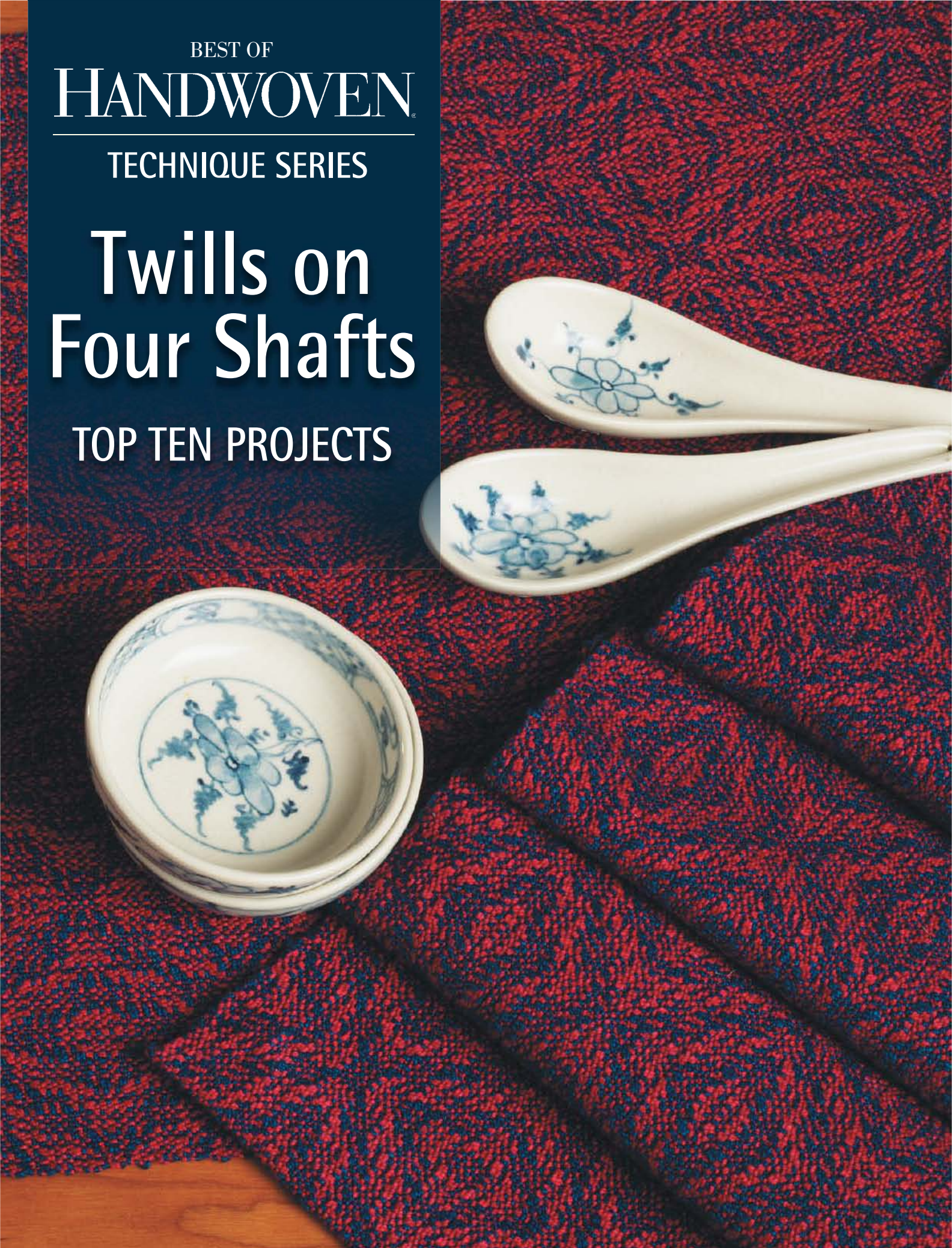
BEST OF

HANDWOVEN

TECHNIQUE SERIES

Twills on Four Shafts

TOP TEN PROJECTS



I sometimes wonder if weavers don't owe Marguerite Porter Davison more than we even think we do. When I was looking for a history of the use of twills by hand-weavers, I found only in her *A Handweaver's Pattern Book* the clear implication that you can thread one of an amazing number of twillls and then, by varying the treadling, weave an even more amazing number of patterns. Since the middle of the last century, weavers have been putting this awareness to use. This eBook gives you the tools to extend the twills in Davison's book along with those in many other resources into original designs. Each project in this eBook presents a type of twill with how-to information for drafting and designing it in addition to a beautiful project to weave. A type of twill devloped very recently but not considered suitable for four shafts is also included here in Barbara Elkins's 4-shaft advancing-twill adaptation. From simple twill stripes to pick-up mock-satin damask, this book has what you need to make other weavers exclaim when they see your fabrics: "Surely that took more than four shafts!"

Madelyn

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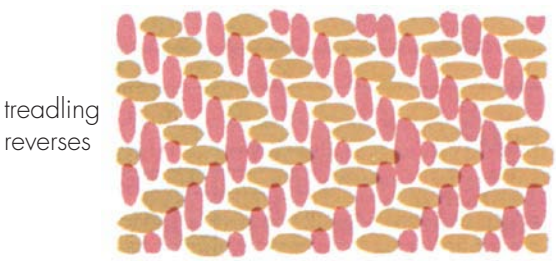
TWILL GLOSSARY

You've probably noticed that the same twill can have more than one name. Here's a brief glossary of basic twills.

Straight twills (also regular, biased, diagonal, direct, continuous, simple, basic, plain) are characterized by diagonal parallel lines; warp and weft yarns are equal weights. They can be right-handed or left-handed as shown here, though in commercial fabrics, straight twills are usually right-handed. Threading is 1, 2, 3, 4 on four shafts, or a straight draw on the number available. The opposite face shows the diagonal in the opposite direction.

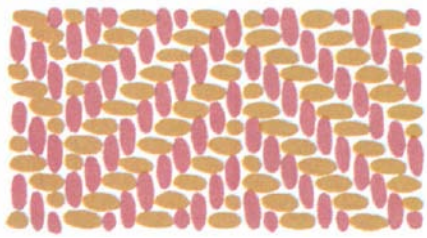
Reverse twills (also wave, horizontal herringbone, zigzag, point) are straight twills where the treadling reverses or "turns" to form points or zigzags (e.g., threading: 1, 2, 3, 4; treadling: 1, 2, 3, 4, 3, 2, 1). In **point twills,** the reversal is in the threading or in both the threading and treadling, as for diamond twills.



Diamond twills (also goose-eye, bird's eye, diaper, point) are a combination of a point-twill threading and reverse or point-twill treadling.

Herringbone twills (also point, chevron, vertical herringbone) are threaded to a point (1, 2, 3, 4, 3, 2,1) and treadled straight (1, 2, 3, 4). The term herringbone probably comes from the fact that the pattern resembles the spine of a fish; herringbone often refers to the exact meeting of diagonals but can also be broken.

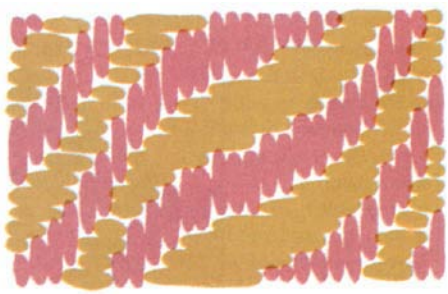
Broken twills (also dornik, broken herringbone, broken point) are usually twills with staggered reversals in the threading (1, 2, 3, 4, 1, 2, 4, 3, 2, 1) with a straight treadling.



Broken point (reverse) twills (also crystal) are broken twills with reversed, staggered threading and treadling orders (threading and treadling: 1, 2, 3, 4, 1, 2, 4, 3,1).

Skip twills (also offset, interrupted) are straight twills where the twill line is interrupted by skipping shafts (threading: 1, 2, 3, 4, 5, 6,1, 4, 5, 6, etc.; treadling is usually straight).

Undulating twills (also wavy) have wavy lines created by irregular sleying, variations in yarn thicknesses, or irregular offsetting of warp and/or weft in the threading or treadling.



Fancy twills refer to combinations of simple twills, irregular patterning with floats, diaper twills, or twill damasks.

Balanced twills vs unbalanced twills (even vs uneven) refer to whether the shafts raised and lowered for each pick are equal or unequal in number. Equal ratios (2/2, 3/3 twills) show equal amounts of warp and weft on both faces. Unequal ratios (1/3, 2/1 twills) produce one face that is warp emphasis, one that is weft emphasis (also called warp and/or weft dominant). In warp-faced or weft-faced fabrics, *only* the warp or weft shows.

Originally published in *Handwoven®*, March/April 1998, pp. 55, 82–83

TWILL RESOURCES

There is a certain amount of satisfaction to be gained by creating your own twill patterns. It makes your handwoven fabric truly a custom one. However, you don't necessarily have to start from scratch! Many excellent sources can be used as starting points from which an idea can be pushed, expanded, and customized. (Some of these sources are no longer in print but can be found in most guild libraries.) Whether you use patterns and drafts directly or as material to modify in some way, you'll find that you also do much to personalize your design by the colors, yarns, setts, and finishing treatment you choose for your fabrics.

In *A Twill of Your Choice* (Interweave 1981), Paul O'Connor shows color-and-weave-effect twills on two to eight shafts. Two-color patterns in black and white are presented; even more possibilities can be achieved when other colors are added.

An excellent source for many twill drafts that is probably in every weaver's library is *A Handweaver's Pattern Book*, by Marguerite Porter Davison (Davison 1944). And while this source is well known as a "look-see" book, did you know that there are some interesting and informative explanations at the beginning of each section? Another oft-forgotten section of this book is Twill Treadlings, which contains forty different treadlings for a straight-twill threading (1-2-3-4).

Two books featuring multishaft twills are *Weaving Techniques for the Multiple-Harness Loom* by Pierre Ryall (Van Nostrand Reinhold, 1979) and *A Handbook of Weaves* by G. H. Oelsner (Dover Publications, 1952). Both are primarily sources for drafts, though Oelsner includes corresponding text for each weave structure discussed. *A Handbook of Weaves* was written for the textile trade, and therefore you'll find some of the text a bit baffling and some of the drafts for dozens of shafts. However, there's plenty of inspiration for eight, twelve, and sixteen shafts. Ryall's book includes drafts for three to twelve shafts, though the emphasis is on multishaft patterns. His shorthand draft notation system is a bit confusing at first but is quickly mastered even though you must refer back and forth between pages in order to have all the information necessary to weave a specific pattern.

For good solid information on twills as well as other basic weave structures, Mary E. Black's *Key to Weaving* (MacMillan, 1980) is an old standby. *Looking at Twills* by Leslie Voiers (Harrisville Designs, 1983) provides easy-to-read information about 4-shaft and 8-shaft twills. Actual fabric swatches tipped into the book make it especially inspirational.

For those particularly interested in fancy and irregular twills, Lucille Landis's *Twills and Twill Derivatives* (Lucille Landis, 1977), *Shadow Weave and Corkscrew Weave* by Clotilde Barrett (Colorado Fiber Center, 1980), and *1000(+) Patterns in 4, 6, and 8 Harness Shadow Weave* by Marian Powell (Robin and Russ Handweavers, 1976) are also helpful resources.

A much-sought-after resource that has recently been reprinted is Helene Bress's *The Weaving Book* (Flower Valley Press, 2010). It contains an incredible number of examples and variations for five basic weave structures. The twill section alone includes scores of treadling variations for straight, point, rosepath, and broken-twill threadings. Treadling variations are included for balanced, unbalanced, and double-faced twills. Twills are used with plain weave, treadled for waffle weave, and woven as overshot, in crackle fashion, and as summer and winter. The list goes on and on!

YARN TWIST AND TWILL

The direction of yarn twist can have interesting effects on fabric results. Either the weft-twill line or the warp-twill line can be emphasized or lessened by the choice of yarn twist. Generally, the twill line will be more pronounced when the twill direction is opposite that of the yarn twist. The tightness of yarn twist and whether the yarn is plied or a singles, along with the sett and beat, influence the final result in the cloth. Plied yarns, whether tightly or loosely spun, tend to subdue the twill line, while a singles enhances it.

These factors can be kept in mind when a fabric is designed. Do you want a more prominent diagonal line in your fabric? Do you want to slightly enhance one color over the other? In a herringbone fabric for instance, do you want the left-hand diagonal to stand out a little more than the right-hand one? (See page 12 for an explanation of right-hand and left-hand twills.)

Some of the effects of yarn twist: When a Z-spun warp yarn is crossed with an S-spun weft in a right-hand twill, an indistinct twill line is produced. In a left-hand twill with the same warp and weft, a distinct twill line results. If both warp and weft are S-spun and woven in a right-hand twill, a prominent warp-twill line is produced. A prominent weft-twill line results when the twill direction is to the left and both warp and weft are S-spun.

There's much to be explored here—and much is in your control when you think of spinning your own yarn to achieve the exact results you want!

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ADVANCING TWILL

BARBARA ELKINS

After a workshop on The Big Twill with Bonnie Inouye some years ago, I began following the "what would happen if…" trail. I wondered if I could come up with drafts that would make 4-shaft designs look as sophisticated as multishaft patterns. This project is the result of my first efforts. Experienced weavers are surprised to discover that these pieces have been woven on only four shafts. Over the next few years, I hope to develop more 4-shaft designs of similar or even greater appeal.

4-SHAFT ADVANCING TWILL

Advancing twills are comprised of straight-twill runs of (usually) three or four threads. Each successive run in the threading begins on one or more shafts up or down from the beginning shaft of the previous run; runs in the treadling begin on one or more treadles to the left or right of the beginning treadle of the previous run. A 4-shaft advancing twill threading with three threads in each run and an advance of one shaft is threaded:

1-2-3, 2-3-4, 3-4-1, 4-1-2.

An innovative way of designing advancing twills is to treat them as block weaves. Each of the four 3-thread runs possible on four shafts, for example, can be considered a block (Block A = 1-2-3; Block B = 2-3-4 ; Block C = 3-4-1; Block D = 4-1-2) and substituted for squares on a threading profile draft. In order to maintain symmetry in the twill interlacements, when the order of the blocks reverses direction, D-C-B-A instead of A-B-C-D, for example, the threading key also must be reversed. When the block order is descending, therefore, Block A becomes 3-2-1, B = 4-3-2, etc.

The draft on page xx used for the placemats and runner is the result of substituting a 3-thread run for each square in the profile draft at the top of page xx. Blocks at points of reversal ("turning" blocks) must contain five threads to maintain symmetry: for example, 1-2-3-2-1 is threaded in the draft for the only turning block in the profile, the center Block A. See if you can find the three threads in the threading draft that correspond to each block in the profile draft and then locate the turning block.

