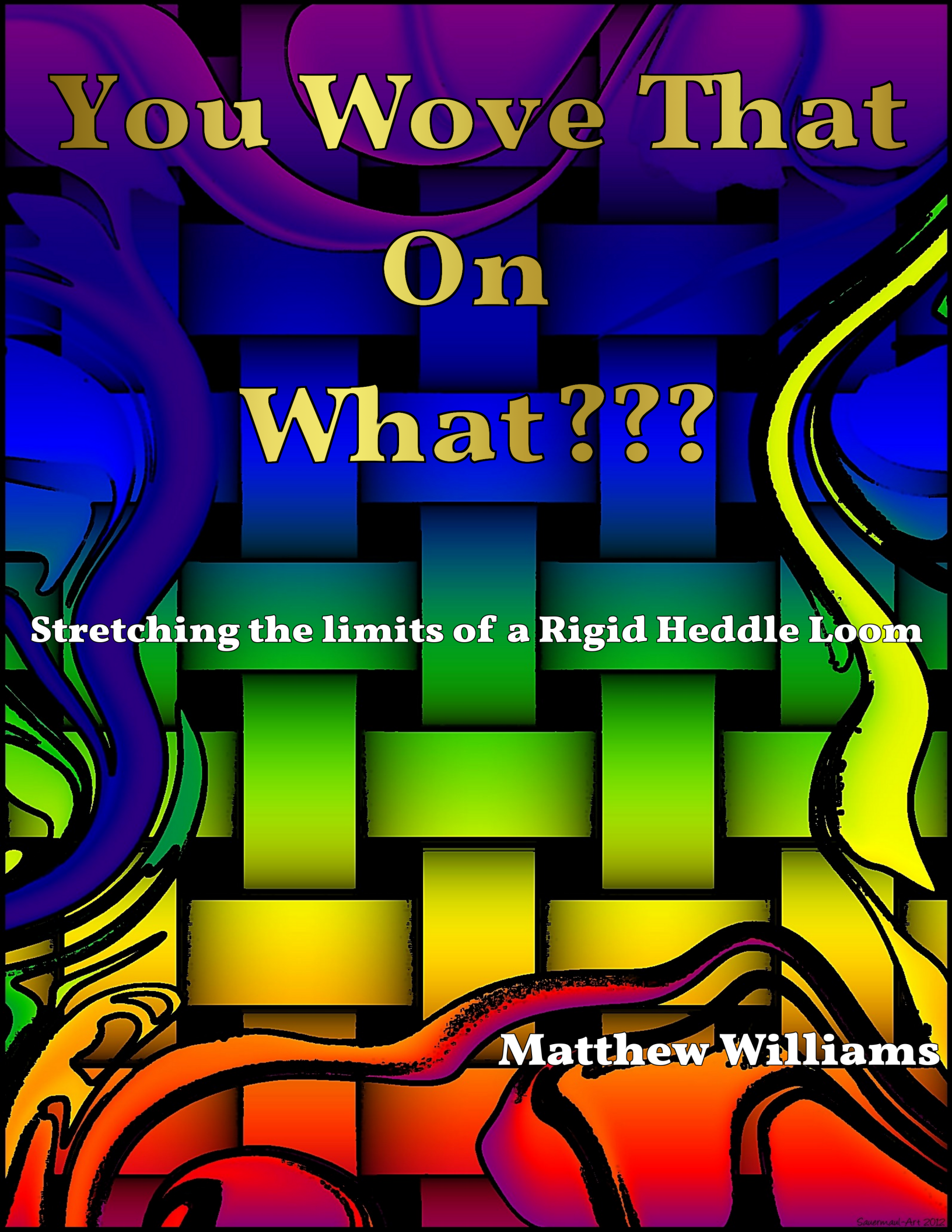


The background is a vibrant, abstract composition. It features a central grid of squares in shades of blue, green, and yellow, which resembles a woven fabric. Overlaid on this grid are thick, flowing, and somewhat chaotic lines in purple, blue, green, and orange, suggesting the movement of threads or the flexibility of a loom. The overall effect is one of dynamic tension between the rigid grid and the fluid lines.

You Wove That On What???

Stretching the limits of a Rigid Heddle Loom

Matthew Williams

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Matthew Williams

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Why?

