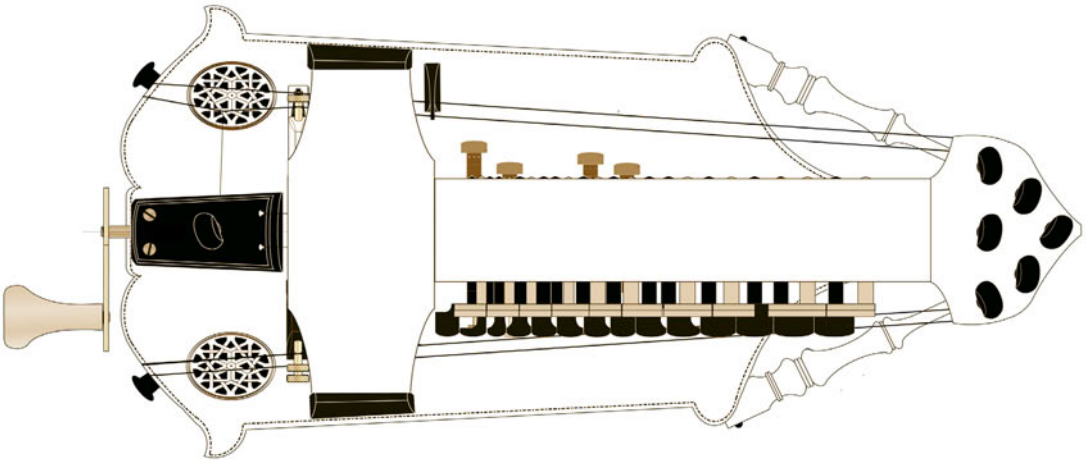


The Construction of the ~Henri III~ Renaissance Hurdy Gurdy

https://sites.google.com/site/mccormackgraeme/antiquatedstrings

mccormack.graeme@gmail.com

Graeme McCormack (03) 62663598 Pelverata, Tasmania

Table of Contents

Go to table of contents

Woods used:

Tasmanian Huon Pine

Tasmanian Huon Pine.
Botanical Name:
Lagarostrobos Franklinii

density 550 Kg/m3

Tasmanian Myrtle

Tasmanian Myrtle. Botanical Name: Nothofagus Cunninghamii

density 705 Kg/m3

Black Heart Sassafrass

Blackhearted Sassafras.
Botanical Name:
Atherosperma Moschatum

density 630 Kg/m3

Go to table of contents

This is the extant instrument in Paris that my Henri 3 is based on. I have tried to keep closely to the original shape while making refinements to the playability of the instrument.

Go to table of contents

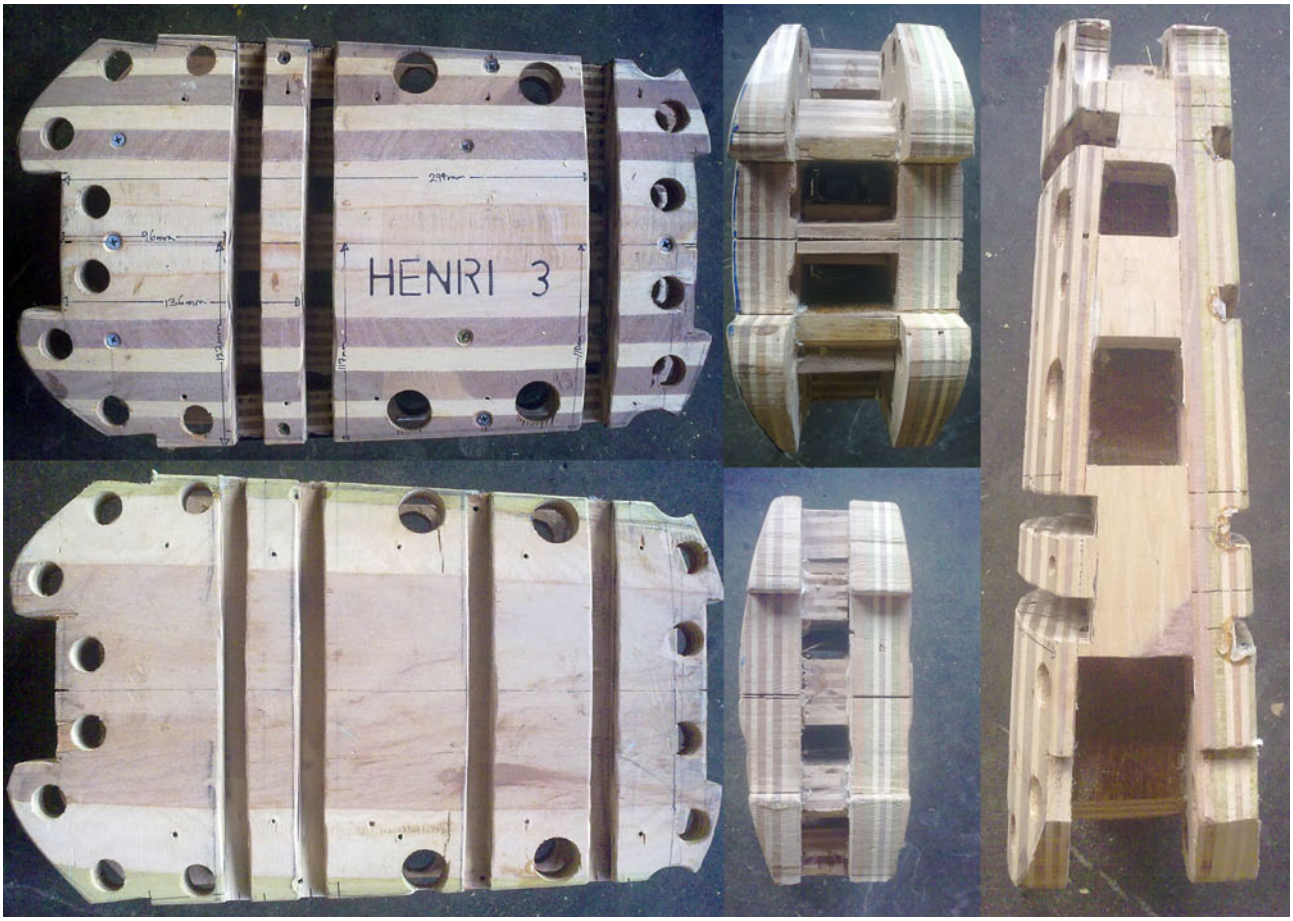
Constructing the Body - (late May 2012)