The treadling is usually "as drawn in" (also called "tromp as writ") using a regular twill tie-up. To weave a draft as drawn in, the treadles are numbered. The treadling order then follows the threading order, using the corresponding treadle for each shaft number in the threading. Patterns in advancing twills can be identified as diamonds, x's, zigzags, and M's and W's just as in regular twills, but are expanded in scale and have softer edges than traditional 4-shaft twills. Profile drafts work best that use blocks in ascending and descending order, not those that produce images.

SPECIAL CONSIDERATIONS

Both the threading and treadling of twills with large repeats such as these require close attention—it is very easy to lose your place. I find it helpful to divide the threading and treadling into small manageable segments and to keep distractions to a minimum while working. It takes more time to correct an error than to spend the effort not to make one.

Another aid is to place a length of contrasting sewing thread in the first shed of each pattern repeat. The sewing threads can then be removed when the weaving is completed. These markers not only help you keep your place in the treadling but are also a visual aid to counting the number of repeats you have woven.

WEAVING

Weave a header with a small amount of scrap yarn raising shafts 1-3 vs 2-4 (true plain weave is not possible with this threading). Start and end each placemat and the runner alternating 1-3 vs 2-4 for 1" with Ink Blue weft for hems.

Weave six repeats with Ink Blue weft following the treadling draft for each placemat. If your table size allows, seven repeats will make a 19" finished mat—a little larger than standard size. For the runner, weave eleven full pattern repeats (or other number for desired length); separate pieces with a pick of contrasting weft.

Remove placemats and runner from the loom, secure raw edges with machine stitching, and wash initially by hand in warm water with mild detergent (I like to do this to check color fastness and shrinkage before machine washing). Air dry. Machine wash with mild detergent, gentle; air dry flat or machine dry, delicate. Cut mats apart, turn up edges twice, and sew hems by hand.

FABRIC DESCRIPTION

Advancing twill.

FINISHED DIMENSIONS

Four hemmed placemats 13" by 17½" each and one hemmed table runner 13" by 28".

WARP and WEFT

Warp: 10/2 pearl cotton at 4,200 yd/lb, 2,129 yd Burgundy #3794. Weft: 10/2 pearl cotton, 1,750 yd Ink Blue #2625.

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YARN SOURCES
Valley Cottons are available from Webs.

TOTAL WARP ENDS 473.

WARP LENGTH
4½ yd (allows take-up, shrinkage, and 30" loom waste).

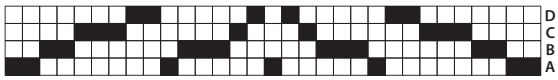
E.P.I. 30.

WIDTH IN THE REED 15¾".

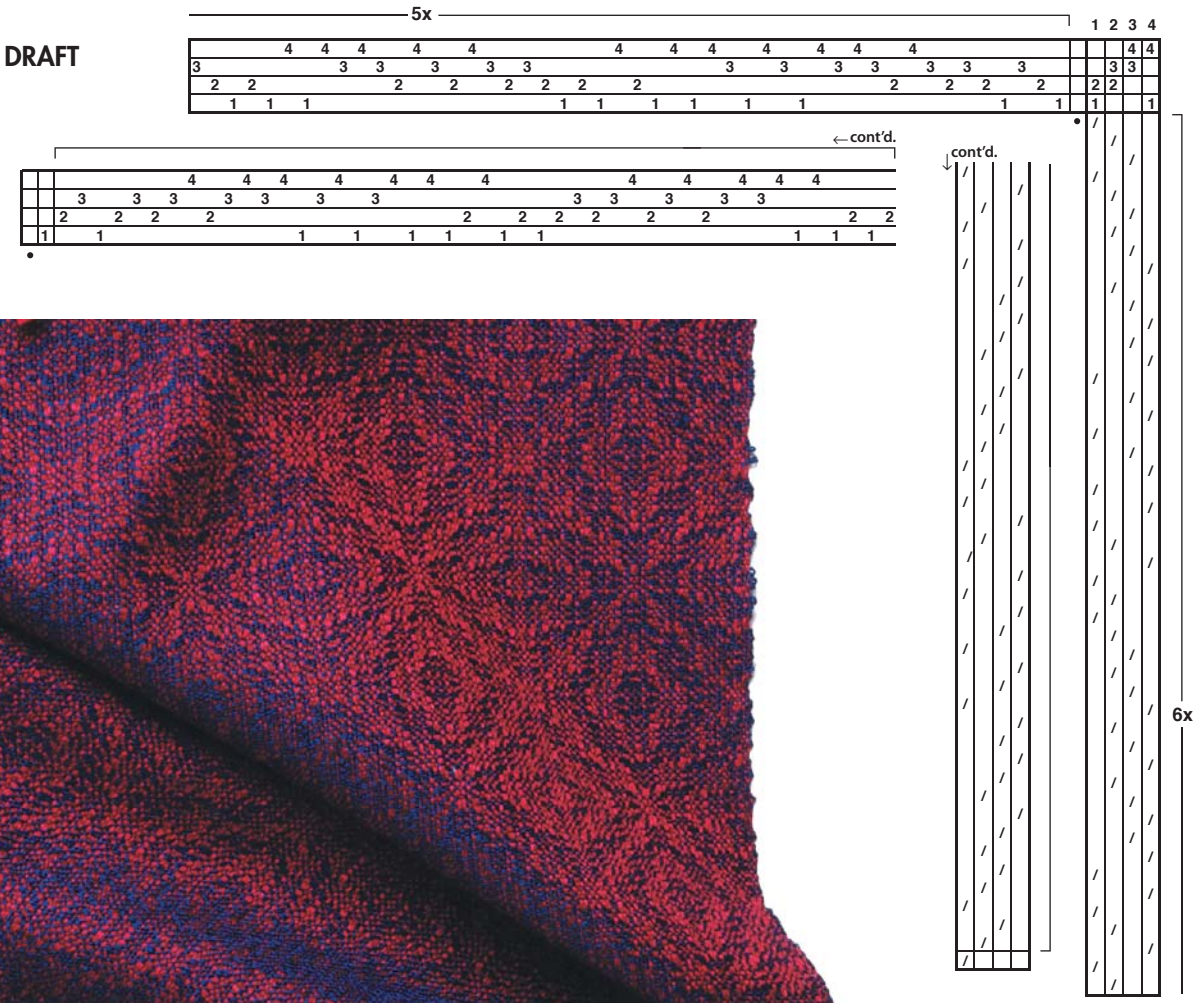
P.P.I. 30.

TAKE-UP and SHRINKAGE
17% in width and length.

PROFILE DRAFT



DRAFT

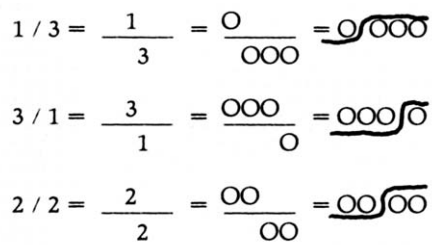


The fabric at the left is a detail of a scarf woven following the same draft as for the placemats and runner, but in 60/2 silk at 48 epi. Fine threads, a balanced interlacement, and warp and weft yarns in similar values but contrasting hues produce iridescence.

A FRACTION OF THE TWILL STORY

TWILL RATIOS

Twills are often named by their float ratios. A 2/2 twill, for example, is one in which the weft goes under 2 warp threads and over 2 warp threads. An easy way to visualize this relationship is to think of the fraction line as a weft thread. The numbers above the line are warp threads on top of the weft; numbers below the line are warp threads beneath the weft. Thus, a 1/3 twill has 1 warp thread showing before the weft floats over the next 3 warp threads.



BALANCED TWILLS VS WARP OR WEFT DOMINANCE

A 1/3 twill is considered a weft-dominant (or weft-emphasis) twill because the weft covers more than half of the warp threads in each row. A 3/1 twill has three warp threads showing before the weft goes over one warp thread for a warp-dominant (or warp-emphasis) twill. A 2/2 twill is called a balanced (or even) twill.

Balanced twills have warp and weft showing equally on both surfaces. (In other words, the numbers above the line equal the numbers below the line.) When one surface of a fabric is warp dominant and the other is weft dominant, the tensions on the two surfaces pull in different directions, sometimes causing the edges of the fabric to roll or curl. Often these fabrics do not lie flat until they are steam-pressed or blocked. In garments, edges of unbalanced twills are often hemmed or bound even if they are selvedges because of this tendency to curl.

Fabrics are considered warp- or weft- faced when only the warp or weft shows on the surface. These fabrics can also have a tendency to curl. Although most rugs are weft- faced on both surfaces so that they lie flat, another problem due to the twill construction can cause the corners to curl: If the weft is tightly twisted and the direction of the twill is the same as the direction of the twist, one corner of the rug will curl up and the other down. On the other end of the rug, the opposite corners will curl down and up. Blocking the rug by pinning it to a flat surface, dampening it, and letting it dry completely before unpinning usually flattens the corners.

TWILLS ON MORE THAN FOUR SHAFTS

The same system for representing the floats is used for twills on more than four shafts. With eight shafts, a number of different twills with floats of different lengths are possible. To design these, make a fraction in which all the numbers add up to eight. Then distribute these numbers above and below the fraction line, being sure that the first number is above the line and the last number is below. Here are some possible examples:

$$\frac{2\ 1}{3\ 2} \quad \frac{4\ 2}{1\ 1} \quad \frac{1\ 1\ 2}{1\ 2\ 1} \quad \frac{5\ 1}{1\ 1}$$

DON'T FLOAT PAST THIS!

When you are treadling straight twill, the weft does not always go around the outside selvedge warp threads. Sometimes the outside warp thread floats continuously on one or both edges. If it is on just one edge, you probably have an odd number of warp threads and the edge warp threads are both on even-numbered shafts or both on odd-numbered ones. The easiest way out of this dilemma is to simply remove the edge thread that is not interlacing. Changing treadles or changing the direction of the shuttle will only shift the problem to the other edge.

If warp threads float on both edges, the remedy is simpler. You've probably threaded an even number of warp threads, and one edge thread is on an even-numbered shaft and the other is on an odd-numbered shaft. Skipping one row in the treadling or starting the shuttle from the other side remedies the situation.

The trick is to thread your loom with an even number of warp threads so that one edge ends on an even-numbered shaft and the other on an odd-numbered shaft to narrow the possibilities for floats on both sides or neither. Then start the treadling with the 1-2 shed and enter your shuttle from the even side, the one with an edge thread on shaft 2 or 4.

This system works on a straight-twill treadling, but when the treadling reverses, floats can appear at both edges. For yardage this may not be a problem because the edge will be cut away or end up in a seam allowance. But when they show, neatly woven selvedges are important.

This is where floating selvedges come to the rescue. Floating selvedges always interlace with the weft. Floating selvedges are the first and last warp threads sleyed in the reed but not threaded in a heddle. They don't rise and fall with the sheds, but are encircled as the shuttle always exits under them and enters over them on each edge.

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TWILLS WITH A TWIST: UNDULATION BY DESIGN

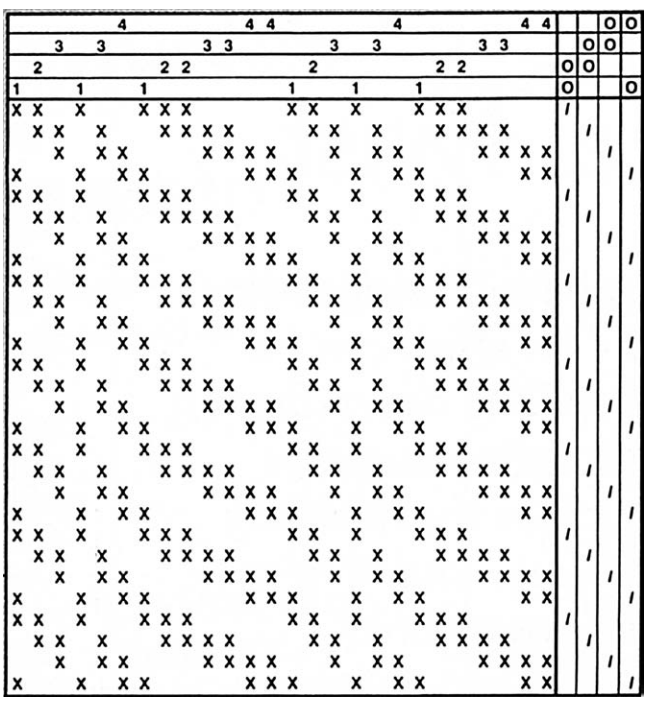
DORAMAY KEASBEY

The graceful waves of undulating twill seem to call naturally for subtle shifts in color to enhance the shimmering effect. The 12-shaft table runner on page 8 has six shades of blue and green arranged in the warp and a gradual blending of brown, gold, and yellow in the weft. Eight shafts or more allow two diagonals, one broad and one very thin, whereas the diagonals in 4-shaft undulating twills are limited to a single width.

Very wavy and shimmering effects can be designed with 4-shaft undulating twills nonetheless. In the sample draft at bottom left, the undulation is achieved by the threading. In the draft at bottom right, it is achieved by the treadling. The effects are the same; only the direction of the diagonal is changed. (The bottom-right example is achieved, in fact, by rotating the draft at the left 90 degrees counterclockwise. So that the interlacement remains the same, when you are turning a draft, the tie-up must be adjusted so that shafts that are raised in the original draft are down in the turned draft.)

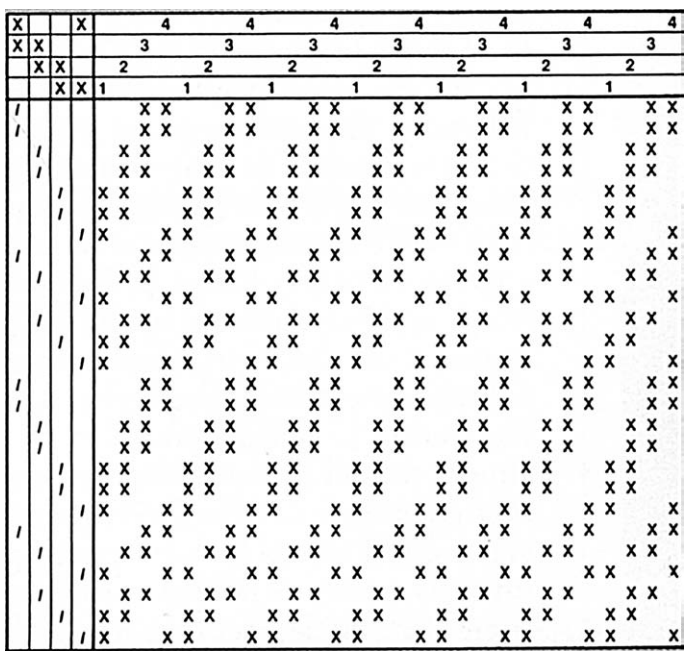
Which version to choose can be determined by the desired end result—the direction the wavy effect would look best in the finished article. A further consideration might be the fact that when threaded as in Version 1, there is little room for variation since this threading can really only be used for weaving an undulating twill. On the other hand, the straight threading in Version 2 offers wide opportunity for a number of different treatments, including any of the usual twill variations, plain weave, and even tabby combined with a supplementary pattern weft—all achieved by treadling variations.