I started weaving in 2009, in part because I'd wanted to do so for years, but also as a means of occupational therapy after a reaction to medicine led to neurological damage. My first loom was an Ashford 32" rigid heddle loom. Within a couple months I'd made 20-30 different items!

I was quickly hooked on weaving.

I've since become a fiberholic, with far, far, far more stash than I should have. Along the way I've learned a lot about the Good, the Bad, and the Ugly of rigid heddle looms.

Despite what many might think or feel, they are not toys. Like any other loom they have their strengths and weaknesses.

It is my hope that I can help share some of the wonder and joy of rigid heddle weaving.

The Good

Rigid Heddle weaving has a number of things which it does well (if not very well).

- For some things it is very, very fast. I've gone into yarn shops and been glared at by knitters when I showed them the scarf I wove that morning.
- Many more options are available for textures. "Novelty" yarns are easier to use.
- Warping can take much less time than other looms.
- Because there is less tension on the warp, it is easier to use singles.
- There is much less loom waste than on other looms. If the piece is fringed, there can be almost no loom waste.
- Reduced barriers to entry. While rigid heddle looms may not be "cheap", they are definitely economical when compared to other looms.
- Many techniques are easier to do on a rigid heddle loom – these include:
 - Leno Lace
 - Lifting arbitrary warp threads with a pattern stick – almost any pattern can be woven.
- Rigid heddle looms are good for learning to weave.
- Rigid heddle looms are good for trying new ideas.

The Bad

While there are many things which rigid heddle looms do well, there are some which are not so good:

- The EPI is limited – it's difficult to weave much more than 25 EPI – not impossible, but lifting individual warp threads is difficult.
- Any structure other than plain weave takes a lot longer than on multi-shaft looms – there is more work involved on the part of the weaver. The shuttle is set down, the heddle(s) are set, the shot thrown, the shuttle set back down, the heddles reset to neutral, then the front heddle tamps the weft shot in place.

The Ugly

As useful as rigid heddle looms might be, there are some things which are definitely ugly.

- The fixed holes in the heddles makes it difficult to weave patterns which have multiple sequential warp threads on the same harness. Even when washed, it still often appears more like warp threads are crammed together with space between groups of threads.
- Intricate patterns, while perhaps possible, are very labor intensive.
- Most rigid heddle looms are pretty narrow; this makes it difficult to make wide fabrics.

A Weaving Prayer

O our mother the earth, O our father the sky
Your children are we, and with tired backs
We bring you the gifts that you love.
Then weave for us a garment of brightness;
May the warp be the white lightning of morning,
May the weft be the red light of evening,
May the fringes be the falling rain,
May the border be the standing rainbow.
Thus weave for us a garment of brightness
That we may walk fittingly where grass is green,
O our mother the earth, O our father the sky.
– Traditional Tewa Pueblo Prayer

Tools

Many of the tools which are used for weaving have other uses as well. However, some tools are specific for weaving. Following is a discussion of the most common.

Sticks

Looking at my collection of tools, many of them are, for better or worse, sticks of wood. They've been shaped and made smooth, but they are sticks none the less. Some I've purchased; others I've made. It's actually a good idea to keep some dowels and flat pieces of wood on hand to use as necessary.



Stick shuttles & pickup stick

Stick Shuttle The stick shuttle is a flat stick with notches cut into each end of the shuttle. The weft is wrapped along the length of the shuttle between the notches. It works best if you use a shuttle which is approximately equal to the width of the warp.



Tapestry beater and pickup sticks

Pattern or Pickup Stick There are several types, but they are all generally sticks which are flat with rounded ends. The stick is placed through the warp threads, above some and below others. It is then turned on end to create a shed through which the shuttle passes. The pickup stick should be longer than the warp is wide.

Tools for Warping

There are a few specialty tools which are used to wind the warp and put it on the loom.



Sleying hooks and threading hook.

Sleying Hook Sleying is the process of threading the reed with the warp threads. The sleying hook is a slender tool, often made of brass or flexible plastic which has a hook at one or both ends. The hook is used to pull the warp threads through the reed.

Threading Hook Threading hooks are typically 8-10" long and consist of a handle and a hook made of metal (or a loop of wire). The hook is used to pull the warp through the heddles.

