Holmegaard Bow Making

This document forms a pictorial tutorial of making an Ash Holmegaard style bow based on the one found in Denmark in the 1940's. This bow is thought to be over 9000 years old.

Holmegaard bow

Source – Online Wikipedia

So what is a bow?

Basically it is a big wooden spring that accumulates, stores and releases energy to an arrow.

Types of Bow

Longbow – This type of bow is deep as it is wide and has a 'D' section profile. Traditionally Longbows in this country were made of Yew wood as this wood is very flexible.
This 'D' profile allowed the Bowers to produce more Longbows from one tree in comparison to making Flatbows.

Cross section of a longbow –

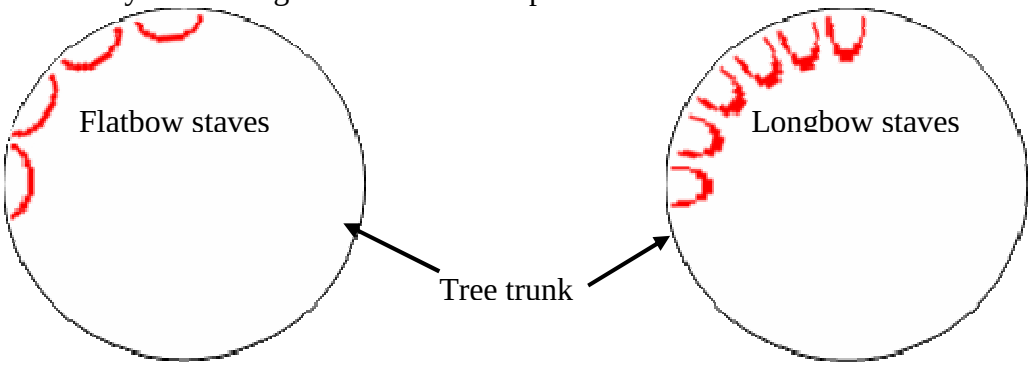
The width is generally the same as the depth.

Flatbow – This type of bow is wider than it is deep. This is a good design for carving when using Ash.
Ash wood is flexible and good for bows but only as a Flatbow as this style allows for more flexibility in the bow in comparison to the 'D' section profile.

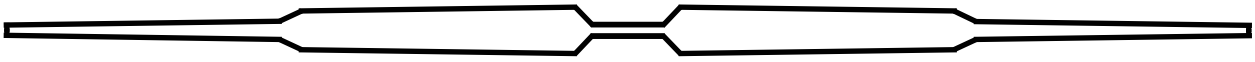
Cross section of a Flatbow -

The width is generally wider than it is deep.

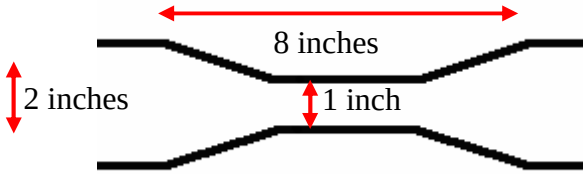
As you can see many more Longbow staves can be produced from one trunk than Flatbow staves.



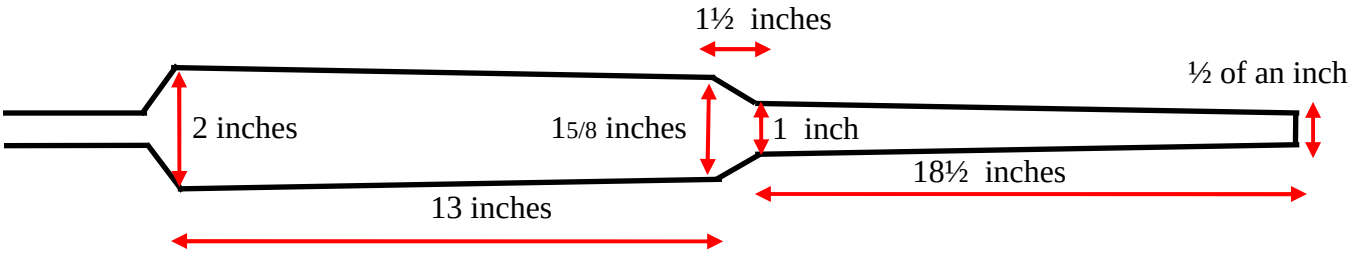
Top profile of the my bow. The bow is 6 foot in length. All the drawings are not drawn to scale.



