

PRACTICAL WEAVING SUGGESTIONS

VOL. 2-55

Cloth Analysis

by Mr. Rupert Peters

The weaver who has not seen a piece of weaving that roused in him the desire to reproduce it but could not because he lacked the necessary data is a rarity. For the simple weaves used commonly by hand weavers it is not difficult to work out this data from the cloth. Securing the kind and grist of the yarns used, their sett, the threading draft, the treadle tie-up, and the treading from a woven piece is called "Cloth Analysis."

One's knowledge of the yarns he commonly uses and a comparison of these in the sample with such or with the numbered sizes on sample cards will usually result in a suitable approximation of grist. A ruler laid on the sample across the warp threads at a point removed from the selvage enables one to count the number of these to the inch. But do not forget to allow for shrinkage. An overshot cushion cover with wool pattern weft, washed a number of times, now has 35 warp threads to the inch while it was set 30 when woven. One's knowledge of the usual settings for common warp yarns must interpret any warp thread count made.

The threading draft is more precise. At first, working this out calls for cross-ruled paper, pins, and often a lens magnifying three or four diameters.

If the sample to be analyzed can lose a little of its length, weft threads are unravelled one at a time, noting for each one how it crosses every warp thread. The easiest way to do this is to cut off the warp threads a quarter of an inch above the starting point. The weft threads are taken out down to this point. The first weft thread to be studied is then worked up from the others an eighth of an inch or so and then its relation to each warp thread is easily determined and recorded. Then the thread is discarded and the next one taken. In doing this it is sufficient to cross a repeat or a repeat and a half of the pattern. If the sample must not be injured the work is a little more difficult but by using pins to outline the working area and one's place in it, the work can usually be done with accuracy. Our samples fall into this class.

The first piece is a runner in overshot weave with a simple over-all pattern. The first step is to select a section of this pattern covering at least a repeat right and left and up and down. Of the many possible the one starting at the left edge of the rose figure and moving to the left to include a star figure and a complete rose figure seems suitable. Similar boundaries are found in the warp direction. As a rule something more than a repeat is used for checking purposes; if both the repeat and the following portion of the second one start the same in the threading worked out, it indicates accuracy. On Fig. 1, the part to be used is enclosed by lines.

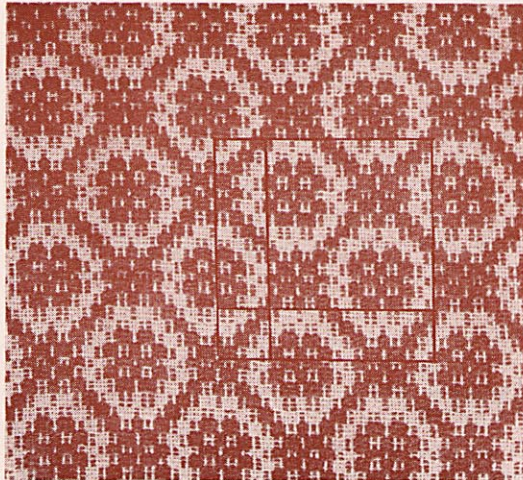


FIG. 1. PORTION OF RUNNER TO BE ANALYSED. PART ENCLOSED BY LINES IS WORKED OUT IN FIG. 2.

For one's first analysis it is well to make pictures of the thread crossings on cross-ruled paper. On this each vertical row of the small squares indicates a warp thread; each horizontal row of squares, a weft thread.

The piece of weaving is spread out before one with the warp threads extending from him. The starting point, the upper right-hand corner of the rectangle marked in Fig. 1, is located by putting a pin in the cloth at the right of the first warp thread in the repeat. Checking all weft threads must begin with this thread.

The first weft thread at the top of the rectangle passes over 4 warp threads, skips the next 21, passes over 4, skips 15, passes over 4, and skips 10. On the paper at the top of the space to be used 4 squares are blocked out at the left of the starting line, 21 squares are left white, 4 are marked out, 15 are left white, 4 are blocked out, and 10 are left white. The blocked-out squares represent the weft thread's passing over the warp threads. Half tones are omitted here, although some analysts put them in. Two other weft threads below this first one are just like it and are drawn below the first on the paper. See Row 1

at the top of Fig. 2. Note that tabby threads are not considered, only the threads entering into the pattern are checked.

The first weft thread in Row 2 skips 3 warp threads, passes over 4, skips 15, passes over 4, skips 21, passes over 4, skips 7. The squares in the next weft row on the paper are marked accordingly: 3 are left white, 4 are blocked out, 15 are left white, 4 are blocked out, 21 are white, 4 are black, and 7 are white. The next two weft threads are exactly like this one and are so drawn.

