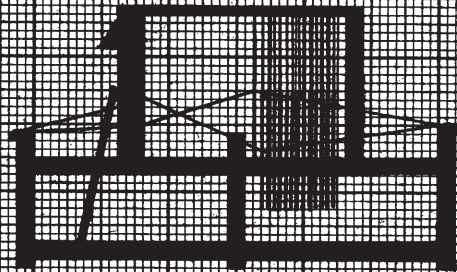
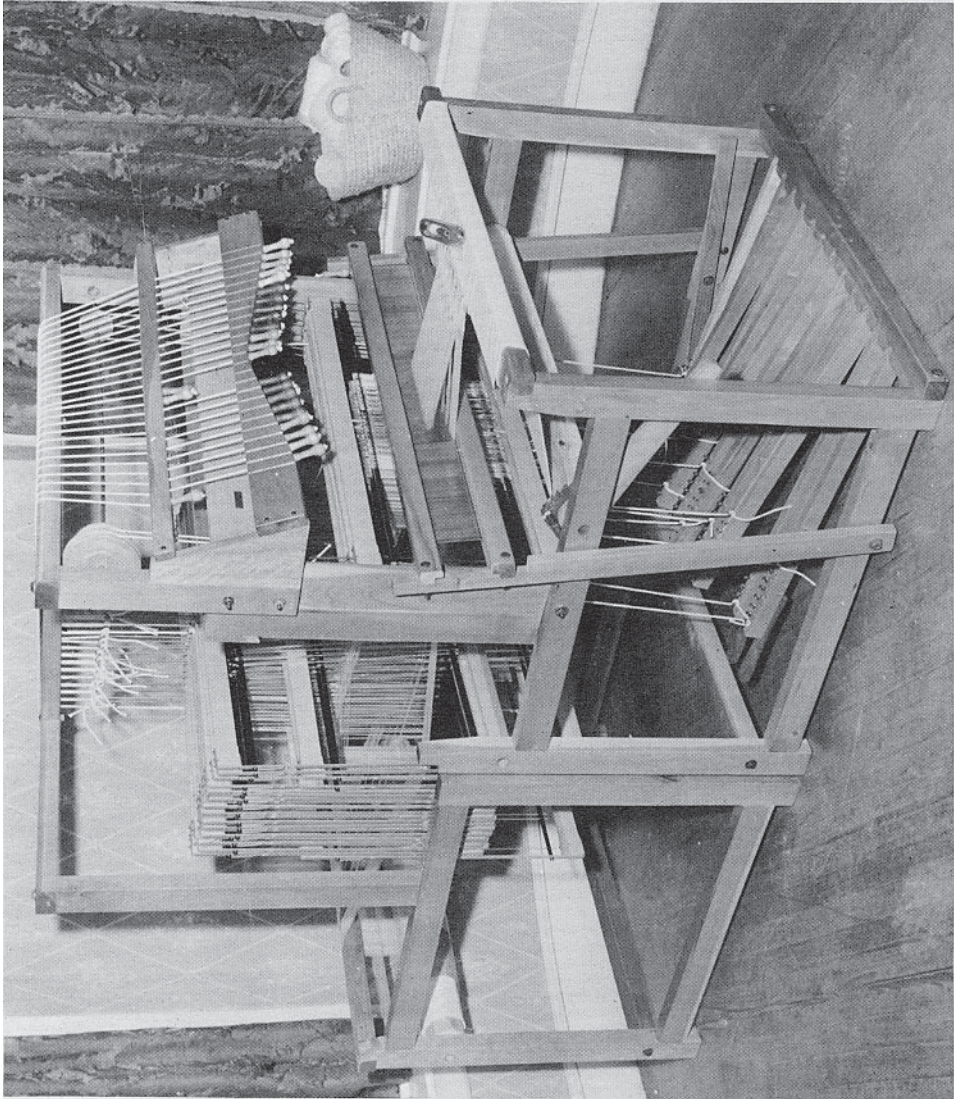


**WEAVING
ON A
DRAW-LOOM**

Part I



Ruth Arnold



PURRINGTON DRAW-LOOM

WEAVING ON A DRAW-LOOM

by

RUTH ARNOLD

PART I. TEXT AND EXPLANATION OF DIAGRAMS

PART II. ILLUSTRATIVE DIAGRAMS

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FOREWORD BY THE MAKER OF THE DRAW-LOOM

In this day of automation and the production line, more and more of us are left with time to pursue our desires. For many, this desire is to create the beautiful, the unusual, or the useful.

One medium for expressing this creative desire is hand-weaving. Through the use of different materials, colors, textures, and designs, the weaver can express his ideas in an infinite variety of textiles. To facilitate these expressions, many hand-operated looms have been evolved. To simplify the weaving of many of the more intricate designs, the draw-loom was developed. While this type of loom has long been used in other countries, up until now it has had very little popularity in the United States.

Mrs. Herbert J. Arnold recently studied "dragrustning" in Sweden. She brought back the basic principle from which I developed the Purrington Draw-loom pictured here. A careful study of the picture will reveal our modern eight-harness loom at the front, while the back half contains the 25 draw-harnesses. These draw-harnesses are operated by the draw-knobs at the front of the loom within easy reach of the weaver. The back harnesses control the pattern and design of the material, while the front harnesses and treadles control the ground weave.

A first impression is that the operation of this draw-loom is complicated. Quite the contrary, it is extremely simple in threading, tie-up, designing, and weaving. Weavers coming to my home are invited to try the Purrington Draw-loom. Without previous instruction in draw-loom weaving, and with only a few suggestions from me, they are able to weave acceptable damask. Recently five different weavers participated in the weaving of one piece without difficulty and without mistakes.

The flexibility and ease of operation of this loom make it possible for the creative weaver to produce readily a wider range of original designs.

Rollo Purrington
Haydenville, Massachusetts

PREFACE

This brief book was written primarily as an instruction manual for the Purrington Draw-loom. The diagrams are the principal part of the book, and the text is an explanation of the diagrams with some additional material. It is not a textbook on weaving and is not designed to be.

In order to have both a diagram and the explanation of this diagram before the reader at the same time, the two parts are bound separately. Either part is incomplete without the other and the two should be used together.

The four weaves discussed were chosen because they are particularly suited to pattern weaving. A fuller discussion of damask is given than for the other three weaves because there is less material on damask available in the books on hand-weaving. This is to be expected because a draw-loom is necessary for weaving damask of more than a very few blocks.

I wish to express my appreciation and gratitude to:

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"Föreningen Handarbetets Vänner", Stockholm, Sweden, for allowing me to study their draw-loom; and to Ann-Beat Carlson, Principal of the Weaving School, for her excellent instruction.

My husband, Herbert J. Arnold, for his unfailing encouragement and invaluable assistance.

Ruth Arnold

A draw-loom is a type of loom used to weave damask and other pattern weaves having designs of many blocks. It is a multiple-harness loom which differs from the usual type in having an arrangement whereby the warp threads may be raised independently of the weaving harnesses. There are two types of draw-loom used by handweavers. The principle of operation is the same for both types. In one type the warp threads are raised by pulling up groups of heddles; in the other, the heddles pulled up are on harnesses or heddle-bars. In the first type a group of heddles is tied to a cord that passes through a reed above the heddles. This cord is then carried to the front of the loom where it passes through a second reed and ends in a loop. The construction and operation of the second type of draw-loom will be described later in greater detail.

Some of the advantages of weaving on a draw-loom are:

1. It is possible to weave patterns of many more blocks than on the usual type of multiple-harness loom.
2. The blocks may be woven in any combination, since each block is controlled individually.
3. The weave is carried on the front harnesses independent of the pattern. This makes the treadling both simple and easy. In the four weaves discussed here, the maximum number of front harnesses used at the same time is three.
4. There is no complicated "tie-up". On the usual type of multiple-harness loom the tabby for a 25-block pattern in the spot-bronson weave would involve 26 harnesses; in "summer and winter", 25 harnesses.
5. Double damask may be woven in patterns of many blocks. This is impossible on a multiple-harness loom of the usual type. Each block would require eight harnesses; to weave a 25-block pattern, 200 harnesses would be necessary.
6. Designing a fabric to be woven on a draw-loom is much simpler. Because the pattern is threaded separately from the weave, and since each block is controlled individually, the number of available treadles does not limit the number of combinations possible. The threading draft is easily planned, because the weave (threaded on the front harnesses) is the same for all blocks; while each block of pattern is threaded through one back harness.

The draw-loom illustrated is a Lane eight-harness loom with a structure to hold the draw apparatus bolted to the rear of the loom. The castle has been raised to allow pulleys to be added. The back and warp beams have been moved to the rear of the draw-apparatus frame. The eight front harnesses are equipped with 10-inch, long-eyed, flat steel heddles, with 3-1/4-inch heddle eyes. The jack action has been modified to allow the front harnesses to move reciprocally in pairs. A cord tied to the jack of one harness passes over a pulley and is tied to the jack of the paired harness. Front harness 1 is paired with 8, 2 with 7, 3 with 6, and 4 with 5 (see Figure 1).

When treadle 1 is pressed down, harness 8 is raised; when 8 is lowered, 1 is raised. The other three pairs of harnesses work in the same way.

The bank of 25 back pattern harnesses is hung by cords some distance behind the bank of eight front harnesses. Each cord goes through a hole in the top board of the draw-apparatus, then to the front of the loom, and ends in a handle (see Figure 1A).

When a back harness is pulled up, the handle locks in a slot. The slots are arranged on a wide-angled V, causing the farthest back harnesses to be pulled up

more than the nearest ones. This gives an even pattern shed at the reed (see Figure 1B).

The front harnesses carry the weave; the back harnesses carry the pattern. When a back harness is raised, all of the warp threads on the same block are raised. When certain of the front harnesses are lowered, some of the threads raised by the pattern harnesses are pulled down. This action will be described in greater detail in the discussion of each weave; for it will vary, as does the threading, with each particular weave.

In all the weaves described there are two sheds involved. The warp threads normally lie at the bottom of the long heddle-eyes. Pulling up the back harnesses raises the threads to the top of the long heddle-eyes. This is the pattern shed. The pattern shed is altered to the shed of the weave by using the treadles to raise and lower the front harnesses.

DESIGNING FOR THE DRAW-LOOM

In order to design a fabric, an understanding of the structure of the weave in which the design is to be woven is a necessity. One must know both the possibilities and limitations of the weave in order to create a suitable and workable design. In a block consisting of a definite number of warp threads, the size of yarn to be used and the sett of the warp will determine the size of the block when woven. An eight-thread damask has both warp and weft floats of seven threads, the eighth thread in each case is the "stitcher". It is desirable, therefore, to use fine yarn set closely in weaving damask. In contrast to damask the warp threads in Swedish lace woven of the same yarn would be set farther apart. The same design would be quite different when woven in the two weaves because of the difference in the size of the blocks and in the texture of the fabric.

The first step in weaving on a draw-loom is to make the design. The design is made on graph paper. To get an accurate picture of size and spacing it is well to use paper where each square is the space occupied by one block of the design. For example: If it is planned to use 50/2 linen set at 60 per inch with a six-thread block, the graduation of the graph paper used in making the design would be ten per inch. If a plain border is desired, one block of the 25 blocks represented by the 25 back harnesses, will be reserved for the border. This will leave 24 blocks for the design. If background space is to be left between repeats of the design, another block must be reserved for this space. This leaves 23 blocks for a design. In Figure 2B, one repeat of a straight threading is shown which represents 25 blocks. If a four-thread block is used, the draft represents 100 threads; if each block is composed of six threads, there would be 150 warp ends in one repeat of the pattern. This may be repeated several times until the desired width is attained. When woven, the design will appear as many times as this straight threading is repeated. In drawing the design a sufficient number of repeats should be drawn to give an accurate picture of the spacing of the whole piece. A design which seems attractive when drawn only once, may appear much less so when repeated several times.

Figure 3 illustrates the method of drafting a design. A is a condensed draft where each square represents one block of warp threads and the weft threads required to weave one block. In this design block 1 is reserved for the border. The number of warp threads and the number of weft picks will vary with the weave.

In some weaves, such as damask and double-cloth, designs using half-blocks in the vertical direction can be woven. The design in Figure 3B illustrates the method of drawing a design under the condensed draft. The design in Figure 3C shows the use of half-blocks. The designs in both B and C in Figure 3 are drawn on 19 blocks giving a space of five blocks before the design is repeated horizontally. Any design that can be drawn on 24 blocks may be woven on this pattern threading. Since each pattern harness is controlled separately, the 24 blocks may be used in any combination. The design may consist of any number of blocks desired in the vertical direction.

The same figure of the design may be repeated in a different position. The figures in the second row may be shifted so that they are not directly over those in the first row. The leaves shown in Figure 3 are drawn under blocks 4 through 22. If the second row of leaves were to start on block 16 instead of block 4, a "half-drop" design would be produced. The same figures may be reversed or inverted as well as shifted. The second row of figures may be an entirely different design as well as in a different position.

A design with bilateral symmetry constructed on 24 blocks may be as much as 47 blocks wide. By threading the pattern harnesses so that the order of threading is reversed, a "point" threading is produced. Figure 4 is a condensed draft for a "point" threading with block 1 reserved for a plain border. Here, too, each square on the draft represents one block. Any symmetrical design that can be drawn under this draft can be woven on this threading.