Making the mold and dowel clamps

Showing how the dowel clamps will hold the bent end pieces in shape until they dry to the shape of the mold.

Make a shooting board large enough to take the 500mm long soundboard

Go to table of contents



Make up sanding boards to the same curve as the soundboard and back plate. Each is a different curve. These will be used to give the front (soundboard) and back (back plate) of the body their correct curve, once braces and linings are in place.
Also make a shooting board for book matching front and back plates.

2- Make the body ears from " huon pine" stock. Join to the ribs. Then make Round " huon pine" dowel and join to the other end of each rib. Use the mold while glueing.

Go to table of contents

3- Bend up the crank end pieces on the bending iron. I soak " huon pine " for 20min prior to bending on the iron. Make up end blocks from " huon pine ". Glue the end pieces to the end blocks and the ribs.
Use the dowel clamps to keep the end pieces in shape while glueing. Do the same to the tail end pieces. Once dried, mark around the inside top and cut along this line. Measure down 10mm from the bottom and cut around this line. This is the final shape of the body.

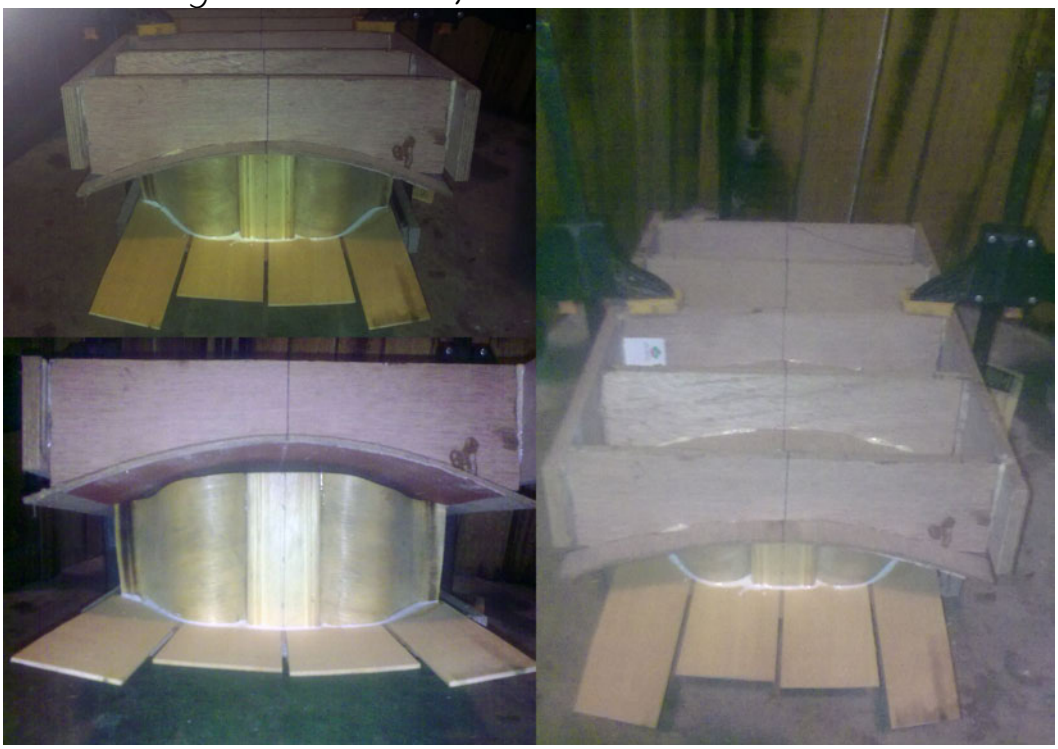
4- Make the back braces and fit to the ribs. Glue and peg (with bamboo skewer) to ribs while still on the mold. This positions the braces correctly.

