

CONSTRUCTION OF SPOT WEAVES

Serial 509

Edition 1

SPOT WEAVES FORMED WITH ONE SYSTEM OF WARP AND FILLING

WARP-SPOT WEAVES

1. Weaves that produce fabrics of a spotted character, that is, cloths with spots distributed over the face, are known as **spot weaves**. These weaves are formed by bringing a certain series of yarn, either the warp or the filling, to the surface of the cloth at certain points and allowing it to float for a number of ends or picks, as the case may be, thus producing a spotted effect on the cloth. The manner in which the yarn is allowed to float on the face will determine the shape and appearance of the spot, and the places where these floats are made will determine the arrangement, or distribution, of the spots on the surface of the fabric. Spots may be made by floating either the warp or the filling on the face of the cloth; the former are known as **warp spots**, and the latter, as **filling spots**.

The first consideration when making a spot weave is the arrangement, or order of distribution, of the spots on the surface of the cloth. Spots may be arranged in plain order, satin order, broken crow order, etc.; by this is meant that the spots appear on the surface of the cloth in the same order that the ends are either raised or depressed in a plain, satin, or broken crow weave, as the case may be. For

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example, if spots are distributed over the surface of a fabric in the same relative position to one another as the risers of the plain weave, they are said to be arranged in plain order, or if they are distributed in the same order as the risers of the 5-end, filling-flush, satin weave, they are said to be arranged in 5-end satin order, etc.

2. To illustrate the method of producing spot weaves, suppose that it is desired to make a warp-spot weave on 8 ends and 8 picks, the spots to be arranged in plain order. Since the spots are to be arranged in plain order, there will be two spots in each repeat of the weave, just as there are two risers in one repeat of the plain weave, and the 8 ends and 8 picks on which the whole weave is to be complete must first be divided into four sections, each containing sixteen small squares of the design paper. Fig. 1 (a) represents

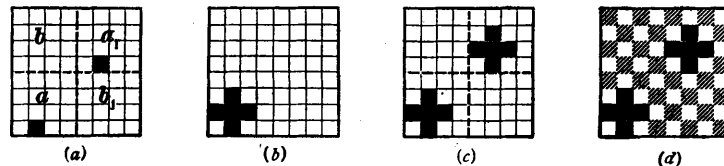


FIG. 1

8 ends and 8 picks of design paper thus divided by heavy dotted lines. Since the spots when arranged in plain-cloth order appear on the face of the cloth in a manner similar to the ends in a plain weave, the two spots may be placed in sections a, a_1 , while sections b, b_1 are reserved for the ground weave.

Before placing the spots in their respective sections, it is best to mark one of the small squares in each section in which the spots are to be placed, these marks to be placed in squares having the same relative position in each section. Thus, in Fig. 1 (a), one square of section a and one of a_1 have been filled in. It is next necessary to determine the spot figure to be used, as a spot must be selected that does not occupy so many ends and picks that two of the spots will run into each other. Since in this case the entire weave is

to be complete on 8 ends and 8 picks, the spot figure cannot occupy many ends and picks, and therefore a simple figure similar to that shown in Fig. 1 (*b*) must be selected.

Although it is not necessary to start the spot weave on any particular end or pick, it must be commenced on the same relative end and pick in both sections *a* and *a*₁, Fig. 1 (*a*). This is the object of the filled-in squares in each of these sections; that is, to give a starting point when placing the spot figure on the design paper, so that each spot will occupy the same relative position in its section. For example, suppose that the lowest square of the spot is to occupy the square that is marked in section *a*, Fig. 1 (*a*). Then, if this is done in section *a*, it must also be done when placing the spot in section *a*₁, and by so doing the spots will have the same relative position in the weave and be equally distant from each other; by marking certain squares as in Fig. 1 (*a*), the correct position of the different spots is readily obtained. It next becomes necessary to place the spots on the design paper. The method spoken of, that is, considering the squares marked in Fig. 1 (*a*) as the lowest marked square of the spot, will be adopted in placing this spot on the design paper. Fig. 1 (*c*) shows the spot figure placed on the design paper in this manner; each spot occupies the same relative position in the section in which it is placed, and if three or four repeats of this figure in both ends and picks are worked out, it will also be apparent that there is the same distance between the spots.

3. After the spots have been placed on the design paper, as shown in Fig. 1 (*c*), the blank spaces must be filled in with some simple weave, known as the **ground weave**, in order to give the fabric the required firmness of texture. It would be impossible to construct a fabric exactly as shown in Fig. 1 (*c*), since the fourth and eighth ends and picks are not interlaced with the fabric, and even if the fabric could be thus woven it would be too loosely constructed to be serviceable. When selecting a ground weave to be used with a spot figure, a weave should be selected that will match up well

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with the spot; that is, one that will not allow large floats of warp or filling in any part of the cloth. The most useful weaves for this purpose are the plain weave, the twills, and satins. A small, simple, and regular weave can generally be used to the best advantage as a ground weave, and should therefore be selected. It is not always possible to find a weave that will neither run into the spot figure nor leave a larger float in some places than in others. In the example under consideration, it will be assumed that the plain weave is to be used for the ground weave.

In placing the ground weave in a design of this kind, the first square to be marked with a riser should always be carefully selected. Thus, for example, with the illustration being used, suppose that the first riser of the plain weave were marked in the upper right-hand corner of Fig. 1 (*c*); then the next riser would come in contact with a riser in the spot, which should always be avoided, if possible, while, on the other hand, if this next square were skipped without being marked, there would be a float at this point longer than the average float in the rest of the ground weave. However, by beginning the plain weave in the upper left-hand corner and marking this square with a riser, the ground weave will not interfere in any way with the spots. Fig. 1 (*d*) shows the completed weave with the ground inserted in this manner; in no place does the plain weave run into the spot, and the floats of both warp and filling are of an equal length in the ground.

