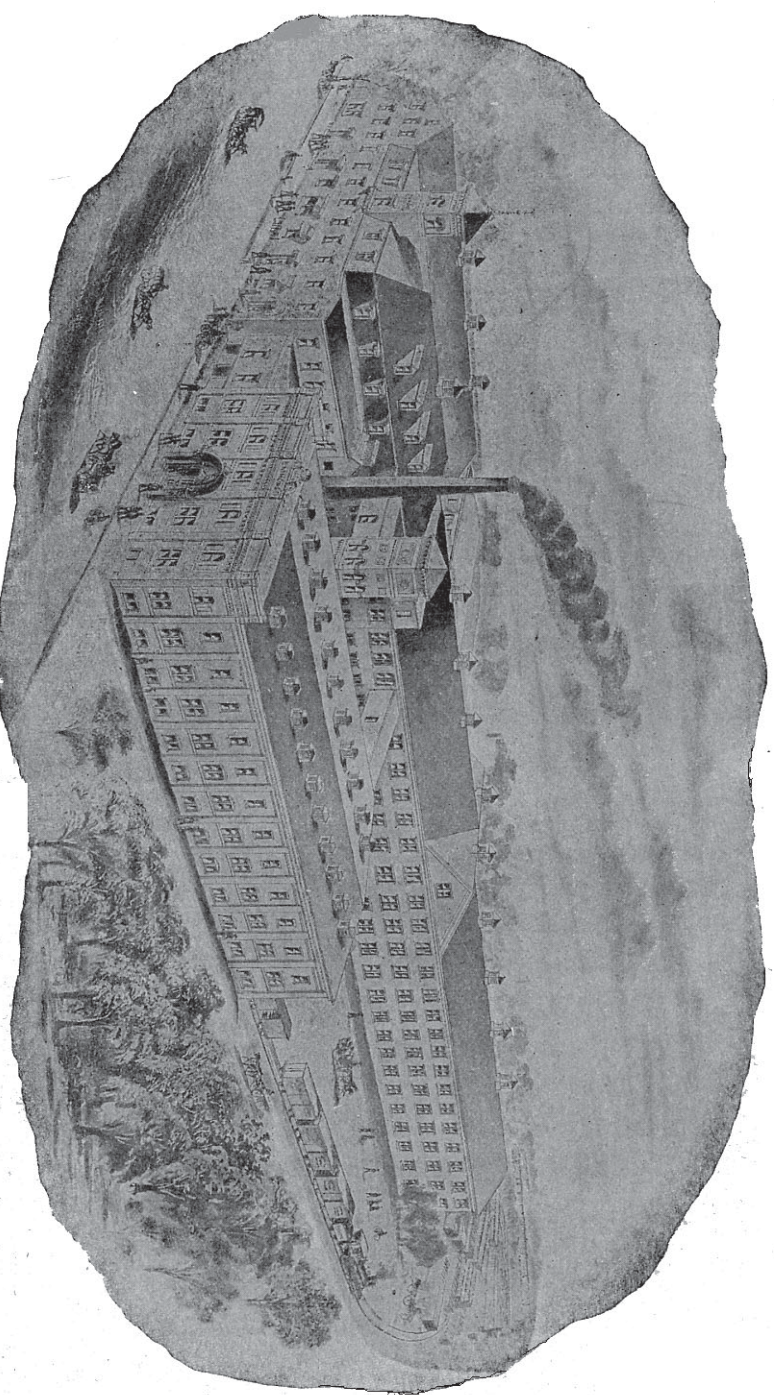
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