Go to table of contents

5- Glue the shaped back linings in place between the braces and ends.

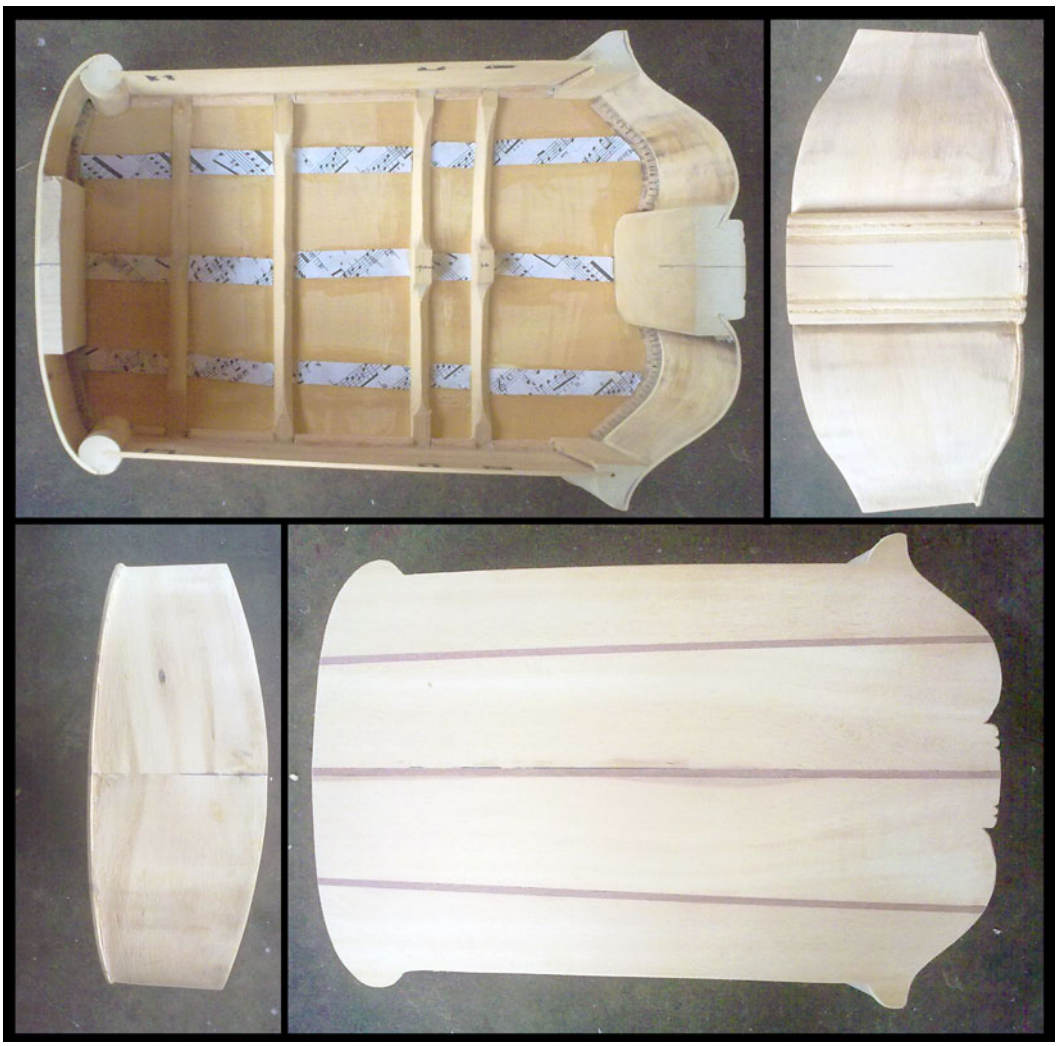
Go to table of contents

6- Make up the back plate out of 4 pieces of" huon pine" separated by 5mm thick strips of Tasmanian Myrtle (Nothofagus Cunninghamii.). Book match the" huon pine" pieces.
7- Thickness the back plate to 3mm thick.
8- Place the body over the mold and mark out the soundboard shape and soundboard brace spacing on the inside of the ribs. Take the body off the mold and shape the back on the "back shaping board".
9- Glue the Ribs/end pieces and end blocks to the back plate. Use the back and front sanding boards as clamps.



Cut the back plate to shape (leaving a 2mm lip all around). Paste strips of paper over the inside of each joint for support. Sand the top to the soundboard profile using the soundboard sanding board. remark the centre.