Warping Board A warping board is a rectangular frame upon which are a number of pegs. It is used to wind a warp when the direct warping method is not used.

Warping Peg One or more pegs which are clamped to a table or other flat surface. If using the direct warping method, typically one peg is used. If using pegs in the place of a warping board, three or more pegs are used.

The Others

Other tools which are useful include:

- Scissors
- Scrap yarn
- A ruler
- Dressmaker's tape
- Pins
- Tapestry needles
- Heavy paper or thin slats that are the width of the loom for winding a warp to help keep the warp threads from tangling
- Magnifying glass
- Good lighting

The Most Important Tool of All

Patience.

In the process of learning to weave, you will make mistakes. It's not the end of the world, by any stretch. Frustrating, perhaps, but not the end of the world.

Sometimes the warp (or weft) does not behave like you think it should. Getting frustrated just makes it worse.

Sometimes you'll weave a bit and realize you've threaded it wrong. At that point you have to decide whether to fix it or go onward. Sometimes happy accidents occur.

Direct Warping

Direct warping is a technique which greatly speeds up the setup of a project. Instead of winding a warp and then threading the reed, the two steps are combined into one. It isn't the best method to use in *every* case, but it definitely helps most.

In order to start, the loom should be placed on a flat surface (or in a stand if you have one) and a warping peg is secured, typically by clamping. The back beam of the loom and the peg need to be separated by the length of the warp.



In order to help with centering the warp, it's helpful to mark the center on the rigid heddle. Other markings (such as inches from center) are also useful.

Warping

1. From the center count the number of slots equivalent to the number of threads divided by four. For example, if weaving a project with forty-eight (48) ends, then twelve (12) slots would be counted.
2. Mark this with a piece of scrap yarn on both sides of the center.
3. With the warp yarn behind the back beam of the loom, tie an end to the back apron rod and using the sleying hook pull a loop through the marked slot on the right.
4. Carefully pull the loop forward and over the warping peg. A steady tension is needed, but do not make it too tight – the wound warp would then be too short. It is important to keep the tension the same and to go around the peg in the same direction each time.
5. Back at the loom, pull the yarn over the apron rod and back through the reed and over the peg. The next time bring the thread under the apron rod and back through.
6. Repeat until all the slots are filled.
7. If there is an odd number of threads, then tie off at the warping peg, otherwise tie off at the loom.



If there are knots in the yarn, then tie off at the peg or the loom – whichever is closer – and start again where you tied off.

Depending on the width of the project, it might be advantageous to use multiple warping pegs otherwise the some warp threads will be longer than others. In essence each thread of the warp is the hypotenuse of a right triangle¹.

$$A^2 + B^2 = C^2$$

If A is the length from the loom to the warping peg and B is the distance from the center then C is the length of the warp thread. As B increases, C will also increase. The shorter the warp, the larger the difference between the center threads and the outer. This difference contributes to:

- Loom waste
- Tension difficulties

Winding

Once the warp is stretched between the peg(s) and the loom, it is time to wind it on the apron rod.

1. Tie a knot around the warp threads near the peg(s). This needs to be fairly tight, but easy to remove.
2. Cut through the loops on the peg.

The next steps are most easily done with assistance, however a weight (like a jug of water) may be substituted for an assistant.

1. Keeping an even tension on the warp, center the warp and begin winding it. It is best wound tight, but it is more important to be even. This is a place where having a wide warp with a single peg can cause issues.
2. Paper or sticks will help to keep the warp threads separated; be certain that they are wider than the warp. I've used both, as well as a woven beach mat; I've found that the sticks are easier to use to maintain a consistent tension.
3. Wind until the ends of the yarn are close to the front beam – this distance varies from loom to loom. Practice will make perfect.
4. Untie the knot and gently spread the warp threads.



It is difficult to maintain tension if the warp is not centered as it is wound.

¹Thank you [Pythagoras](#).

Sleying

Sleying is the process of threading the warp through the heddles. This is best accomplished with the threading hook.

1. Starting from the right if right handed, separate the first two threads and determine their order – it may take a bit of wiggling.
2. Take the left-most thread and, using the threading hook, thread it through the hole.
3. Repeat across the rest of the warp.