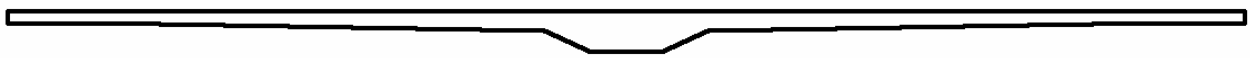
Zoomed in top profile of the bow handle.



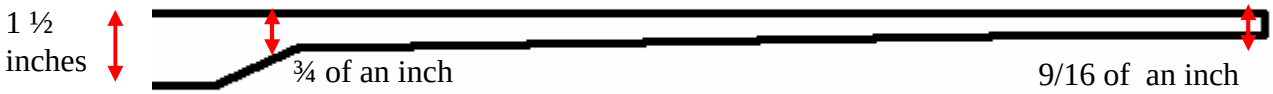
Zoomed in top profile of one limb.



Side profile of the bow



Side profile of the right limb prior to tillering



The production of the bow itself is covered in the following pages in the form of a pictorial tutorial.
Some Bow terminology*

Back (of bow) - The face of the bow on the opposite side to the string
Belly (of bow) - The face of the bow on the same side as the string
Brace height - The distance between the deepest part of the grip and the string
Grip - The part of the bow held by the bow hand
Limbs - The upper and lower *working parts* of the bow, which come in a variety of different poundages
Nocking point - The place on the bowstring where the nock (end) of an arrow is fitted
Riser - The rigid centre section of a bow to which the limbs are attached
String - The cord that attaches to both limb tips and transforms stored energy from the limbs into kinetic energy in the arrow
Tab - A protection for the fingers that draw the string. Usually made of leather.
Tiller - The difference between the limb-string distances measured where the limbs are attached to the riser: usually the upper distance is slightly more than the bottom one, resulting in a *positive* tiller. Reflects the power-balance between both limbs.

***Source – Online Wikipedia**

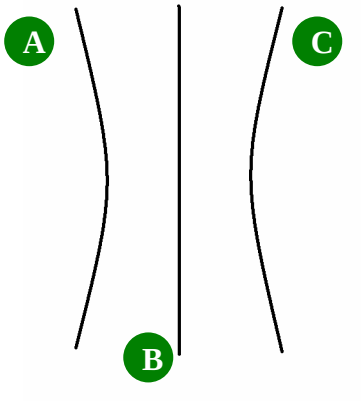
Before looking at the tutorial it would be good to look at some of factors that influence the energy going into a bow. All these factors are key to the final make up of the bow.

1. **Bow profile** – The profile that your bow retains will affect the amount of energy it can store.

A – Reflex profile. This stores far more energy than a straight bow but are not as accurate as a straight bow

B – Straight bow. Less energy can be stored in the limbs but more accurate than a reflex profile

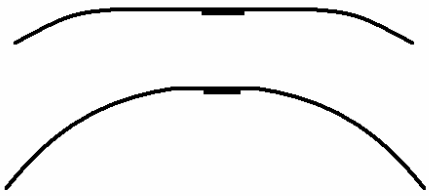
C – String follow/Set. The bow has retained its drawn profile and will store less energy than the straight or reflex bows.



2. **Draw length** – how far you can pull the string back

3. **Brace height** – the distance from the belly of the bow to the string.
    - The higher the brace height the more accurate your shot as the string paradoxes less (string bending around the bow) before it straightens itself after the shot. Paradoxing can cause the bow to judder as the string bends around the bow and can upset your shot as the arrow is released.
    - A low brace height means the limbs will come further forward and create more noise as you take your shot
    - A very high brace height can damage the bow as it puts the bow under higher strain
    - Also a high brace height can cause ‘string follow’ or ‘set’ where the bow does not flatten out when the string is removed but retains a curve. This means less energy is able to be stored in the bow prior to shooting.

4. **Whip Ending** – When carving your bow you need to be continually be aware of whip ending. This is normally where the middle area of the bow is too stiff and only the tips bend. You need to look for a nice curved profile as much as possible so that you can store the maximum but even amounts of energy in each limb.



