# Broken Lozenge Twill Weaving

**10th Century – England**

(Glossary of weaving terms can be found on page 4)

## *Introduction*

As part of the One Step Further Challenge for Arn Hold, I decided to try to weave enough fabric to actually make a dress out of (for me!). This project was fraught with complications from everything to me being scissors-happy while measuring/cutting the warp threads to major warp thread tension issues due to the winding process to my taking time off due to being elevated to Baroness and being pregnant, tired and cranky! But the weaving is DONE (and turned into a dress!)

## *Project Information*

The weave for this project was based off of a tenth century textile find from Coppergate, York. I searched for a fine-spun strong wool yarn and chose a worsted 20/2 Jaggerspun Maineline yarn (Claret and Raspberry colored). The yarn was fine enough that I decided on a sett of 27 EPI and PPI.

The weaving pattern that I based this off is a broken lozenge twill pattern (Fig.3). The pattern created is diamond (or lozenge) shaped but the "broken" refers to the fact that the various lines of the pattern are disconnected. (Fig. 2)

The weaving was done on my (old!) four-harness jack floor loom, which can produce fabric up to 3' wide (before fulling).

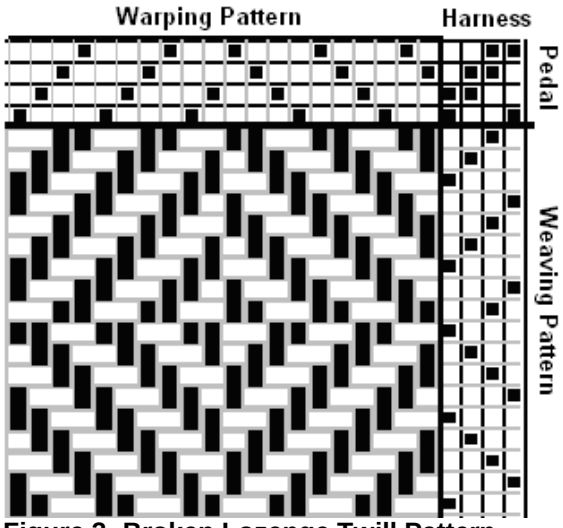


**Figure 3- Broken Lozenge Twill Pattern**

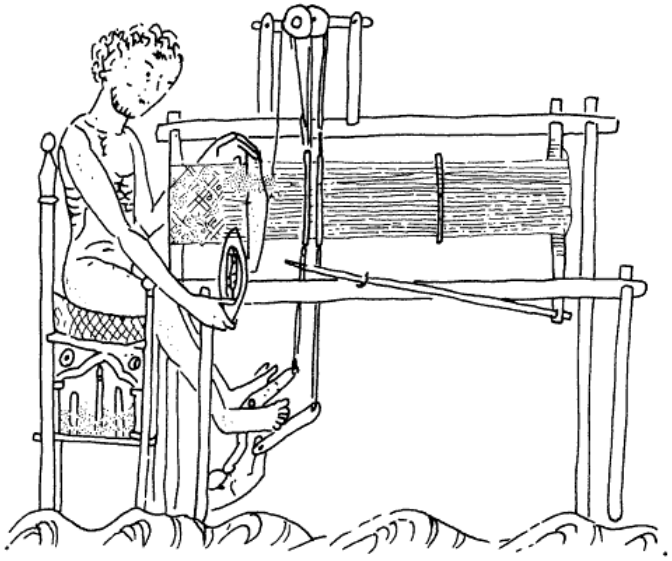

**Figure 1 - The horizontal loom illustrated in the Romance of Alexander, ca. 1250 C.E. The loom has treadles bound to a pair of linked shafts and a reed while the weaver holds a boat shuttle. (The pattern even appears to be a lozenge!)**