When spots are placed on a plain ground, it will often be found necessary to move one or more spots 1 end or 1 pick out of position, in order to make the plain weave join the spot in the proper manner. This is always advisable when the spots are placed some distance apart, since a slight displacement of the spot will hardly be noticed, while, if the ground weave does not join the spot properly, the entire design is spoiled. Fig. 1 (*d*) serves as an illustration of the manner of constructing spot weaves rather than as an especially meritorious example of such weaves; for, since it is complete on 8 ends and 8 picks, and since two spots have to be placed in this space, it is not possible for the spots to

occupy a very large number of ends and picks, while in order to have a spot weave appear well in the cloth, the spot figure should occupy a comparatively large number of ends and picks. Most spot weaves will, consequently, be found to extend for some distance before repeating. It will also be noted that in many of the spot weaves shown in this Section the spots are placed comparatively close together, but spot weaves are often arranged with the spots a considerable distance apart. The same principles of construction apply, however, as are herein described, and it is only necessary to insert as many ends and picks of the ground weave as desired between the spots in order to distribute them any required distance apart on the face of the cloth.

4. As a further illustration of the method of constructing spot weaves, suppose that it is desired to construct a spot weave on 20 ends and 20 picks and that the spots are to be arranged in 5-end satin order. This will necessitate five spots being placed in one repeat of the weave, and therefore the design paper containing the squares on which the complete weave is to be placed must first be divided into five sections each way, thus producing twenty-five sections in all, as shown in Fig. 2 (*a*). In this illustration heavy dotted lines are used to separate the sections, and as certain of these lines coincide with the heavy lines of the design paper, the latter have been omitted. In practice, pencil lines may be used to divide the design paper into sections, as they may be made more quickly, and the only purpose is to divide the weave into imaginary sections. In Fig. 2 (*a*) certain of the sections, taken in 5-end satin order, have each been marked with a small square.

The next thing to be considered is the spot that will be placed on the design, as one must be selected that will not be so large as to interfere with other spots nor so small as to be obscure when the fabric is woven. It will be assumed that the spot shown in Fig. 2 (*b*) is to be used. The spots must be placed on the design paper in such a manner that they will be arranged in satin order, and be equally distant from each

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other. By taking as a guide on which to build these spot figures the marked squares of Fig. 2 (a), which were placed on the sections in satin order, the desired result will be obtained.

It will be assumed that the squares marked in Fig. 2 (a) represent the topmost riser of the spot shown in Fig. 2 (b);

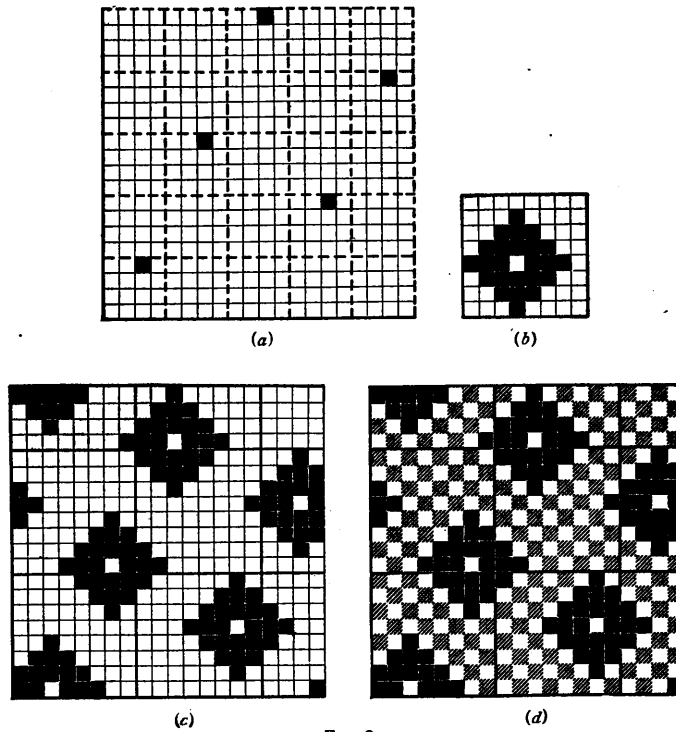


FIG. 2

then completing each spot, the 5-end satin arrangement of the spots shown in Fig. 2 (c) is obtained. The plain weave makes a very suitable ground weave for this design, and by inserting it properly, the completed design shown in Fig. 2 (d) is obtained.

5. As another example of spot-weave construction, suppose that it is desired to construct a spot weave on 24 ends and 24 picks, the spots to be arranged in broken crow order,

which will give four spots in each repeat of the weave. Fig. 3 (a) shows the design paper divided into sections after the manner previously explained. Small squares are also marked in certain sections, arranged in broken crow order, to indicate the positions of the spot figures. Fig. 3 (b)

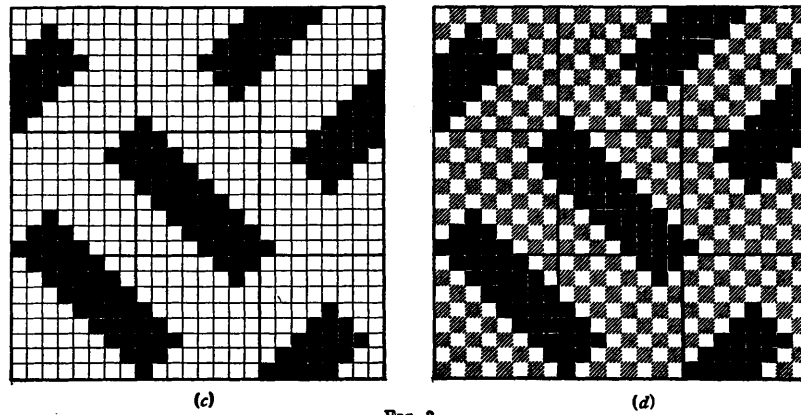
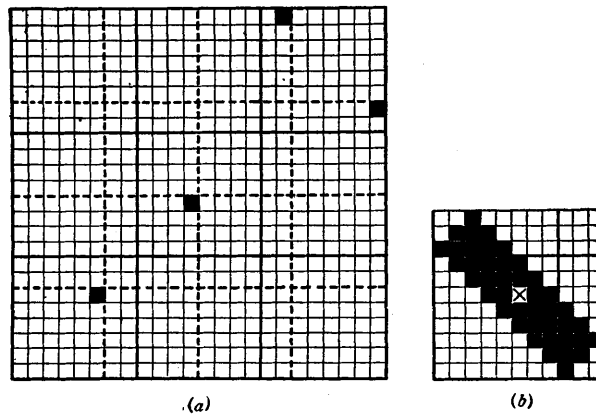


FIG. 3

shows the spot figure that is to be used, a small square in the center of the spot having been marked with a cross. It is intended that this square shall fall on the marked squares in Fig. 3 (a) when the spots are inserted in the design.