Go to table of contents

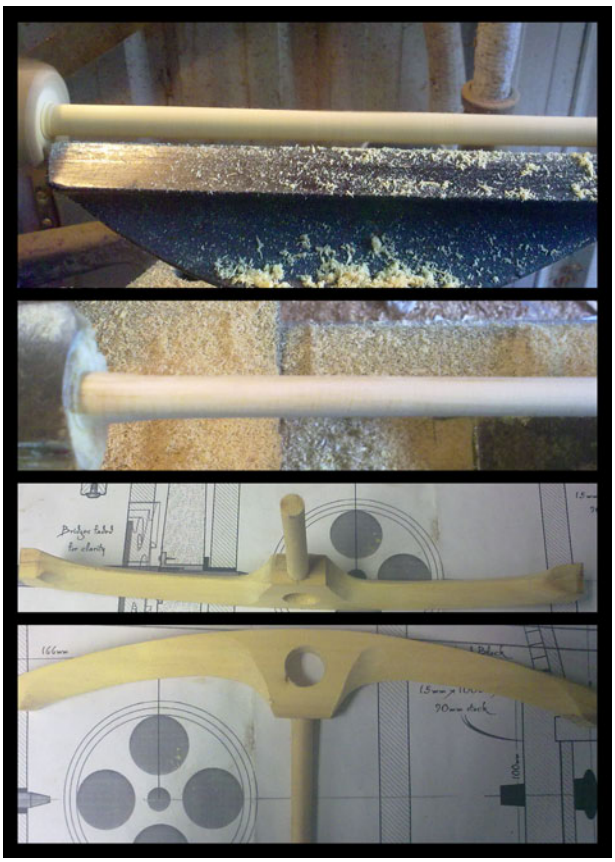


The assembled body

Go to table of contents

10. Make up the 3 sound board braces . Make sure that Brace number 1 has its 14mm shaft hole predrilled prior to installing. Also make sure the 2 sound posts are installed at the same time.

Split a billet of straight grained " huon Pine" to turn down to 8mm diameter. This is the sound post material. The grain has to have no runout along the length. It then gets attached to the brace (soundboard and back plate brace) using a tight fit drill hole and glue.



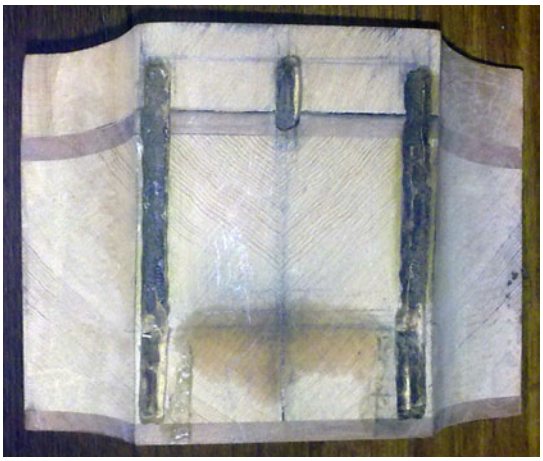
Install all 3 braces with glue and peg to the ribs (use bamboo skewers again). Instal the buttresses using a spacer block. Thens glue in the buttress end block level with the inner flange of the peg head tenon. Glue on the top linings and sand the front (sound board face) to the correct profile using the sanding board again.

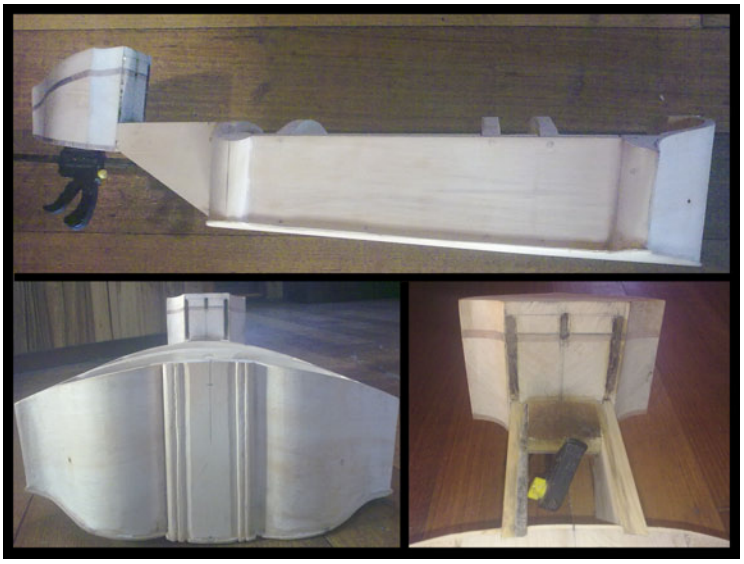
Go to table of contents

The peg head

The peg head is constructed out of 5 pieces of wood. This is to make the stock of Huon pine needed smaller and give access to the shaping of the inner parts of the peg head. I'm using contrasting myrtle 5mm thick to balance the strips of myrtle on the backplate and key box.