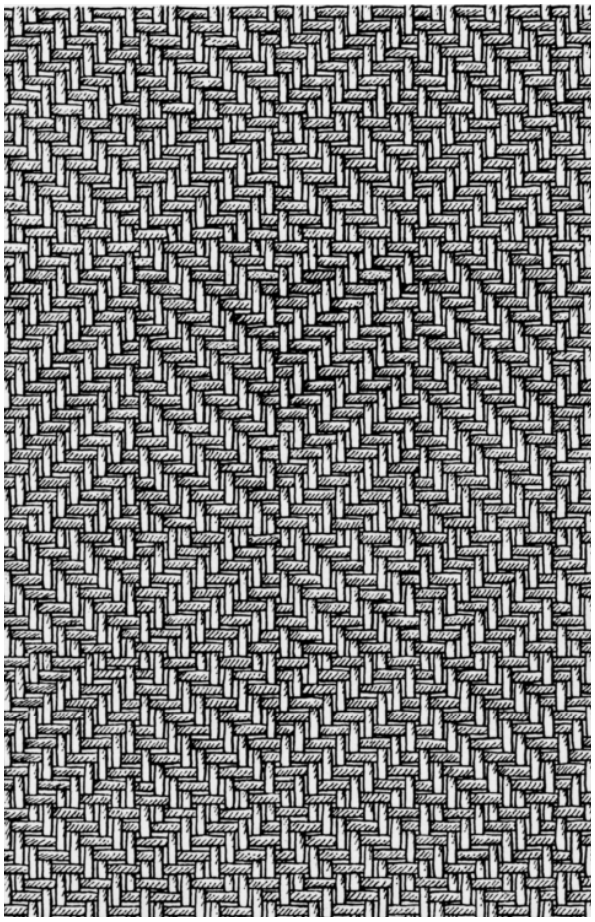

**Figure 2 - Example of Broken Lozenge Twill from Sutton Hoo Burial**

# *Weaving History*

## Broken Lozenge Twill Pattern

The pattern used here has been found as early as an Iron Age burial in Karlby Mose, Denmark. Several examples have been found at Roman sites in Britain such as Hadrian's Wall and Corbridge. Four examples were found in the Sutton Hoo Ship Burial (early Saxon England, East Anglia, ca. 625 AD). Dozens of examples have been found in wool and linen from Viking sites. Examples of this type of weave were found into the twelfth century. This project was based most specifically on one of the wool textiles found at Coppergate in York from the 10th century (#1307 - Walton, Penelope). The sett of this project matches the same range of sett found on this Coppergate wool textile.

Fabric of this sort would have been used in clothing such as cloaks, gowns, tunics and hose as well as items such as furnishings, wall hangings, beds and curtains.

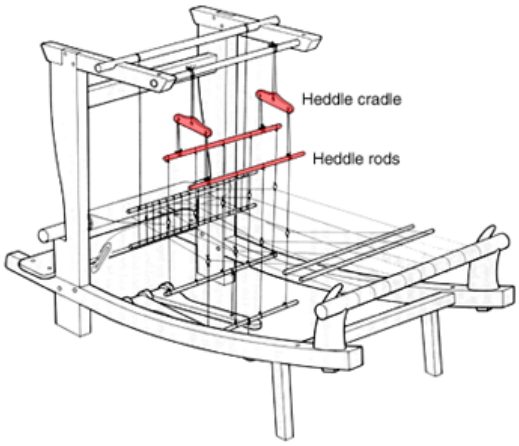


**Figure 4 - Counterbalance Floor Loom**

## Equipment and Tools

The type of loom that I used for this project is a floor loom that closely resembles the counterbalance floor loom (Fig. 1 and Fig. 4) that came into wide use in Europe during the 11th century. While the technology involved in the counterbalance floor loom helped to streamline cloth production, it was much simpler on a loom of this type to create a tabby or simple weave using only two harnesses. Four harnesses would require three sets of pulleys where two harnesses required only one set. Once this type of loom took over there were considerably fewer examples of this broken lozenge twill weave, which requires four harnesses. This pattern was much more likely to be woven on an earlier period warp weighted loom (Fig 5). Extra harnesses simply required additional heddle rods. Constructing a warp weighted loom is one of my other projects but the end product is the same regardless of the loom that it was woven on.

For the shuttle, used to carry the weft thread through the shed, I used a boat shuttle. This sort of shuttle has a bobbin wound with weft thread inside a boat shaped enclosure. As the shuttle passed through the shed, the bobbin unwinds and releases more weft thread. This can only work on a horizontal loom. This type of shuttle was in use by at least the 13th century (Fig. 1). With a warp-weighted loom, a stick shuttle would have likely been used. This is basically a stick that the weft thread would be wound around and manually unwound before passing the shuttle through the shed.

Additionally, the warp-weighted loom would have needed a weaver's sword to pack the weft thread in. On a horizontal loom, the reed fills this function. The reed is a comb-like fixture that both evenly spaces the warp threads and is used to pack in the weft.

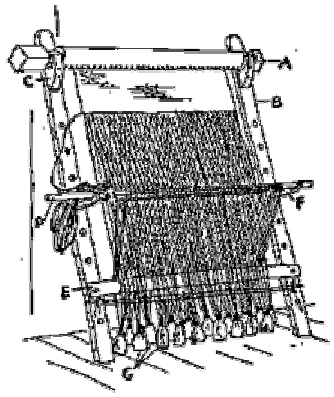

**Figure 5 – Warp Weighted**

## Materials

Wool was one of the most prevalently available textiles in Europe throughout the Middle Ages. Weaving was usually done with worsted yarn rather than woolen. Worsted yarn is spun from longer staple-length fibers that are combed so as to be parallel before the yarn is spun. This yarn (and fabric made from the yarn) tends to be strong and smooth. Woolen yarn is spun from the shorter fibers that are generally carded such that the fibers do not line up which results in yarn (and fabric) that is more suited to sprang or knitting as it is less strong and tends to be fuzzier. Worsted yarn is needed especially for the warp threads because of the tension put on the threads during the weaving process either by the attached weights or by winding up the excess on the horizontal loom. The yarn that I used is worsted wool. The colors that I chose were two shades of a maroon color (to better show the weave pattern). This type of color would have been achieved with madder and/or brazilwood, possibly with an iron post-mordant, or from a dye extracted from bugs such as kermes, lac or cochineal.