Here the top bow is whip ended. The limbs are both too stiff when drawn resulting in less energy being stored in the limbs.
The lower bow has a more even spread of stored energy and are bending more evenly. Any stiffness should be retained just around the handle and in the tips of the limbs.

The following is a pictorial tutorial of creating an Ash Flatbow starting from a recently felled Ash tree.

These pictures are of an Ash tree felled by John Ryder.

A line is scored in the bark with a wedge down to the wood firstly. This helps with guiding the split of the log.

Note that the wedge is positioned to one side of the person scoring the line. This maintains a safe position for the worker.

Then a wedge is then driven into the scored lined to start the split at one end of the log (upper wedge in picture 2).

A second wedge is driven in at the base of the log to further split the log (lower wedge).

Taking the first wedge out and driving it in further down the line then widens the split further.

In this case the scored line helped greatly with controlling the split.

As other wedges are driven deeper into the split the previous ones can be removed to be used again.

An axe can also be used to cut the wood fibres not split by the wedges.

Once the log has been split once the process is repeated again and again until you have the staves you require.

Here are two staves ready for shaping.

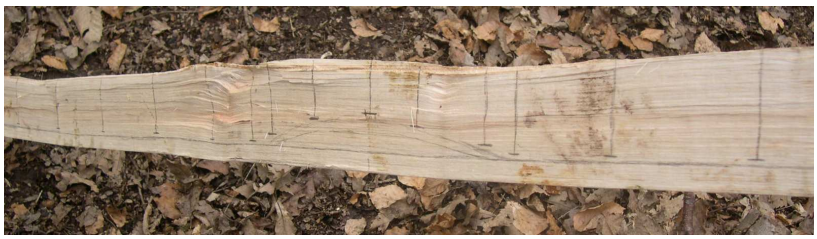
Using a wooden wedge I shaved of the bark of the stave.

I was very careful only to remove the outer and inner bark and not touch any of the wood.

The wood found just under the bark is the most flexible part of the bow and will form the back of the bow. Apart from light sanding this area of the bow will not be touched.

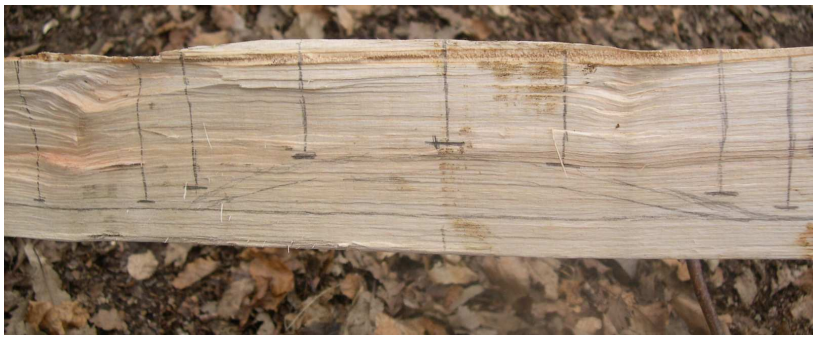
This is the side profile of the stave.

The bow side profile has been roughly drawn out leaving plenty of room for error.



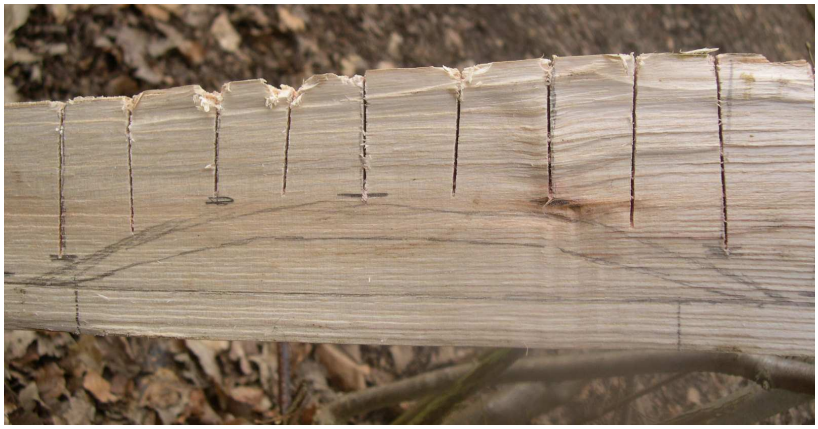
A close up of the handle area.