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Fig. 3 (c) shows the spot inserted; two of the spots are twilled to the right and two to the left, for if all four of the spots were twilled in the same direction, two of the spots would necessarily run together, owing to their elongated shape. Fig. 3 (d) shows the completed design with the plain

weave inserted as a ground weave.

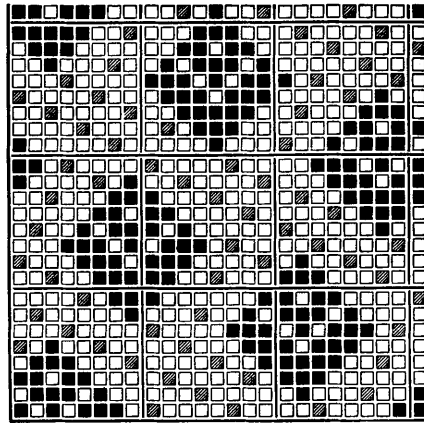


FIG. 4

6. Various weaves other than the plain weave may be used as ground weaves. Fig. 4 is given as an example of another type of ground weave. It is a spot weave on 25 ends and 25 picks, having the 5-end filling satin weave as a ground weave and with the spots arranged in 5-end satin order. In

this design, wherever a riser of the ground would come in such a position as to interfere with the spot figure, that riser has been omitted. A plain ground could not be used in this design, because it would not match up well with every spot, and also because the weave repeats on an odd number of ends and picks.

FILLING-SPOT WEAVES

7. In constructing filling-spot weaves, the arrangement of the spots on the surface of the cloth is determined in exactly the same manner as described in connection with warp-spot weaves; in fact, the construction of a filling-spot weave very closely resembles that of a warp-spot weave with the single exception that in the former the filling floats on the surface of the cloth to form the spots, instead of the warp, as in the latter. To illustrate the construction of filling-spot weaves, suppose that it is desired to construct a spot weave

similar to that shown in Fig. 1 (*d*), with the exception that the spots are to be formed by the filling floating on the face of the cloth instead of the warp. In constructing this weave, wherever the spots are to appear on the cloth the warp must be depressed, so as to allow the spots to be formed by the filling floating, as shown in Fig. 5, and the spot is shown by blank squares instead of filled squares, as in the case of Fig. 1 (*d*), on this account. When inserting the ground weave in filling-spot designs, care should be taken to have the warp flushes of the ground weave oppose the filling flushes of the spot at every point so that the filling will not float over more ends than is desired to form the spots. In Fig. 5 the plain weave has been used as a ground weave and the risers of the ground weave completely encircle the filling flushes that form the spots.

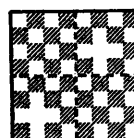


FIG. 5

As another illustration of the construction of spot weaves, suppose that it is desired to convert the warp-spot weaves

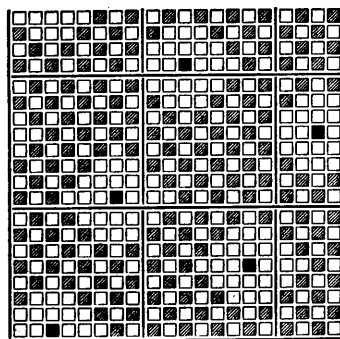


FIG. 6

shown in Fig. 2 (*d*) into a filling-spot weave, retaining the same arrangement of the spots. Fig. 6 shows this weave complete, the spots being shown with blank squares, thus indicating that the warp is depressed and the filling raised, and therefore that the filling flushes form the spots on the face of the cloth.

The plain weave has been used for a ground weave in this design, and the warp flushes of the ground weave oppose the filling flushes on all sides of the spots, as previously explained.

8. Very neat effects may be formed in filling-spot weaves by using corkscrew or cord weaves as ground weaves, since both warp-corkscrew and warp-cord weaves show only warp on the face, or for that matter on the back of the cloth.

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Filling spots may be made by allowing the filling to flush over a number of ends, and by having the warp of one color of yarn and the filling of another, a spot of a distinct color from the body of the cloth may be made; that is, the contrast between the color of the spot and the color of the ground is greater, because with warp corkscrews or cords as ground weaves the interlacings of the filling with the warp in the ground of the cloth do not show. Fig. 7 shows a weave constructed by this method in which a 7-end warp corkscrew has been used as a ground weave and the spots formed by flushing the filling on the surface of the cloth. In constructing weaves of

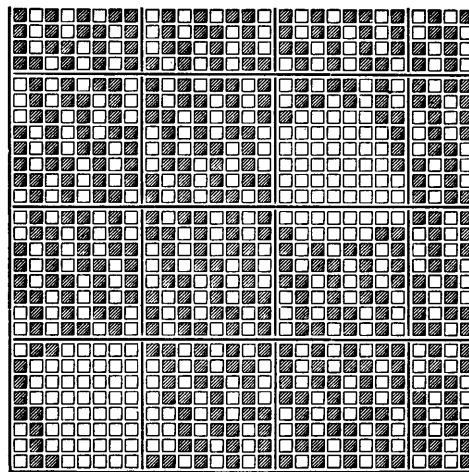


FIG. 7

of risers that are erased will of course determine the extent of the individual spot. In constructing these weaves, it is very important that the warp flushes of corkscrew weave shall oppose the filling flushes on both sides of the spot. This has been done in Fig. 7; thus, considering the spot in the lower left-hand corner, on the eighth pick the third end is up and the fourth end down to form the spot, on the second end the filling that forms the spot flushes on the fifth, sixth, and seventh picks, while the warp flushes of the first end occur on these same picks. Again the filling flushes that

constructing weaves of this type, the best method of procedure is first to place the corkscrew or cord weave on the desired number of ends and picks, after which the spots may be made by erasing certain of the risers of the ground weave wherever it is desired to have a spot appear on the surface of the cloth. The number

form the spot cover the third end on the second, third, and fourth picks, while the second end is up on the same picks, etc. Warp-spot weaves may be made with corkscrew or cord weaves as ground weaves in a similar manner to filling-spot weaves. In this case, however, filling-corkscrew or filling-cord weaves are used as the ground weave and the spots produced by raising certain ends on as many picks as desired so as to form the spots.