The 12-shaft draft for the table runner in the photo on page 8 was designed with this in mind and therefore uses a straight twill threading; the undulation is achieved only in the treadling. Warp and weft setts are 18 epi and ppi. The yarn is 3/2 pearl cotton, which helps to give the weave stability. Undulating twill is characteristically a very loose weave. With a lighter, smoother yarn or a more open sett, it might be desirable to alternate a tabby pick between the twill picks.



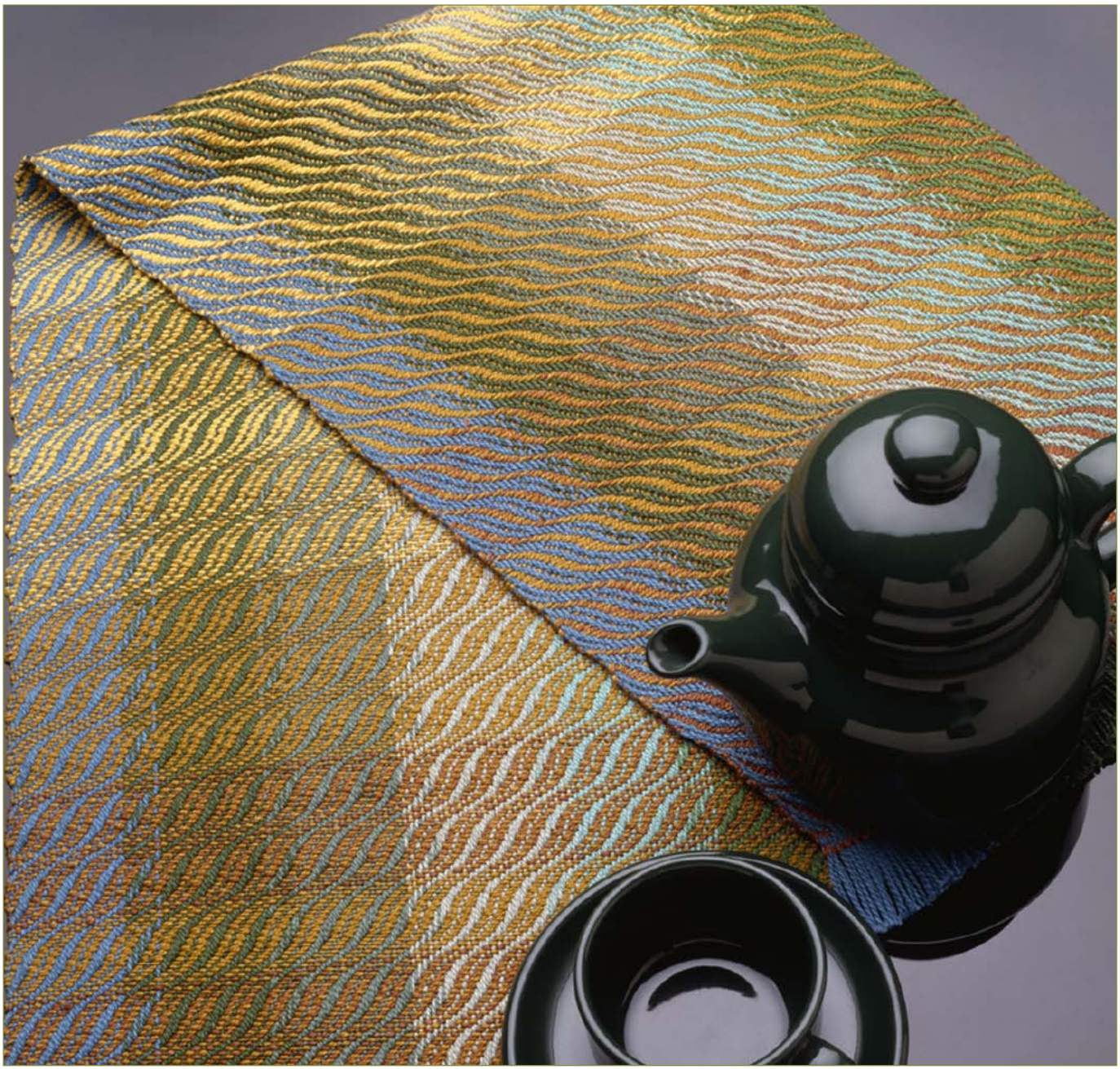
UNDULATING TWILL: VERSION 1

In this version, the undulation is achieved in the threading. In the tie-up, an "o" indicates shafts that rise. Diagonals are flattened by threading more than one thread on the same shaft; heightened by skipping shafts in the threading.



UNDULATING TWILL: VERSION 2

This draft is achieved by "turning" the draft in Version 1 (rotating the draft 90 degrees). An "x" in the drawdown indicates a weft passing over a warp thread; an "x" in the tie-up indicates a shaft that sinks. The drawdown is a "weft" drawdown; the drawdown in Version 1 is a "warp" drawdown.



DESIGNING UNDULATING TWILLS

You can design your own undulating twills. It is just a matter of combining flat, steep, and 45° diagonals in a pleasing progression. Here is the method used for the table runner:

1. First write a straight threading draft for the maximum number of shafts available.

2. Then choose a twill tie-up with at least one strong diagonal (a float over 3 or more threads, 5 in the runner).

3. Next, plan the treadling sequence to include a few sheds in regular twill order, a few that repeat each shed once or twice each, another section in regular twill order, and then a few sheds that skip one or more treadles.

If you fill in the drawdown as you proceed, you'll see how each of these treadling choices affects the twill angle. Using the treadles in sequence produces a 45-degree angle; repeating makes the diagonal steeper, skipping makes it flatter.

Be sure to plan carefully to lead smoothly into the next repeat of the entire sequence.

4. Finally, choose whether to weave it the way you wrote the draft or to turn the draft so that the longer, undulating sequence becomes the threading and the easily remembered straight progression forms the treadling.

5. Now select your colors, set up a real project on your loom, and weave a masterpiece!

Originally published in *Handwoven*®, November/December 1985, pp. 31–32

SIMPLE TWILL TOWELS

MARGARET GAYNES

The functional textiles we surround ourselves with should be beautiful! Drying dishes is more enjoyable if I'm using a colorful and attractive towel—preferably one that is handwoven.

Towels are one of my favorite weaving projects because each towel on any given warp can be woven with a different weft color or stripe sequence. Handwoven towels make perfect gifts, too; everyone can use more towels.

DESIGN CHOICES

Cottolin is an ideal fiber to use for towels. A sturdy and practical yarn, cottolin comes in a wide range of colors. Towels made from cottolin are absorbent, can be machine washed and dried, and need no ironing! Cottolin is available in an amazing range of colors.

A good way to learn about color and design is to start with analogous colors. Analogous colors are next to each other on the color wheel and almost always make a pleasing combination. For these towels, blue-green is used as the main color with blue and green, the two colors closest to blue-green on the color wheel. The green and blue-green yarns are similar in value (degree of lightness or darkness), while the blue yarn is darker for an accent. A slightly warp-dominant 2/2 twill emphasizes the colors in the warp and provides a sturdy, pliable structure—slightly denser than plain weave—that is suitable for towels.

DESIGNING STRIPES

To design the warp stripes, I cut a strip of graph paper as wide as the warp (19" for these towels). If the graph paper squares coordinate with the dents in the reed, the paper can be used as a guide for sleying (with front-to-back warping). For a 12-dent reed sleyed 2/dent, for example, each square of 4-square/inch graph paper represents 6 warp threads. The graph paper strip can be taped on the shuttle race next to the reed and the graph paper lines aligned with the reed teeth. With the graph paper in place, each color can be wound separately on the warping board (easier than changing to a new color for each stripe) and sleyed over the correspondingly colored squares.

To design stripe proportions, I first mark the center point on the graph paper strip and then, using a pencil and eraser, play with stripe widths. The warp for these towels uses a Fibonacci proportion (see Further Reading, page) of 5, 8, 5, 3, 2, 1, 2, 3, 5, 8, which then reverses to make the stripes symmetrical. The unit of measure is ¼" (one square), so, for example, if the number in the Fibonacci sequence is 5, the width of that stripe is 1¼" (5 × ¼").

To judge the effectiveness of a design with many colors or many narrow stripes, it is a good idea to make a wrap by winding threads around a ruler or piece of smooth cardboard in the intended proportions. For these towels, since all three colors clearly work well with each other in both wide and narrow stripes, coloring in the marked stripes on the graph paper strip with colored pencils is sufficient to determine design success. Once the stripes are filled in, step back to see if you like the result. If not, cut another graph paper strip and try a different color order and/or stripe proportion until you are satisfied.

For these towels, the three colors are used in rotation. Although the stripe proportions are arranged symmetrically, the three-color rotation gives the design an appealing asymmetrical look. If you examine the warp color order closely, you will notice, however, that the main color, blue-green, appears symmetrically, which adds harmony to the design.

WEAVING

To make the winding of this warp easiest, wind each of the colors as separate warp chains. To do this, color a 4-square/inch graph paper strip to match the proportions in the Warp Color Order (page 11): 5, 8, 5, 3, 2, 1, 2, 3, 5, 8, 5, 3, 2, 1, 2, 3, 5, 8, 5 (numbers indicate numbers of squares). Each square represents 6 ends (3 dents of a 12-dent reed). Line the graph paper up carefully with the teeth in the reed and tape securely. Wind 168 ends blue-green and sley 2/dent above blue-green squares on the graph paper. Wind 144 ends blue and sley above the blue squares. Finish with green in the same way.

The Weft Color Order (page 11) for these towels mimics the color order of a section of the warp with blue stripes at each end to balance and outline the stripe sequence. To make sure that the stripes at both ends of the towel match, cut a strip of paper (adding-machine tape works well) half the length of the towel (15" for these 30" towels) plus an inch or so at each end. Mark the start and end of the 15" and pin the tape to the cloth, lining up the starting mark with your first pick.

Weave following the Weft Color Order, marking the width, number of picks, and color of each weft stripe on the tape as you weave. When you finish weaving the stripe sequence, weave with blue-green to the center mark on the tape.

Originally published in *Handwoven®*, March/April 2001, pp. 34–36.

Then unpin the tape and reverse it, placing the center mark at the fell of the cloth. Continue weaving, following the stripe widths and colors marked on the tape; the color order will be automatically reversed so the two ends of the towel match.

Separate the towels with two picks of a dyefast yarn in a contrasting color. Keep track of how many towels you have woven by making notes on the tape.

Each towel can be woven with a different colored weft and/or stripe sequence, or try using one weft color for a towel. Weave other sets of towels in other analogous color schemes—red, red-violet, violet, for example. Towels present a wonderful opportunity to experiment!

FINISHING
Cut the fabric from the loom and machine staystitch raw edges. Machine wash in warm water with mild detergent. Tumble dry, removing the fabric from the dryer while it is still slightly damp. Press with the iron on a cotton setting. Staystitch the ends of each towel, and cut them apart, trimming close to the staystitching and removing the contrasting marker wefts. Turn the ends under ¼" and then turn under again. Stitch the hems by hand or machine and press once more.

FURTHER READING
Moore, Jennifer. "The Golden Proportion." *Handwoven*, September/October, 2000, pp. 64–67.

FABRIC DESCRIPTION
2/2 twill.

FINISHED DIMENSIONS
Four hemmed towels 16⅛" by 24¾" each.

WARP and WEFT
Warp: 22/2 Cottolin (50% cotton, 50% linen) a 3,200 yd/lb), 756 yd #7322 blue-green, 648 yd #7840 green, 648 yd #6252 blue.
Weft: 22/2 Cottolin, 1,020 yd #7322 blue-green, 140 yd #7840 green, 308 yd #6252 blue.

YARN SOURCES
Cottolin is available from the Lone Star Loom Room, Västuga, and many weaving retailers.

NOTIONS
Sewing thread for hems.

TOTAL WARP ENDS 456.

WARP LENGTH
4½ yd (allows take-up, shrinkage, and 28" loom waste).

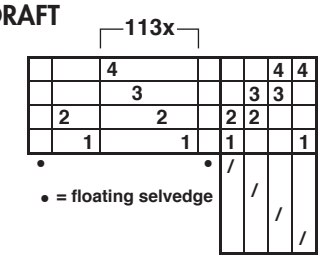
E.P.I. 24.

WIDTH IN THE REED 19".

P.P.I 21.

TAKE-UP and SHRINKAGE
15% in width and 13% in length.

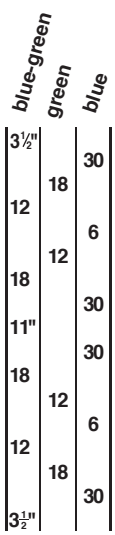
DRAFT



WARP COLOR ORDER

168	30	18	12	48	12	18	30	blue-green
144	48	12	18	30	6	30		green
144	30	6	30	18	12	48		blue
456								

WEFT COLOR ORDER



Numbers followed by (") indicate the inches to be woven. Other numbers indicate the number of picks to weave.

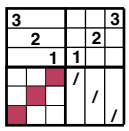
TWILL BASICS

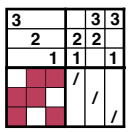
MADELYN VAN DER HOOGT

It is no exaggeration to say that twill is the most versatile of weave structures. Twills provide stable fabrics in an astonishing range of hands with truly infinite potential for pattern.

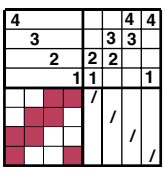
TWILL CHARACTERISTICS

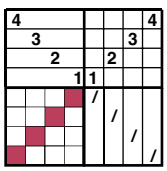
Twill requires a minimum of 3 weft threads and 3 warp threads. In a 1/2 twill, 1 warp thread is up, 2 down for each pick. In a 2/1 twill, 2 warp threads are up, 1 down for each. The ratio of warp threads up to warp threads down moves to the left in the examples at the right by 1 warp thread in each succeeding pick, creating a diagonal line. If this order moves to the right instead of to the left, the diagonal develops in the opposite direction.