It is important, as much as is possible, to keep the thread order. It's not so important that if a single pair is twisted that the process needs to be undone, but it helps keep the warp straight.

In the case of colors needing to be in a certain order, such as log cabin weaves, there will be some twisting or re-ordering of the threads. In this case, there are two options:

1. As the warp is unwound, occasionally push the heddle back to the back beam, straightening the yarns.
2. Before weaving, place the heddle in the upright position and place a stick in the shed *behind the heddle*. Lower the heddle and repeat with another stick. In some cases it might be helpful to loosely tie the ends together in order to stay organized. The sticks will keep the twist from being too close to the heddle. However, it can affect how large the shed can be made.

Tying

When tying the warp to the front apron rod, the most important thing is to *keep the tension equal*. This is difficult, and requires a good deal of attention. However, the more care which is taken to start, the easier the weaving is later. Or, if you will:

An ounce of prevention is worth a pound of cure.

1. Starting from the centre, grasp no more than one (1) inch of the warp and separate it in half. Larger bunches will make it harder to spread the warp evenly.
2. Take both sides over the front apron rod then over both sets of warp threads tie an overhand knot. Do not make it too tight as it needs to be loose to equalize the tension at the end.
3. Taking turns on either side of the centre, repeat steps one and two. The outer ones, at this point, will be tighter with each successive knot – that's normal. Just try to keep it from being excessive.
4. Once all the knots are tied, Pat across the warp and tighten or loosen as appropriate so that the warp has a consistent tension.

5. Tie a second overhand knot in each group, making a square knot as opposed to a granny knot. This is important if the warp ends are to be used for a fringe. Another option would be to put a bow instead of the square knot.



Be sure to keep the tension even.

Spreading the warp

At this point the warp threads are clumped together at the knots. The next step will spread the warp evenly across the loom.

1. Open the shed and, taking scrap yarn throw the shuttle, but *do not beat*. A contrasting color or different type of yarn makes it easy to tell where the weaving begins.
2. Open the shed in the opposite direction and throw again.
3. Repeat a third time and beat.
4. If the warp is not evenly spread, then repeat steps one (1) through three(3) again.

Now the warp is spread.