EXAMPLES FOR PRACTICE

1. Make a warp-spot weave on 24 ends and 24 picks, using the plain weave as a ground weave and arranging the spot shown in Fig. 1 (*b*) in 8-end satin order.
2. Arrange the spot shown in Fig. 2 (*b*) in plain order on 18 ends and 18 picks and insert the plain weave as a ground weave.
3. Make an original warp-spot weave on 24 ends and 24 picks with the spot figures arranged in 6-end satin order.
4. Make a filling-spot weave on 28 ends and 28 picks, arranging the spots in plain order.
5. Arrange the spot shown in Fig. 3 (*b*) in plain order, twilling one spot to the right and the other to the left. Make the weave repeat on 16 ends and 16 picks and insert the plain weave as a ground weave.

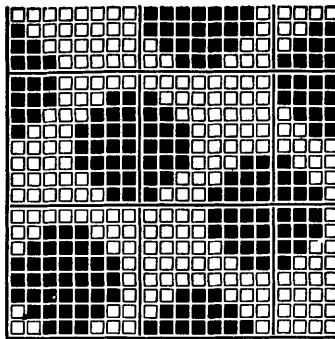
SPOT WEAVES FORMED WITH AN EXTRA SYSTEM OF YARN

SPOT EFFECTS WITH EXTRA WARP

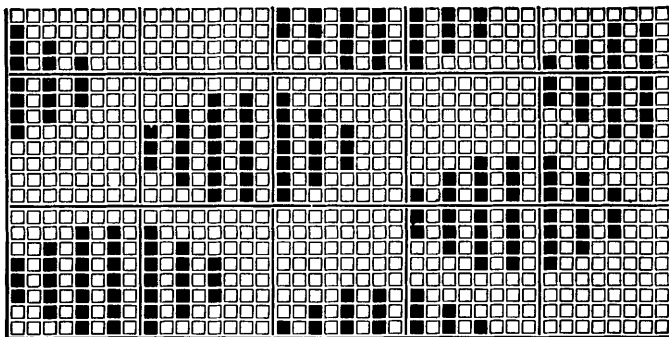
9. In many fabrics of a spotted character, the ground is woven with one warp and one filling, and the spots, which are generally of a different color from the ground, are produced by the use of an extra, or figuring, warp or filling, or both. In these cloths, the ground, or body, of the fabric is produced in the ordinary manner, while the extra system of yarn, either warp or filling, that produces the spot figures is allowed to float at the back of the cloth except at those places where the spots occur, where it floats on the face in such a manner as to produce a spot of the required shape and size.

10. Suppose that it is desired to construct a spotted fabric with the spots produced by an extra system of warp

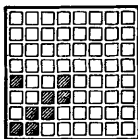
yarn. In producing a design of this character, the first step is to decide on the spot figure that is to be used, and the arrangement of the spots on the surface of the cloth. Fig. 8 (a) shows a spot figure arranged in 5-end satin order, which, for the purpose of illustration, will be converted into an extra-warp spot design. It is constructed after the manner of the spot weaves previously described, except that the ground weave is omitted. The first step in arranging this spot for extra warp is to separate the ends of the spot design, as shown in Fig. 8 (a), by blank ends, as shown in Fig. 8 (b). That is, in Fig. 8 (b) each end of Fig. 8 (a) is copied, but is placed on an odd-numbered end of Fig. 8 (b), the even-numbered ends being left blank for the reception of the ground weave. The completed weave for an extra-warp fabric of this type will require twice as many ends and the same number of picks as the spot arrangement; that is, Fig. 8 (a) occupies 20 ends and 20 picks, while Fig. 8 (b) occupies 40 ends and 20 picks. The next step is to insert the ground weave, which forms the body of the cloth; in this case, the cassimere twill, Fig. 8 (c), will be used. The ground weave is inserted on the ends of Fig. 8 (b) that were left blank, or, in this case, the even-numbered ends, as shown in Fig. 8 (d), which is the completed design. If this weave is warped 1 end of white and 1 end of green throughout the warp, and a solid-green filling used, it will be seen that white spots arranged as in Fig. 8 (a) will be produced on the surface of a solid-green twilled fabric. The extra, or white, warp floats on the face only to form the spot, and when not producing the spot is carried to the back of the fabric. The green, or body, warp, however, is interlaced with the filling as a cassimere twill to form the ground fabric on which the white spots are arranged. Since the extra, or figuring, warp interlaces so infrequently with the filling, it takes no part in forming the structure, or body, of the cloth; the ground ends, being crowded together by the interlacing of the filling, throw the extra-warp ends up on the face to form the spot when these ends are raised and force them to the back when they are depressed. Care



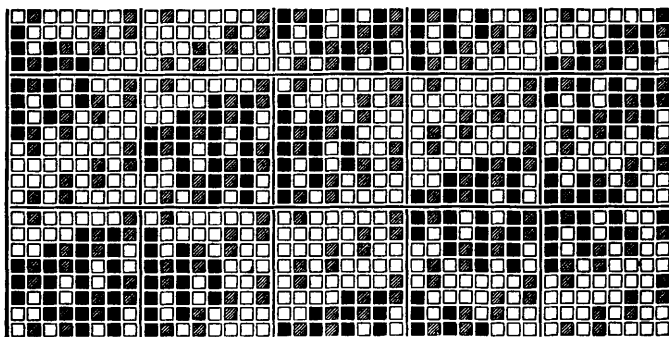
(a)



(b)



(c)



(d)

FIG. 8.

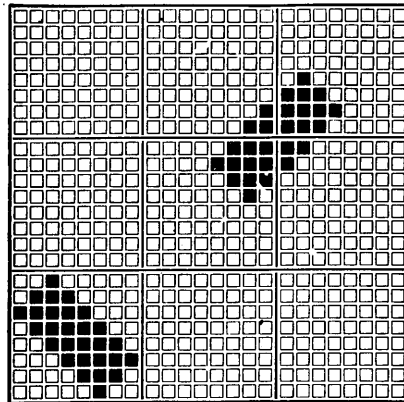
must be taken in selecting a ground weave for these fabrics to select a weave that will repeat evenly on the number of ends and picks that is occupied by the spot arrangement; that is, it must repeat evenly on the same number of picks and one-half the number of ends that the completed weave occupies.