If one wishes to weave a piece with a border of design, some of the blocks are reserved for the border parallel to the selvages. The remaining blocks are repeated in the same order to the center. If the design of the border is to be symmetrical, the order is then reversed to the other selvage. Figure 5 is a condensed draft for the pattern threading for a border on all sides of the piece to be woven. In this draft the figure that is repeated can be 12 blocks in each direction. The 24 blocks may be divided in other proportions than 12 and 12, depending on the design to be woven. If a wide symmetrical border is desired, a "point" threading can be used. These are but a few of the many possible arrangements of the 25 blocks. They are used only as illustrations of possible combinations, not as suggestions for pattern.

The straight threading is especially useful in center designs because many different designs can be woven on the same threading. When the loom is threaded for a particular pattern there are fewer possibilities.

This discussion has been concerned only with the mechanics of making a design using the 25 blocks available. No attempt will be made here to give directions for designing. One way to produce a design is to draw a condensed draft on graph paper and then to draw on the squares under the draft until a design that pleases is achieved. There are ideas all about which will suggest designs which can be made on squared paper. Producing a design to weave is no small part of the fun of weaving on a draw-loom.

THREADING THE DRAW-LOOM

To thread the draw-loom from the front:

1. Thread the reed in the usual manner.
2. Thread the long-eyed heddles on the front harnesses. The threading will

vary with each weave. The threading draft for each of the weaves discussed is given.

3. Make a tabby shed and put in a lease stick behind the front harnesses. Pull the lease stick back. Make the other tabby shed and put in the second lease stick behind the front harnesses. Tie the lease sticks together and fasten them a short distance in front of the bank of back pattern harnesses. This step is not absolutely necessary, but it makes the threading of the back harnesses more convenient by bringing the warp threads within easy reach.

4. Thread the back harnesses from the lease which has just been made, by blocks following the pattern to be woven. The size of the block will depend on the weave. One unit of one block of "summer and winter" will be four threads; in damask it may be four, six, or eight threads, depending on the size of the figures desired and the size of the yarn used. All the threads of one block are threaded on the same harness. Figure 2A is the threading draft for a "straight" threading of the pattern harnesses using a four-thread block. Each square represents one thread. Note that pulls 1 through 13 are connected to the odd-numbered back harnesses, and pulls 14 through 25 are connected to the even-numbered harnesses. The condensed draft below the threading indicates the blocks. The draw-apparatus is constructed in this way to avoid crossing the cords, which would produce undue wear from friction. In any threading of the pattern harnesses, block 1 is threaded on back harness 25, block 2 on harness 23, etc. In weaving, block 1 is represented by the first pull on the right, block 2 by the second, block 3 by the third, and so on.

Below is a table showing the connections between the pulls and the back pattern harnesses.

<u>Pulls</u>	<u>Back Harnesses</u>	<u>Pulls</u>	<u>Back Harnesses</u>	<u>Pull</u>	<u>Back Harnesses</u>
1-----	25	9-----	9	17-----	8
2-----	23	10-----	7	18-----	10
3-----	21	11-----	5	19-----	12
4-----	19	12-----	3	20-----	14
5-----	17	13-----	1	21-----	16
6-----	15	14-----	2	22-----	18
7-----	13	15-----	4	23-----	20
8-----	11	16-----	6	24-----	22
				25-----	24

In drafting designs, block 1 corresponds to pull 1, block 2 to pull 2, and so on. This system makes the threading a little more complicated, but makes the weaving and drafting much simpler.

Figure 6 represents the top of the draw-apparatus. It shows the cords from the back harnesses passing through the top board to the front of the loom, then through the holes on the "key-board". The diagram illustrates the connections listed in the table above.

5. Tie the warp to the warp beam and wind it on the beam.

If the loom is threaded from the back the same steps are followed in the reverse order.

When the warp has been tied to the cloth beam, the draw-loom is dressed and ready for weaving.

DAMASK

Damask is a fabric woven in the satin weave. Satin is either warp-faced or weft-faced. The figures of the design woven may be weft-faced satin with a warp-faced satin background, or warp-faced satin with a weft-faced satin background. Usually the figures of the design on the upper face of the finished fabric are in weft-faced satin. In either case the cloth is reversible. What is warp-faced on one side will be weft-faced on the reverse side.

The first step in weaving damask is to make the design. From the design a working draft for weaving is made. The next step is to make the threading draft for the pattern harnesses. Now the warp can be planned. The sett of the warp in the reed depends upon the size of yarn used. 50/2 linen set at 60 ends per inch produces a good warp. If a finer yarn is used it should be set closer. A warp coarser than 50/2 linen does not give a lustrous warp-faced satin in linen damask.

The problem in weaving damask is to weave both warp-faced satin and weft-faced satin on the same pick. Satin is woven on a twill threading. The simplest satin weave requires five harnesses. A broken twill woven on four harnesses is frequently called satin but it is not a true satin. The smooth, lustrous surface of satin is produced by relatively long weft or warp floats. In weft-faced satin, the weft thread passes over several warp threads and under one; in warp-faced satin, the weft passes under several warp threads and over one. The pattern of damask is produced by the different directions of the two satin weaves without contrast of color. Damask woven on a five-thread satin is called "single damask". Damask woven on an eight-thread satin is called "double damask", and is usually woven with about 50 per cent more picks than warp ends per inch. For double damask the satin weave is threaded as an eight-harness twill on the front harnesses (see Figure 7). The eight front harnesses carry the weave and the 25 back harnesses control the pattern. When the pattern is woven, the shed through which the weft passes is produced by raising and lowering harnesses in the front set, and raising harnesses in the back set.

Figure 7A is the threading draft for an eight-thread satin damask. It represents the straight threading shown in the condensed draft in 7B. The front harnesses are threaded to a straight eight-harness twill. Each pattern block is six threads. The tie-up of the treadles for the regular 8-harness satin is shown in 7C.

One front harness is lowered for each pick; as a result the other harness of the pair is raised (see Figure 1). To avoid the diagonal line characteristic of twills, the harnesses are not lowered in order, that is, the twill is "broken". One order commonly used in lowering the harnesses in the eight-thread satin weave is 1-4-7-2-5-8-3-6. The thread that is lowered "stitches" or binds the floats of the warp-faced blocks, while the thread that is raised "stitches" the weft-faced blocks.

In weaving damask, weft-faced satin figures on a warp-faced satin background, there are really two sheds involved. First the pattern shed is made by pulling up the back harnesses that are to be background on the block being woven. This raises some of the threads in the long-eyed heddles. These will become warp-faced satin. The remaining threads are still in the normal position at the bottom of the long heddle-eyes. These will become weft-faced satin. Eight picks (one block) are woven by raising and lowering the front harnesses, using the treadles in the order given above (see Figure 7C). If the design changes with the next

block, the pattern shed is changed by manipulating the draw-apparatus and the same eight picks are repeated.

In each pick the weft passes under seven threads and over one of the threads raised by the draw-apparatus producing the warp-faced satin background. In the blocks that are not raised, the weft passes over seven threads and under one, producing the weft-faced satin figures of the design.

Figure 8 shows the steps involved in weaving the eight weft threads (one block), where block 1 is to be warp-faced satin background and block 2 is to be weft-faced satin pattern. (Because of its greater size, Figure 8 is out of sequence in Part II.)

A shows the warp threads in their normal position at the bottom of the long heddle-eyes on the front harnesses.

B shows the change in position of the warp threads when the pattern shed is opened by pulling up back harness 1 on the draw-apparatus. The threads of block 1 are now at the top of the long heddle-eyes, and the threads of block 2 lie in their normal position at the bottom of the long heddle-eyes. The pattern shed shown at B remains the same for the eight weaving sheds shown in C through J.

C shows the change produced in the pattern shed when front harness 1 is lowered by treadle, causing the other harness of the pair, harness 8, to be raised. This is the weaving shed for the first pick.

D shows the weaving shed for the second pick. Harness 4 is lowered causing harness 5 to be raised.

E shows the weaving shed for the third pick. Harness 7 is lowered causing harness 2 to be raised.

F shows the weaving shed for the fourth pick. Harness 2 is lowered causing harness 7 to be raised.

G shows the weaving shed for the fifth pick. Harness 5 is lowered causing harness 4 to be raised.

H shows the weaving shed for the sixth pick. Harness 8 is lowered causing harness 1 to be raised.

I shows the weaving shed for the seventh pick. Harness 3 is lowered causing harness 6 to be raised.

J shows the weaving shed for the eighth pick. Harness 6 is lowered causing harness 3 to be raised.

Figure 9 is a side view of the sixteen threads shown in Figure 8D. The eight front harnesses are indicated by the eight long-eyed heddles at the left. Each of these heddles represents two heddles on a front harness. At the right of the diagram two back harnesses are indicated by a single heddle for each harness. Each of these heddles represents eight heddles on a back pattern harness. The threads of block 1 have been raised on the draw-apparatus; those of block 2 are in the normal position even though they may appear to have been pulled down. The back pattern harnesses are hung so that when they are in the normal (not raised) position, the heddle-eyes are below the level of the heddle-eyes on the front harnesses.

Front harness 4 has been lowered, thus raising the other harness of the pair, harness 5. The fourth thread in block 1, the raised block, has been pulled down to the bottom of the shed, and the fifth thread of block 2 has been pulled up to the top of the shed. These are the "stitchers" for this pick.

The same sixteen threads are shown at the bottom of the diagram. Here the threading draft (an eight-harness twill) indicates the heddles on the front harnesses. The two rows of heddle-eyes at the right indicate the two back harnesses.

The upper part of this diagram shows how the "stitchers" are crossed when a weaving shed is opened for the second pick. A crossing of the "stitchers" occurs in each of the eight weaving sheds when the design is being woven.

The warp threads are crossed in a similar way in each of the other three weaves to be discussed later.

Figure 10 represents a flat view of the cloth with eight weft threads interlaced with the sixteen warp threads in Figure 8. The warp threads are connected to the corresponding squares in the threading draft shown above the flat view. This flat view shows the long warp floats of block 1 and the long weft floats of block 2.

The tie-up is shown at the right of the threading draft. Below the tie-up, to the right of the flat view, the treadling for the eight weft picks is given. The cross-sections for each of the eight picks are at the left of the flat view, connected by lines to the corresponding weft threads in the flat view.

When weaving damask in eight-thread satin, the same eight picks are repeated throughout, regardless of any changes in the pattern shed. In other words, the order of the treadling is constant.

Figure 11 is the working draft for weaving in damask the maple-leaf design shown in Figure 3C. This design is chosen for illustration because it shows the use of half-blocks. Each small square, reading vertically, represents one weft thread; four small squares, one half-block; and eight squares, one block. Each group of four small squares, reading horizontally, represents one pattern block. If the damask is to be woven on the threading draft shown in Figure 7A, each block represents six warp threads. The working draft would be the same regardless of the number of threads in each pattern block. The numbers on the working draft indicate the pulls which raise the back harnesses.

If the loom is threaded for damask in the pattern shown in Figure 3A, a place mat using the maple-leaf design is woven as follows:

1. Weave four inches of weft-faced satin. Use only the front harnesses and treadles. Lower the front harnesses in the order 1-4-7-2-5-8-3-6. There should be two beats after each pick; for example, step on treadle 1, throw the shuttle through the shed, and beat once. Change to the next shed by lowering harness 4; a second beat on the open shed clears the shed for the next pick. The second beat is necessary because the threads tend to cling together when set closely in long-eyed heddles.
2. Raise all the back harnesses except the harness controlled by pull 1. (The harness controlled by pull 1, block 1, has been threaded for the border). Weave the warp-faced background for the design, using the treadles as before, until one-half inch has been woven.
3. Start the design by weaving the first block, beginning at the bottom of the working draft and working up.

Block 1 First half-block.

Pattern shed: Lower the two harnesses controlled by pulls 15 and 16. Weave harnesses 1-4-7-2 (or treadle 1-2-3-4).

Second half-block.

Pattern shed: Raise the harness controlled by pull 16 and lower the harness controlled by pull 14. Weave harnesses 5-8-3-6 (or treadle 5-6-7-8).

Block 2. First half-block.

Pattern shed: Same as for block 1, second half. Weave harnesses 1-4-7-2.
Second half-block.

Pattern shed: Raise the harness controlled by pull 15 and lower the harness controlled by pull 13. Weave harnesses 5-8-3-6.

Block 3 First half-block

Pattern shed: Same as for block 2, second half. Weave harnesses 1-4-7-2.
Second half-block.

Pattern shed: Lower the harnesses controlled by pulls 9 and 12.

Weave harnesses 5-8-3-6.

The weaving continues in the same manner until all the blocks have been woven. If there is to be background space between the rows of design figures, all the pattern harnesses except the border harness are raised and the desired length of warp-faced background woven, before beginning to weave the weft-faced design.

These directions serve only to illustrate how to make and follow a working draft. The working draft is not difficult to draw. Other weavers working on a draw-loom may work out different systems of drafting that will suit their needs better than this one. However, this method is a useful one and after very little practice it is easy to follow.