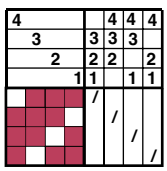




There are three possible ratios of warp threads up to warp threads down if 4 warp and 4 weft threads are used:





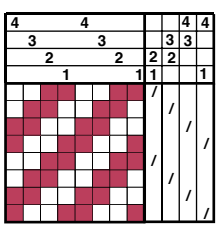


TWILL DIRECTIONS: DON'T GET LOST!

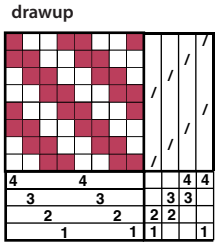
Sometimes it is desirable to produce a twill fabric with a prescribed diagonal direction. Z-twist yarns, for example, tend to show the twill lines more distinctly if woven in a left twill, S-twist yarns in a right twill (see also pages 1–2). A left twill is one that moves upward toward the left during weaving and a right twill as one that moves upward toward the right.

This brings up an interesting drafting dilemma. Most weavers are accustomed to creating drafts with draw*downs*; that is, we begin at the top and work downward. On the loom, however, the first pick is placed at the "bottom" of the weaving and the subsequent weft threads are inserted moving upward. "Draw*ups*" show the correct direction of the twill (a right-hand twill in the fabric produced from both the examples below).

drawdown

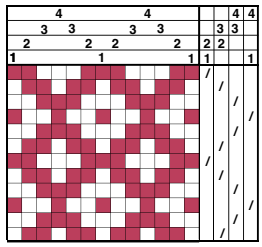


drawup

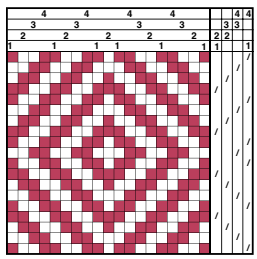


Originally published in *Handwoven*®, November/December 1985, pp. 42, 44

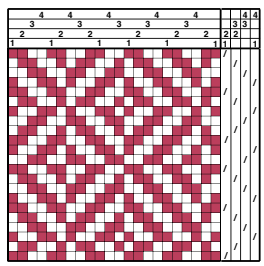
TWILL DESIGN VARIATIONS



Most twills fall into one of four categories: straight, point, extended point, or broken. In straight twills, the shafts are threaded in succession from first to last and the treadles are used in succession from first to last. In a point twill, the shafts are threaded in succession, but the threading reverses on the last and first shafts. If the treadling reverses on the last and first treadles, diamond motifs are created.

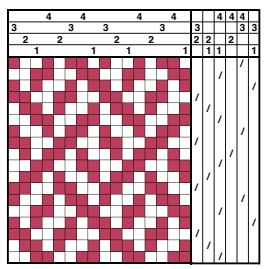


In extended point-twill threadings, the direction changes after more than one threading sequence of all the shafts and/or more than one treadling sequence of all the treadles. Extended point-twill threading and treadling orders usually create a design of concentric diamonds (see the second example from the top at the right).



In broken twills, a shaft or shafts are skipped at reversal points.

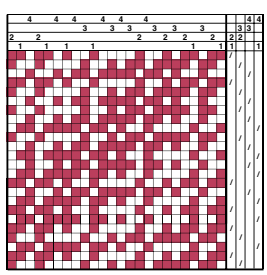
REGULAR AND FANCY TWILLS



Twills are "regular" when the tie-up can be expressed by a twill ratio arranged in sequence. If successive treadles lift different combinations of shafts or use an irregular sequence, the twills are "fancy" or "irregular."

ADVANCING TWILLS

Advancing (or progressive) twills have been a part of our weaving repertoire for more than a century, but the recent use of the computer has led to an explosion of original designs. The computer allows long threading and treadling repeats to be evaluated.



Advancing-twill threadings are characterized by "runs" of 3 or more threads. Each run begins one or more shafts higher (or lower) than the starting shaft of the previous run. Advancing twills expand the scale of characteristic twill designs (diagonals, zigzags, "X's," and diamonds).

PILLOW IN BIRD'S-EYE TWILL

MATILDA MACGEORGE

PROJECT NOTES
This pillow is fast and fun to weave—a good project for a beginning weaver. The draft is a simple twill variation for easy threading and treadling (A German Bird's Eye from Marguerite Porter Davison's *A Handweaver's Pattern Book,* page 20). A seam around the pillow 1" from the edge makes a handsome corded-edge frame for the pillow.

FABRIC DESCRIPTION Bird's eye twill.

FINISHED DIMENSIONS
One pillow 14" by 15". Before cutting, the fabric measured 16" by 33".

WARP and WEFT
Warp: 2-ply wool at 1,800 yd/lb (Harrisville Shetland): 410 yd Cobalt #31 (dark blue-green). Weft: 276 yd Azure #30 (bright blue).

YARN SOURCES
Harrisville Shetland by Harrisville Designs is available from most weaving retailers.

NOTIONS
Blue sewing thread, ½ yd thin polyester quilt batting, polyester stuffing.

TOTAL WARP ENDS 205.

WARP LENGTH
2 yd (allows take-up, shrinkage, and 27" loom waste).

E.P.I. 10. **WIDTH IN REED** 20½".

P.P.I. 10.

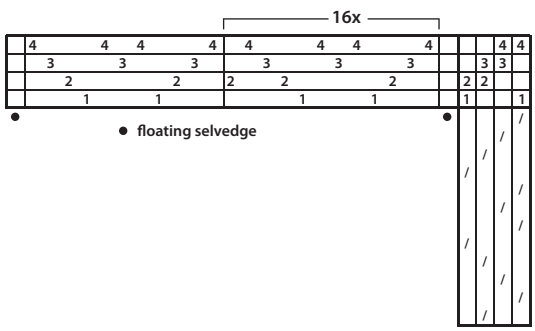
TAKE-UP and SHRINKAGE 22% in width and length.

WEAVING
Using the bright blue weft yarn, weave the length of the warp following the treadling order in the draft, about 44" measured under tension.

FINISHING
Machine stitch both raw edges. Full the wool fabric by machine washing, using warm water and a short, gentle cycle. Lay flat to dry. (Check during agitation to make sure that the fabric does not overfull. Usually, five minutes agitation is enough; then spin out water and take the fabric through the rinse cycle.) Steam-press the fabric when it is completely dry.

ASSEMBLY
Cut the fabric into two equal lengths. Place right sides together and add a layer of quilt batting on the top and bottom. Using a ¾" seam allowance, machine stitch the four layers together around the outside edge, rounding the corners using a half-dollar or a small jar as a guide and leaving a 4" opening for stuffing. Trim the seam allowances and turn the pillow right side out. To form the flanged edge: Machine stitch 1" from the edge around all four sides except for the 4" opening. After stuffing the pillow, handsew the outer opening closed and then machine stitch to complete the flanged edge.

DRAFT



Originally published in *Handwoven*®, November/December 1994, pp. 70, 97

BLUE PLAID LAP ROBE IN DORNICK TWILL

SHARON ALDERMAN

PROJECT NOTES

Dornick twills, similarly to herringbone twills, are designed with changes in twill direction in both the threading and treadling. In dornick twills, however, a shaft is skipped at the reversal points. The skips provide pattern breaks that add interest to the overall patterning. In the lap robe, because the reversals coincide with color changes, these breaks are subtle.

This lap robe's edge finish is especially neat, and there are no fringes, hems, or binding to tangle or wear out. The robe is woven in a woolen-spun yarn that fulls beautifully to produce a thick, cozy fabric.

FABRIC DESCRIPTION Dornick twill.

FINISHED DIMENSIONS

33" by 51" (note that 2" unwoven warp at each end is needle-woven back into the edge).

WARP and WEFT

2-ply wool at 900 yd/lb (Harrisville Highland): 1,050 yd Iris (reddish blue), 150 yd Emerald (green), 150 yd Peacock (blue-green), and 900 yd Lupine (reddish-blue tweed).

YARN SOURCES

Harrisville Highland wool by Harrisville Designs is available from most weaving retailers.

NOTIONS Small latch hook or blunt tapestry needle.

TOTAL WARP ENDS 456.

WARP LENGTH

3 yd (allows take-up, shrinkage, and 27" loom waste).

E.P.I. 10.

WIDTH IN REED 45⅗".

P.P.I. 9.

TAKE-UP and SHRINKAGE

28% in width and length (less fulling will result in less shrinkage).

WEAVING

Avoid draw-in at the edges, especially at the beginning and the end of the lap robe, because the warp ends will be needle-woven back into the edge of the weaving. Use a temple, if available. Allowing about 6" for fringe including amount used to tie on, maintain an even beat at about 9 picks per inch and weave following the draft, about 73".

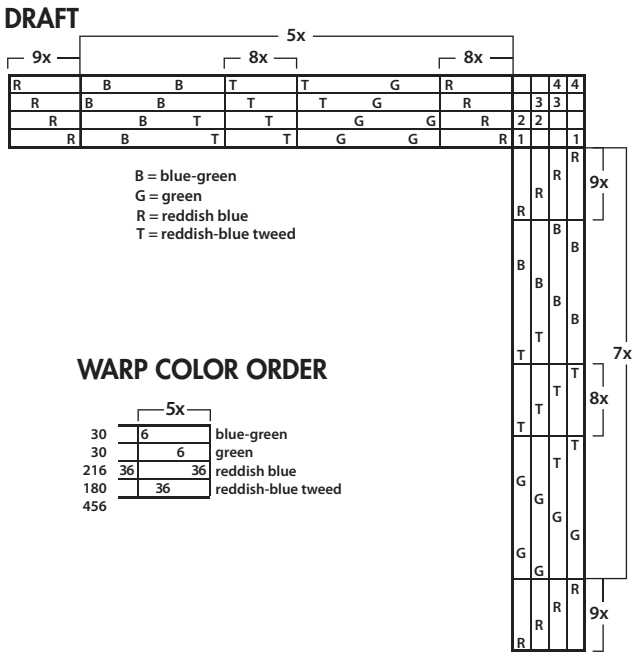
FINISHING

Relax the tension on the warp slightly and begin the first needle-woven edge with the lap robe still on the loom. Having the cloth stretched and under some tension makes the process easier. Cut 1 warp end about 4" from the fell and using a small latch hook or blunt tapestry needle, go around the last pick and weave the end back into the fabric for about 2" following the path of the warp end next to it. Cut and weave every other (every alternate) warp end into the edge of the lap robe in the same manner. Cut the remaining warp ends (the alternate threads you have not worked in) to 4" and remove the lap robe from the loom. Turn the lap robe over and darn in the cut ends for about 1". Staggering these ends helps to make them less visible. Trim excess yarn.

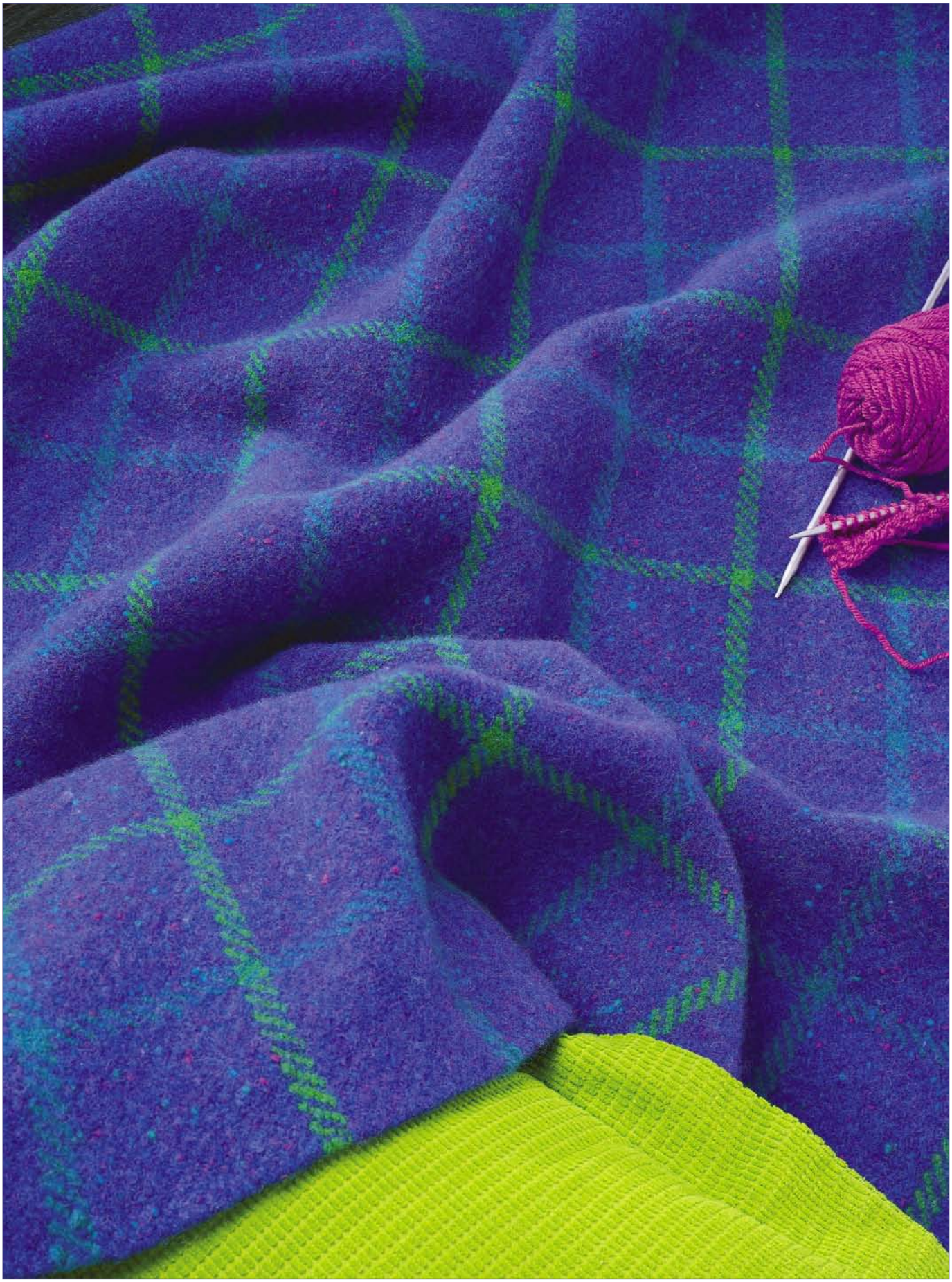
Removing the lap robe from the loom, untie the ends from the apron rod and cut all of these warp threads evenly to about 4". Place the lap robe on a table and weight it with books or other heavy objects. Darn each of the cut warp threads into the lap robe in the same way as for the other end of the lap robe.