## Selvedges

There are a number of ways to reinforce the selvedge (edge) of the fabric. One of the simplest ways is to use a floating warp thread cord. This is a cord of several warp threads (in this case, two) that is threaded through the reed but not through any heddles. The weft thread is sent around the floating warp cord on every pass. Otherwise, depending on the pattern, there may be warp threads on the outside that are left outside the weave on a pass. This technique is seen in many 13th century weaving fragments. I do not currently have information on the selvedges found at the Coppergate site, but the technique would be as easy to do on a warp weighted loom as on a floor loom, so it is reasonable to assume that it would have been used. Because of the slight draw-in on the selvedges, it was also custom to double up the pattern on the outer 6-8 threads, which I also did here.

## *Process – "I am smarter than the string. (barely)"*

The lengthiest and most difficult part of any weaving project is warping the loom. The first step to this was to measure and cut my warp threads. I used a simple warping board (after adding some more pegs for additional length) as found all throughout period to cut my 972 ends 11.5 yards long. There are various tricks to doing this that help in containing the rat's nest of string that every weaving project wants to turn into. Properly tying the bundle of warp threads as well as creating a tight warp chain are two valuable skills!

The next step is to sley the reed. The reed is used both as a beater as well as a guide for the warp spacing. My reed has a spacing of 10 dents (or holes) per inch. In order to get a spacing of 27 ends per inch, I sleyed the reed with a pattern of 2-3-3 warp threads per hole.

The most concentration is required when threading the heddles. Threading the warp threads into heddles on the correct harness (in the correct order, even!) is what creates the pattern when various harnesses are raised. My beloved and patient husband was my String Monkey and helped me for the project by handing me the next thread in line so I could add it to the correct harness.

Finally the warp threads are tied on to the back beam and wound up, taking all of the warp thread bundles through the reed and heddles, so they are straight and even. This is where another trick came in. If there are tangles building up in your warp threads, rather than trying to comb them out (Noooo!) take the whole bundle and give it a good yank. This loosens the tangles so the winding can continue. Once that is done, the warp threads are tied onto the front beam at an even tension. There was a bit of trouble in the winding of this project, as the warp threads on the ends did not stay lined up properly on top of the bundle (like a cylinder). They fell off and, consequentially, had a smaller diameter circle than the inner threads. This created major warp thread tensioning issues that required most of my household's dishtowels to solve! (I stuffed them in the center to take up the slack created by this issue). This made weaving go rather slowly and caused some unevenness in the pattern.

Now weave…
…a lot.

Weaving on a horizontal loom involves pressing down the appropriate treadles, per the desired pattern, which will raise up a set (or sets) of warp threads, creating an opening between the top and bottom threads called the shed. The shuttle is passed through the shed. The next treadle(s) is then pressed. After using the reed to pack in the previous pass, the shuttle is sent through again.

The difference in the actual weaving process between my floor loom and a warp-weighted loom (other than the mechanism itself) is mainly that, on a floor loom, I pack the weave toward me. The woven fabric is gathered by rolling it up on the front beam. On a warp-weighted loom, the weave is packed upward and the woven fabric is gathered by rolling it on the top beam (which is a considerably more involved process).

Rather than finishing my fabric by waulking it (wetting it and stomping on it to get the fabric to full), due to time constraints I chose to use a washing machine to full it. This process took about 10 minutes, rather than all day.

## *Lessons Learned*

Weaving is all about attention to detail. Details like, in your excitement about finishing the measuring of the last bunch of warp threads on the warping board, do not miss the trailing thread with your scissors and, instead, cut halfway through the bundle itself. Also, when using a devoted and dedicated best friend as your string monkey during the winding on phase of warping the loom, do not assume that she knows what you want and then later find out that your tension is going to have major issues because it was wound on all wonky! It's all about the details!

## *Glossary*

**Dent** - One space in a reed. Each space can hold one or more threads. Most fabrics are evenly spaced, i.e. two threads per dent or double-sleyed, three threads per dent or triple-sleyed.