SPOT WEAVES

In general the spot weaves are "fifty-fifty" weaves; that is, the number of weft picks per inch is equal to the number of warp threads. The "spots" are produced by either warp or weft floats, usually on a ground of plain weave. The floats may be of heavier pattern yarn, of a different color, or of a different material from the warp. The "spot" may be a weave different from the background, for example, satin spots on a plain weave ground. Long warp floats appear on the back of the cloth where the spots are not woven on the surface. This weave requires a loom with two warp beams and will not be discussed here. Frequently, upholstery material is woven with spots of weft floats. The weft may be either part of the ground weave, or may be carried on the wrong side in long weft floats.

The spot weave discussed here will be of the spot-bronson type where the pattern weft is also part of the ground weave. When there is a weft float on one surface of the cloth a corresponding warp float appears on the reverse side.

There are several threadings for spot weaves. The threading used and discussed here will be the spot-bronson threading in which there is a "stitcher," or binder, as the last thread of each block. This threading makes it possible to use the 25 blocks available in any desired combination. All the odd-numbered threads are on one front harness, the "stitcher" or binder, on another harness, and the remaining threads on a third harness. The other five front harnesses are not used. Figure 12 shows this threading for spot-bronson. Figure 12A shows the threading for this type of spot-bronson as it is usually written. Each block consists of six warp threads. Figure 12B shows the same threading for four blocks where each block consists of four warp threads. Figure 12C shows the threading on the draw-loom; two threadings for the front harnesses are given in this figure. Each threading has its own advantage. The tie-up for the threading in 12C1 is simpler; the weaving harnesses in 12C2 are closer together. Each block is six warp threads and corresponds to the threading shown in Figure 12A. Each square

represents one warp thread. Here, as in damask, the front harnesses carry the weave and the back harnesses carry the pattern. On the front harnesses the threading of each block is the same. When this is woven, there will be a float over five warp threads. If a shorter float of three threads is desired, the front harnesses will be threaded to a four-thread block. The back harnesses will also have a four-thread block. The condensed draft for the pattern harnesses for both threadings is the same and is shown in Figure 12D. The tie-up for the threading shown in Figure 12C1 is given in 12E, and the tie-up for the threading shown in Figure 12C2 is given in 12F.

If the design includes a border or selvage of plain weave, block 1 should be repeated for the desired width. In this case block 1 may be threaded on the front harnesses like the other blocks, or as follows: 1-8-1-8-1-8. To maintain an even tension, however, the threads on block 1 must be threaded through both front and back harnesses.

Swedish lace is usually woven on a spot-bronson threading when the pattern has more than two blocks. Since the "windows" are between the blocks, it is advisable to avoid single blocks in the design.

Figure 13 shows the sheds involved in weaving Swedish lace where block 1 is to be plain weave and block 2 is to be a lace spot.

A shows the warp threads in the normal position at the bottom of the long heddle-eyes.

B shows the warp threads of block 1 raised to the top of the long heddle-eyes by the draw-apparatus. This is a pattern shed.

C shows the weaving shed for the first and third picks (pattern picks). Front harness 1 has been lowered by treadle, raising harness 8.

D shows the tabby shed for picks 2, 4, and 6. Front harnesses 2 and 8 have been lowered, raising harness 1. This is a weaving shed.

E shows the second tabby shed for pick 5. Front harnesses 1 and 7 have been lowered, raising harnesses 2 and 8.

Figure 14A represents a flat view of cloth with six weft threads (one block) interlaced with the twelve warp threads illustrated in Figure 13. Block 1 will be plain weave and block 2 the lace spot. The warp threads are connected by broken lines to the corresponding squares in the threading draft shown above the flat view. The tie-up is shown at the right of the threading draft. The treading for the six weft picks of Swedish lace is at the right of the flat view.

Figure 14C shows the cross-sections for the three different picks --- one pattern and the two tabbies. The weft threads of the cross-sections are connected by broken lines to the corresponding weft threads in the flat view at 14A.

To weave Swedish lace on a draw-loom:

1. Weave plain weave for the hem and border. To weave plain weave or tabby on the threading shown in Figure 12, lower front harnesses 2 and 8 for one tabby shed and front harness 1 for the other tabby shed.

2. The design is woven from a working draft similar to the working draft for weaving damask. Since half-blocks are not woven in this weave, one block moving both horizontally and vertically may well be four small squares.

Pull up the back harnesses on the draw-apparatus corresponding to the numbers on the working draft. This is the pattern shed.

Pick 1. Lower front harness 1 by treadle, raising harness 8. The sixth and last

thread of the block (threaded on harness 8) stitches the float that passes over the first five threads of the blocks that were not raised on the draw-apparatus. Since every other warp thread is threaded on harness 1, a plain weave results on the blocks that have been raised, and weft floats are produced on the blocks that were not raised.

Pick 2. Weave a tabby by lowering front harnesses 2 and 8. Since harness 1 is paired with harness 8, harness 1 will be raised.

Pick 3. Repeat pick 1.

Pick 4. Repeat pick 2.

Pick 5. Lower front harness 1, raising harness 8; and raise harness 2 by lowering harness 7.

Pick 6. Repeat pick 2.

These six picks complete the weaving of one block of Swedish lace on the threading shown.

If an eight-thread block is used for Swedish lace, picks 1 and 2 will be repeated once more; that is, there will be three pattern picks each followed by the same tabby pick; then pick 5 becomes pick 7, and the tabby pick 6 becomes the eighth pick of the block.

Figure 14B shows a flat view of a spot-bronson weave done on the same threading as the Swedish lace. Here each pattern pick is followed by two tabby picks. The pattern picks are indicated by the heavier yarn and the two tabbies by the finer darker yarns. The treadling for this variation is given at the right of the flat view.

A cloth woven in this manner will not have the "windows" of the lace weave because of the two tabbies. This will be a firmer fabric than the lace weave. It can be seen from the flat view that if the pattern pick were to be removed entirely, a cloth of plain weave would remain.

There are other threadings for spot weave and other methods of weaving it. The threadings and methods of weaving given here serve to illustrate the possibilities.

SUMMER AND WINTER

"Summer and winter" is a type of spot weave. The pattern is produced by weft floats usually in a heavier yarn than the warp. The background consists of warp floats. On the reverse face of the cloth the pattern blocks that were weft floats are warp floats; and the blocks that were background are weft floats. Each pattern pick is held in place by a tabby pick. The tabby weft is usually much finer than the pattern weft.

The unit block of "summer and winter" consists of four threads, two of which are pattern. Either of the other two threads of the block may be used as the "stitcher", while the other becomes part of the group over which the weft pattern float passes. Figure 15A is a threading draft for "summer and winter" weave. The condensed draft shown in figure 15B shows a pattern under which a design can be drawn. This is a straight threading. The tie-up is shown in Figure 15C. As in the case of damask, the pattern can be threaded on the back pattern harnesses by dividing the 25 blocks available to produce borders, point threadings, etc. The first step in weaving "summer and winter" on a draw-loom is to make a working draft of the design to be woven. The blocks to be background are raised on the

draw-apparatus; then the front harnesses are raised and lowered to make the sheds through which the weft threads are woven.

Figure 16 shows the sheds involved in weaving "summer and winter", where block 1 is to be background and block 2 design.

A shows the eight threads of these two blocks in their normal position at the bottom of the long heddle-eyes.

B shows the shed produced when the four threads of block 1 are raised to the top of the long heddle-eyes by the draw-apparatus. This is the pattern shed.

C shows the weaving shed produced when the pattern shed shown at B is changed for a pattern pick by lowering front harness 1 and raising front harness 2. When the weft is passed through this shed, it will pass over the two pattern threads of block 2 and under the pattern threads of block 1, over the first thread of each block 1 and under the third thread.

D shows the shed for the other pattern pick produced by altering the shed shown at B by lowering front harness 2 and raising front harness 1.

E and F show the position of the threads in the long heddle-eyes for the two tabby picks.

The cross-sections G, H, I, and J illustrate the results when weft threads are passed through the sheds shown at C, D, E, and F.

In weaving "summer and winter" the blocks should "square". The number of picks required to weave a square block depends upon several factors: the size of the warp, how closely it is set, the size of the pattern weft, and the size of the tabby weft. There are many possible combinations of the four picks illustrated in G, H, I, and J. The flat views in Figure 17 show six combinations of the two pattern picks and the two tabby picks. The warp threads of the flat view are connected to the corresponding squares in the threading draft for the front harnesses.

A shows the traditional method of two picks of pattern on the same shed, each followed by a tabby; then two picks of the pattern on the other pattern shed, each followed by a tabby.

B shows the two different pattern picks each followed by two tabbies.

C and D show the fabrics produced by the use of one of the two pattern picks each followed by two tabbies.

E and F show the use of one of the two pattern picks at a time each followed by one tabby.

The flat views in Figure 17 show only six of the possible ways of weaving "summer and winter". There are others. A study of the flat views in Figure 17 will show that each of the various fabrics illustrated will be different from the others in either background, or pattern, or both. Like damask, "summer and winter" is a reversible cloth with the design on both sides, one the opposite of the other.

One great advantage of weaving "summer and winter" on a draw-loom is that the pattern shed on the draw-apparatus does not have to be changed for the tabby picks. The pattern shed is changed only when the design changes, as indicated on the working draft.

The working drafts for weaving designs in "summer and winter" will be the same as those used for the spot weaves.

The "summer and winter" threading shown in Figure 15A can be used as well for weaving a spot-bronson having a four-thread block. It would not be suitable

for Swedish lace, which is usually woven on a block of six or eight threads depending on the use to which the fabric is to be put.

When weaving spot-bronson on a "summer and winter" threading, the warp threads on front harness 3 correspond to those on front harness 1 in the spot weave threading given in Figure 12. Harness 1 of the "summer and winter" then becomes the "stitcher", or binder, of the floats, and corresponds to harness 8 in the spot weave threading.

DOUBLE WEAVE

Double weave is a type of weave in which two pieces of cloth are woven simultaneously, one below the other. There are several kinds of double weave; the one discussed here will be a double plain weave in which the two layers of cloth are fastened together by a pictorial design. The draw-loom is particularly suited to weaving this type of double weave. The design is controlled by the draw-apparatus and the front harnesses control the weave. As in the other weaves already discussed, the first step is to draw a design on graph paper using the 25 blocks available. From the draft of the design, a working draft is made.

Usually two contrasting colors of warp thread are used, one light and one dark. On one face of the cloth there will be light figures of the design on a dark background; on the reverse face the figures will be dark on a light background.

To weave a double cloth in plain weave, four of the front harnesses are needed. Any two of the four pairs may be used. Each block of the design represents four threads, two dark and two light. The weft should be of the same size yarn as the warp to give a "50-50" weave. Since there will be two layers of cloth, the warp should be set twice as closely as for a single cloth woven in plain weave with the same yarn.

Figure 18A is a threading draft for a 25-block double weave on a straight threading. The condensed draft for making a design to be woven on this threading is shown in Figure 18B. The light warp threads are represented by a hollow square, and the dark warp threads by a solid square. Front harness 1 is paired with 8, and 2 with 7 (see Figure 1). When front harness 1 is pulled down by treadle, harness 8 is raised. A plain weave will result from lowering these two harnesses alternately. A plain weave will also be produced by weaving on harnesses 2 and 7. The light-colored warp is threaded on harnesses 1 and 8, and the dark warp is threaded on harnesses 2 and 7. The tie-up is shown in Figure 18C.

Figure 19 illustrates the various sheds involved in weaving double plain weave on the draw-loom, where blocks 1 and 2 are to be dark background and blocks 3 and 4 are to be light design. The light warp threads are indicated by small hollow circles and the dark by solid black circles.

A is the pattern shed for the first and third picks in weaving double cloth in plain weave. Blocks 1 and 2 are raised on the draw-apparatus, raising the warp threads to the top of the long heddle-eyes.

B shows the weaving shed for the first pick. Front harness 1 has been pulled down by treadle, raising the other harness of the pair -- harness 8.

C is the pattern shed for the second and fourth picks. Blocks 3 and 4 are raised on the draw-apparatus.

D shows the weaving shed for the second pick. Harness 2 has been pulled down by treadle, raising the other harness of this pair -- harness 7.

E shows the weaving shed for the third pick. Harness 8 has been lowered, thus raising harness 1.

F shows the weaving shed for the fourth pick. Harness 7 has been lowered, raising harness 2.

If the design being woven is so spaced that there are sections of background between the figures of the design, pick 3 may follow pick 1, and pick 4 may follow pick 2. The order of the picks would then be 1, shed shown at B; 3, shed shown at E; 2, shed shown at D; and 4, shed shown at F. The advantage of this order would be that the pattern shed need be changed only half as often as when weaving the figures of the design. (The pattern harnesses as well as the front harnesses are used in weaving plain double cloth on this threading.)

Figure 20 is a flat view showing the same four blocks and four weft picks. The warp threads are connected to the corresponding squares in the threading draft for the four blocks above the flat view. This flat view shows the dark fabric lying above the light fabric in blocks 1 and 2, and the light fabric lying above the dark in blocks 3 and 4. The tie-up is shown to the right of the threading draft. The treadling for the four weft picks is shown at the right of the flat view. The cross-section resulting from weaving one block, four weft threads, is shown below the flat view. The light weft weaves only the light warp, and the dark weft weaves only the dark warp. Where the weft threads cross from top to bottom between blocks 2 and 3, the two fabrics are stitched together.