11. Tying.—It frequently happens in the case of very thin fabrics that the extra warp when carried to the back of the fabric will show through on the face, especially if the ground cloth is of a light color and the figuring warp dark, or vice versa. When this is the case, the loose floats of the extra warp must be cut from the back of the fabric, but if this is done, the weave must be arranged so that the spots will be firmly bound to the cloth. In the case of Fig. 8 (*d*), if the floats of the extra warp on the back of the cloth were cut off close, there would be nothing to attach the face floats of extra warp to the cloth, since the extra warp is only passed from the face to the back without other interlacing with the filling. Therefore, such a fabric would not be serviceable, since the spots would easily rub and wear off. To remedy this fault, it is customary, when the figuring warp is to be cut from the back of the cloth, to bind each float of the extra warp on the face by passing it under 1 pick and over 1 pick of the ground before passing it finally to the back of the cloth. This extra binding at the edge of the spots prevents the floats of the extra warp on the face from being too easily rubbed off after the floats at the back of the cloth have been cut and removed.

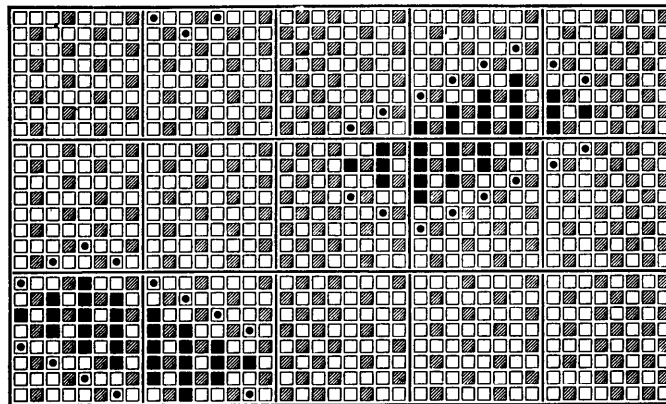
Fig. 9 (*a*) shows an arrangement of spot figures in plain order, while Fig. 9 (*b*) shows these spots arranged as an extra-warp design with each face float of the extra warp bound to the cloth by passing it under and over the filling before finally allowing it to float on the back of the fabric. The ground weave in this case is the plain weave.

In some cases it is not desired to cut the extra-warp floats from the back of the cloth, and yet the spots are so far apart on the face that the floats on the back are so long as to be very loose. When this is the case, the extra warp is usually

tied to the ground cloth by being raised over a single pick of the ground weave at a point approximately half way between the spots, that is, in the center of the float on the back, or perhaps the float may be tied twice or even oftener between



(a)



(b)

FIG. 9

the spots. In arranging these tying places, care should be taken to bring the extra warp up on a pick that has a ground-warp end on each side also raised over it. These floats of the ground ends will then crowd together and completely

hide the tying place of the extra warp. To illustrate this point, Fig. 10 (a) shows an elliptical spot arranged in plain order, while Fig. 10 (b) shows the same design arranged for extra warp, with the extra warp tied into the cloth. Particular attention should be paid to the position of the tying

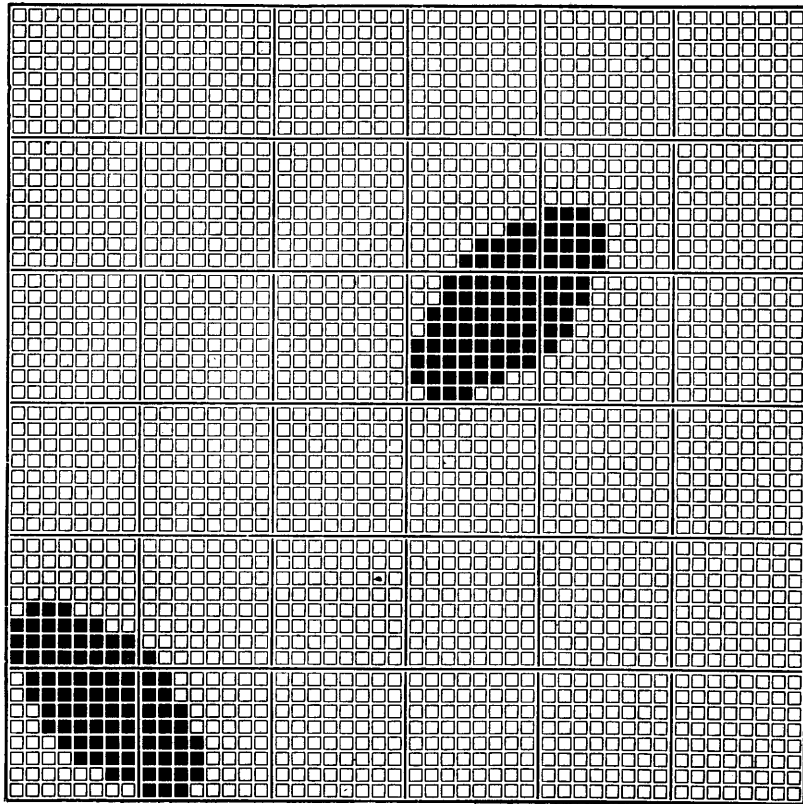


FIG. 10 (a)

places, since the extra warp is raised in each instance between two warp floats of the ground weave and as near the center of the extra-warp float on the back of the cloth as is consistent with the attainment of proper binding places for concealing the extra-warp end.