The vertical lines are for the stop cuts.



Here you can see the stop cuts cut into the wood around the handle.

As a piece of wood is cut out with the axe or the knife the stop cut stops a split running through the whole bow so that you only cut out the wood you want.



Here you can see the stop cuts cut into the wood around one of the limbs.

Some of the tools that are used to take off the excess wood.

The axe for the start of the process and a knife and batton to finish it off.

Keeping the stave off to one side of me and resting on a log I trimmed the excess wood of.

As the stave is off to one side I am in a safe position. If the axe slips the follow through path of the axe will be to my side. It would be highly unlikely that the axe could harm me in this position.

The top tool here is a draw knife. This can be used to finely trim the bow shape.

I prefer though to use a knife embedded into a batton as this gives me much finer control of the shavings.

Using the knife and batton to finelky shave wood off to create the blanked out bow (Belly area of the bow).

For this part I securely attached the bow to a table top to stop it slipping.

As the knife is drawn towards me I am using short draws towards myself so as to always be in control of the blade.

A line was drawn that I needed to reach on each limb.

Reducing the amount of wood on the stave will allow the bow to season quicker.

Also make it easier to trim when tillering and should help to stop any cracks appearing along the bow as it seasons.

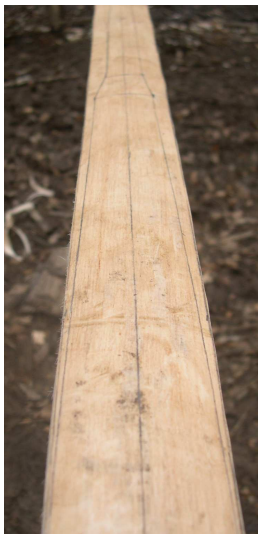
The final tuning to the side profile is completed.

The finished side profile of the bow.

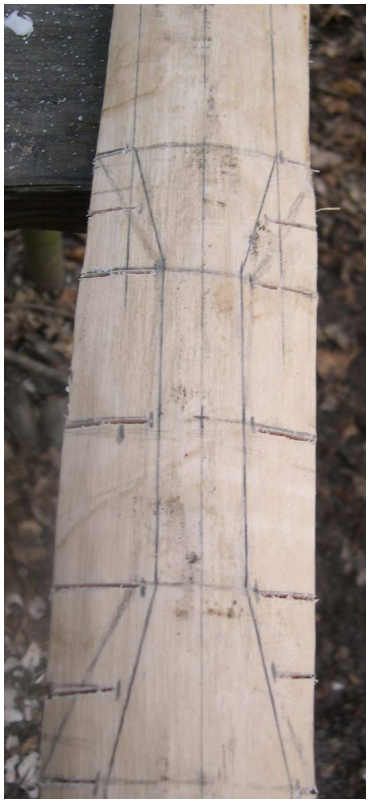
The next stage is to mark out the top profile of the bow

Using a string I marked out a centre line down the length of the stave (Picture 1).

Using the measurements shown at the beginning of the tutorial I then marked out the shape of the bow (Picture 2).

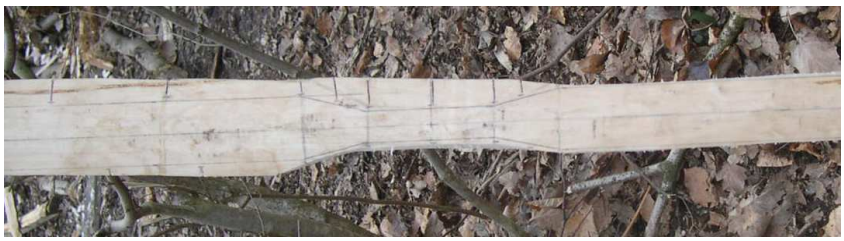


The first picture is the handle area and the other two are of the limbs.



Both now have stop cuts sawn in to help with chopping the bow shape out.

The bow shape is now appearing as the excess wood is chopped out.



Here you can see the sop cuts. Also that I am using the axe in a safe and controlled manner. The bow is wedged against a tree and resting on a stump. The axe is in front of me and at 90 degrees away from my body.

Using the draw knife to finely trim the top profile.

You can now see the top profile appearing.

Some more fine trimming is required.

Finishing one limb.

Then the other.