A light-colored design in plain weave on a dark background of plain weave is woven on the draw-loom as follows:

1. Raise the blocks that are to be background on the draw-apparatus. This is the pattern shed.
2. Lower front harness 1 by treadle, raising harness 8. Weave the light weft through this shed.
3. Raise the blocks that are to be light design on the draw-apparatus. This is the pattern shed.
4. Lower front harness 2, raising harness 7. Weave the dark weft through this shed.
5. Raise the blocks that are to be background on the draw-apparatus.
6. Lower front harness 8, raising harness 1. Weave the light weft through this shed.
7. Raise the blocks that are to be light design on the draw-apparatus.
8. Lower front harness 7, raising harness 2. Weave the dark weft through this shed.

This constitutes one block of the weave. Two layers of cloth have been produced which are stitched together by the design blocks coming to the upper surface.

This is but a small start in setting forth the possibilities of weaving on a draw-loom. It was not intended to give, in these brief directions, a complete discussion of the fundamental structure of the four weaves described. The purpose of this manual is to explain how these weaves may be woven on a simple type of draw-loom. There are several excellent books written for the handweaver which give detailed explanations of these weaves. The weaver who wishes additional information should consult the books listed in the bibliography.

If this serves only to give some idea of what can be done in the wide field of multiple-harness pattern weaving, and to acquaint handweavers with a simple type of draw-loom, its purpose will have been accomplished. To the handweaver who

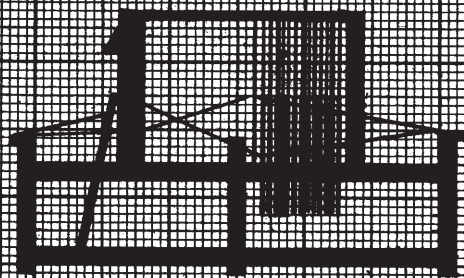
likes to explore new paths and to create fabrics of original design, the draw-loom offers great opportunity to achieve the satisfaction that comes from creating new and beautiful fabrics.

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**WEAVING
ON A
DRAW-LOOM**

Part II



Ruth Arnold

WEAVING ON A DRAW-LOOM

by

RUTH ARNOLD

PART I. TEXT AND EXPLANATION OF DIAGRAMS

PART II. ILLUSTRATIVE DIAGRAMS

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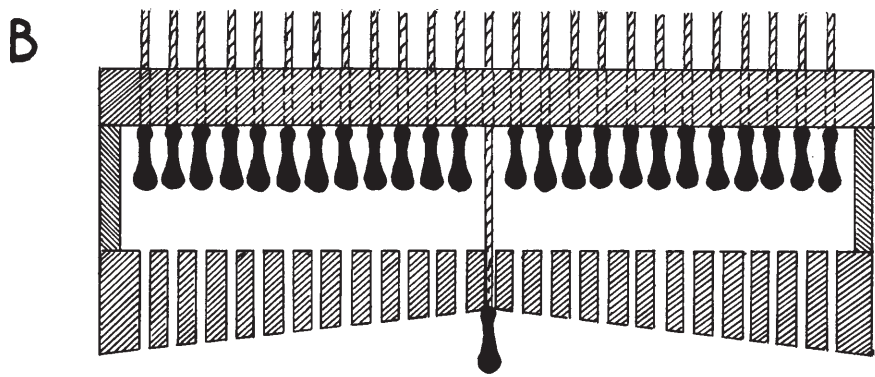
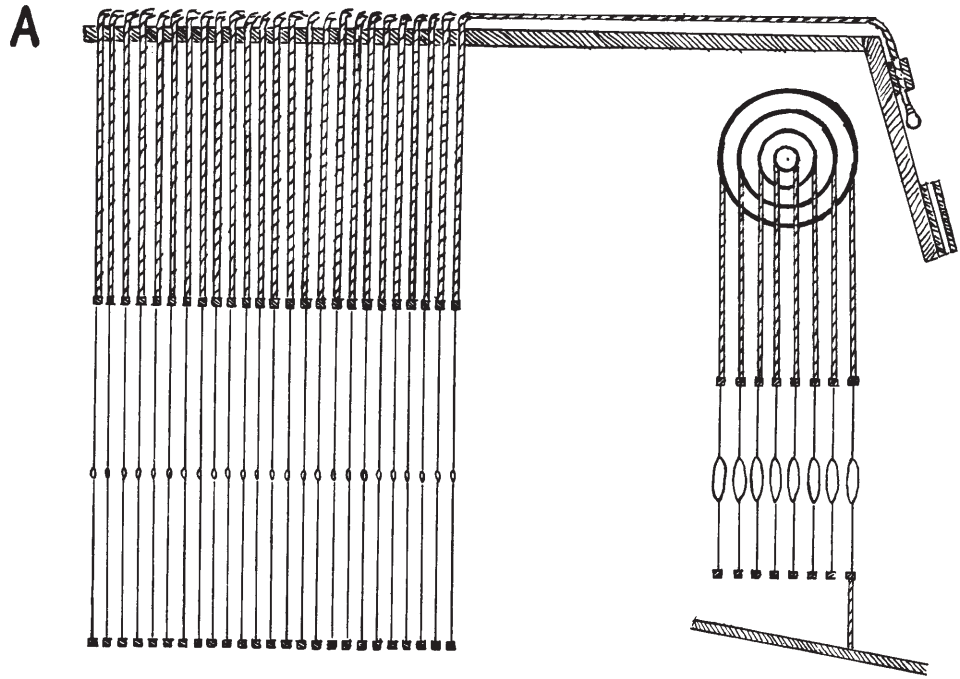
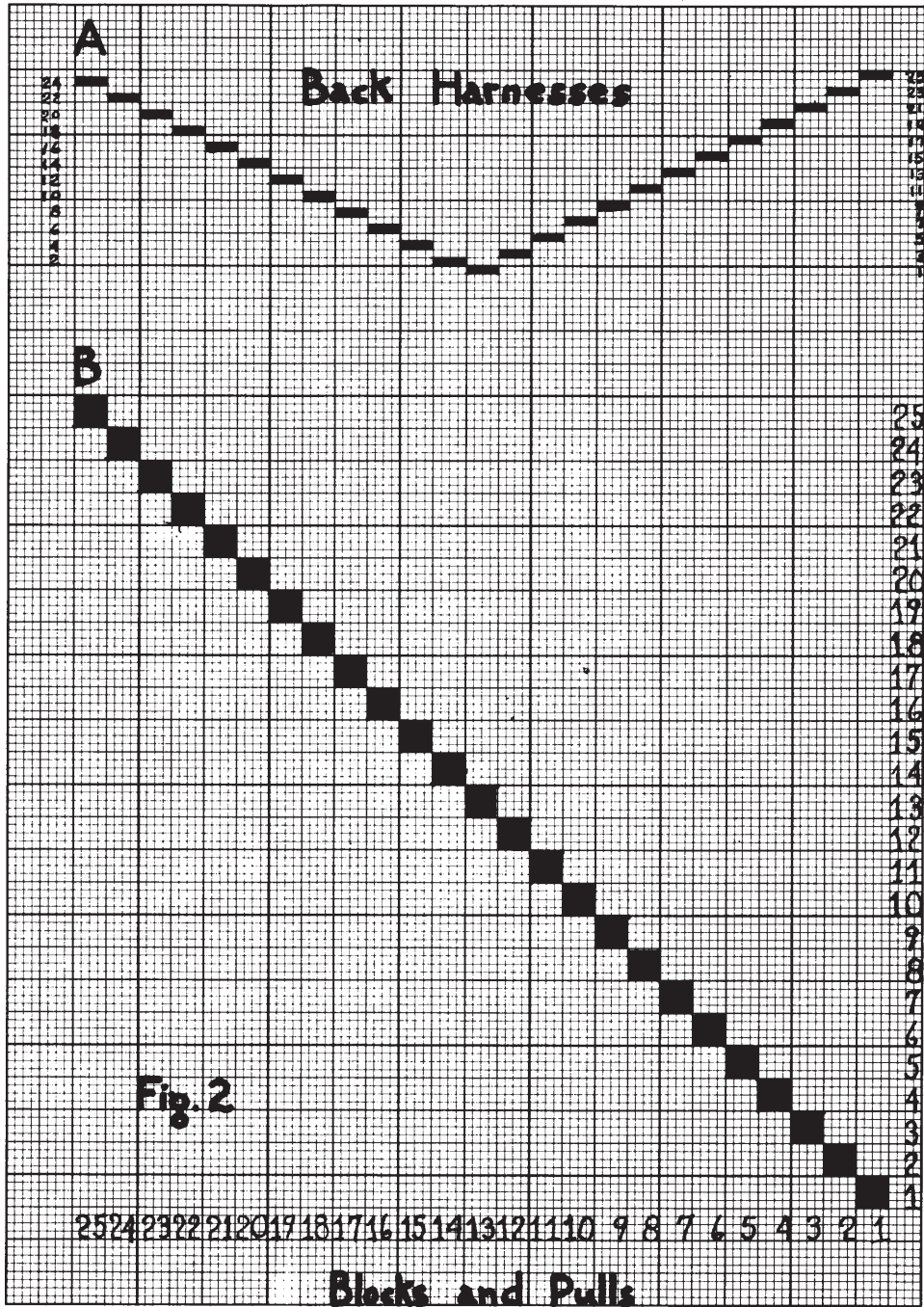


