International Association of Penturners

Staves with a Twist

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Introduction

The basic principle is to drill through a stave blank at an angle and not along the cylinder axis as is typically done for staved designs. This sounds straight forward enough but will test your skills. As with all woodworking, stock preparation is crucial. It is particularly important in this case since dimensional consistency will aid in accurate drilling. Staves made from stock of the same dimensions will gave a solid blank.

The approach described here to create "Staves with a Twist" uses drilling at a set angle into the top face of a stave blank. Varying the entry and exit points will give different results. The number of staves does not matter. In some cases, it may be best to use a round blank. The composition of the stave blank is simply up to your imagination. However, to ensure a good result, there should be **no gap down the center**, or this might show up when turning. This will dictate how the staves are made. This is left up to the reader.

Method

Before you start, have a clear goal and plan based upon the chosen pen kit.

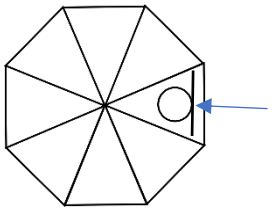
- Prepare stock to produce a staved blank of between 1" and 1 ½" in diameter – this is dependent upon the kit chosen – 1" should be OK for kits with 7mm or 8 mm tubes, 1 ¼" for Sierra and equivalent and 1 ½" for most larger pens – experience will guide you
- A 6 or 8 stave blank is good for first attempts – cutting accuracy is important
- Make the staves of equal length and allow ⅜" at each end to square the tube to the ends because the tube will be at an angle to the end faces
- Lightly sand the cut surfaces to ensure a sound glue-up
- Carefully do the glue-up aligning the staves as accurately as possible to aim for flat ends – since the staves may move slightly under clamping pressure allow an extra 1/16" at each end for trimming the ends square to the centerline

Mahogany, walnut, and maple

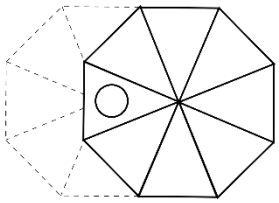
No gap down the center or between the staves and staves of equal size

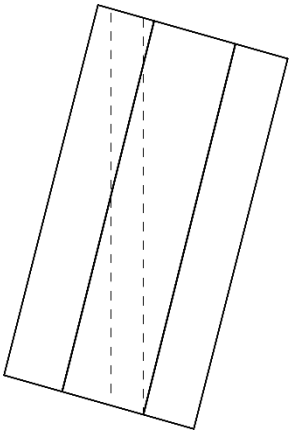
- With blanks of multiple faces the blank is approximately round and should be turned round on the lathe before drilling
- Blanks **must be well secured** during drilling to avoid out of round or wandering holes

- Depending upon the diameter of the blank, the drill entry point should be ¼" to ⅜" from the centerline of the blank
- The outside face of the tube should be no closer than ⅛" to the outside face of the blank to avoid exiting very close to the side of the blank or worse exiting through the side due to misaligned drilling – it is easy to do!



- Choose a drilling angle such that the exit point is in the opposite end of the blank - between 10 and 15 deg is about right
- To aim for an exit point the same distance from the centre as the entry point calculate the drilling angle as:
    - Inverse tangent (2 x distance from the centre divided by blank length)
    - This will give a turned blank with symmetrical faces where the face on one side is mirrored on the other side but turned 180 deg
    - Deviation from this will give nonsymmetrical faces on opposite sides of the turning and extreme deviation may cause turning problems
- Since you will be drilling through perhaps different woods and different grains and turning a segmented blank, it is recommended to let the glue-up sit overnight





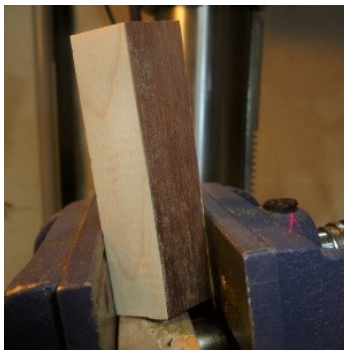
To drill vertically there are 2 options:

- hold the blank at the drilling angle in an angle vice (see below) – easiest and likely most accurate
- hold the blank at the drilling angle in a regular vice

Accuracy here can save a lot of grief later

When drilling, place a sacrificial piece under the blank to prevent blowout and protect the drill bit

Angle vice



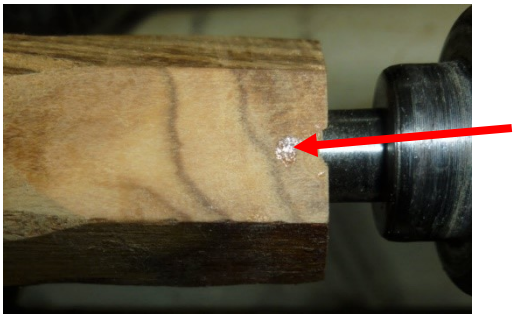
Sacrificial Piece

Parallel to Drill

- For the drill bit to exit as planned take great care with the setup – time taken here will bring its rewards – every 1 deg from out of parallel to the drill bit can translate into up to 1/16" change on the exit - **check setup at least twice**!
- It is strongly recommended to use epoxy or polyurethane glue (watch out for the expansion) for securing the tube in the blank – near the ends the grain can be going in all directions and possibly some very small pieces will depart during turning ☹

Here the grain is "wild"

- If using a pen mill to trim to the tube take great care or the blank may chip and be ruined as it will be approaching the blank at an angle – so go very carefully and slowly! – if it starts to chip use some thin CA to stabilize



Thin CA applied here during trimming to the tube

- The shape that is now ready for turning may be very different from anything that you have turned before plus it is segmented – check for clearance before starting the lathe

Shape just after the start of turning

- Go carefully and slowly because the wood thickness above the tube is very non-uniform and liable to chip
- Once the turning is approximately round you can proceed as normal
- If end pieces are planned, after turning down to near final size cut down to the tube to create space for end pieces – remove the blank from the lathe, glue and trim the pre-drilled end pieces and return to the lathe - this has the advantage that the end pieces can be squared to the tube even if the drilling was not perfect
- It pays to take great care when the ends are approaching the thickness of the bushings – use thin CA to stabilize – experience will tell you how often and when to start – better earlier than later

Thin CA was applied at this point to prevent chipping near the bushings

- If you don't want to risk ruining a turning, consider starting sanding earlier than usual using coarser grits
- Now finish the blank to your choice

Examples

Examples that stayed in one piece but weren't made into pens:

Purpleheart, canary wood and zebra wood (don't know what the ends are made from, but it is hard and heavy)

Padauk, walnut and maple with ebony ends

Examples that made it all the way:

Sierra – zebra wood, pink ivory, and canary wood (ends ?)

Sierra – mahogany and maple

Experimenting and coming up with something new and different is what gets us up in a morning! So go and enjoy your turning.

Graham