Route out the slots for the buttresses, key box sides and nut separator. Then align the peg head on the buttress end block. Make sure that it is at the correct angle to take the key box and that it is aligned level to the body in cross section.





Don't glue to the body yet. I need to make the key box first. The body is basically finished and now awaits the soundboard, piezo electrics and coax cable to be installed.

Go to table of contents

9mm "Classic" grip
typical of 19th century
and earlier instruments
Weight: 91gms per set of 6

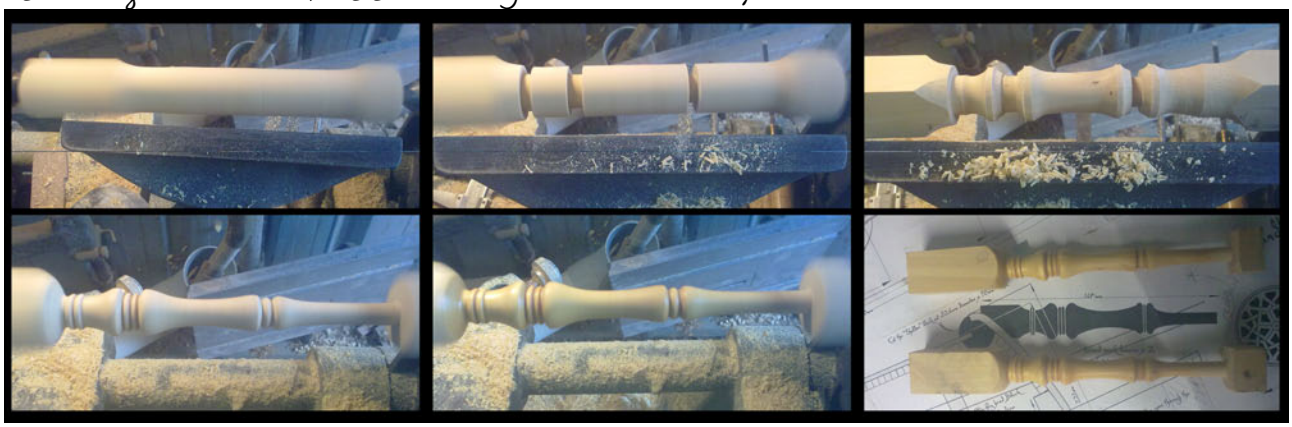
PEGHEDS

These are the "pegheds" pegs I bought from John Charles (Chuck) Herin <chuck@pegheds.com> They fit the look of this instrument well and work wonderfully. They are fully geared machine heads.