Correct any flaws. Machine wash the lap robe in very warm water with a mild detergent until the lap robe is fulled almost as much as you like. Rinse three times. Spin out the water and air-dry over a rod. Brush lightly, if desired.

DRAFT



WARP COLOR ORDER

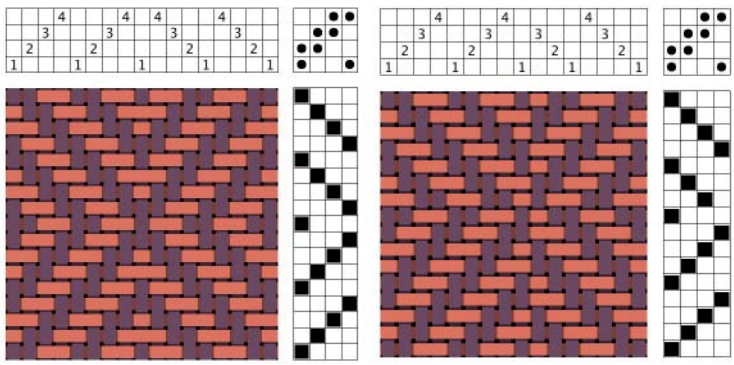


Originally published in *Handwoven*®, January/February 1999, pp. 58, 76–77

GLOWING EMBERS SCARF

LESLIE VOIERS

Dornick twills are point twills in which a shaft is skipped at reversal points so that the 3-thread floats that normally occur with a 2/2 twill are eliminated. The result is less texture and a more uniform surface. In this scarf, the dornick twill creates a clean line break between colors, where the direction of the twill also changes, and a smooth surface texture.



point twill with 3-thread floats | dornick twill with 2-thread floats only

PROJECT NOTES

Black stripes separate the graduated shades of red through purple, and a heathery, dark red weft unifies the stripes.

Try other color combinations, such as white, oatmeal, suede, hickory, charcoal, chocolate, and black with a teak weft for a neutral look.

FABRIC DESCRIPTION Dornick twill.

FINISHED DIMENSIONS

9½" by 80" plus 5" fringe at each end.

WARP and WEFT

Warp: 2-ply wool at 2,000 yd/lb, 133 yd Black, 28 yd Tomato, and 56 yd each of Navy, Violet, Plum, Magenta, and Red. Weft: 2-ply wool, 310 yd Garnet.

YARN SOURCES

2-ply Harrisville Shetland by Harrisville Designs is available from most weaving retailers.

TOTAL WARP ENDS 126.

WARP LENGTH

3½ yd (allows take-up, shrinkage and 27" loom waste; loom waste includes fringe).

E.P.I. 10. **WIDTH IN REED** 12½". **P.P.I.** 8½–9.

TAKE-UP and SHRINKAGE 22% in width, 10% in length.

WEAVING

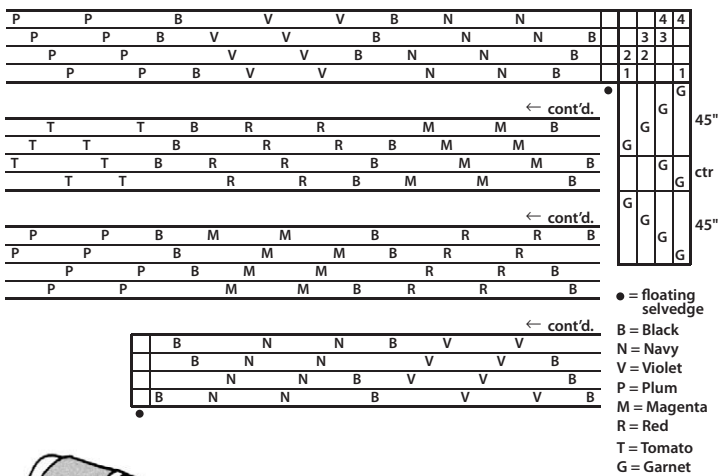
To keep the fringes from fulling and twisting during finishing, weave a temporary heading of I", leave 6" unwoven warp for fringe, weave 90" for the scarf, leave 6" unwoven warp for fringe, and end with a heading of I". A very light and even beat is necessary to achieve soft fluffiness when the scarf is washed.

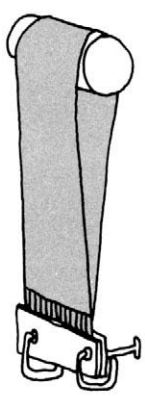
FINISHING

Machine zigzag the very edges of the headings to keep them from raveling during washing. Machine wash on gentle cycle with warm water for about 6 minutes. Rinse with warm water, adding fabric softener to the last rinse. There should be about 13 ends per inch and 10 picks per inch when the fabric has fulled to the right degree of softness. Repeat the process if it is not fulled enough.

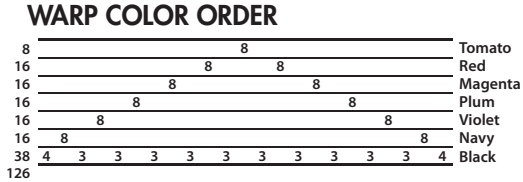
Since pressing will crush the loft, let the scarf dry over a large padded beam with the fringe clamped and weighted as shown below. When the fabric is thoroughly dry, ravel or cut off the heading and make a twisted fringe with groups of 6 ends per fringe and secure each with an overhand knot.

DRAFT

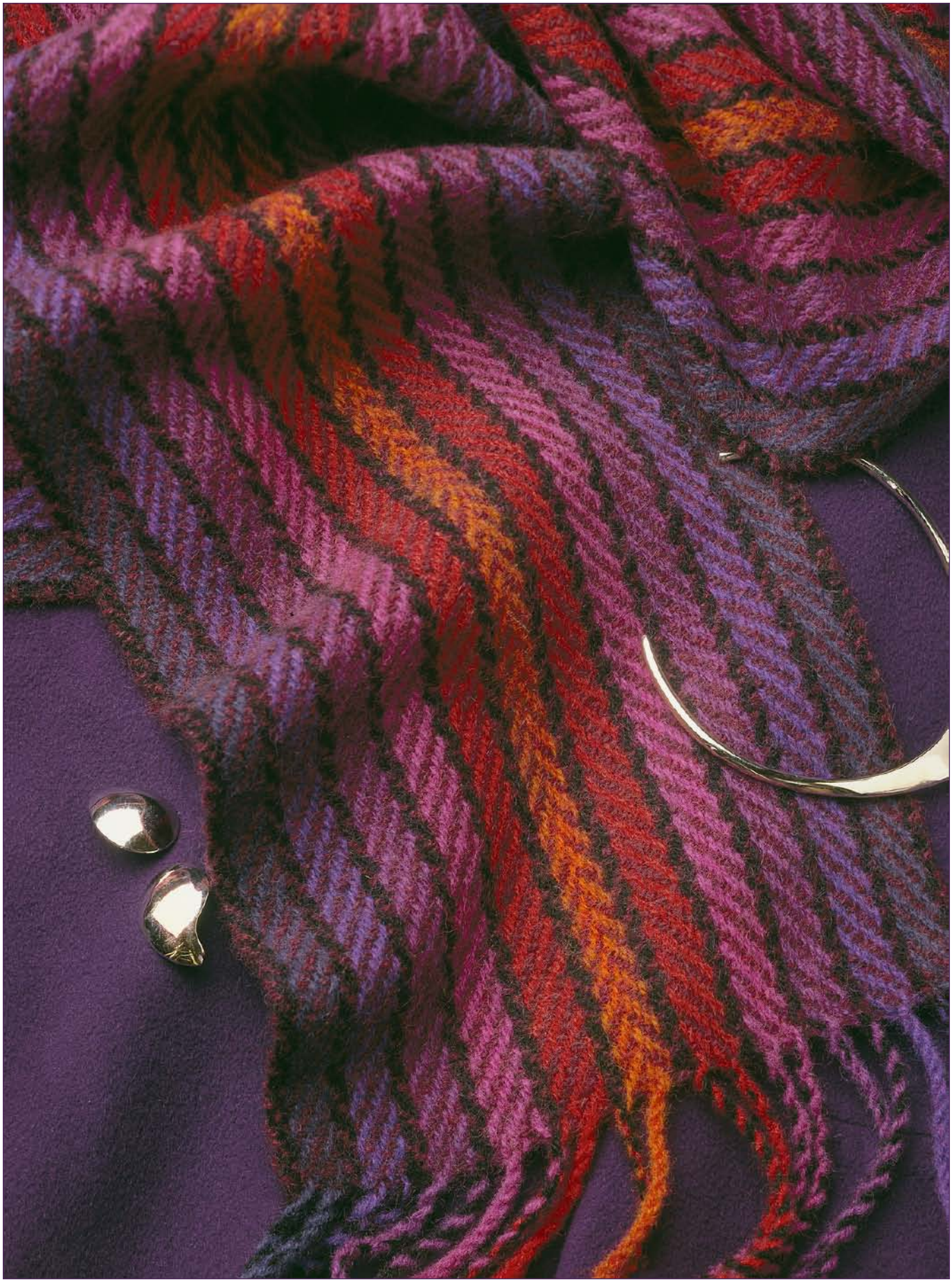




WARP COLOR ORDER



WEIGHTED FRINGE



Originally published in *Handwoven*®, November/December 1985, pp. 42–43; Instruction Supplement, pp. 5–6.

TWILL-BLOCK TOWELS ON FOUR SHAFTS

GLORIA MARTIN

PROJECT NOTES

Twill block weaves usually require a minimum of eight shafts (four shafts for each of two blocks). Either block can produce 3/1 (warp-emphasis) twill or 1/3 (weft-emphasis) twill, depending on the block design. Reducing the twill to three shafts per block to produce 2/1 warp-emphasis twill vs 1/2 weft-emphasis twill reduces the number of shafts to six for two blocks but still prevents weavers with 4-shaft looms from enjoying the delights of damask-like patterning.

For some time, I've been interested in exploring a clever variation of 3-end twill blocks that can be woven on four shafts, such as Twill Blocks No. 2 on page 31 of *A Handweaver's Pattern Book* by Marguerite Davison. I've developed several further variations of this idea, including one in which the twill lines run in the same direction in both blocks that can be expanded to multishaft weaving.

These dish towels use a version in which the twill lines in the two blocks run in opposite directions.

FABRIC DESCRIPTION 3-end, 2-block twill.

FINISHED DIMENSIONS

Three hemmed towels, 15¼" by 30" each.

WARP and WEFT

Warp: 8/2 unmercerized cotton at 3,360 yd/lb, 1,526 yd white. Weft: 8/2 unmercerized cotton, 1,650 yd brown.

YARN SOURCES

8/2 unmercerized cotton is available from most weaving retailers.

NOTIONS

White sewing thread.

TOTAL WARP ENDS 359.

WARP LENGTH

4¼ yd (allows take-up, shrinkage, and 27" loom waste).

E.P.I. 20.

WIDTH IN REED 18".

P.P.I.

27–28. (Because of the construction of the weave, 4 weft threads are needed to square every 3 warp ends.)

TAKE-UP and SHRINKAGE 15% in width and length.

WEAVING

There is no true plain weave with this threading. Begin and end each towel with a "false tabby" ("hem" in the treadling draft).

CHECKED TOWEL: With brown weft, weave 1" for hem, (3" Block A, 1" Block B, 1" Block A, 1" Block B) five times; then end with 3" Block A and l" for hem.

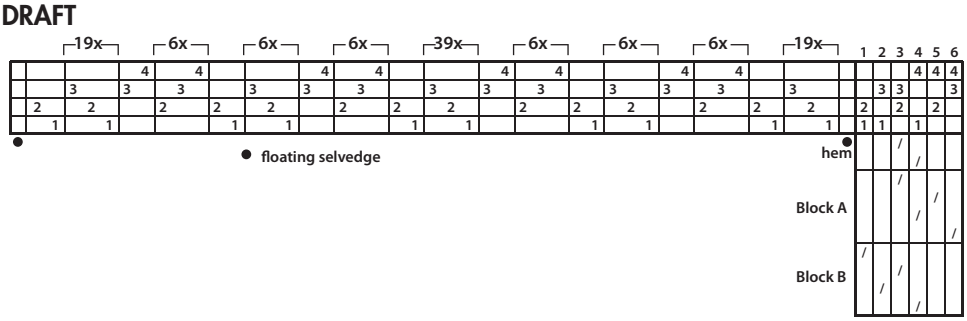
LADDER TOWEL: With brown, weave 1" for hem, 3" Block A, (1" Block B, 1" Block A) thirteen times; then end with 1" Block B, 3" Block A, 1" for hem.

BORDERED TOWEL: With brown, weave 1" for hem, 3" Block A, 1" Block B, 1" Block A, 1" Block B, 21" Block A for the middle of the towel; then reverse the border blocks back to the beginning.

FINISHING

Machine stitch between towels and cut apart. Turn each end under ¼" twice and machine stitch hems. Machine wash in warm water and tumble dry.

DRAFT



Originally published in *Handwoven®*, January/February 1994, pp. 78, 99

WHITE RABBIT TEA TOWELS

ALISON IRWIN

You needn't have the imagination of Lewis Carroll to weave motifs inspired by the many curious creatures in *Alice in Wonderland*. If you can chart it, you can weave it. Or can you?

Use this article as the start of many weaving adventures with mock-satin damask. You'll discover, as Alice did, that sometimes the route to get where you're going is not so very straightforward.

"Oh dear! Oh dear! I shall be too late."

The White Rabbit's lament echoed my own predicament last fall. The Tzouhalem Spinners and Weavers Guild of Duncan, British Columbia, was celebrating its twentieth anniversary in early November of 1993 with their China Tea, a special show. In keeping with the theme, several members had made kitchen towels to wear as aprons during the show. Because I enjoy pick-up, my towels would have to have pictures on them: flowers to match our dinnerware, sheep to go with my mother's small flock, and a rabbit for my sister, who raises French Angoras.

But I was starting the project in mid-September! Determining what designs to put on the towels was easier than deciding what weave structure and yarn to put on the loom.

"There was not a moment to be lost!"

I needed something faster than my favorite doubleweave pick-up if I wanted to finish the towels on time—and a more suitable structure for towels than doubleweave. A quick look through my notebook gave me what I wanted: "mock-satin damask."