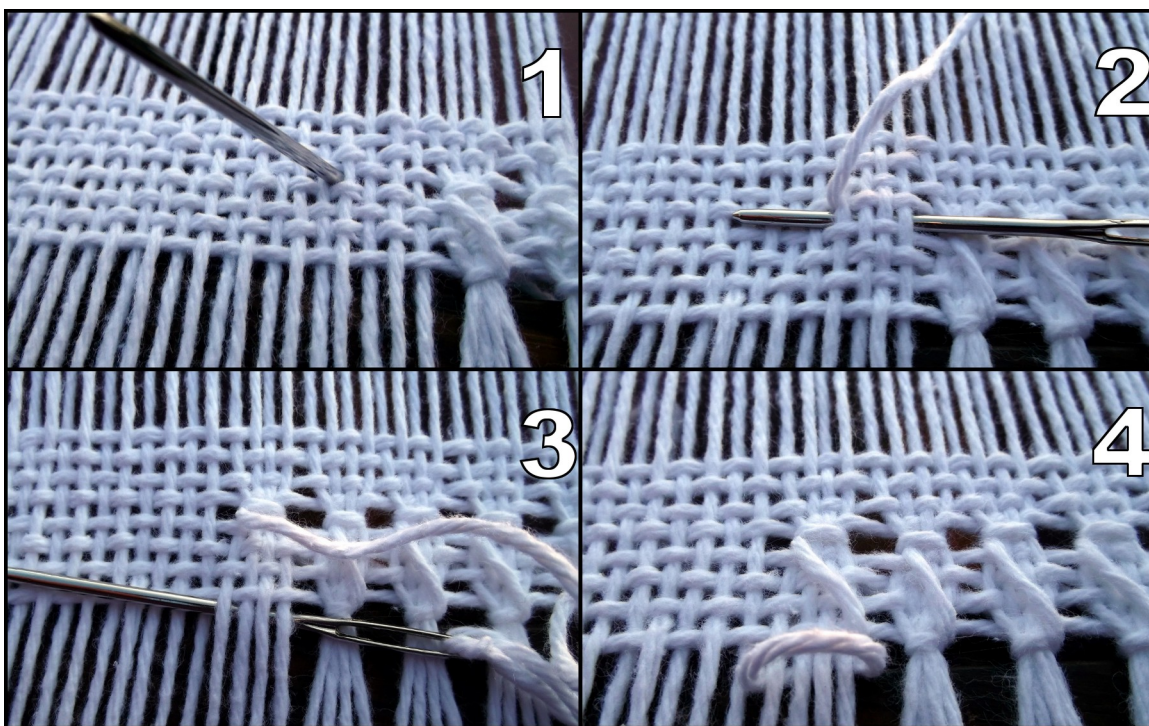


If the shots of scrap yarn is not fairly straight but bows or is wiggly then it is likely that there is a tension problem. Depending on how bad it is, it may be helpful to unweave the scrap yarn and re-tie the warp. If it isn't bad, a folded strip of paper can be placed in an open shed to provide a straight line against which to weave.

Loosen the back brake, advance the warp, and tighten. Now it is time to weave.

Hemstitching

Hemstitching is a method to finish the ends of a woven fabric. It provides a nicely finished edge which will not unravel.



Hemstitching

1. Pull approximately four (4) times the width of your warp from the shuttle, leaving it as a tail.
2. Weave one (1) inch, remembering to leave the tail.
3. Place the tail in a tapestry needle and count in four (4) warp threads and up four (4) picks. Coming up from the bottom, place your needle here. (Step 1 above)
4. Go back four (4) warp threads, going under the fabric bring the tail back up, making a loop through which the tail is pulled. Pull the loop tight – this holds the edge in place. (Step 2 above)
5. Go back to the beginning, pulling the thread over the fabric. (Step 3 above)
6. Go in 4 warp threads under the fabric, then back over, making a loop and pulling it tight. (Step 4 above)
7. Repeat across the width of the warp.
8. To finish, weave the tail into the woven cloth.

When finished weaving, follow the same steps, except that the tail is left after the last shot.



It is easiest to do hemstitching while it's on the loom. While not *impossible*, it's very difficult to do once it is off the loom. Trust me... This is the voice of experience.

Leno Lace

Leno is a type of weave where the weft passes through warp threads which have been twisted around each other. More than one pair of thread can be twisted, however above three (3) or four (4) it can become unworkable – too much stress is put on the warp and it can break.

Often leno is woven by putting the twists in with a pattern stick and using it to make the shed. However, you can use string heddles held on a piece of doweling to put the twist into the pattern. This has the advantage of taking less time once the string heddles are made. However, due to the nature of rigid heddles, there are limits as to how many pairs can be twisted using this method.



Leno woven with string heddles

I have found that when weaving leno lace it is advantageous to use yarns which are not slippery – slippery yarns have a tendency to, well, slip and the fabric and/or isn't as stable. Slippery yarns can produce interesting effects in a shawl as the warp and weft slide as they drape, but they can also be prone to snagging.

Using a pattern stick

When using a pattern stick to make leno lace, first open the shed. Then the appropriate warp threads are twisted and the shuttle is thrown. With the extra friction and bunching which occurs, you will need to beat extra hard. This can be done with the reed, a weaver's sword, a tapestry beater, or some combination thereof.

Things to watch for

- Leno lace has a tendency to pull in the selvages. This can be helped either with temples or by keeping the weaving close to the reed – typically the latter is not a good idea, but in some cases it can help keep from pulling in.
- One shot of leno tends to take up the space of three “normal” shots.
- Plan for extra warp.



Showing the twist. This pattern is a combination of plain weave and leno.

Weaving with Multiple Shuttles

Many weavings have more than one type of yarn in the weft. This is done, particularly when there are many yarn changes, through the use of multiple shuttles, one for each yarn.

The following method allows for the switching of yarns where the weft threads are carried up the side and locked in place. It's best for short repeats – after a certain length the weft is easily snagged. This length depends on the size of the thread and the number of picks between changes.

In short, the idea is to start both shuttles from the right and when it is time to change shuttles, place it closest to the apron. Then pick up the shuttle which is closest to the reed. This will lock the threads in place.

A good description may be found at Weavezine's article on [Double Heddle Bookmarks](http://www.weavezine.com/content/double-heddle-bookmarks)².