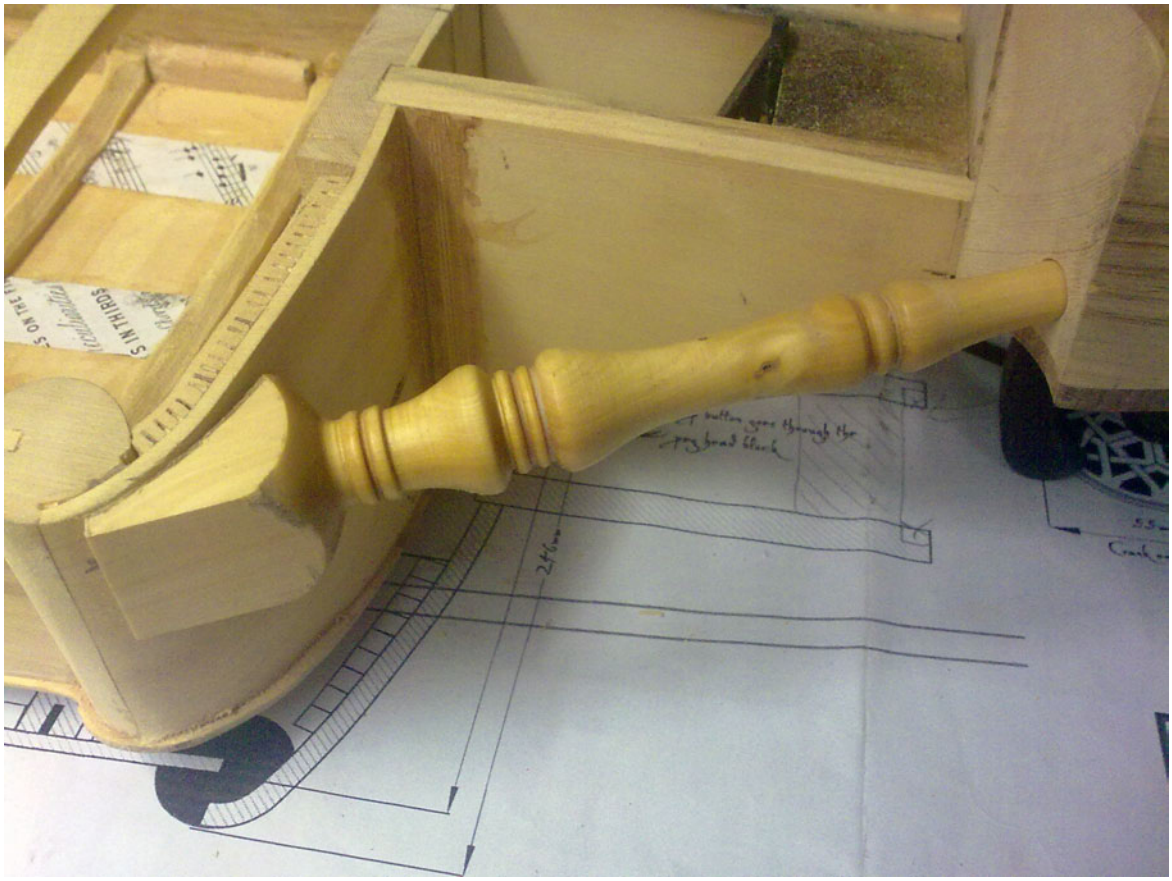
Go to table of contents

The Spindles

Turn up 2 identical spindles to go between the body end and the peg head. I used 30mm square stock 200mm long to turn one spindle.



Turning the Spindles



Drilling out the axle holes in the body end piece and sound board braces. Clamp the brace being drilled and make sure the drill bit is aligned correctly while drilling.

Go to table of contents

Drilling the axle holes

The Wheel and Shaft

The wheel is made from a core of marine ply (5 ply hard wood) decorated with

Quarters of Huon Pine and Myrtle. The grains of the decorative woods are at right angles to each other. This gives more stability to the wheel. The rim is made from Tas Sassafrass (fine grain and takes rosin well).

Go to table of contents

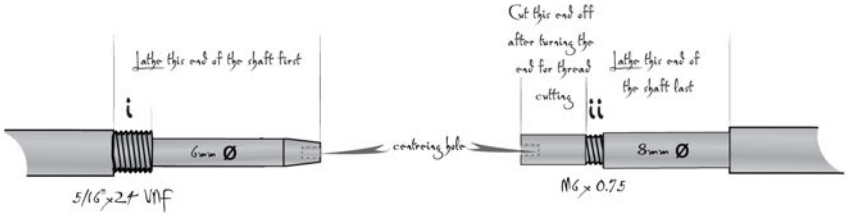
Wheel Shaft details

Wheel Shaft turning sequence

A

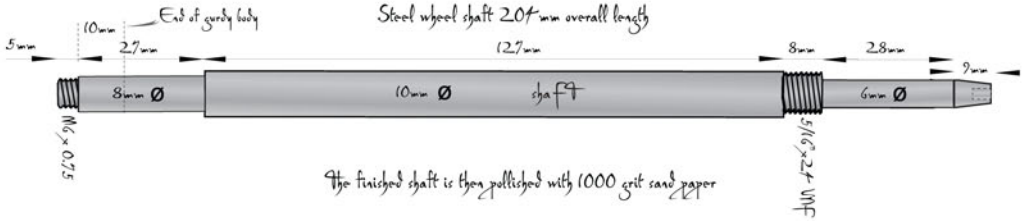
Cut 10mm diameter stainless stock to 220mm long and drill 2mm diameter centreing holes in each end. This is so a live centre can be used while turning each end

B



The 5/16"x24 (7.94mm) thread region "i" needs to be turned to 7.82mm prior to cutting the thread with a 5/16x24 "button" die
The M6x0.75 (6mm) thread region "ii" needs to be turned to 5.90mm prior to cutting the thread with a M6x0.75 "button" die

C



The finished shaft is then pollished with 1000 grit sand paper

Go to table of contents

⇐ Wheel thread

⇐ End cap with bushing apart

⇐ End cap and bushing together (left two shots). Brace bush and thrust washer (right two shots).