Fig. 1



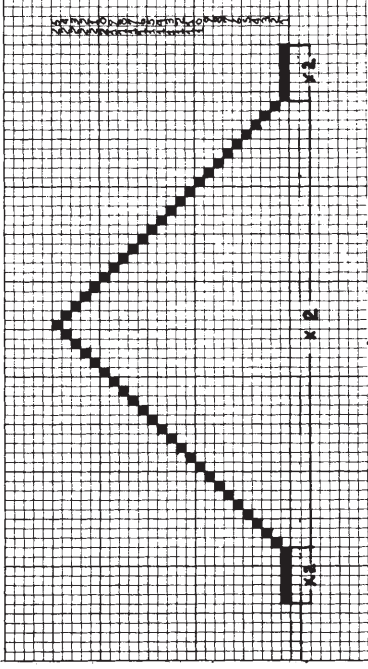


Fig. 4

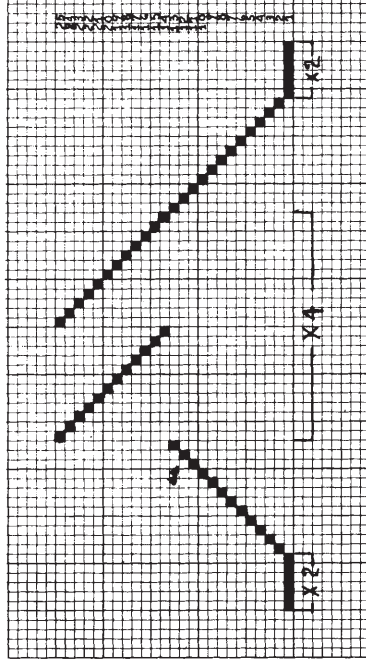


Fig. 5

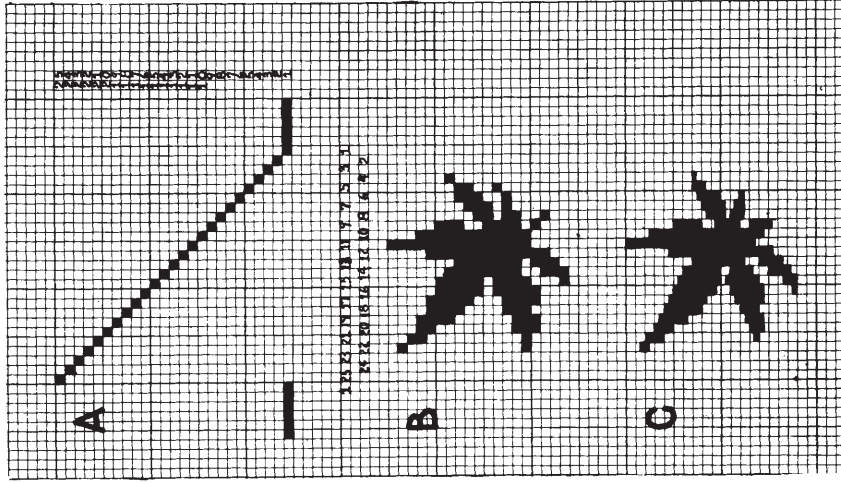


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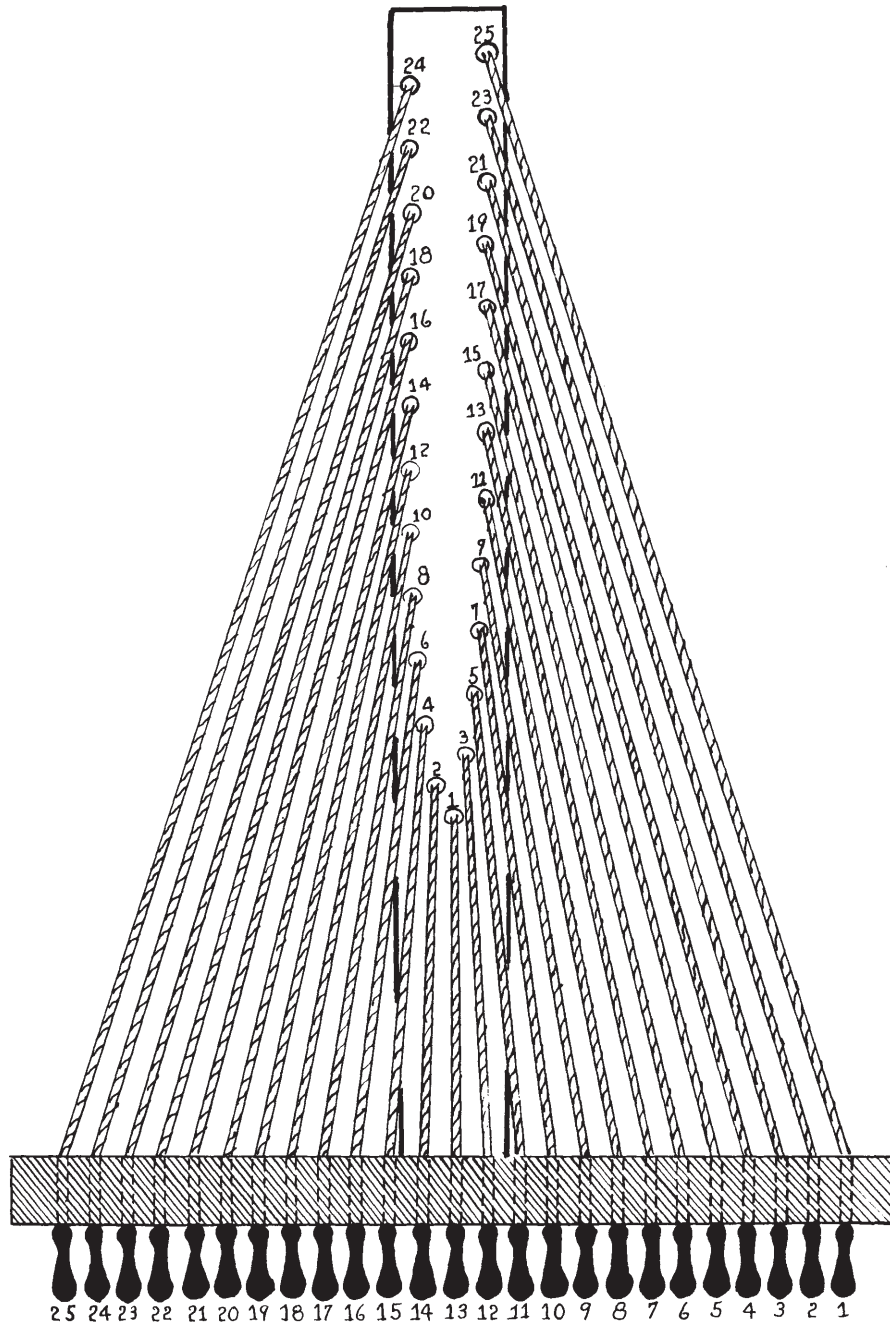


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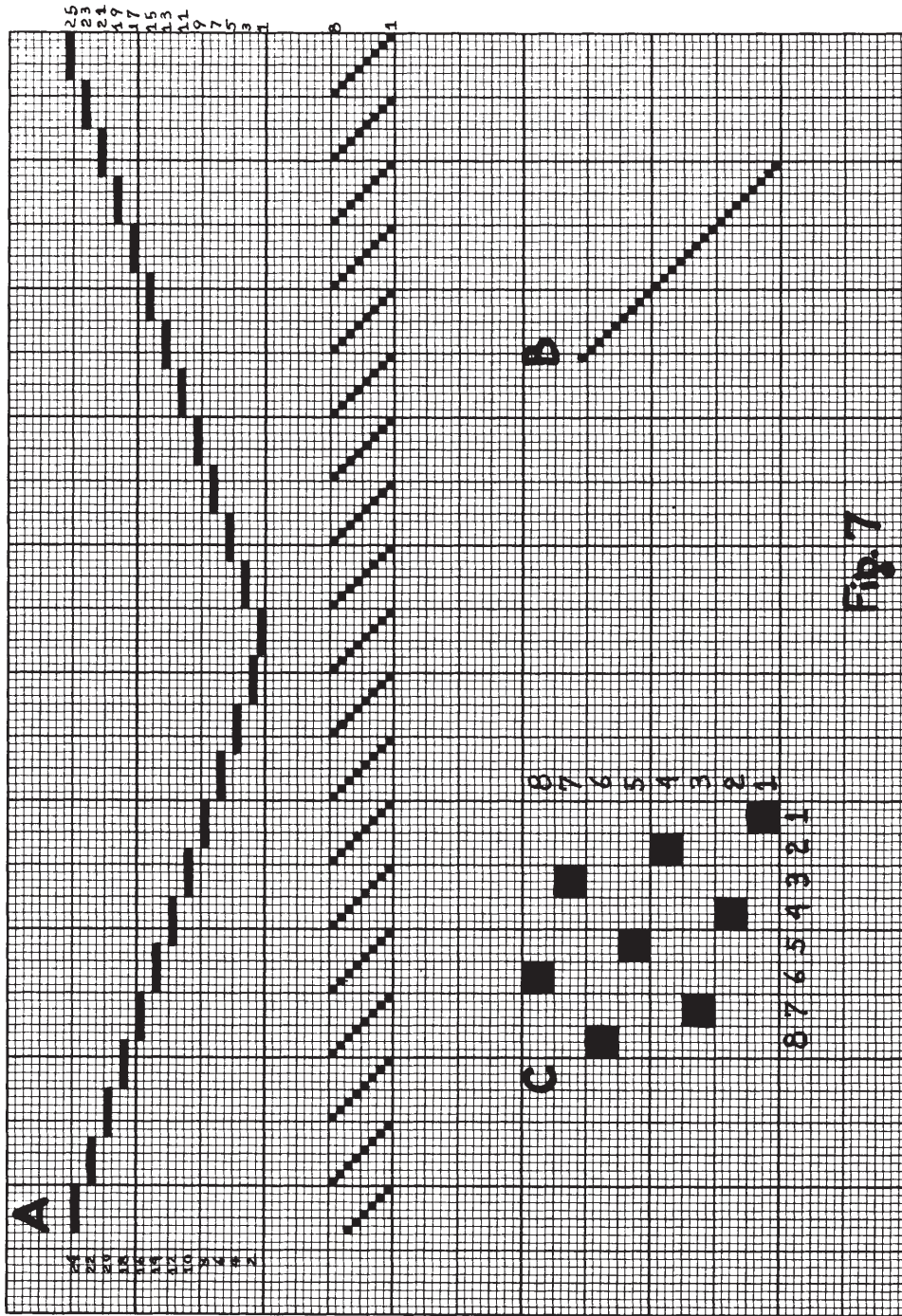


Fig. 7

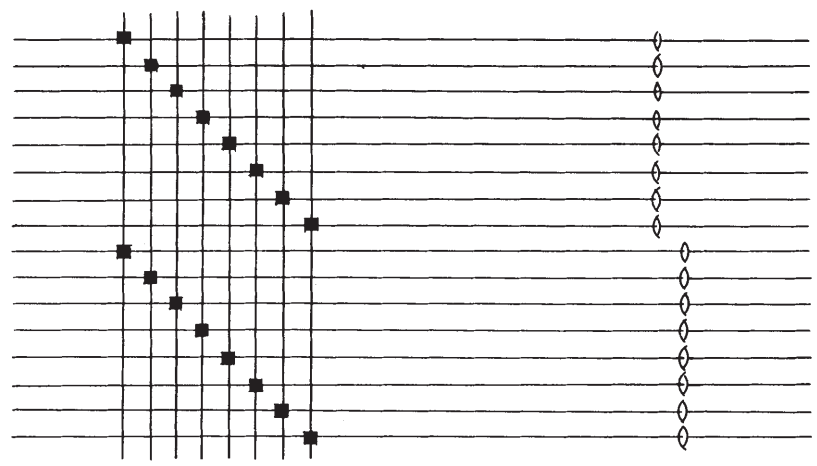
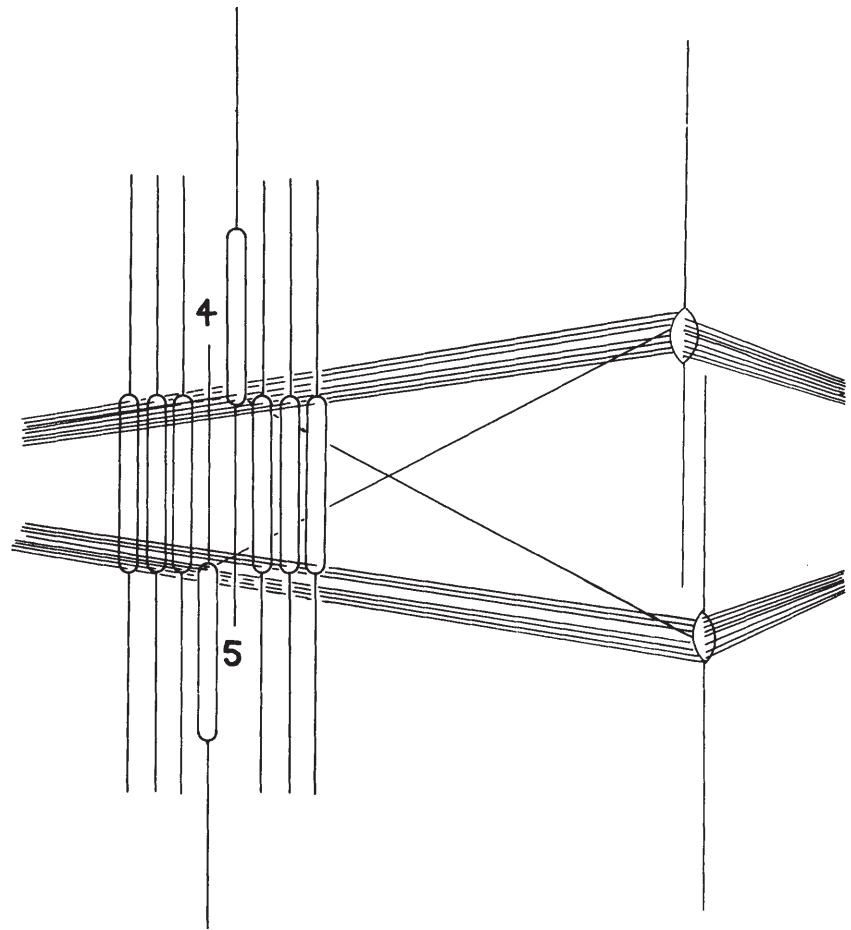