Mock-satin damask is a block weave in which the pattern interlacement is 3/1 broken twill and the background interlacement is 1/3 broken twill, or vice versa. True damask is a block weave in which the pattern interlacement is warp satin (4/1, 7/1, 9/1, for example) vs weft satin (1/4, 1/7, 1/9, for example), or vice versa. Broken twill imitates satin in its interruption of the diagonal line, but it is not a satin; hence the adjective "mock." Mock-satin damask is more accurately called turned broken twill.

Whatever it's called, it is a 4-shaft pictorial weave with a simple threading (straight twill) and a speedy, one-shuttle treadling order, very suited to pick-up. The picked-up blocks of warp floats show up nicely on a background of weft floats, and both sides of the fabric can be used as the "right" side. Mock-satin damask would be perfect for those special towel border designs I had in mind.

Or so I thought, until I wove a sample.

"I should like to have it explained," said the Mock Turtle.

After trying out setts and a variety of weft yarns and colors on the cottolin warp that I planned to use, I was startled to see that the picture growing on the loom didn't match my drawing. The tidy squares on the graph paper had become ragged-edged blocks in my weaving. Why had the crisp lines disappeared? Would the figured bands work if they were woven another way? I put down my shuttle and retired to the library.

The calendar in the library told me that it was now October.

She was now only ten inches high, and her face brightened up at the thought that she was now the right size.

I picked up my pencil again. As I researched satin damask, I read that designs are most effective when there are sharp breaks between the weft-float and warp-float units. When the breaks are not sharp, the edges of the pattern become indistinct because the yarns float across the lines where they should change from warp floats to weft floats and vice versa. The same principles apply to mock-satin damask.

Unlike Alice, I couldn't shrink to inspect the wandering threads, but I could enlarge the interlacements on paper and make them big enough to see easily. An examination of the units reveals why the edges were ragged: Both warp and weft floats from one block extended into the neighboring blocks (see Figure 1b, page 23. It's no wonder, then, that what I wove didn't accurately represent the drawing!

"Then it ought to be Number One," said Alice.

Elated with this discovery, I played with other pick-up pairings and tried out different treadlings. As Alice had suggested, the solution lay with the first warp end and the first weft pick. Notice in the revised threading and weaving sequence in Figure 1c on page 23 that the breaks between the weft- and warp-float areas are clean. Although weaving this way means that each unit requires three pick-up rows rather than two, I think the results are worth it.

My problem solved, I returned to the loom and wove madly. In the end, this was one White Rabbit who wasn't late, and the towels are perfect.

"Take some more tea."
"Why not?" said the March Hare.

Originally published in *Handwoven*®, May/June 1994, pp. 68–70, 91

Some configurations of mock-satin damask break more cleanly than others. If the pick-up stick is inserted and kept in place for 2 picks, then reinserted for 2 picks as in Figure 1b, the edges of the block are not cut cleanly. If the pick is made three times, as in Figure 1c, the design shows a clean cut, worth the extra pick-up.

THE PICK-UP PROCESS

Without a clean cut (2 pick-ups per 4 picks)

1. Raise shafts 1 and 3 and pick up on the pick-up stick the 2-3 pair of ends for each marked square in the row.
2. Lift shaft 4 and weave.
3. Lift shaft 1 and weave. Remove the pick-up stick.
4. Pick up the 4-1 pair on either side of the 2-3 pair lifted in Step 1.
5. Lift shaft 3 and weave.
6. Lift shaft 2 and weave. Remove the pick-up stick.

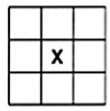
Repeat Steps 1 to 6 for every row in the design.

With a clean cut (3 pick-ups per 4 picks)

1. Raise shafts 1 and 3 and pick up on the pick-up stick the 2-3 pair of ends for each marked square in the row.
2. Lift shaft 1 and weave. Remove the pick-up stick.
3. Pick up the 1 and 4 on either side of the 2-3 pairs picked up in Step 1.
4. Lift shaft 3 and weave.
5. Lift shaft 2 and weave. Remove the pick-up stick.
6. Repeat Step 1.
7. Lift shaft 4 and weave. Remove the pick-up stick. Repeat Steps 1 to 7 for every row in the design.

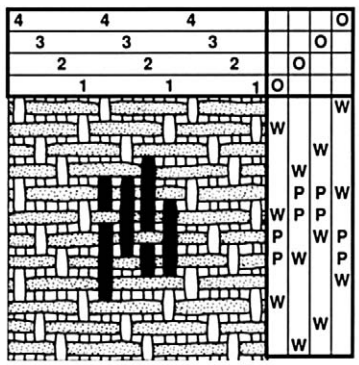
ACHIEVING CLEAN BLOCK EDGES

1a. The design: one block of 4 ends and 4 picks weaves warp-faced mock satin in a background of weft-faced mock satin

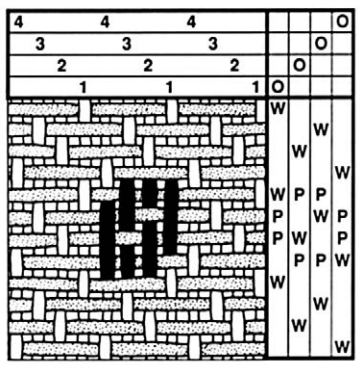


1b. Warp and weft floats overlap block edges

W = weft pick
P = pick-up stick inserted



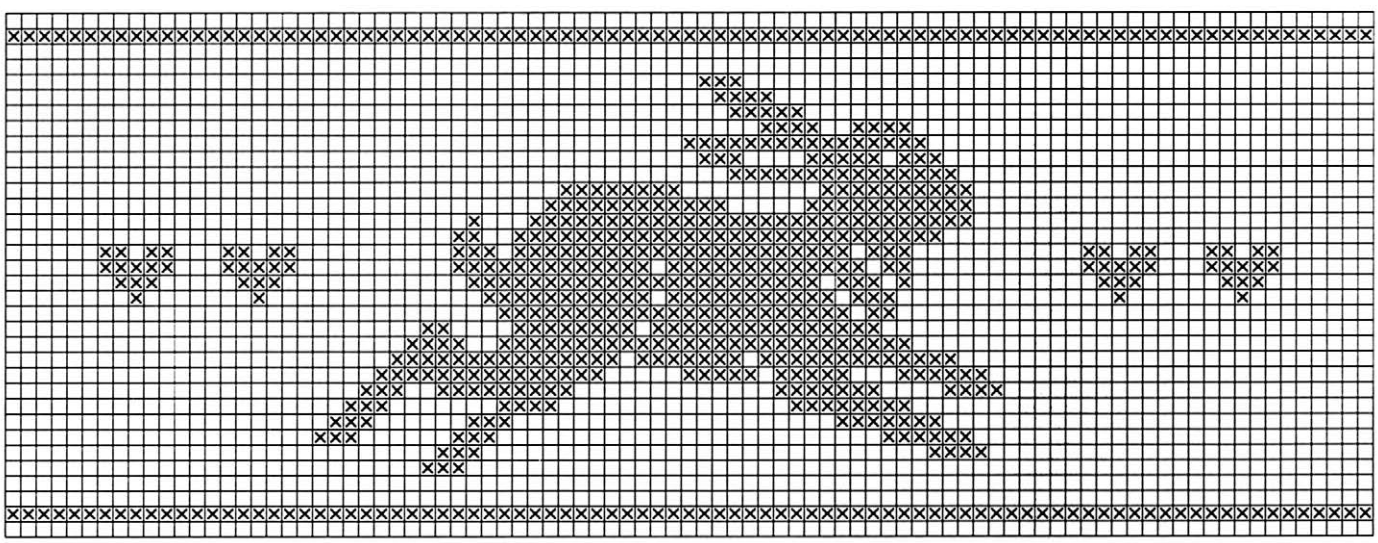
1c. Warp and weft floats are "cut" at block edges



PICK-UP DESIGN

X = pick-up units

= 4 ends and 4 picks



PROJECT NOTES

These towels add just the right touch to an *Alice in Wonderland* tea party. Mock-satin damask offers picked-up blocks of warp floats that show up nicely on a background of weft floats. It's easier to weave than doubleweave pick-up and makes a reversible fabric. Through a change in treadling, the body of this towel is a textured waffle-like cloth. For your own designs, draw upon ideas from cross-stitch and needlepoint patterns since each square translates easily into a 4-end unit. This rabbit comes from *A Prairie Christmas*, a needlepoint publication from The Prairie Schooner.

FABRIC DESCRIPTION

Texture weave with mock-satin damask pick-up.

FINISHED DIMENSIONS

Two hemmed towels 16½" by 26" each.

WARP and WEFT

22/2 cottolin (60% cotton/40% linen) at 3,200 yd/lb: 1,750 yd white, 420 yd unbleached.

YARN SOURCES Cottolin is available from the Lone Star Loom Room and Vävstuga.

NOTIONS and other TOOLS

White sewing thread, pick-up stick.

TOTAL WARP ENDS 462.

WARP LENGTH

2¾ yd (allows take-up, shrinkage, and 27" loom waste).

E.P.I. 24 (sleyed 4/dent in a 6-dent reed).

WIDTH IN REED 19¼". **P.P.I.** 21.

TAKE-UP and SHRINKAGE 14% in width and in length.

WEAVING

I use hemstitching at each end of the towel. When I work hemstitching, I weave 2 picks raising 1-2 and 3-4 and hemstitch in groups of 4 ends. Start the towel with a 3" border of 1/3 mock satin. Follow with 1 repeat of 3/1 mock satin and 2 repeats of 1/3 mock satin, which bring you to the first row of the pick-up pattern.

WEAVING THE PATTERN

In the pick-up sections, each square in the Pick-Up Design represents 4 ends and 4 picks. Use the denting of the warp threads as a guide. First pick up the ends threaded on shafts 2 and 3 for each marked square on the graph, raise shaft 1, and weave. The weft goes under the ends on shaft 1 and the picked-up ends on shafts 2 and 3. Remove the pick-up stick and pick up the 1,4 ends on either side of the 2-3 pairs that you picked up in the last step. (For each square, all 4 ends to be picked up are in the same dent so it is easy to find the ends for the second pick-up.) Weave raising shaft 3, then shaft 2, and remove the pick-up stick. Pick up the same 2-3 ends as in the first step, weave raising shaft 4, and remove the pick-up stick.

After working the pick-up pattern, weave two repeats of 1/3 mock satin, one repeat of 3/1 mock satin, and three repeats of 1/3 mock satin. Switch to the white yarn and weave 20" using the texture treadling. Return to the unbleached yarn and weave three repeats of 1/3 mock satin, one repeat of 3/1 mock satin, and end with 3" of 1/3 mock satin. Weave 1 pick of contrasting yarn between towels.

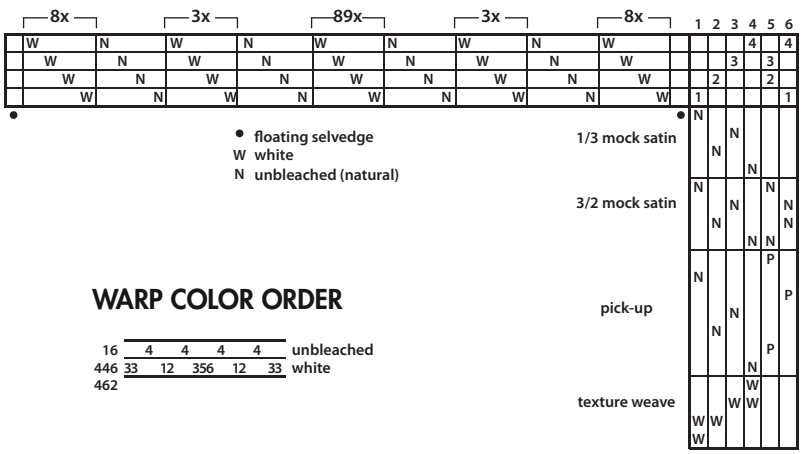
FINISHING

Machine wash in warm water. Tumble dry and steam-press.

ASSEMBLY

Cut apart the towels. Fold ends under about 1" twice, aligning hems with the narrow stripe. Press flat and sew by hand.

DRAFT



WARP COLOR ORDER

16 4 4 4 4 unbleached
446 33 12 356 12 33 white
462

NINE-PATCH PICNIC MATS

ALISON IRWIN

PROJECT NOTES

I use these small placemats at lunchtime under salad plates, but I can also see them as lap mats at a picnic. The easy-care fabric will travel well—just roll the mats and tie with a kumihimo braid before slipping them into the picnic basket.

FABRIC DESCRIPTION

The weave structure is sometimes called turned broken twill, sometimes mock-satin damask, sometimes false damask (see also pages 21–24). The pick-up pattern is 3/1 warp-dominant twill in a background of 1/3 weft-dominant twill.

FINISHED DIMENSIONS

Four small hemmed placemats, 12⅛" by 12⅝" each.

WARP and WEFT

22/2 cottolin (60% cotton, 40% linen) at 3,175 yd/lb: 972 yd gold for warp; 875 yd white for warp and weft.

YARN SOURCES

22/2 cottolin is available from most weaving retailers.

NOTIONS and TOOLS

Thin pick-up stick at least 20" long (I use a length of fine music or piano wire), flat regular pick-up stick (at least as wide as the shuttle is deep), matching sewing thread, tapestry needle.

TOTAL WARP ENDS 358.

WARP LENGTH

3 yd (allows take-up, shrinkage, and 27" loom waste).

E.P.I. 24. **WIDTH IN REED** 15". **P.P.I.** 24.

TAKE-UP and SHRINKAGE 15% in width and length.

WEAVING

For each mat: Follow the Pick-Up Design from the beginning (bottom) to the end (top), then reverse without repeating the center pick-up rows. Separate mats with 2 picks basketweave in a colorfast, contrasting-color yarn.