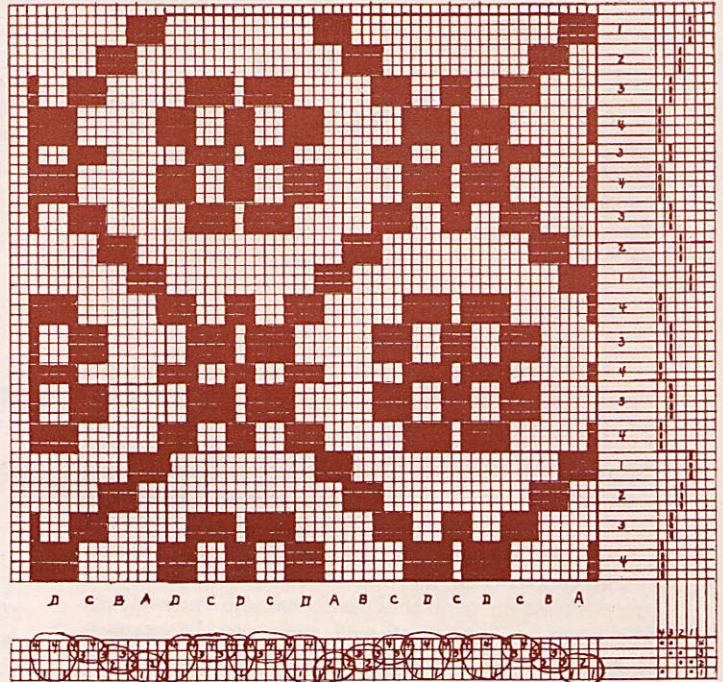


FIG. 2. DRAW DOWN OF PART MARKED OFF IN FIG. 1. THREADING DRAFT, TIE-UP, AND TREADLING WORKED OUT FROM IT.

Note that the first pattern block in Row 2 is in a diagonal row of blocks extending downward and to the left across the weaving at a 45° angle. Theoretically, every pattern block on this diagonal is square. Blocks to the right or the left of these key blocks may or may not be square depending upon the pattern. Note also that this key block overlaps the block above it, both are over the same warp thread, and that this is also true for the block below it. This narrows, left to right, the part of the pattern these blocks are helping to form and to counteract this and so keep the rose and star figures square, the general rule is to weave in one weft thread fewer than the number of warp threads under the key block. This accounts for the three like weft threads drawn to represent each of the two rows already drawn. The grist of the weft yarn may modify this rule but on the evenly drawn squares of our paper we follow it.

For Row 3 the warp thread numbers are 6, 4, 3, 3, 3, 4, 8, 5, 1, 5, 8, 4, 3, 1, the underlined numbers being those helping form blocks. These are drawn on our paper just as the preceding ones were. The key block is over 4 warp threads, hence, two more weft threads are drawn below the first one to complete the row.

For Row 5, the warp thread groups are 1, 8, 5, 1, 5, 8, 4, 3, 3, 3, 4, 8, 5. When spotted in on the paper three other lines are filled in below it in the same way since there are 5 warp threads under the key block.

Row 5 is like Row 3 save for one fewer weft thread and is drawn accordingly. Row 6 is like Row 4; Row 7, like Row 3; Row 8, like Row 2; etc. Thus, row by row, the weft threads are checked and are drawn until the area indicated on Fig. 1 has been covered. Since drawing Row 4 every following row was found to have the same arrangement of pattern blocks as some one of the first four rows. Since each row was made by pressing down some treadle to open that shed and since there are four different sheds used, this has four pattern treadles. This is shown more clearly by the row of figures at the right of the drawing, Fig. 2. Every row like the first one is marked 1; like the second one, 2; like the third one, 3; and like the fourth one, 4.

The arrangement of the pattern blocks is now checked in the vertical rows. That of Row A is noted and is compared with that of every other vertical row. Each one found to be the same is marked "A". Rows B, C, and D are checked in the same way and when this is done we find that every vertical row belongs to some one of these four groups. This indicates that we have a 4-harness pattern.