Fig. 9

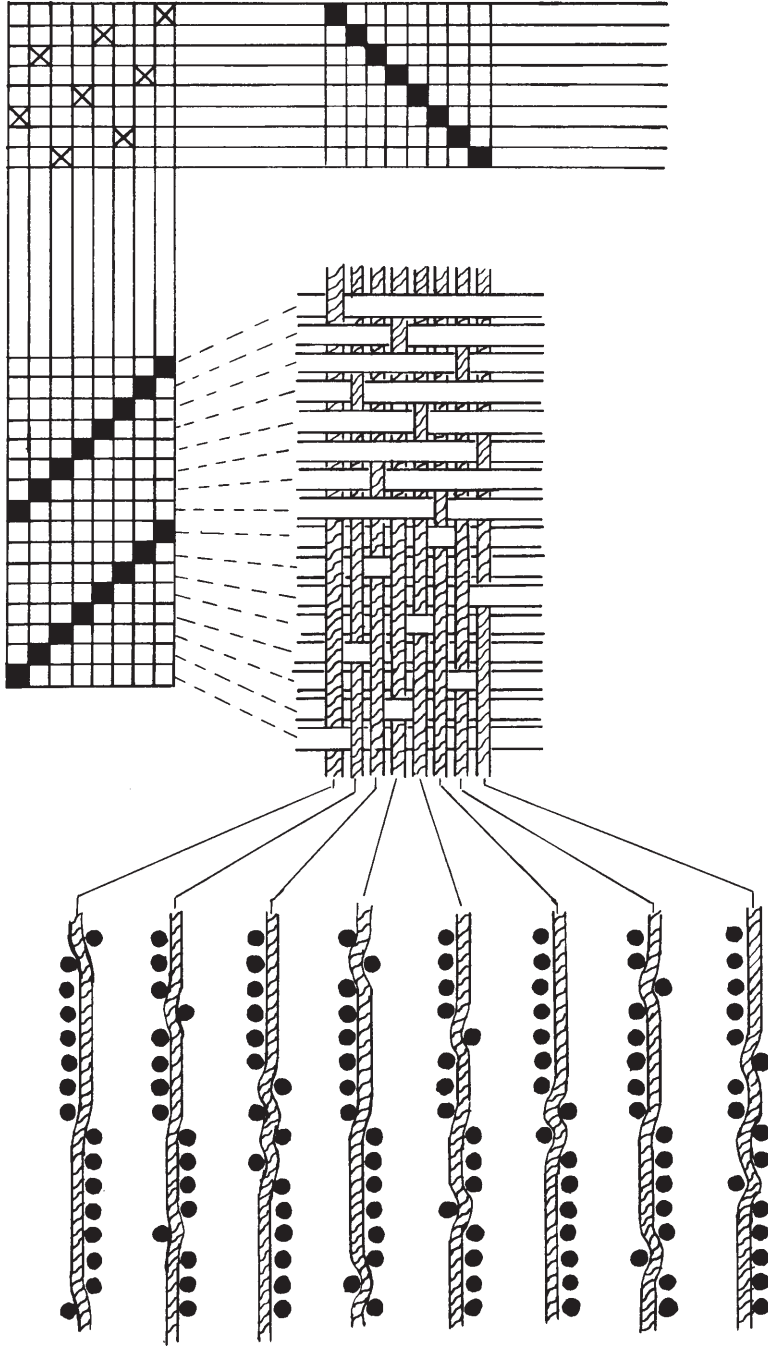
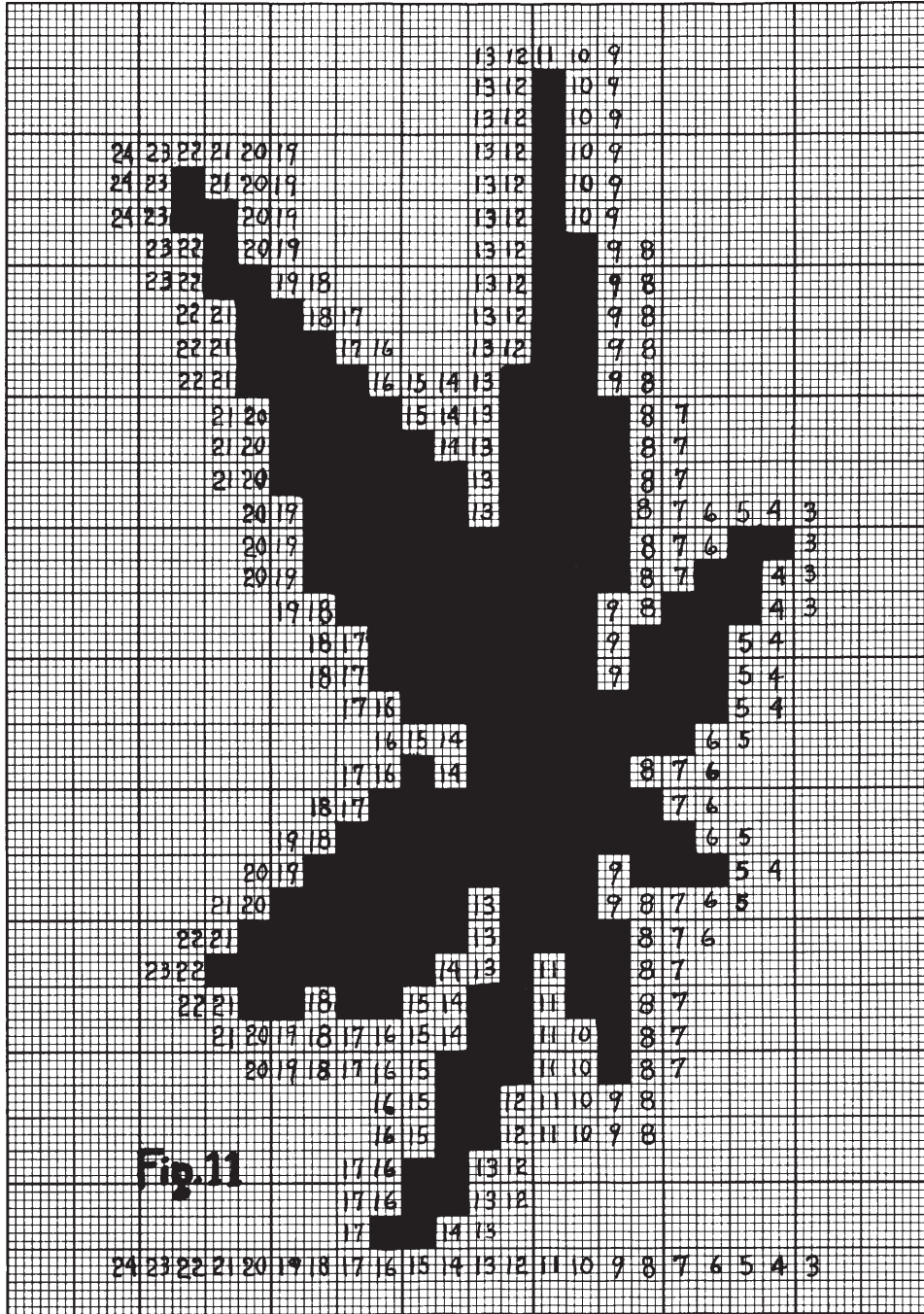
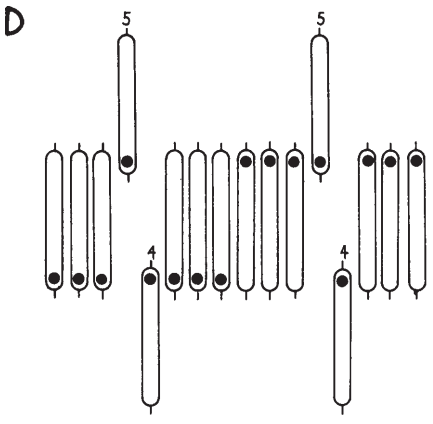
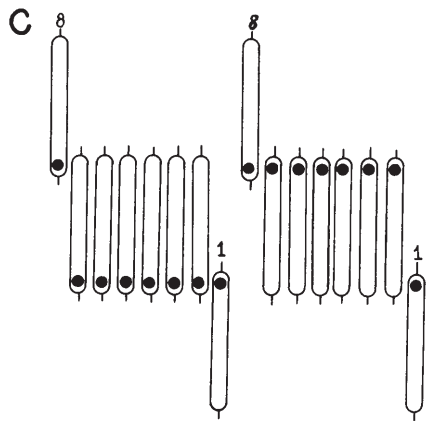
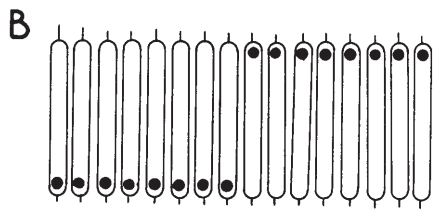
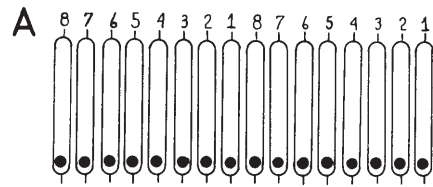


Fig 10





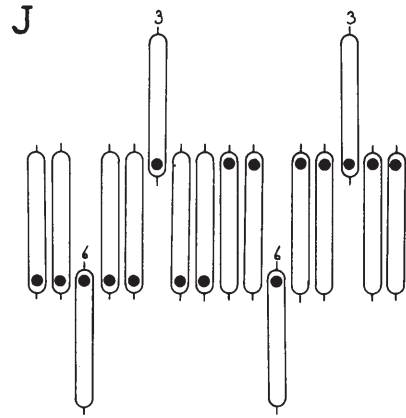
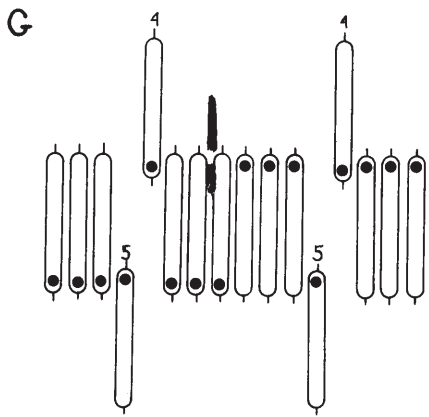
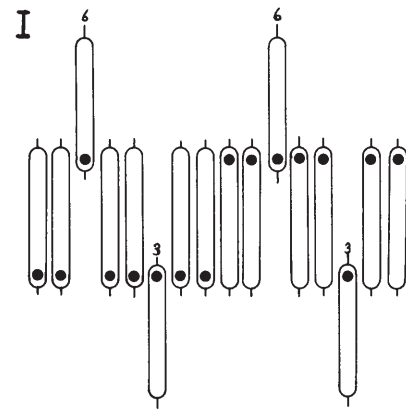
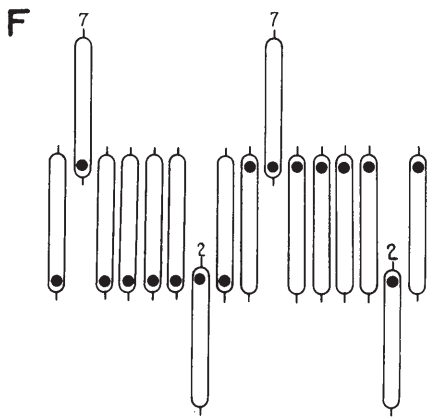
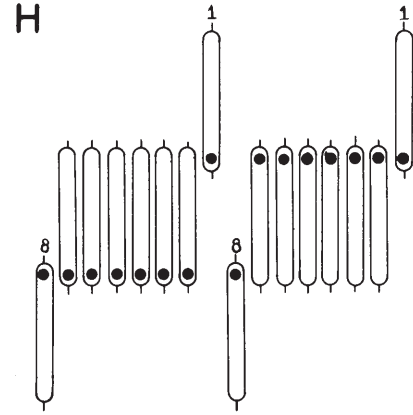
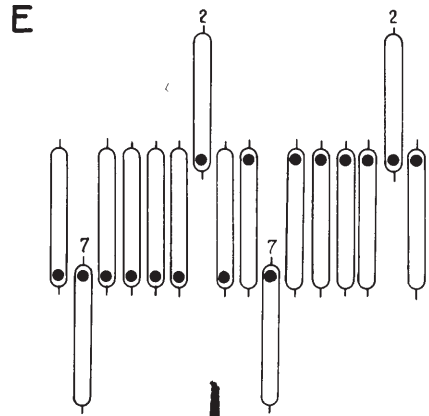