At this point the bow was left to season for a month. One week in my garage and for three weeks in a cool spot in my house.

This allowed the wood to season enough to start the fine work.

During this seasoning process the bow has been tied into a frame so as to induce some reflex into the bow.

After a month it was time to finish the bow.

The tips of the bow needed to be shaped so that they would have more of a ‘D’ section shape to them.

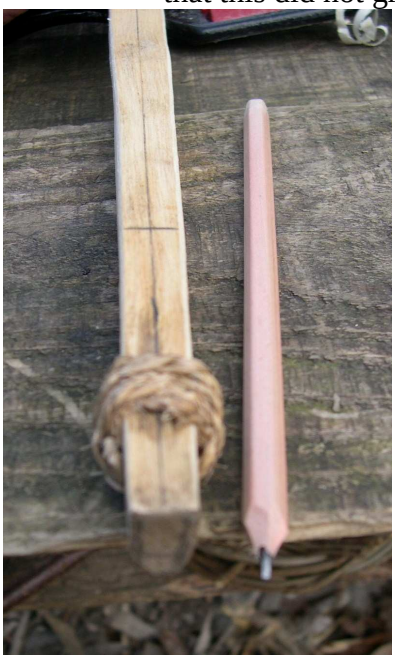
The pencil marking at the tip gives a rough final shape. Making the tips smaller means there will be leass weight in them allowing the tips to move faster when shooting an arrow.

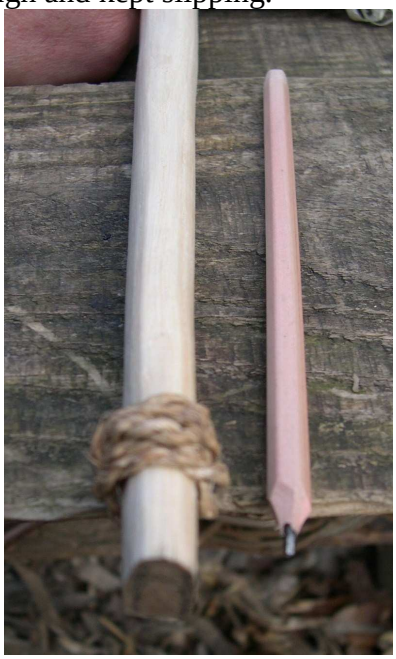
Using my knife as a draw knife I was able to finely carve the shape of the D section.

With the tip of the knife firmly embedded into a piece of wood it is very safe and highly manouverable.

The tip of one limb is now clearly D sectioned.

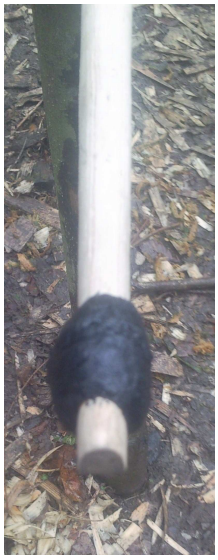
To make the Knocks for the Bow I decided to try using cordage made from Western Red Cedar. I found that this did not grip the wood firmly enough and kept slipping.





Next I tried Rawhide. This was soaked in hot water and then strips were wrapped onto each end. This took about one and a half days to harden but allowed me to string the bow.

Pine Pitch was added to waterproof the rawhide so it would not soften and slip if it gort wet.



Up to this point I tested the bows flexibility by floor tillering it.

This involved pushing down on each limb to test their flexibility and compare the flexibility of each limb.

I was looking for an even flexibility in each limb.

To take of excess wood I used a cabinet scraper (metal) to start evening up the curve on each limb.

Having the bow clamped allowed me to use these tools safely and with precision.

After a little bit of scraping I would floor tiller again to check the eveness of each limb. At this stage I am looking to see the start of each limb curving

Temporary string for tillering.

I just used some strong nylon string at first.

One end of the string is tied on with an overhand loop and the other end with a timber hitch.

At this stage the bow was not put under any tension by the string.

This was so that I could train the bow to bend in increments by using the upright tiller.

Putting the bow under too much tension would lead quite quickly to it snapping or cracking.

I then placed the bow on the tiller and in increments slowly bent it to view the curve on each limb.

The following pictures (overleaf) are of the bow during the tillering process. After viewing it each time I would return to the workbench to scrape wood from areas of stiffness using the cabinet scraper or spoke shave.