In overshot weaving two harnesses are pulled down together to open a pattern shed. With 4 harnesses, but 6 pattern combinations of 2 harnesses each are possible. The combinations 1-3 and 2-4 are reserved for tabby, leaving 1-2, 2-3, 3-4, and 1-4 for pattern work. Every pattern block is made by drawing down the harnesses in one of these combinations. Since every block in a vertical row is over the same warp threads, these threads must be threaded in one of these four combinations. We may start the threading on Row A with either of these, different treadlings would bring the same result in the end. The warp lines are extended downward far enough to give a little space between the threading where four horizontal rows of squares represent the four harnesses, and the row of letters above. The 1-2 combination is used for Row A. The first warp thread is placed upon harness 1, the second upon harness 2, the third upon harness 1, and the fourth upon harness 2. A circle is drawn around these in order to make the

row threading stand out more clearly. Row B overlaps Row A by one thread which is on harness 2. The only other combination of 2 harnesses containing harness 2 is 2-3. (Combination 2-4 is tabby and 1-2 has just been used; it cannot be repeated here because Row B differs from Row A). Warp thread 5 is put on harness 3, 6 upon harness 2, 7 upon harness 3, and a circle is drawn around the four threads. Row C overlaps Row B making the former's first thread upon harness 3 and the 3-4 combination must be used for this row. The other three are 4, 3, 4. The last one, on 4, is the first thread for Row 4, hence, this row must be threaded upon harnesses 1 and 4. The five threads are on 4, 1, 4, 1, 4. See this in Fig. 2.

Thus, row by row, the threading for each is written until the left side of the drawing is reached. Then the whole is given a final check. Every vertical row marked "A" must be threaded upon the 1-2 combination; every row marked "B", upon the 2-3 one; etc.

A further check shows that the repeat begins at the right and extends over fourteen blocks to the left, then it begins all over again. A line is drawn between the fourteenth and fifteenth blocks to indicate the dividing point between threading repeats. Vertically, it is found that the repeat also covers fourteen rows and a similar line is drawn between the fourteenth and fifteenth horizontal rows, counting from the top, to show the treadling repeat. The square enclosed by these lines and the bounding lines at the top and the right side is called the "repeat square".

For the treadle tie-up the four combinations used in the threading draft are also used for making the ties to the treadles. These combinations are arranged side by side on an extension of the threading draft lines to the right far enough to clear the vertical row of figures by three or four squares.

The treadling is next indicated. In the vertical row of squares above the treadle tied to harnesses 1 and 2, at its intersection with every weft thread found in a 1-2 block, a check mark is made. This treadle had to be used to put in that weft thread. This brings three check marks opposite each of rows 1, 9, and 15. See Fig. 2. Each of the other treadles is checked in the same way.

The treadles of course may be arranged to suit the weaver's convenience. Those using Mrs. Atwater's tie-up would place the tabby treadles, A and B, at the right of the pattern treadles and would reverse the position of the four pattern treadles, placing treadle 1 at the left. For the Scandinavian form used by Mr. Worst, the tabby treadles are put in the middle as treadles 3 and 4, and the 3 and 4 given here become 5 and 6. Either tie-up gives the same result in the end.

If preferred the treadling draft is easily put in conventional form. Starting at the bottom of the repeat square as in weaving, the first horizontal row has 3 weft threads upon treadle 4; the second row 4 weft threads upon treadle 3; the third 2 upon treadle 4; etc. Hence, carried out the treadling is

4—3X
 3—4X
 4—2X
 3—4X
 4, 1, 2, 3—3X each
 4—4X
 3—2X
 4—4X
 3, 2, 1—3X each
 Repeat as desired.

A short method of securing the threading draft is to pick out from the sample the differently arranged rows of blocks and copy these under each other on paper. In overshot they are often to be found in succession in some part of the pattern as in the rectangular area below the repeat square in Figs. 1 and 2. The four rows there represent every different arrangement of block lines in the repeat and every block shown contains the same number of warp threads as does every other block in the vertical column it represents. Hence, the threading draft can be written from these as well as from the complete picture of the repeat. (See Lily's Practical Weaving Suggestions, Vol. XXVIII, "The Profile Method of Writing Drafts," page 3, C, and its explanation).

The data secured above is now put in conventional form for weaving a reproduction of the Bachelor's Button runner analyzed.

Warp and tabby: 20/2 cotton, natural (Lily's Art. 314).

Our next piece is a copy of a Finnish towel. Because warp and weft are of the same material the skips do not stand out as in the preceding. This lack of contrast makes it advisable to follow the first method given above and a section about twenty threads square is worked out on cross-ruled paper in the same way as was done for the Bachelor's Button pattern. See Fig. 4. A lens is decidedly helpful in doing this. Checking the vertical lines, four different groupings of thread crossings are found; hence, this is a 4-harness pattern. Four weft lines are chosen a little below the drawing for the threading draft.

Pattern weft: floss (Lily's Art. 114, # 920 or some other desired color).

Reed: # 15; 2 ends to a dent.