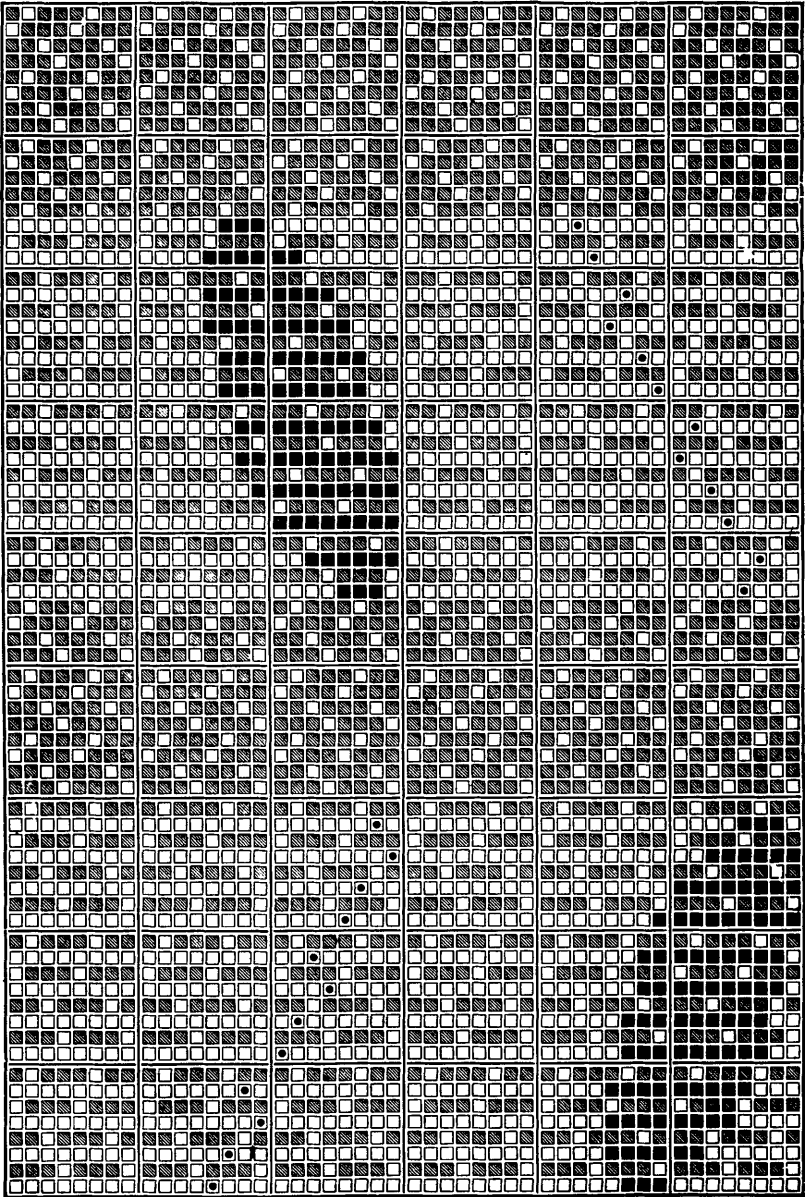


FIG. 10 (b)

12. Stripe Spot Effects.—When it is desired to separate the spots so that they will appear on the surface of the cloth a greater distance apart, as many ends of the

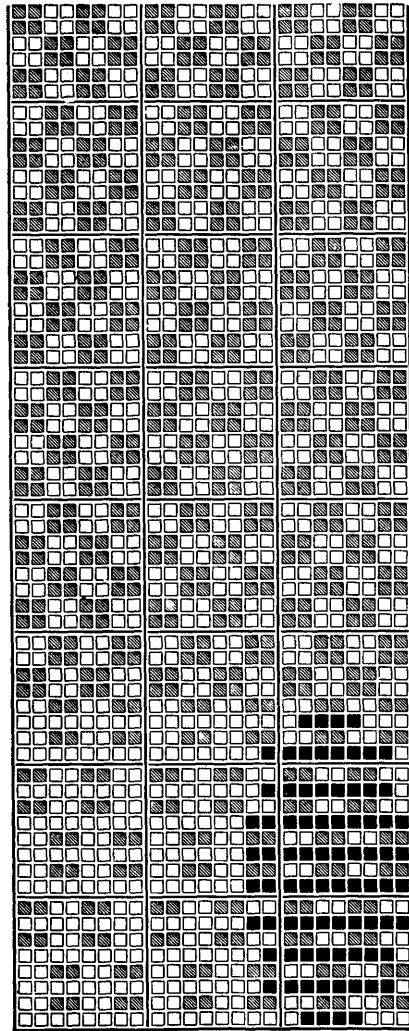


FIG. 11

ground weave as are desired may be inserted between the spots. Spots are often arranged one above the other in the direction of the warp and a large number of ground ends inserted between them, thus forming a cloth having a **spot stripe** running through it. Fig. 11 shows a design of this description, a simple round spot being arranged so that as the design repeats in the cloth, the spots will be repeated one over the other throughout the length of the cloth. The ground weave is the 4-harness basket and is repeated so that the spotted stripes down the length of the cloth will be separated by 43 ends of the ground. This separation of the stripes can of course be increased or diminished to suit any requirements, by

simply inserting the required number of repeats of the ground weave. If this weave were woven with a warp

arranged 1 end of black and 1 end of red for 20 ends and then 42 ends of red, and a solid-red filling used, a stripe of black spots would be formed on a red ground.

Stripe spot effects are often arranged so that spots of two or more different colors are formed, often alternately one above the other. When this is the case, 2 extra-warp ends must be inserted together between the ground ends; that is, if two differently colored spots are to be formed. Fig. 12 shows a design arranged in this manner. If the warp were arranged 1 black, 1 white, 1 red, for 18 ends, 1 black, 1 white, 80 red, and woven with red filling, a red fabric would be formed with a stripe composed of alternate spots of black and white. The lower spot in Fig. 12 would form a black spot and the upper one a white spot.