Fig. 8

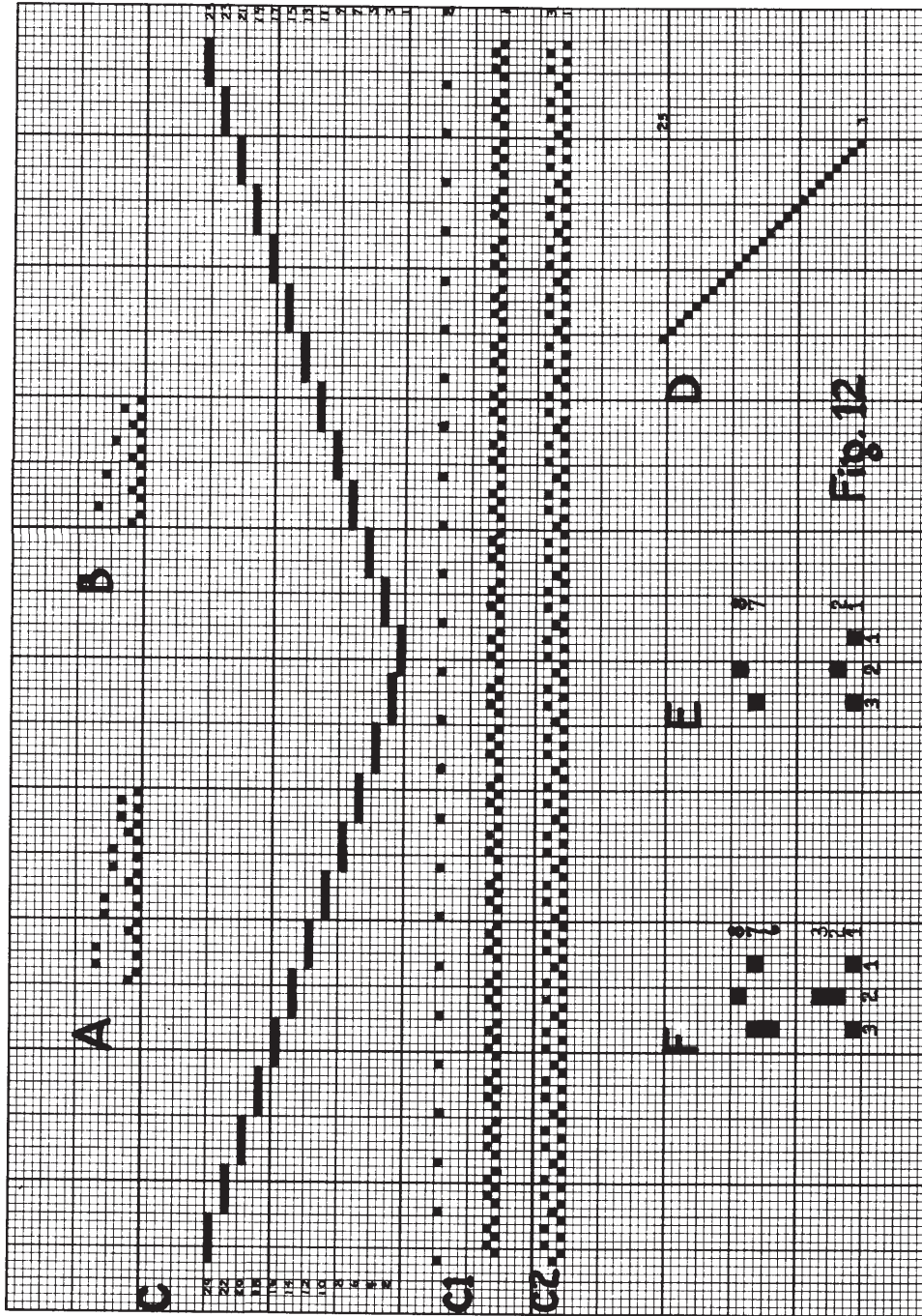


Fig. 12

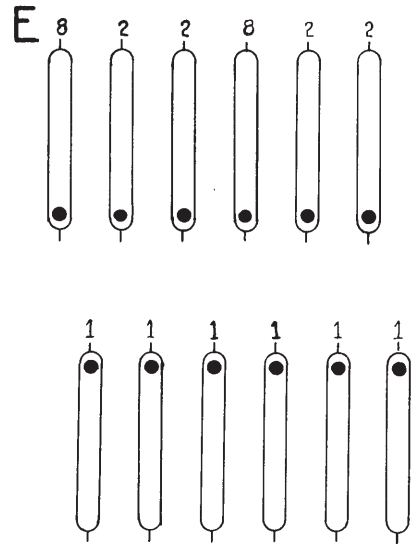
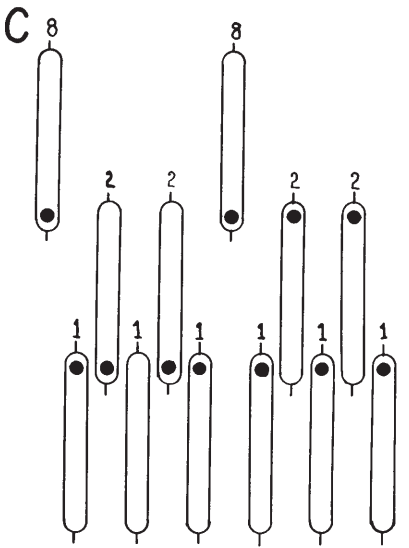
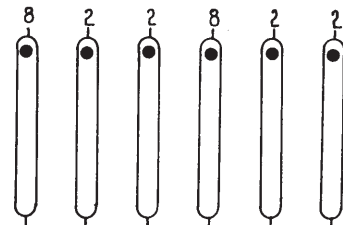
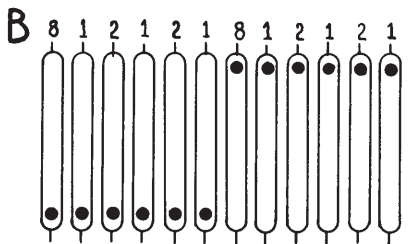
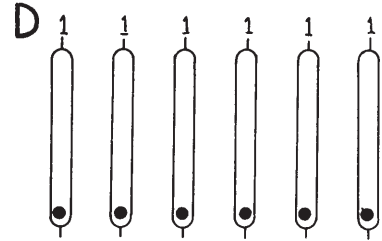
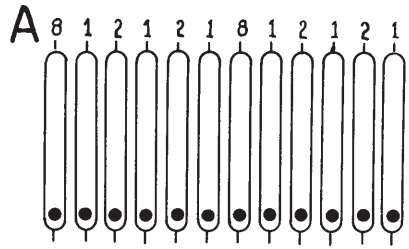