Threading:

Right selvage: 3, 4.	2 threads
Right border: 1, 2, 1, 2, 3, 2, 3, 4, 3, 4, 1, 4—6 X	72 "
Pattern repeat: (From Fig. 2)—10 X	440 "
To balance pattern: First 29 threads of repeat	29 "
Left Border: 4, 1, 4, 3, 4, 3, 2, 3, 2, 1, 2, 1—6 X	72 "
Left selvage: 4, 3	2 "
	617 threads

Tie-Up: Treadle 1, 1 & 2; 2, 2 & 3; 3, 1 & 3; 4, 2 & 4; 5, 3 & 4; 6, 1 & 4.

Treadling: Two shuttles; tabby shots alternate on treadles 3 and 4 as in plain weave, one preceding each pattern shot. They are omitted in the following directions but must be woven in.

Pattern weft is put in as follows:

1, 2, 5, 6—3X each	Repeat 6X or more for
1, 2, 5—3X each	lower border.
6—4X)
5—2X)
6—4X)
5, 2, 1, ★, 6—3X each) Pattern repeat
5—4X)
6—2X)
5—4X)
6—3X)

To balance pattern, follow pattern repeat to the star; then, 6, 5, 2, 1—3X each, repeated as for lower border.

At the intersection of the first (right) warp thread with these, this warp thread is marked to go on harness 1. Checking across to the left every warp thread showing the same arrangement of weft thread crossings is marked to go on this harness. The second warp thread is marked to go on harness 2 and all warp threads like it are marked to go on the same harness. Threads 3 and 4 are treated in the same way and when this is done all warp threads have been placed upon some harness and the threading draft is written, very clearly a twill derivative.

Using the data just worked out and adding a border by using repeats of the first six blocks of the profile, the following directions are for the Rose and Compass pillow top.

Warp and tabby: 20/2 cotton, natural (Lily's Art. 314).

Weft for pattern: floss or 5/2 cotton (Lily's Art. 114, #1457 or your choice).

Reed: #15, 2 ends to a dent.

Width in reed: 20"

Threading order,

Selvage: 1, 2, 1, 2,	4 threads
Border: units on 5, 6, 5, 4, 3, 4 — 3X	72 "
Pattern: units as given under profile — 6X	432 "
To balance: first nine units of pattern repeat	36 "
Border: units on 4, 3, 4, 5, 6, 5 — 3X	72 "
Selvage: 1, 2, 1, 2	4 "
	620 "

(For Structo 20" loom omit 3 outside border units on each side; leaves 584 threads).

Tie-up: As shown in Fig. 6.

Treading: lower border, 1 unit each upon 6, 7, 6, 3, 4, 3 — 3X. Note that these figures are treadle numbers.

Center: 1 unit each upon 6, 7, 6, 3, 4, 3, 6, 7, 6, 5, 4, 3, 4, 3, 4, 3, 4, 5. Repeat to desired length.

To balance: Use the first nine units of the center repeat.

Upper border: reverse the lower border.

Note: Normally Bronson is woven with the same weight of yarn for both warp and weft. In this case but one side of the fabric is to be used and a pattern that stands out is desired on that face. The heavy weft shows prominently on one side, scarcely at all on the other, making a very one-sided cloth.

Fig. 7 shows a stand cover in summer and winter weave. The whole piece forms a unit; there are no pattern repeats. Yet, it is easy to see that the left half is exactly like the right half except that it is reversed. This means that one needs analyze half of the whole cover, the other half is then this reversed.

A check shows four different arrangements of blocks in the horizontal lines and the four are found in



FIG. 7. A STAND COVER IN SUMMER AND WINTER WEAVE.

← Center



FIG. 8. PROFILE AND TREADLE TIE-UP FOR STAND COVER.

succession between the ruled lines on Fig. 7. Drawn on cross-ruled paper these make the profile, Fig. 8.

Summer and winter is made up of 4-thread units. In each of these the first warp thread is on harness 1; the second is on the harness upon which the unit is based; the third is on harness 2; and the fourth is on the same harness as the second. In the profile the first block is of 8 warp threads, or two units, based upon harness 5, and is threaded 1, 5, 2, 5, 1, 5, 2, 5. The second block, on harness 6, is of 24 units; each is threaded 1, 6, 2, 6. (Compare page 8 in Lily's Weaving Suggestions, Vol. XXVIII, The Profile System of Writing Drafts. Our sample's profile is of 4 rows instead of the 2 rows shown there).

The next 13 2-unit blocks are alternately upon harnesses 5 and 6 and are threaded 1, 5, 2, 5, 1, 5, 2, 5, and 1, 6, 2, 6, 1, 6, 2, 6. The next block, on harness 4, 2 units, is threaded 1, 4, 2, 4, 1, 4, 2, 4, and the following one, on harness 3, is 1, 3, 2, 3, 1, 3, 2, 3. Etc.