⇐ Shaft assembly

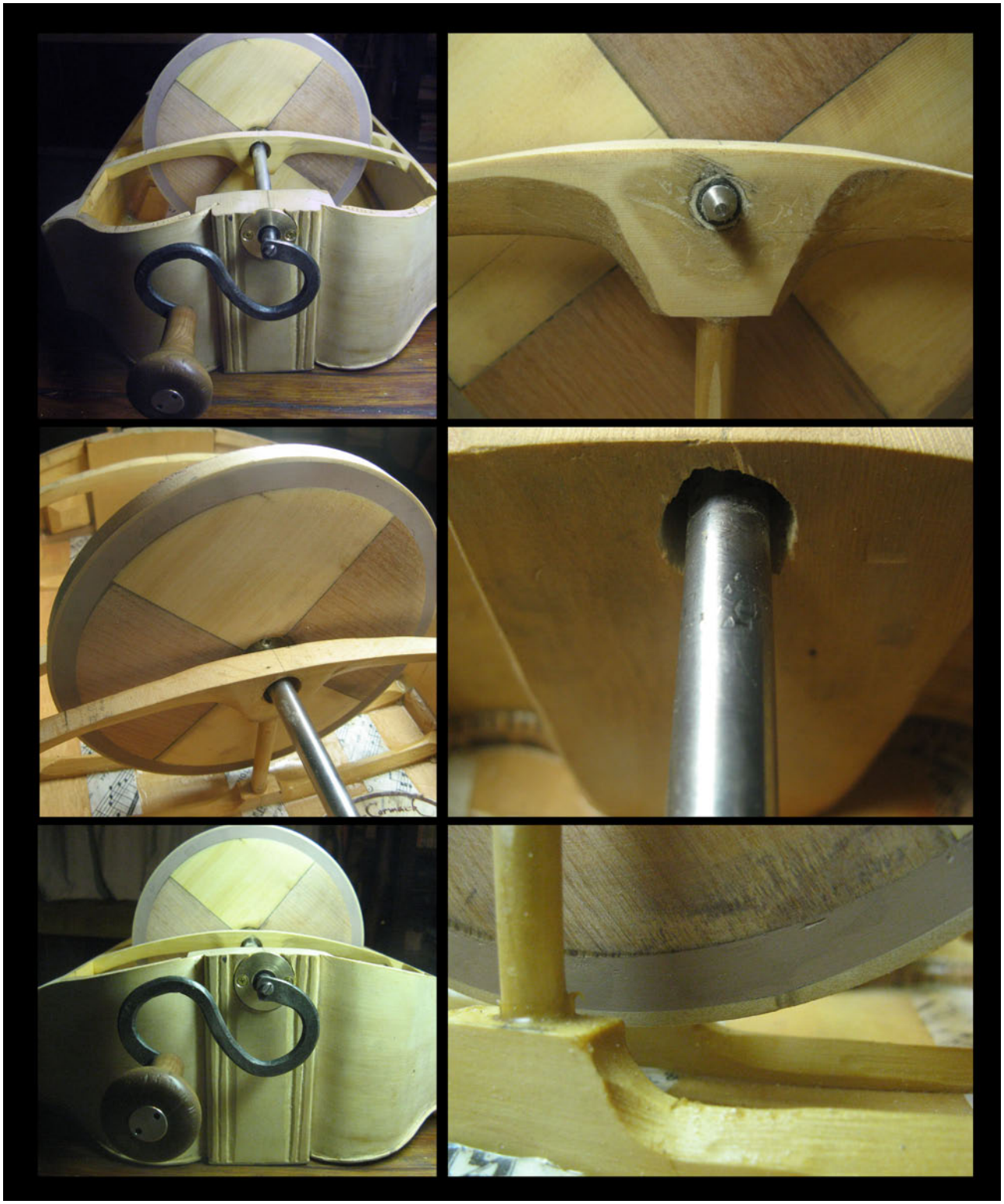
⇐ Shaft

These are the bushings and the wheel shaft. The shaft is made of Stainless steel. The black bushings are delrin and the other parts are brass.

Go to table of contents

The wheel and shaft installed. This photo shows the clearance of the bridge brace to the shaft.

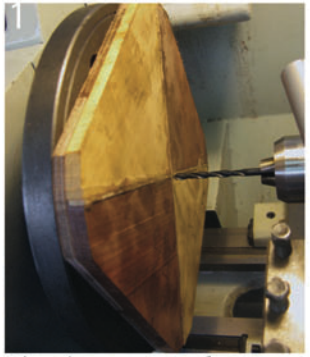
Go to table of contents

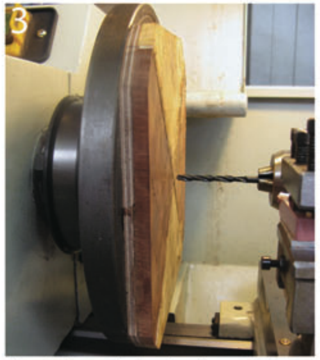


The new wheel

I had to make up a new wheel because I drilled and installed the " wheel thread" after turning the wheel up. This meant that the wheel wasn't exactly perpendicular to the shaft. So the wheel was not running true on the shaft. Turning up the wheel on the shaft is the preferable way to go. The following was the fabrication sequence of the new wheel.