²<http://www.weavezine.com/content/double-heddle-bookmarks>

Projects

I am a great believer in learning through doing. All the theory in the world doesn't do much once you begin to dress a loom and go through the hassles wonders of working with wool or cotton or

Every fiber is different. Loose spun yarns are different from tightly plied. Singles behave differently, too. Woolen or Worsted. Novelty yarns. Fuzzy yarns.

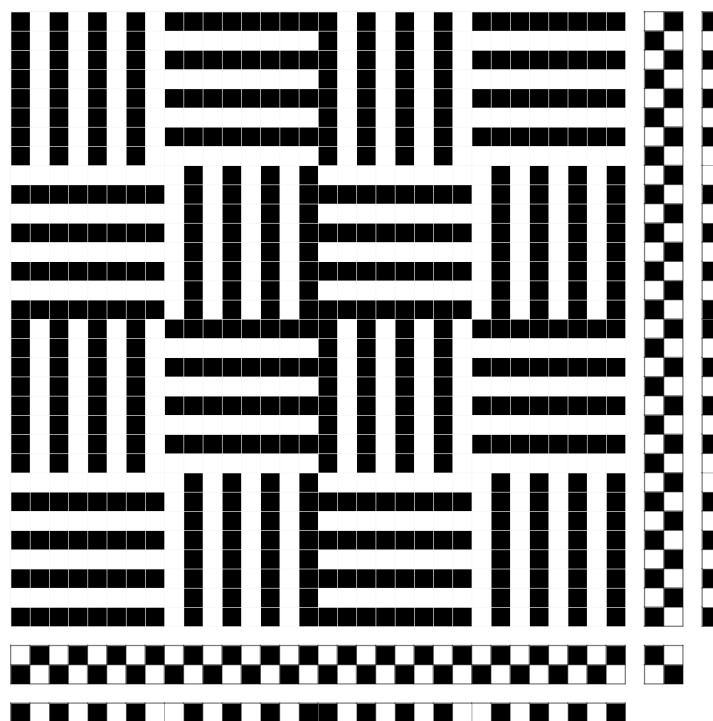
Books can advise give ideas, but until you actually begin to weave, they're only ideas. Sitting in front of a piece of software, too, is a great way to come up with ideas. However, ideas only go so far – something might look beautiful in software but be totally impractical in practice.

The projects which follow provide a variety of different techniques and skills which can be used to explore rigid heddle weaving.

Log Cabin

This weave structure uses two contrasting colours to make alternating squares with the colours appearing to go in different directions.

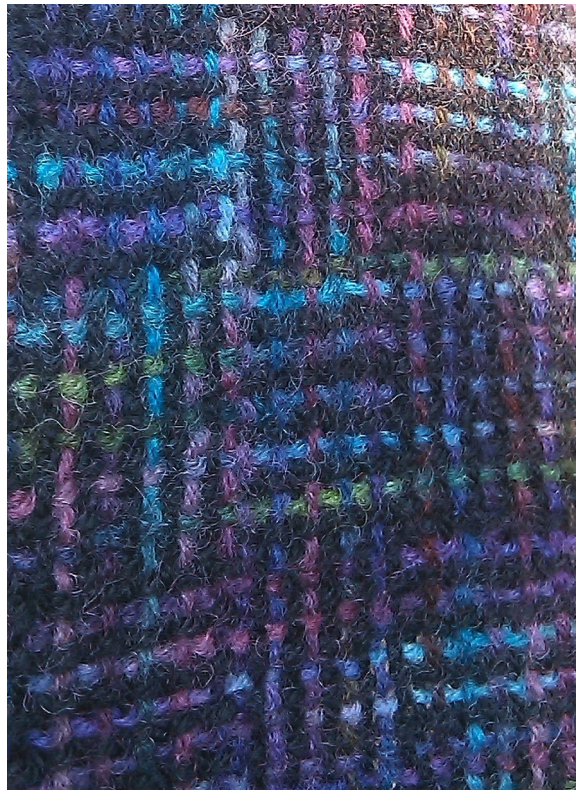
In order to do this, the colour order is important in the threading as well as the weaving.