**Dents Per Inch (DPI)** - On a reed, the number of spaces in one inch. See Dent.

**Ends Per Inch (EPI)** - See **Sett**. The number of warp threads in an inch.

**Float** - A thread which is not caught at every intersection. Can be warp floats or weft floats. Long floats tend to catch on things and weaken the fabric.

**Full -** Fulling is the process of fluffing up an already woven or knitted piece of woolen cloth. It's to be distinguished from felting, which takes raw fleece and puts it through the same process without having any initial structure.

**Harness** - A device on a horizontal loom that holds a set of heddles. Doesn't really apply to smaller looms.

**Heddle** - Anything you put warp threads through to create a shed; rigid heddles are usually made of wood, bone or (modernly) plastic or metal. Heddles on warp weighted looms, inkle looms, tapestry looms, and some horizontal looms are made of string.

**Picks Per Inch (PPI)** - The number of weft threads in an inch.

**Reed** - A comb that goes in the warp and is used to beat the fabric as it is woven. Only applies to horizontal looms. They are usually metal today but were originally made by fixing slats of reeds between two bars at even intervals.

**Sett** - The spacing of the warp threads. The reed on a horizontal loom determines this.

**Shed** - The opening created when you pull some warp threads up and some down. Different types of looms create sheds with different methods.

**Sley** – A verb used to describe the process of pulling the warp threads through the reed.

**Thread Count** - A sum of the warp threads plus the weft threads in one square inch or centimeter. EPI + PPI = Thread Count Per Inch.

**Warp** - Warp threads are the threads that are held taut by the frame. If they're too tight they can "warp" your weaving frame. You can't weave unless you are "warped".

**Weft** - Weft threads are the threads you manipulate through the warp to make fabric. They go from right to "weft". Sometimes also called "woof".

**Worsted** - Yarn (and fabric) made of long fibers, combed, and tightly twisted in spinning.

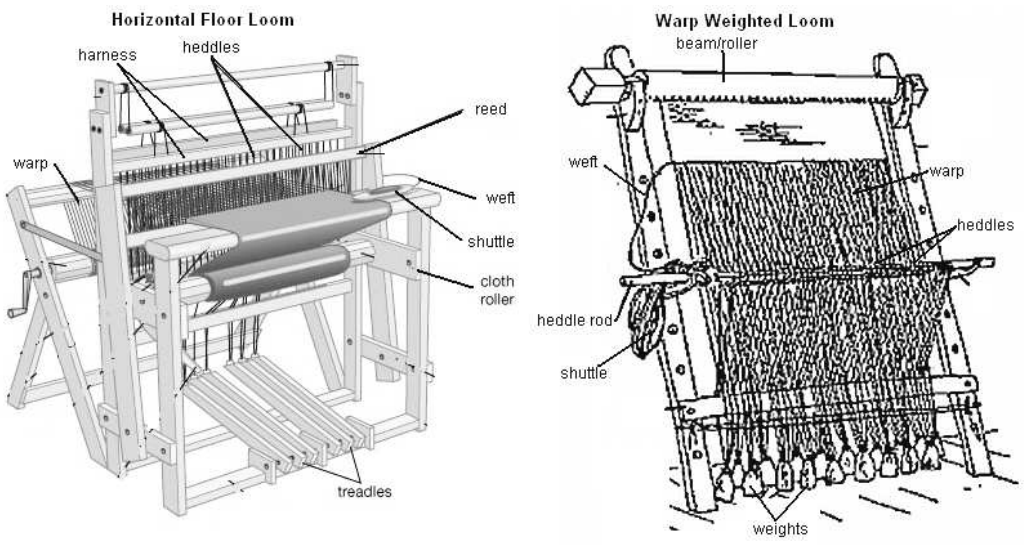


**Figure 6 - Loom Diagrams**

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## *Weaving Project Info*

**Project**: One Step Further Project Weaving

**Yarn Info:**

| | |
|---|---|
| Yarn | Jagerspun Maine Line |
| Fiber Content | Wool |
| Color | Raspberry/Claret |
| Size | 20/2 |
| Yards per Pound | 5600 |

$$\text{Pounds Needed} = \frac{(\text{length}/.85 + 36'')*\text{width}*(\text{sett})}{36*\text{ypp}}$$

**Yarn Measurements:**

| | |
|---|---|
| Desired Length (inches) | 322 |
| Starting Width (inches) | 36 |
| EPI | 27 |
| PPI | 27 |
| YPP | 5600 |
| Pounds needed - Warp | 1.97 |
| Pounds needed - Weft | 1.83 |
| Total Pounds Needed | 3.80 |
| # Ends Needed | 972 |
| Warp Length (yds) | 11.52 |
| Order of Sley in Reed | 2-3-3 |

**Pattern Info:**
Broken Diamond Twill