13. Harness and Chain Drafts. In making harness, or drawing-in, and chain drafts for extra-warp fabrics, it is advisable to

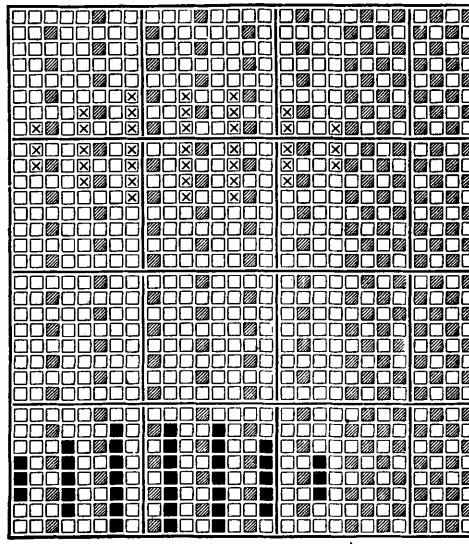
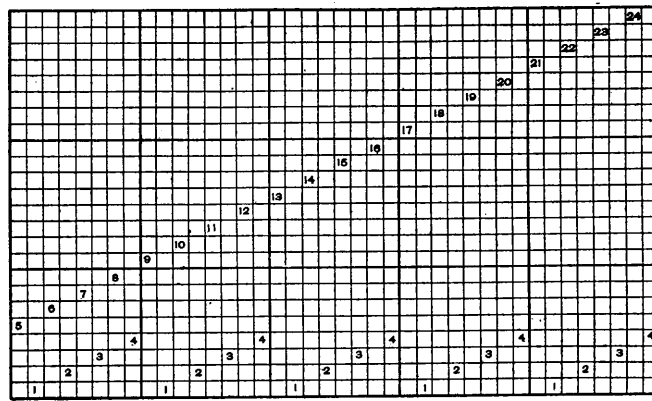


FIG. 12 10x

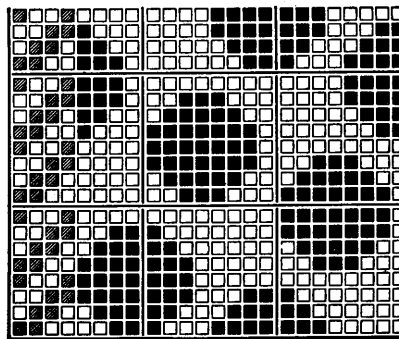
separate the harnesses carrying the ground ends from those carrying the extra-warp ends, since fabrics of this description require two beams, owing to the difference in take-up between the ground warp and the extra, or figuring, warp. It is customary to draw the ground ends on the front harnesses and the extra-warp ends on the back harnesses, although this is a matter of very little importance. The design could just as well be woven with the extra warp

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drawn on the front harnesses as with the ground warp drawn on the front harnesses, but the latter is a little more convenient, since the ground warp in many cases contains a greater number of ends than the figuring warp; consequently there is a greater liability of the ground ends breaking, and



(a)

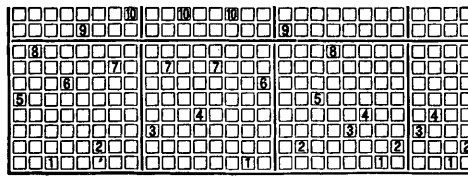


(b)
FIG. 13

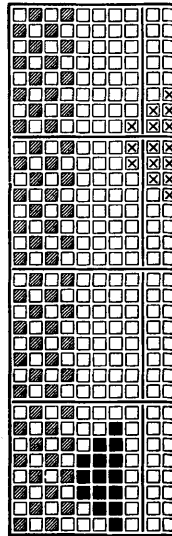
if drawn on the front harnesses, it is very much easier to tie ends in when they break in the loom. Fig. 13 (a) shows the drawing-in draft for the design shown in Fig. 8 (d), while Fig. 13 (b) shows the corresponding chain draft. From a careful study of these drafts, their method of construction

will be readily apparent and no further explanation will be necessary.

As another illustration, however, using a somewhat different case, Fig. 14 (a) and (b) is given. Fig. 14 (a) is the drawing-in draft, and Fig. 14 (b) the chain draft for Fig. 12. There are two distinct systems of extra warp; the ground



(a) 10x



(b)

FIG. 14

ends have been drawn on the first 4 harnesses, the black extra warp on the second set of 3 harnesses, that is, on the fifth, sixth, and seventh harnesses, and the white extra warp on the eighth, ninth, and tenth harnesses. By separating the warp into three systems in this manner, the first

4 harnesses will carry red ends only, while the fifth, sixth, and seventh will carry only black ends, and the eighth, ninth, and tenth only white. This makes it much easier for the weaver when tying in broken ends than would be the case if the black and the red extra-warp ends were drawn in on alternate harnesses, as they appear in the design; that is, this design could be drawn in so that the first 4 harnesses would contain the ground ends; the fifth harness, black extra-warp; the sixth harness, white extra-warp; the seventh harness, black extra-warp; the eighth, white extra-warp; the ninth, black extra-warp; and the tenth, white extra-warp. If this method were used, there would be some liability of the weaver drawing the extra-warp ends through the wrong harnesses when tying in broken ends. A careful comparison of Fig. 14 (*a*) and (*b*) and Fig. 12 will show distinctly the method of constructing the harness and chain drafts.

EXAMPLES FOR PRACTICE

1. Arrange Fig. 3 (*c*) as an extra-warp spot design, using the plain weave as a ground weave.
2. Show harness and chain drafts for the design made in answer to example 1, showing the ground ends drawn on the 4 front harnesses.
3. Arrange Fig. 2 (*c*) as an extra-warp spot design, using the 4-harness cassimere twill for a ground weave.
4. Show harness and chain drafts for the design made in answer to example 3.
5. Show harness and chain drafts for Fig. 11, drawing the ground weave on 4 harnesses.

SPOTS FORMED BY EXTRA FILLING

14. Cloths in which the spot is formed on the surface by an extra, or figuring, series of filling yarn are constructed very similar to extra-warp fabrics, except that the spots are produced by filling yarn instead of warp yarn. The structure of the fabric may be said to be practically the same; that is, the cloth consists of a ground, or body, woven with a simple weave, and spots produced by flushes of extra filling on the face at certain points, while when the figuring filling is not to be used to form a spot, it floats on the back of the

cloth. In constructing fabrics of this kind, place the spot figures on the design paper, alternating each pick with a blank pick, on which the ground weave may afterwards be inserted.