PICK-UP PROCESS

Each row in the design represents 4 picks. To make the pick-up easier: Run a strand of dark sewing thread in the 2-3 shed of the first pick-up row and leave it in place for all 4 picks. Then pull it out and repeat for the next sequence. For each row:

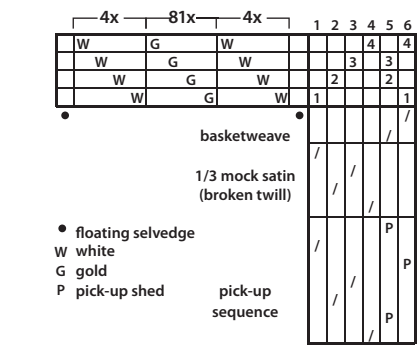
1. Raise shafts 2-3 and pick up a pair of ends on the thin pick-up stick (the thin stick makes all the pick-ups) for each dark square. Release the shafts and slide the pick-up stick to the reed.
2. Raise shaft 1, insert the flat stick, and turn on edge against the reed. Weave. Remove both sticks. Beat.
3. Raise shafts 1-4. Pick up threads on either side of the 2-3 pairs just picked up. Release the shafts; slide pick-up stick to the reed.
4. Raise shaft 3, insert the flat stick, and weave. Remove only the flat stick; beat. Slide the thin pick-up stick to the reed.
5. Raise shaft 2, insert the flat stick, and weave. Remove both sticks; beat.
6. Raise shafts 2-3. Pick up the same pairs as in the first row. Release the shafts; slide pick-up stick to the reed.
7. Raise shaft 4, insert the flat stick, and weave. Remove both sticks; beat.

FINISHING

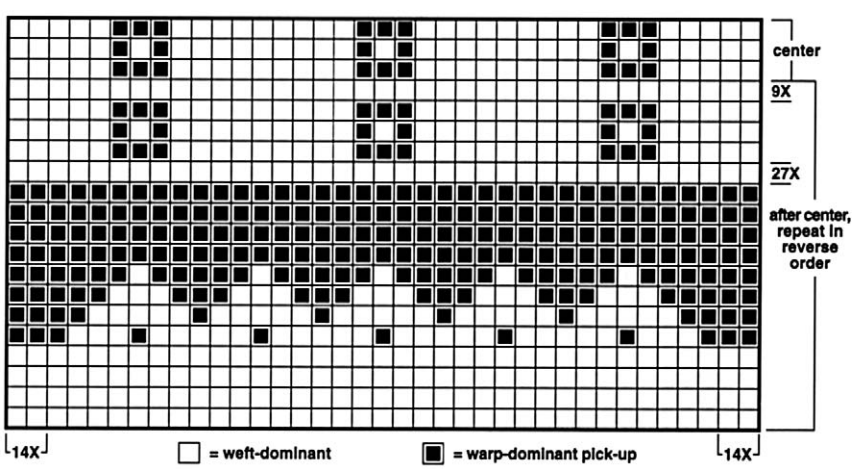
Machine wash, hot water, mild detergent, cold rinse. Tumble dry, remove before completely dry, and steam-press. Cut mats apart. Turn hems under twice toward the light side so that the triangle pick-up design is visible on light side only; handsew hems.

WARP COLOR ORDER

DRAFT



PICK-UP DESIGN



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MINUET IN COLOR: RUNNER AND MATS

TRACY KAESTNER

Most new weavers are struck by the similarities between threading drafts and musical scores. When my son took up the violin and sheet music became part of our lives, the similarities caught my attention again. Then my son requested a weaving based on Minuet 3 by Johann Sebastian Bach. Transposing the notes directly from the score into a threading draft seems the most logical way to begin, but when I've tried this, the results have been too busy and have required extensive adjustments to provide a stable cloth. Associating musical notes with colors rather than shafts has been more successful for me!

Minuet 3 uses nine colors from around the color wheel (color names are from Lunatic Fringe's Tubular Spectrum). Red is designated to represent the lowest note, Purple Blue the highest. All notes are assigned 11 ends each except for the dotted half note, which is assigned 33 ends (the Green Yellow stripe at one edge), and the note played twice in succession, which is assigned 22 ends (the Red stripe near the center).

FABRIC DESCRIPTION

Extended point twill.

FINISHED DIMENSIONS

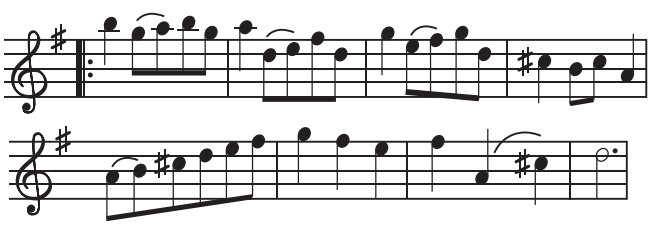
One hemmed runner 13⅝" × 42" and two hemmed mats 13⅝" × 13½" each.

WARP and WEFT

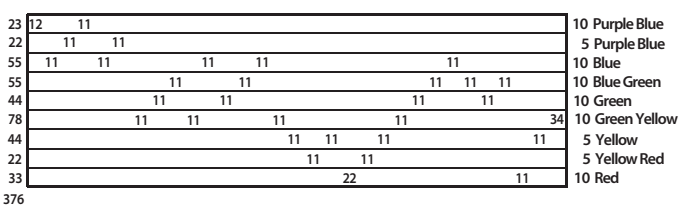
Warp: 10/2 pearl cotton at 4,200 yd/lb in nine Tubular Spectrum colors, 116 yd #10 Red (½ oz), 77 yd #5 Yellow Red (⅓ oz), 154 yd #5 Yellow (⅔ oz), 273 yd #10 Green Yellow (1⅛ oz), 154 yd #10 Green (⅔ oz), 193 yd #10 Blue Green (¾ oz), 193 #10 Blue yd (¾ oz), 77 yd #5 Purple Blue (⅓ oz), 81 yd #10 Purple Blue (⅓ oz).

Weft: 10/2 pearl cotton, 900 yd Black, (3½ oz); 40 yd (⅕ oz) of each warp color for borders (30 total stripes).

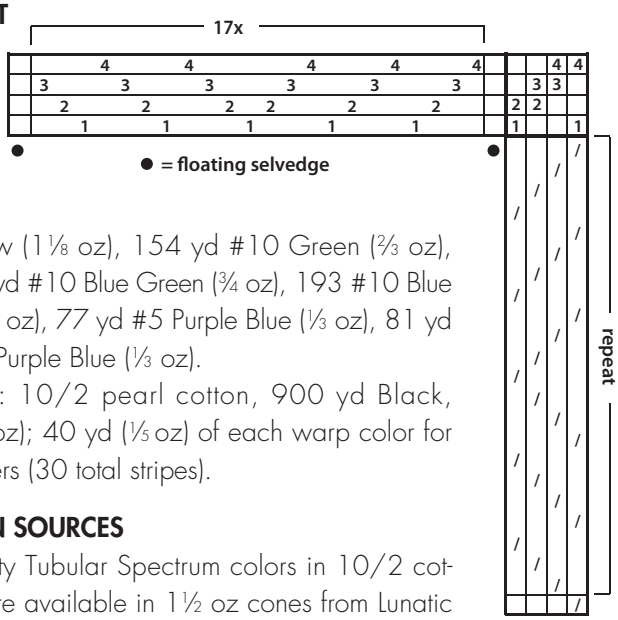
MINUET 3 (EIGHT MEASURES)



WARP COLOR ORDER



DRAFT



YARN SOURCES

Twenty Tubular Spectrum colors in 10/2 cotton are available in 1½ oz cones from Lunatic Fringe. Black 10/2 cotton is available on 8 oz cones from Lunatic Fringe.

NOTIONS

Sewing thread.

TOTAL WARP ENDS 376.

WARP LENGTH

3½ yd (allows take-up, shrinkage,and 35" loom waste).

E.P.I. 24. **WIDTH IN REED** 15⅝". **P.P.I.** 28.

TAKE-UP and SHRINKAGE

13% in width, 15% in length (5% take-up, 10% shrinkage).

WEAVING

Weave the runner following the draft: 1¼" with Black weft for first hem, 3½" for a border of five stripes of 11 picks of a selected warp color for each stripe, 38½" with Black weft for body, 3½" for a second border using different colors than for the first, 1¼" Black for second hem (48" total). Weave the pottery mats with the same hems and borders as the runner but weave 8½" with Black for the center (18" total).

FINISHING

Cut the three pieces from the loom and serge or machine zigzag between them. Machine wash, warm; tumble dry on low heat. Press with a hot iron. Cut pieces apart and turn up hems at border edges. Turn half under again and sew hems by hand.

Originally published in *Handwoven®*, September/October 2000, pp. 44–46.

VARIATIONS ON A THEME: TWO SCARVES

DORAMAY KEASBEY

Written music bears such a striking resemblance to drafts for weaving that weavers are often tempted to thread their looms directly from a musical score. The process of transcribing musical notation into a draft is not at all difficult and doesn't even require that you know how to read music. With this article and a little imagination, your fully warped loom can become a marvelous stringed instrument with organ-like pedals capable of sustaining a rhythmic beat. The scarves on pages 30 and 33 are only two of many possible variations on a simple melodic theme.

CHOOSE THE SCORE

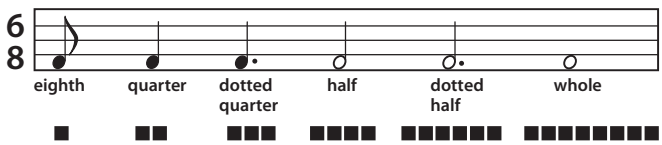
When selecting a musical score to translate into a draft for weaving, choose a short tune or a favorite phrase from a longer piece. Because notes bounce up and down in pitch according to the aesthetic principles of music rather than the rules of weave structure, notes written on a staff cannot be expected to translate directly into a threading draft without considerable adjustment. They can be translated more directly, however, if they are used to derive a threading order for blocks instead of shafts. The resulting profile draft can then be interpreted in a selected block weave.

SIMPLIFY THE SCORE

Since profile threading drafts show only one mark in each vertical column while musical notation can include several vertically stacked notes, a choice must be made of which note to translate when this happens. The easiest solution is to select the top note since it is usually part of the main melody.

DETERMINE THE BLOCK WIDTHS

Musical rhythm can be captured by translating long notes as wider blocks than short notes. To do this, first determine which note in the musical score has the shortest duration. Assign to it the value of one square in the profile threading and then assign appropriate multiples to longer notes. In the example



given above, an eighth note is the shortest note and a whole note the longest note. Thus a single square on the profile represents an eighth note, two squares a quarter note, etc. A dot after a note means that it is half again as long; a dotted quarter note is therefore equal in time to three eighth notes.

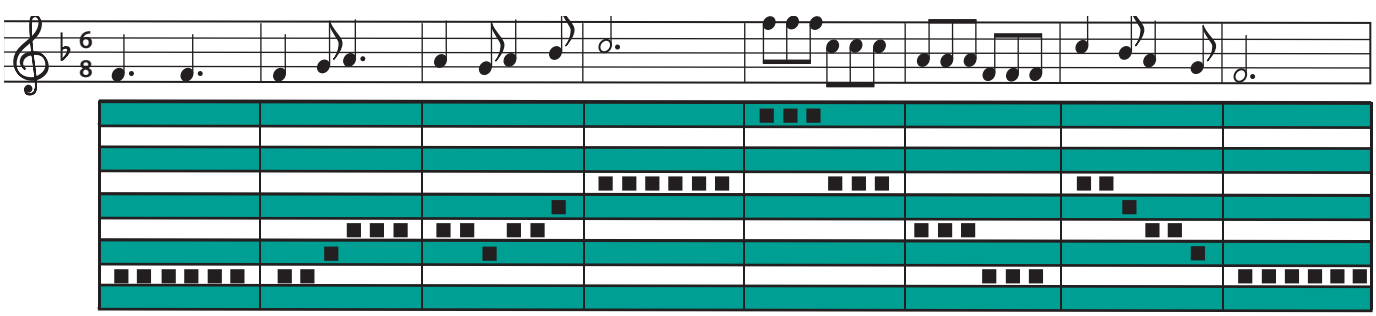
If a sixteenth note is the shortest note, one square is assigned to it, two to an eighth note, etc.

DEVELOP THE THREADING PROFILE

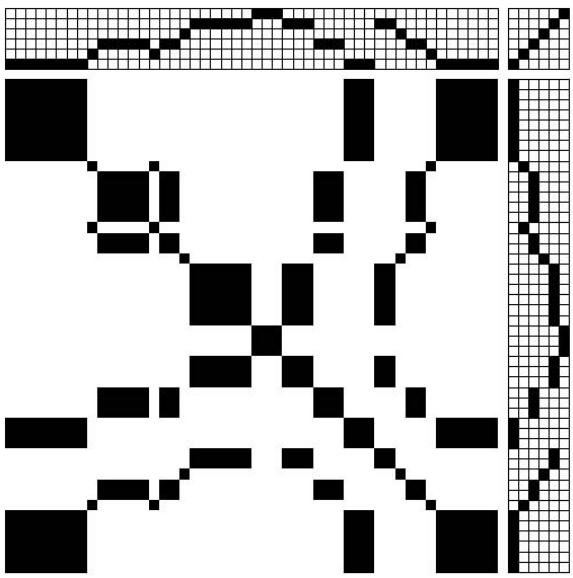
The next step is to place the appropriate number of squares for each note on the proper row of a profile threading draft. Since musical notes can occupy both lines and spaces while profile squares occupy only spaces, some adjusting must occur. Notes from "Row, Row, Row Your Boat" are translated into a threading profile at the bottom of this page. Notice that the profile threading does not actually use all of the rows provided. This means that the profile can be compressed to fewer rows by omitting the unused rows, six for this threading, as in the profile threading draft in the 6-Block Profile Draft, page 30.

The 6-Block Profile Draft shows the resulting design if the treadling order of the blocks is the same as the threading order. Because looms with few shafts have limited block capacity, it is often necessary to compress a profile to even fewer rows. In the 5-Block Profile Draft at the bottom right of page 30, the very highest notes at the center of the 6-Block Profile Draft have been rewritten on the bottom row. This is similar to the method for reducing a draft that weavers call telescoping: A portion of a threading draft that extends beyond the usable number of rows can be sliced off and redrawn on the available rows.