1

2

3

4

5 – The bow was now braced about 4 inches

6 – Tillering complete with even limbs

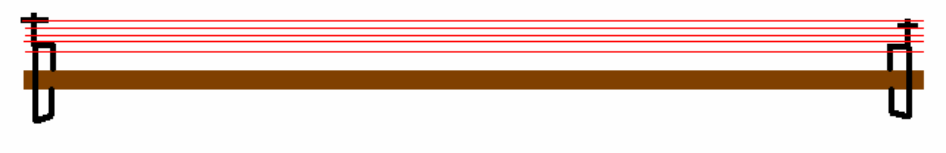
First Shots

The next stage is to make the string for your bow.

Traditionally natural materials such as sinew, rawhide, plant fibres (nettle) or linen were used but modern materials were used for our bows. As modern string such as Dacron B-50 (50lb) is non biodegradable there is less chance of the string breaking so less chance of your bow breaking.

To make the string a plank is used with a clamp at either end. The clamps need to be placed apart 18 inches longer than your bow. Tie one end of the string to a clamp and run the string around the other clamp, then around the first one again. Keep doing this for five more cycles. Cut the string at each clamp and you should be left with two sets of five strings.

Cut here Cut here

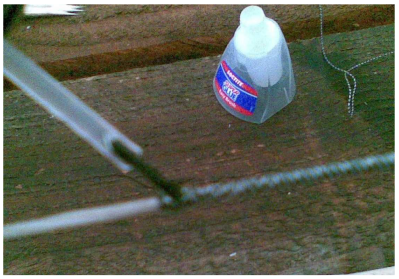


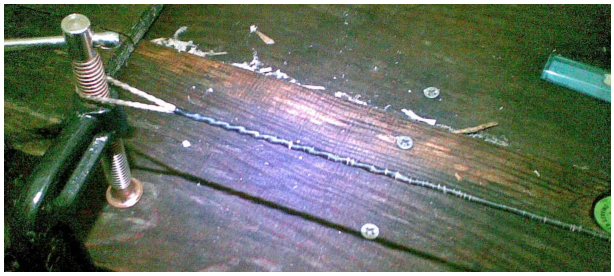
The two sets of five strings need then to be woven together on one end to form a loop that will not come loose. The other end at this stage need only be tied together with an overhand knot.

Repeating the steps with the previous string the looped end is placed in one Knock and a Timber hitch on the other. When completed the bow is then braced again.

The string now needs to be Served in the centre of the bow where the arrow will be knocked.

The serving of the string is basically a whipping to keep the individual pieces of string that are loosely wrapped around each other together and provide a firm area to knock into your arrow. I also served the top of the string near my loop to stop it unraveling. After finishing serving the string I put some superglue at the end to keep it in place





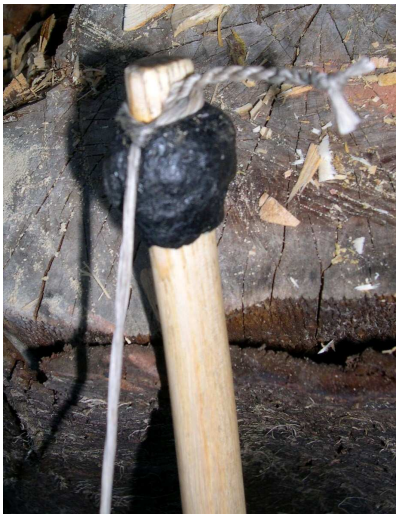
Using various grades of sandpaper I sanded the bow down to get rid of any marks and sharp edges.



To protect the bow I then stained the wood slightly. Then applied a mixture of Boiled Linseed oil and white spirits (50/50 at first). After this had dried I reapplied more oil but with less white spirits each time until I just applied oil.


The next stage was to Bone the wood. This is done by rubbing the whole bow with a small smooth pebble. This helps to close the fibres and make the bow very smooth. It also helps to lock in the oil.

I then had to readjust the Knocks. The ones I had constructed were too big as I could not get the string loop around it before shooting. This involved sanding the Rawhide down to reshape it and apply more Pine Pitch.



Lastly I wrapped on a small leather handle with a little glue. I thought about stitching one on but felt it maybe too uncomfortable when holding it.

The completed bow.

Belly

Side

Back