In this way the detailed threading draft can be rapidly written, or, when one grasps it, the threading may be done from the profile itself. When the block marked "Center" is reached and used, one reverses or reads the blocks to the right for the rest of the pattern. The unit threadings are not reversed.

The tie-up requires 4 treadles for a unit, 2 for tabby and 2 for pattern. The same tabby treadles are

used for every unit. Since the first thread in a unit is on harness 1 and the third thread is on harness 2, alternate threads clear across the web are on 1, 2, 1, 2, 1, 2, etc., and when these harnesses are pulled down together we have a tabby shed, so, harnesses 1 and 2 are tied to the first tabby treadle. The alternating threads are found on the pattern harnesses and all of these are tied to the second tabby treadle. The first pattern treadle for each unit is tied to harness 1 and to the harness upon which the unit is based. The second pattern treadle is tied to harness 2 and to the harness upon which the unit is based. See treadles 3 and 4 in the tie-up, Fig. 8, for a unit based upon harness 3; treadles 5 and 6 for one based upon harness 4; etc.

Note that this treadle tie-up, like all others given in this discussion, is for counter-balanced looms with their sinking sheds. Weavers using jack type looms will tie their treadles to the blank spaces in the treadling drafts instead of using the filled ones. This leaves down the harnesses pulled down on the counter-balanced loom and the same result will be secured upon each.

Several methods are in use in weaving summer and winter. The drawing on page 8 in the bulletin referred to above shows the 3-thread weft skips arranged in pairs, as in Fig. 9, A. This sample shows them singly (Fig. 9, B) and a different treadling was used to get this result. The former is called "in pairs;" the latter, "one and one." The first row of blocks, either at the bottom or the top of the sample, is like the row on harness 5 in the profile, but is 2 units in height. It is treadled: tabby 1, pattern 7, tabby 2, pattern 8, tabby 1, pattern 7, tabby 2, pattern 8; treadles 7 and 8 being tied to harness 5. Next in the profile is the long 24-unit block on harness 6 and this is treadled tabby 1, pattern 9, tabby 2, pattern 10 for each of the 24 units. Thus one works through the sample, checking each weft row of blocks with the profile and treadling accordingly. This cover is not treadled throughout in the order in which the blocks occur in the profile; hence, the treadling follows. It is ar-



FIG. 9. ARRANGEMENT OF WEFT SKIPS WHEN SUMMER AND WINTER IS TREADLED "IN PAIRS." A: AND "ONE AND ONE." B.

ranged in conventional form omitting the tabby treadlings which come in every unit, are understood, and need not be written.

7 then 8— 2X	5 then 6— 2X
9 then 10—24X	3 then 4— 2X
7 then 8— 2X) 5X	9 then 10— 2X
9 then 10— 2X)	7 then 8— 2X
7 then 8— 2X	5 then 6— 2X) 2X
9 then 10— 4X	3 then 4— 2X)
3 then 4— 2X) 2X	9 then 10— 4X
5 then 6— 2X)	7 then 8— 4X
7 then 8— 2X	9 then 10— 2X
9 then 10— 2X	7 then 8— 2X (Center, re-
3 then 4— 2X	9 then 10— 2X
5 then 6— 2X	7 then 8— 4X
3 then 4— 1X	9 then 10— 4X

verse to start).
Etc.

In treadling summer and winter there is a close relation between the sett of the warp, the grist of the yarn used, and the beat. When a single unit is treadled a square spot of color should result. To gain width this weaver set her warp 24 to the inch instead of the usual 30: all of her woven units are long crosswise. To remedy this she had to weave 30 units, instead of 24, to make square the big spot in the corner. Her narrow stripes are 2½ and 3X instead of 2X; her broad stripe is 5½X instead of 4X; etc.

This piece was chosen to illustrate the fact that the old weavers made as many mistakes as we do today. In working out patterns from their samples it is often necessary to correct the errors found. Note the omission of two blocks in the treadling of the upper diamond in the sample, for example. If one wishes to weave this the simplest way to handle the treadling errors would be to set the warp 30 to the inch. With Lily's Art. 914, size 20/6, the beat can be adjusted to fit the treadling given above.

Such a piece is a challenge to the weaver and the thrill that comes when one has worked it out successfully is one of the rewarding things in our craft.

One thing more: practice analysis. To analyze a piece now and do no more for weeks until something new comes along means that you must then start from scratch again. But to analyze a piece every ten days or so for six months will fix the procedure so that it becomes as automatic as following a threading draft.

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