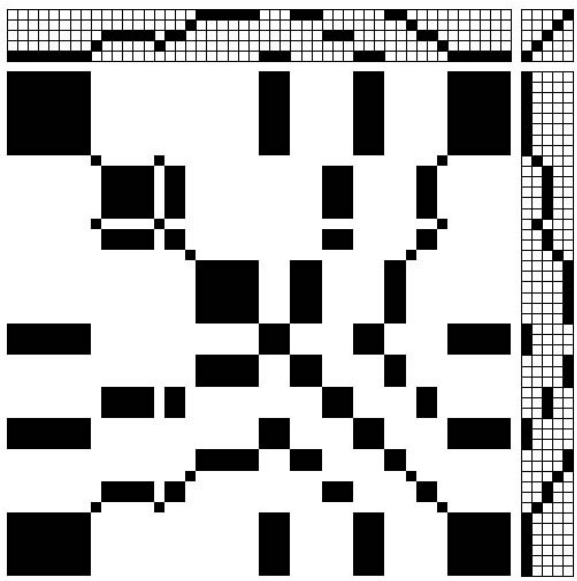
DERIVING A PROFILE THREADING FROM "ROW, ROW, ROW YOUR BOAT"



6-BLOCK PROFILE DRAFT

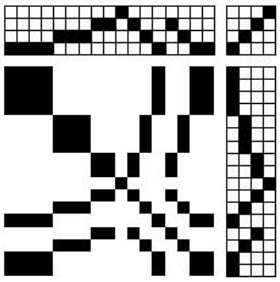


5-BLOCK PROFILE DRAFT



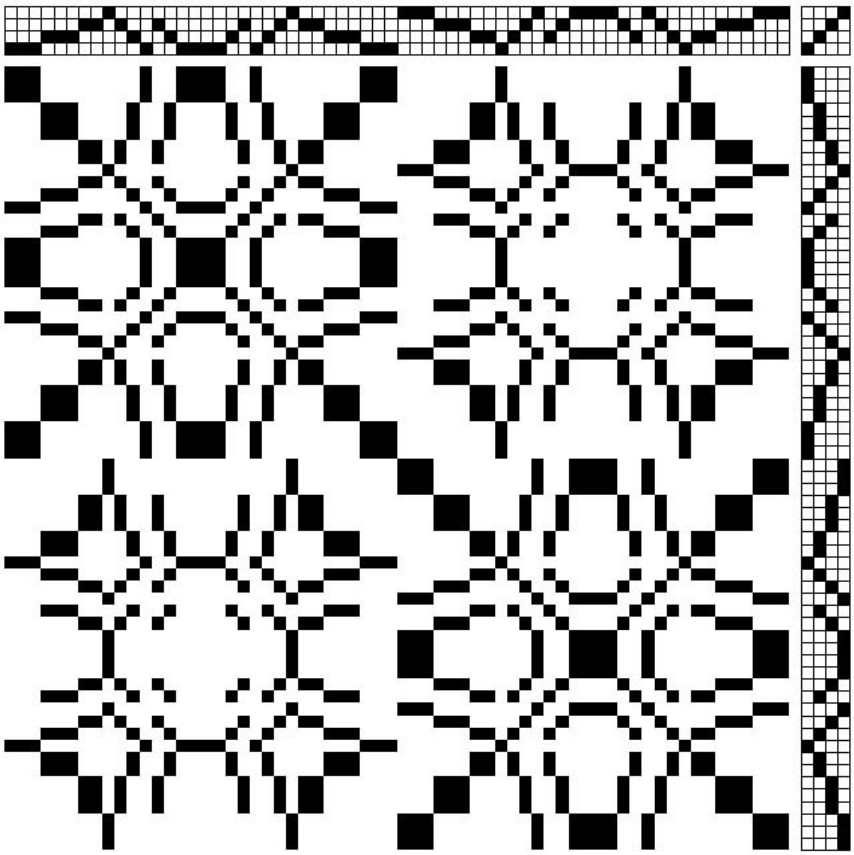
Originally published in *Handwoven*®, September/October 2000, pp. 52–58.

4-BLOCK PROFILE DRAFT



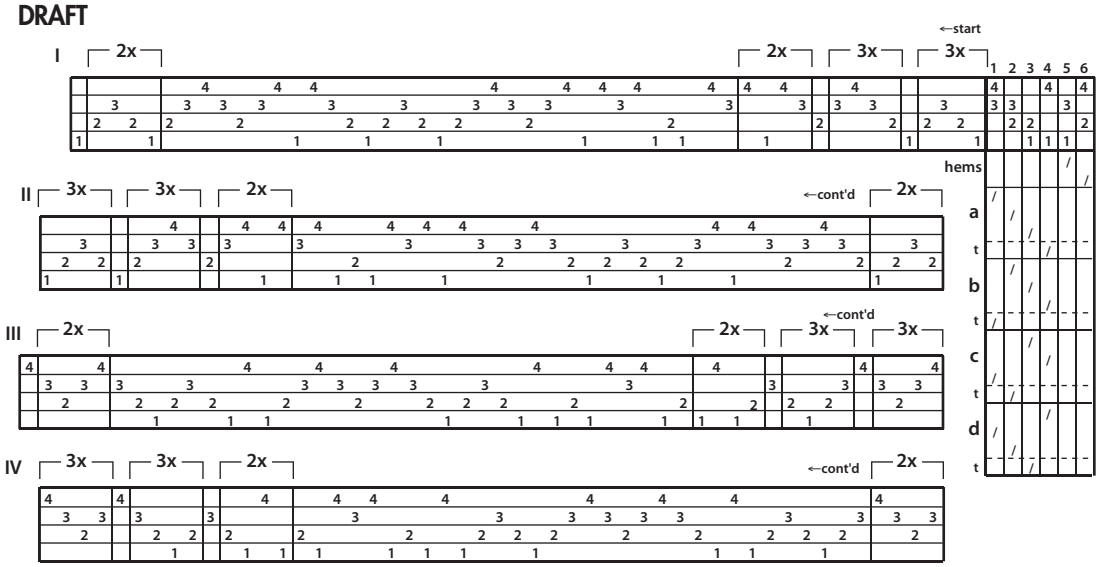
The original 6-Block Profile Draft is compressed by placing each eighth note on the same row as the quarter note that precedes it.

EXPANDED 4-BLOCK PROFILE DRAFT



The 4-Block Profile Draft is expanded by reversing and inverting.

DRAFT



Thread (from right to left) I, II, III, IV, I, II, III, IV, I, II.

For Adagio, rotate colors A (Aqua), G (Bottle Green), and C (Champagne) throughout. Weave each sequence (a, b, c, d) for the desired height for each (repeat the 3 picks in each section as many times as desired; weave the transition pick 't' only when changing to a new sequence).

For Allegro, to weave as-drawn-in: Read the numbers in the threading as the treadle numbers to use for each pick. Repeat I, II, III, IV for length of scarf; balance with I, II.

Another method for reducing a profile to a practical size is to merge adjacent rows. For example, our original 6-Block Profile Draft can be compressed to four rows by combining the shortest notes with their longer neighbors. In the 4-Block Profile Draft, page 31, a very successful reduction occurs when each eighth note is placed on the same row as the quarter note that precedes it. Note that the time signature 6/8 near the left end of the staff means that each measure (bounded by vertical lines) contains six beats and that each eighth note is worth one beat. When the notes are constrained to just four rows in the method indicated above, each measure contains two sets of three beats. Thus the profile can be simplified as in our 4-Block Profile Draft, in which each set of three beats is translated as a single square.

BALANCE THE ARRANGEMENT

A sense of balance in music can be provided by repetition, as when one musical phrase is restated immediately or is rendered again after a contrasting interlude. In the Expanded 4-Block Profile Draft, page 31, the 4-Block Profile Draft is expanded and balanced by reversal—similarly to the musical form known as a crab canon! The resulting motif is then inverted in the second half of the draft.

THE PROJECT SCARVES

The threading draft for both scarves is derived from substituting the following threading keys for each square on the Expanded 4-Block Profile Draft, adding incidentals (+) at block changes: A = 1-2-3-2 (+1); B = 2-3-4-3 (+2); C = 3-4-1-4 (+3); D = 4-1-2-1 (+4). These substitutions are made for the first motif and the resulting threading inverted for the second.

You may recognize this threading as the threading for crackle. The treadling used for the scarves does not produce crackle, however, in which tabby and pattern wefts alternate. Two different twill sequences are used instead, one for each scarf, and many other twill variations are possible on the threading. For Adagio, page 30, blocks of color are built using a constant rotation of three colors. For Allegro, page 33, the treadling is "tromp as writ." Consider winding a much longer warp to play with the possibilities and create additional scarves using other twill treadling sequences and/or other weft color orders.

FABRIC DESCRIPTION

Twill variation on a crackle threading.

FINISHED DIMENSIONS

Two hemmed scarves 9½" × 68" each.

WARP and WEFT

Warp: 140/2 spun silk at 35,000 yd/lb, 1,964 yd each of Seafoam and Champagne (or Natural).

Weft: 140/2 spun silk, for Adagio 940 yd each of Aqua, Bottle Green, and Champagne; for Allegro 2,100 yd total of miscellaneous colors in a range that includes violet, blue, red, orange, and gold.

YARN SOURCES

140/2 silk is available from Lunatic Fringe.

NOTIONS

Sewing needle for hemming.

TOTAL WARP ENDS 747.

WARP LENGTH 5¼ yd (allows take-up, shrinkage, and 36" loom waste).

E.P.I. 72 epi. **WIDTH IN THE REED** 10⅖".

P.P.I. Adagio, 120; Allegro, 30 ppi (of tripled weft).

TAKE-UP and SHRINKAGE

8% in width and 6% (5% take-up, 1% shrinkage) in length.

WARPING

Wind a warp of 747 ends alternating 1 end Seafoam/1 end Champagne (use the first and last ends as floating selvedges; the floating selvedges are not shown in the Draft).

WEAVING: ADAGIO

Begin and end the scarf by weaving ¼–½" in plain weave for hems using the Aqua weft, maintaining a firm beat. Weave the scarf following treadling sequences a–d in the Draft using the 3 weft colors in constant rotation: Aqua (A), Bottle Green (G), and Champagne (C) for 72"; repeat the 3 picks in each sequence as many times as desired and weave a transition pick (t) only when you change to a new sequence. With this technique, even though the weft color order remains constant, the colors shift to a new position each time the shed sequence changes (from a to b, b to c, etc.).

WEAVING: ALLEGRO

For this scarf, use all the colors at your disposal in a succession of tripled wefts for quick, easy progress. In the same way that skillful orchestration combines different instruments at different times to provide rich tonal color, you can group trios of weft colors artistically to feature three at a time performing in unison in pleasing sequences to emulate the glowing colors of a glorious sunset.

Begin and end with ¼–½" plain weave for hem as for the first scarf. Then weave as drawn in by using the treadle number that corresponds to each shaft in the threading draft. For example, the first shaft in the threading is shaft 1. Weave 1 pick using treadle 1. The next shaft in the threading is 2; use treadle 2. Where there are repeats marked 2× or 3× in the threading, also repeat these sections in the treadling. Weave repeating the first four rows (I–IV) of the threading draft for the length of the scarf; end with the first and second (I, II) rows only to balance.

Prepare the weft by assembling all the colors you wish to use and arranging them individually in order to blend gradually with each other. Then wind a bobbin with the first three colors and weave a few inches with it. Wind the next bobbin using two of the same colors plus one new color, dropping the first of the original colors. After weaving a few inches with the second bobbin, wind a third by dropping the second original color and adding a new one. Continue, using all the colors for 72". For smoothest color blending, at color changes try alternating the two bobbins for several picks before dropping the bobbin that is being replaced.

THE GRAND FINALE

These scarves are finished with narrow rolled hems. Remove the fabric from the loom and secure raw edges and between scarves by running a line of machine stitching across the end of each plain-weave hem section, allowing ¼" for hems. Cut scarves apart between the lines of stitching and trim next to stitching. Dampen hem areas slightly and roll each hem as narrowly as possible. Thread a fine needle with silk weft to match the scarf and stitch the hem invisibly. Wash scarves by hand in warm sudsy water; rinse well; steam-press while scarves are still damp.

TIPS FOR PLANNING, HEMSTITCHING, AND FRINGING

TAKE-UP AND SHRINKAGE

Weft take-up and shrinkage. As you weave, extra weft length (beyond the width of the warp in the reed) must be placed in the shed to allow for weft take-up (in *Handwoven* projects, this amount is included in required weft yardage). The fabric then draws in as the weft bends over and under the warp threads, so that the width of the woven cloth is narrower than the width of the warp in the reed. The cloth narrows further after it is removed from the loom, and shrinkage narrows it even more if it is washed. To calculate the percentage of weft take-up and shrinkage, divide the finished width by the width of the warp in the reed.

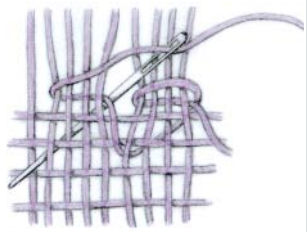
Warp take-up and shrinkage. As you weave, the warp bends over and under the weft threads. Fabric length is therefore less than the length of the warp threads that produce it (*Handwoven* projects give the number of inches allowed for this take-up under Warp Order and Length). When you release tension and remove the fabric from the loom, the fabric takes up in the warp direction. If you wash the fabric, shrinkage further decreases its length. To calculate the percentage of warp take-up and shrinkage, divide the finished fabric length by the woven length (measured under tension on the loom) plus the inches given for warp take-up.

To calculate how long to weave a fabric for a specific finished length, use the percentage derived by dividing the finished length listed in the project by the woven length measured under tension on the loom (for this percentage, do not include the inches allowed for take-up in the warp yarn).

TWISTING (OR PLYING) THE FRINGE

Divide the number of threads for each fringe into two groups. Twist each group clockwise until it kinks. Bring both groups together and allow them to twist around each other counterclockwise (or twist them together in that direction). Secure the ends with an overhand knot. (Use the same method to make a plied cord by attaching one end to a stationary object.)

SIMPLE HEMSTITCHING



Weave several picks of plain weave, ending with the shuttle on the right side if you are right-handed, left side if you are left-handed. Measure a length of weft three times the warp width and cut, leaving the measured length as a tail. Thread the tail into a blunt tapestry needle.

Take the needle under a selected group of ends above the fell and bring it up and back to the starting point, encircling the group. Pass the needle under the same group of ends, bringing it out through the weaving two (or more) weft threads below the fell. Repeat for each group of ends across the fell. Needleweave the tail into the selvedge and trim. (See * below.)

DOUBLE (ITALIAN) HEMSTITCHING

Weave several picks plain weave, ending with the shuttle on the right side if right-handed, left side if left-handed. Measure a length of weft four times the warp width and cut, leaving the measured length as a tail. Thread the tail into a blunt tapestry needle.

Take the needle under a selected group of warp ends above the fell and bring the needle back to encircle the ends. Next, pass the needle under the same ends but come up two or more weft rows down from the fell. Then bring the needle back around the same group of ends below the fell. Then begin again, encircling the next group of ends. (See * below.)

**For both methods: To hemstitch the first end of a piece, weave a header, weave four or five picks of plain weave (or of the basic weave structure used in the piece), and hemstitch over the top two or three weft rows. Weave the piece and then hemstitch the other end over the last two or three weft rows. Remove the fabric from the loom and discard the header and weft threads below the first hemstitching.*