Fig.13

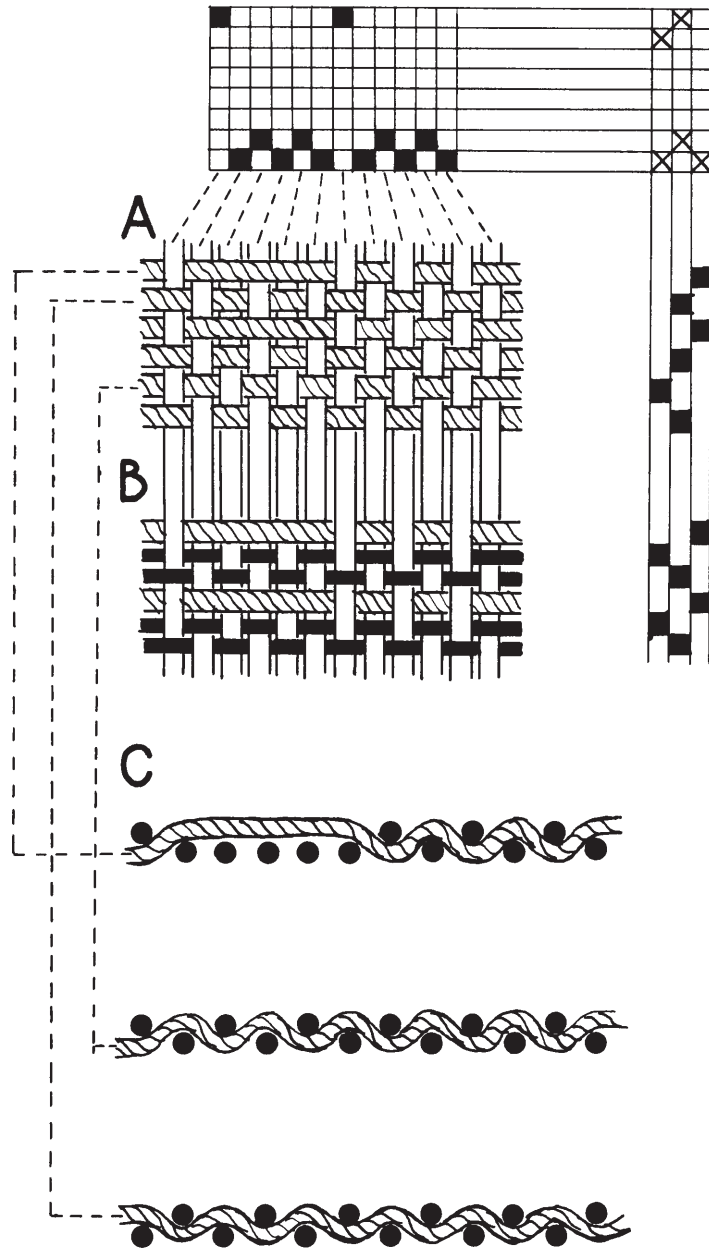


Fig. 14

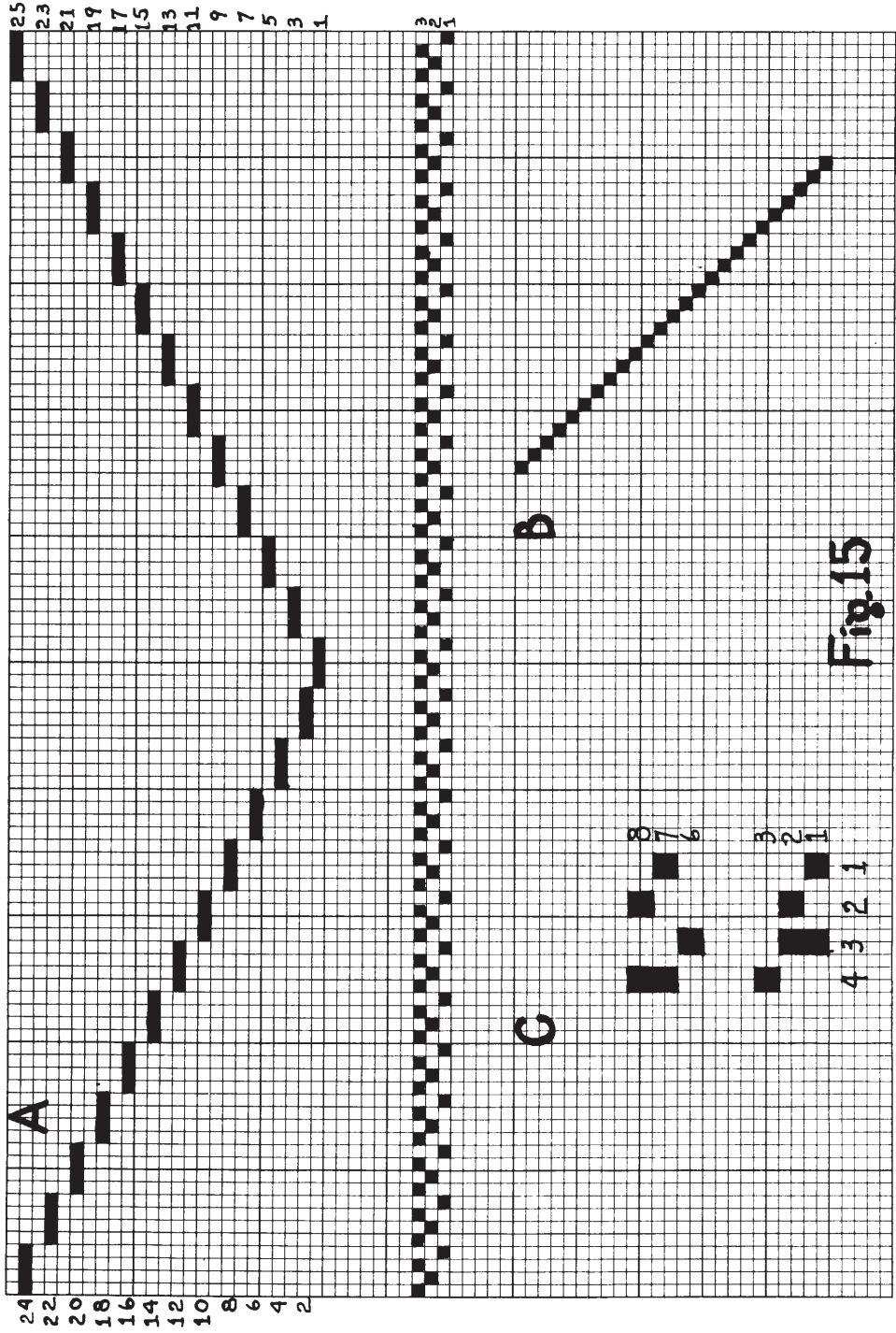


Fig.15

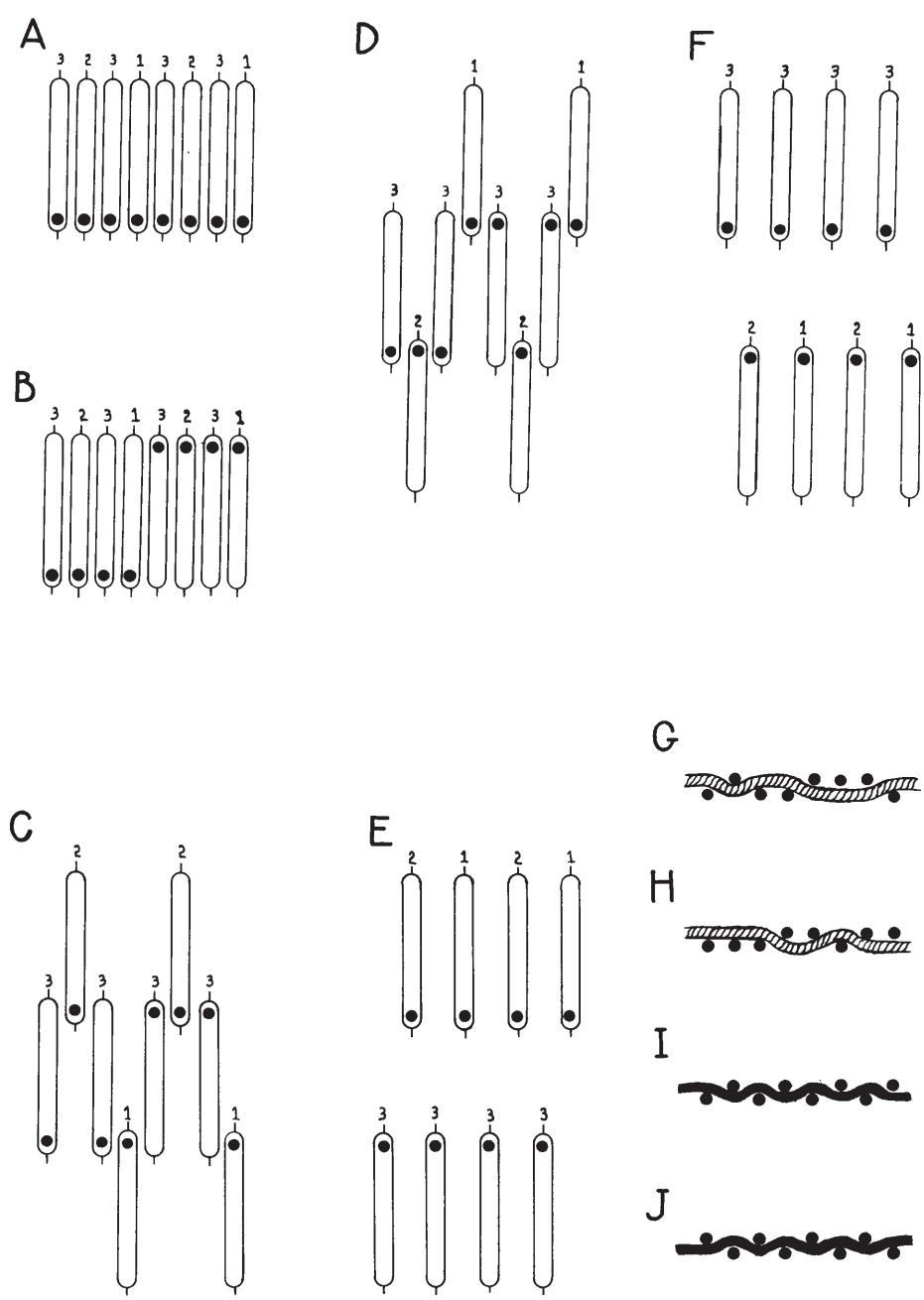


Fig. 16

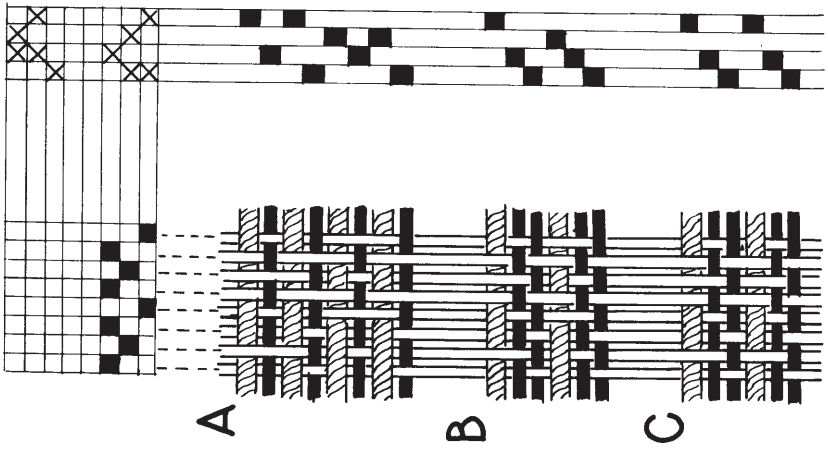
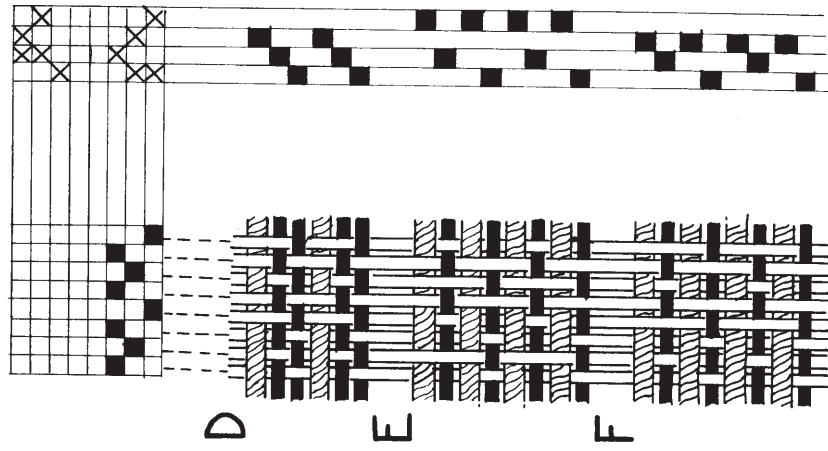


Fig. 17

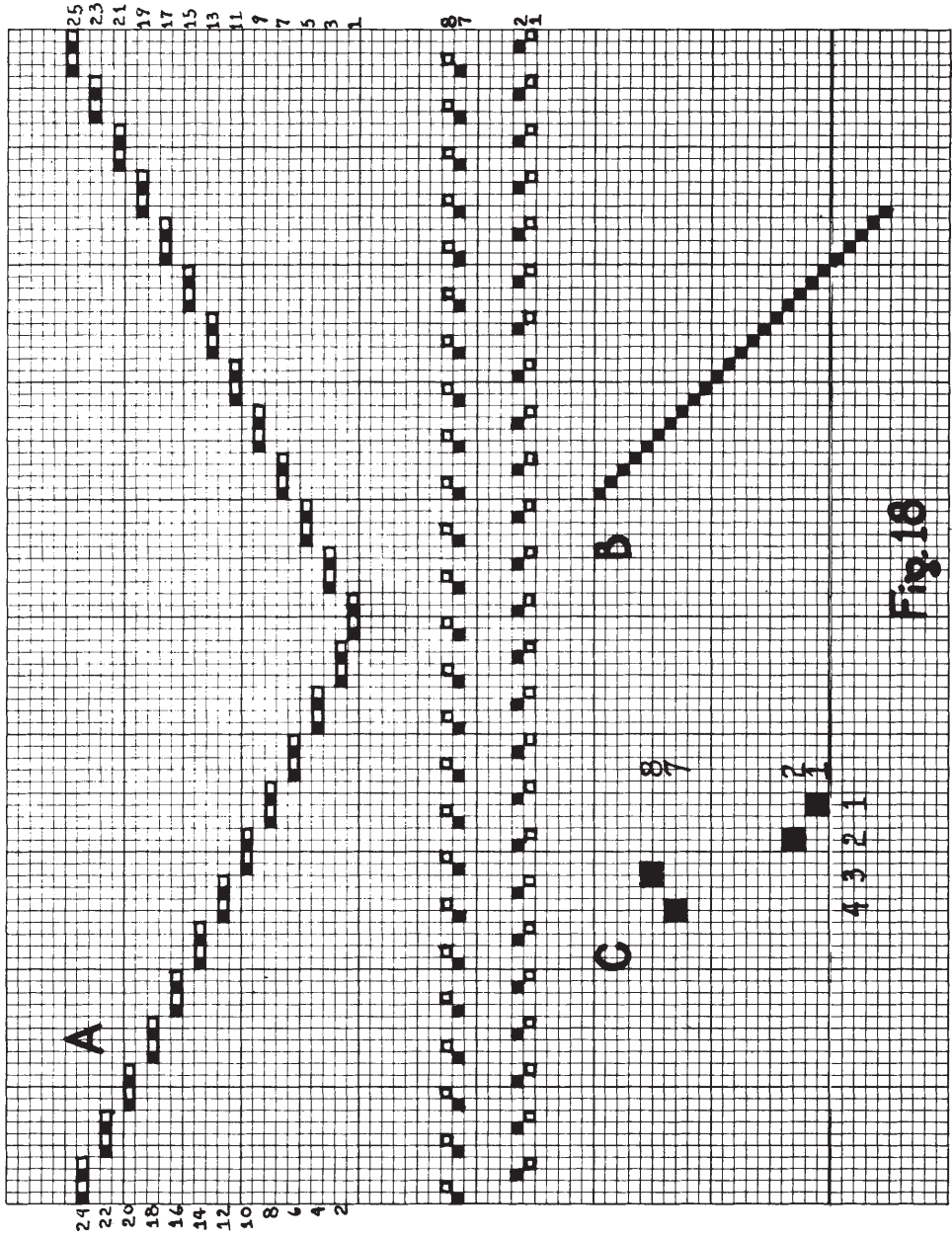


Fig. 10

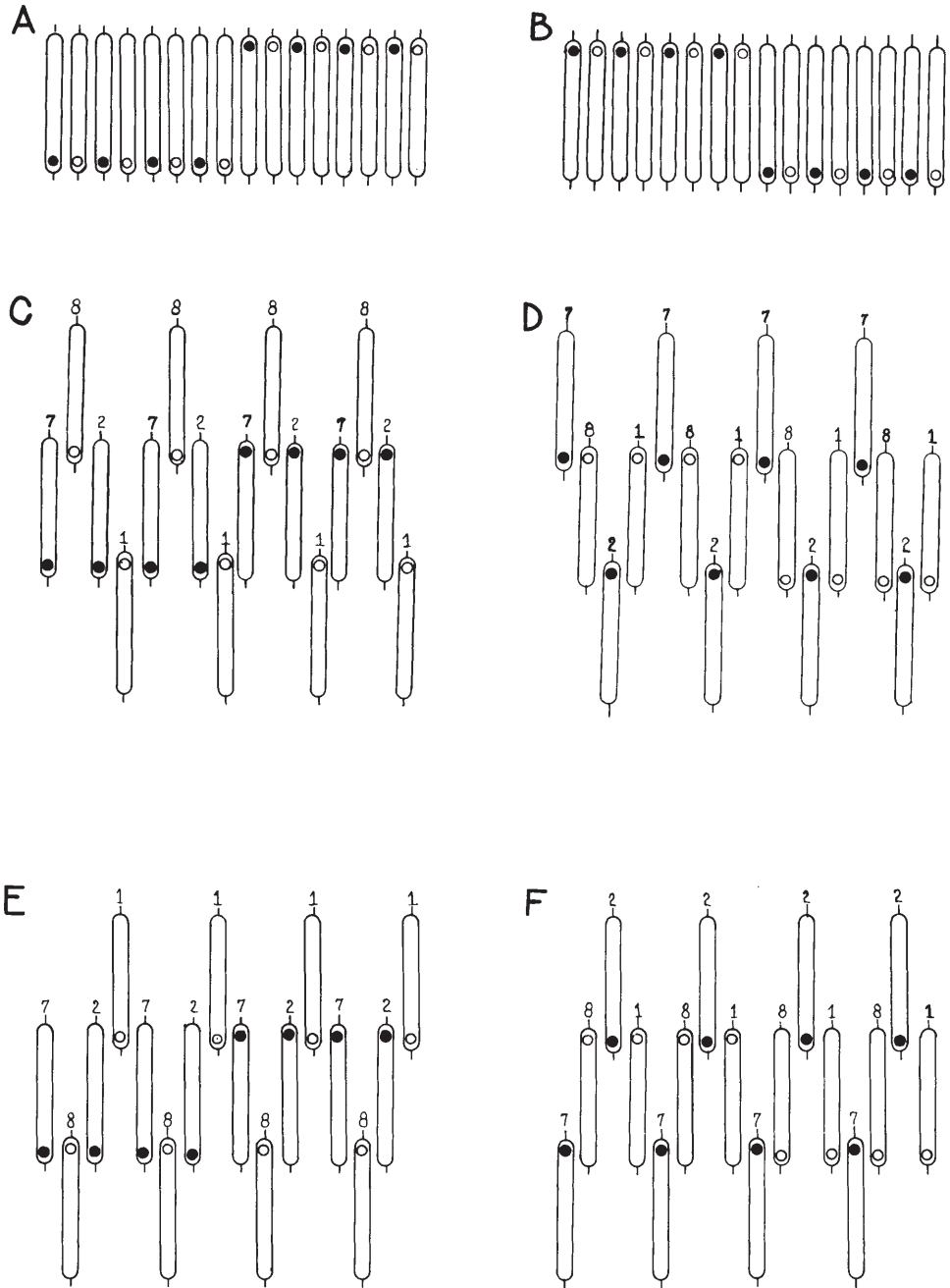


Fig. 19

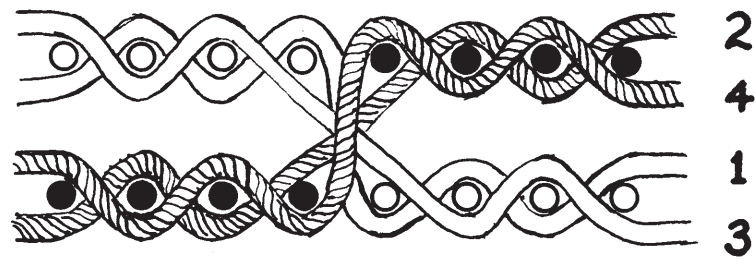
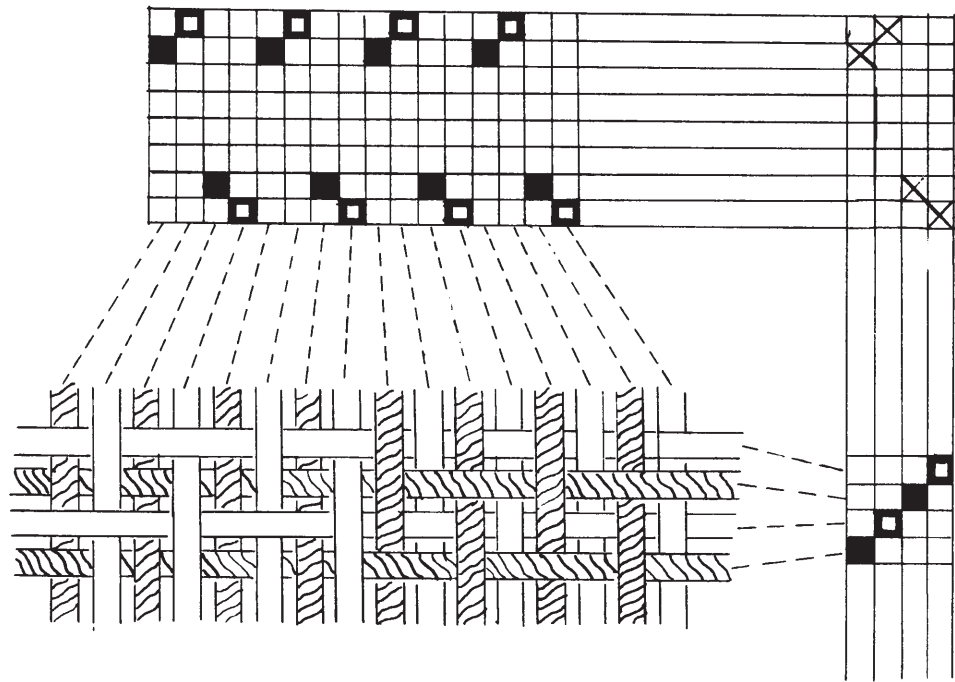


Fig. 20