After deciding on a certain spot and arrangement of spots, the spots must be so placed on the design that the filling will flush on the face at those points where it is desired to have

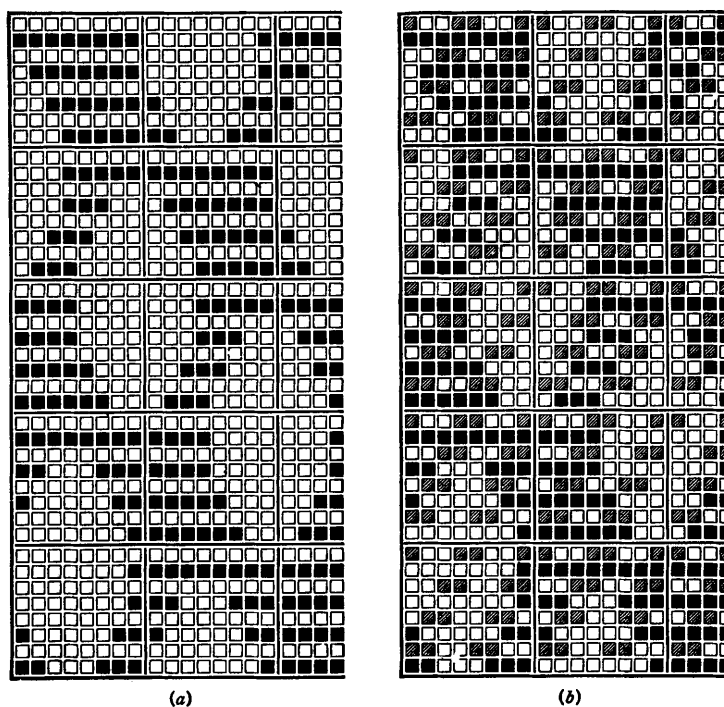


FIG. 15

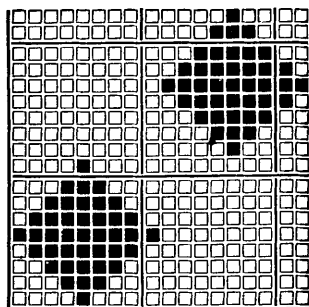
the spots appear. For instance, suppose that it is desired to arrange Fig. 8 (a) for an extra-filling design. Separate the picks and place them on design paper, as shown in Fig. 15 (a); wherever it is desired to have the spot appear, the filling is allowed to flush on the face, and at every other place the entire warp is raised over the pick of filling so that it will float on the back of the cloth. Fig. 15 (a) represents the

exact reverse of Fig. 8 (*a*), with the exception, of course, that Fig. 15 (*a*) is opened out, the picks being separated by blank picks. To complete the design it is now only necessary to insert the ground weave on the blank picks that are left for its reception. The completed design is shown in Fig. 15 (*b*), in which the 4-harness, or cassimere, twill has been inserted as a ground weave. While with extra-warp fabrics twice as many ends as picks were required, in extra-filling fabrics twice as many picks as ends are required, that is, if the spots are not separated by several picks of ground.

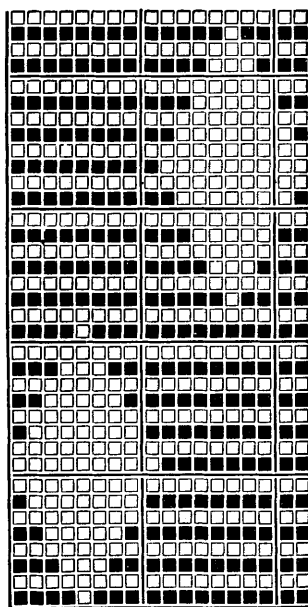
15. To illustrate further the method of forming designs of this type, suppose that it is desired to arrange the spot shown in Fig. 16 (*a*) as an extra-filling design. Fig. 16 (*b*) shows this spot arrangement placed on the design paper occupying 18 ends and 36 picks; that is, Fig. 16 (*b*) occupies the same number of ends and twice as many picks as Fig. 16 (*a*). Inserting a plain ground weave, as shown in Fig. 16 (*c*), completes the design, which will produce a spot arranged in plain order. If either Fig. 15 (*b*) or Fig. 16 (*c*) is woven with a solid-red warp, and picked 1 white and 1 red, white spots will be produced on a red fabric, and in the case of Fig. 15 (*b*), the arrangement, shape, and size of the spots will be exactly the same as in Fig. 8 (*d*), except that the spots in Fig. 15 (*b*) will be formed with an extra-filling yarn, while in Fig. 8 (*d*) they are formed with extra-warp yarn.

16. Tying.—In cases where the extra-filling yarn is to be cut from the back of the cloth, each float of extra filling on the face of the cloth may be bound in a manner similar to that explained in connection with extra-warp fabrics. This is accomplished by allowing the filling to be depressed under 1 end and float over 1 end at each end of each filling float on the face, thus tying the fabric in the same manner as the extra warp was tied. Also, if the floats of filling on the back of the cloth are not cut off and are very long, it is well to tie the extra filling to the body of the cloth. This may be accomplished by raising the pick of filling over a single end at a point somewhere near the middle of the float on

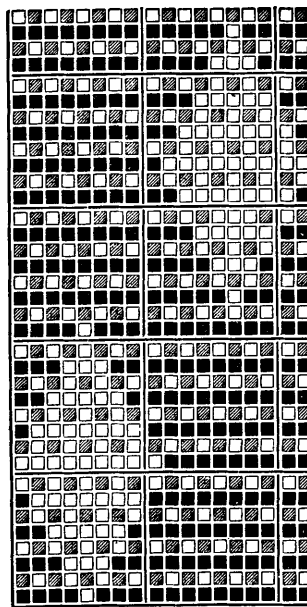
the back, arranging this tying place so that the extra filling will be raised over an end between two picks of the ground filling that are raised over the same end. These two filling



(a)



(b)



(c)

FIG. 16

flushes of the ground will cover the tying place so that it cannot be seen on the face of the cloth.

17. In arranging the harness and chain drafts for extra-filling fabrics, no difficulty should be experienced, since the fabrics are woven with a single system of warp and drawn in exactly like a simple fabric, usually being arranged as a straight draft.

EXAMPLES FOR PRACTICE

1. Arrange Fig. 3 (*c*) as an extra-filling design, using the plain weave for the ground.
2. Arrange Fig. 9 (*a*) as an extra-filling design, using the cassimere twill for the ground weave.
3. Arrange Fig. 10 (*a*) as an extra-filling design, using the 4-harness basket weave for the ground.
4. Make an original spot figure and arrange it in 6-end satin order as an extra-filling design to be complete on 30 ends and 60 picks.
5. Show harness draft for the design made in answer to example 3.