Log Cabin Drawdown

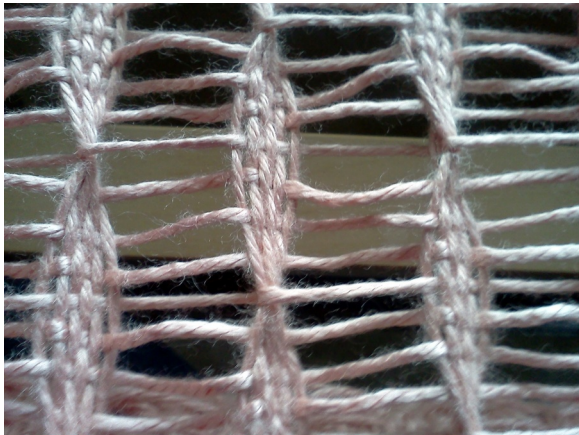
1. There will be a total of forty-eight (48) threads in the warp.
2. The first eight threads are in pairs of dark and light.
3. The next eight are in pairs of light and then dark.
4. Repeat across the warp.
5. When weaving, two shuttles are needed. One for the dark and the other for the light.
6. Weave eight picks alternating dark and light.
7. Weave eight picks alternating light and dark.
8. Repeat steps 6-7 until finished.

Solid colours need not be used, although it's probably not a good idea to use two multi-coloured yarns. However, contrasting yarns are best.



5 Pair Log Cabin

Gauze Lozenges

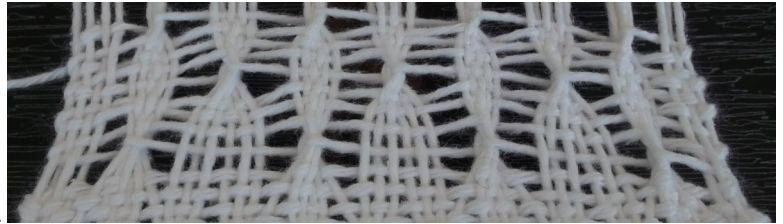


This is inspired by the *Shuttle Craft Guild Monograph Twenty-One, Two-Harness Textiles: The Open-Work Weaves*.

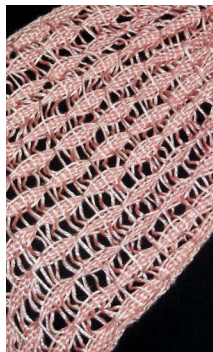
It consists of tabby and alternating groups of three thread leno.

1. Begin by warping the loom with forty-eight (48) warp threads.

2. Weave an inch of plain weave and hemstitch.
3. Open the shed, and using the pattern stick, insert it between the first three threads.
4. For the next six threads, take the 2nd group of three (3) over and the first group under, making a twist through which the pattern stick is placed.



5. The next six threads are plain weave.
6. Repeat steps 4-5 across the warp, ending with 3 plain weave threads.
7. Beat hard, keeping tension on the weft to maintain the twist.
8. Weave three shots of plain weave.
9. Open the shed, and using the pattern stick count off 9 warp threads before starting the twist.
Repeat steps 4-5 across the warp, as in step 6 above.
10. Weave three (3) more shots of plain weave, then go to step 3 and repeat.
11. End with an inch of plain weave and hemstitch.



A finished weaving

Glossary of Weaving Terms

The following weaving terms are used in this book. A more complete list of terms may be found at [Weaving Today](http://www.weavingtoday.com/Glossary/)³.

Dent Slot in a reed

DPI Dents per inch – the number of slots per inch in the reed

EPI Number of warp threads per inch

Shed Triangular space between warp threads made by raising heddles or a pattern stick. The shuttle is passed through the shed.

Shot A weft thread; a shot comes from a throw or passing of the shuttle through the shed.

Throw The process of passing the shuttle through the shed

³<http://www.weavingtoday.com/Glossary/>

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About the Author

Matthew Williams lives in Columbus, Ohio in a house filled with Computers, Cats, and Fiber. He's working diligently on training the cats to avoid the "stringy things" while he weaves and is happy to announce some progress. He expects success in 5-10 years.

He writes about weaving topics at [Woven Threads](http://woven-threads.net)⁴. Questions about weaving can be sent to matt@woven-threads.net⁵.



Woven Threads

⁴<http://woven-threads.net>

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