Go to table of contents

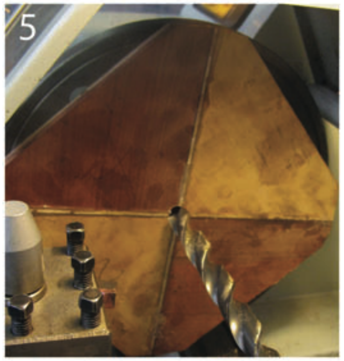


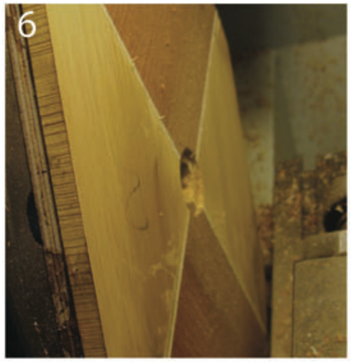


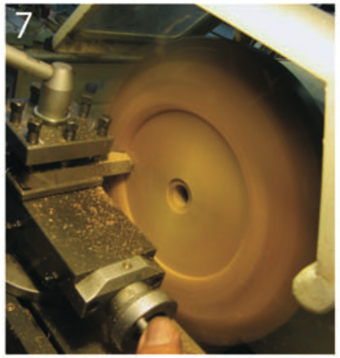
Glue the quarters of contrasting woods (huon and blackwood) to the hardwood plywood core. This is then attached to the lathe faceplate

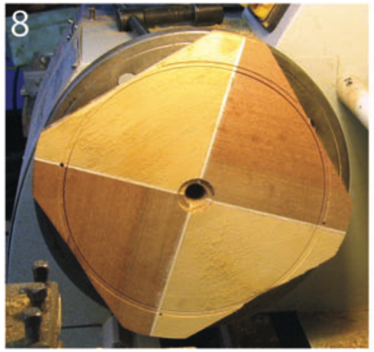
Centre the pilot hole drill and check that it is exactly 90˚ to the wheel face. Now drill the pilot hole

Now drill the 2mm deep wheel thread flange seat. ie. the largest diameter of the wheel thread.









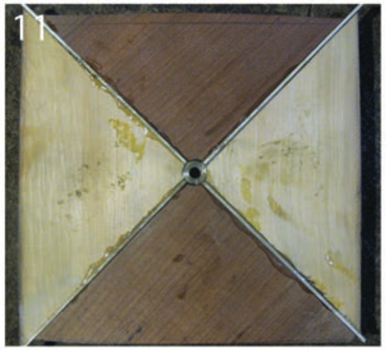
Next drill the wheel thread hole all the way through

The finished wheel thread flange and hole

turn the face to correct taper

insert the wheel flange, using the shaft as a guide to make sure it is at 90˚ to the

Glue and screw the wheel thread into place



Once the wheel thread is glued then take the wheel off the face plate and glue the quarters to the other side. Re-mount the other way around on the shaft for turning

Go to table of contents

Once the wheel is turned up true to the shaft, I then installed the sassafrass rim as show with the first wheel.

The Sound board

I bought a 7.5 super-foot block of quarter sawn Huon pine for the soundboard. I cut 2 10mm slabs off the block to use. These were book-matched and the joint planed true on the shooting board.

I then glued the two slabs together and thicknessed the soundboard down to 2.5mm. The roses were marked out and the pattern glued to the underside of the soundboard ready for drilling and cutting. I then chip carved the top of the roses.

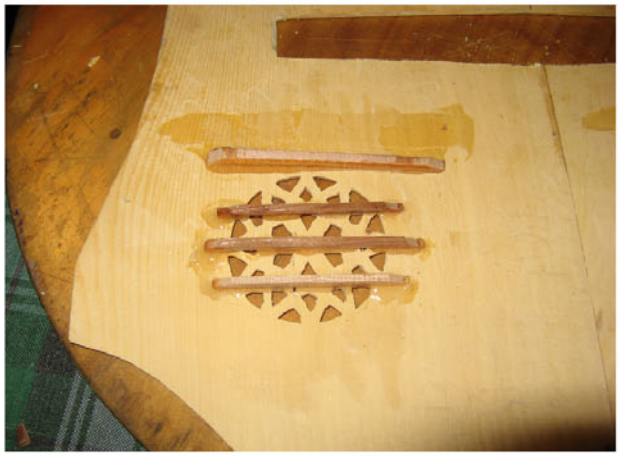
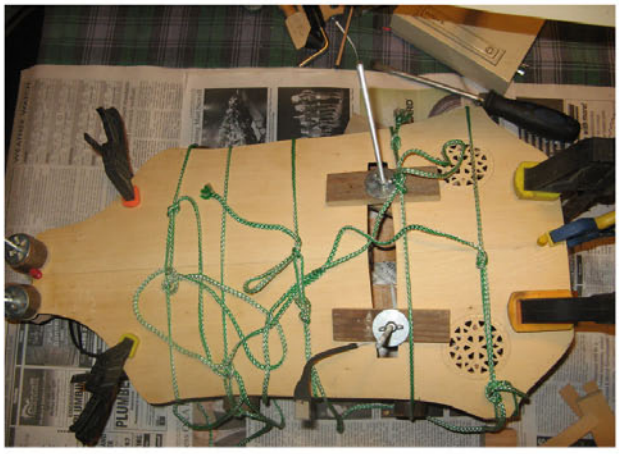
Go to table of contents

From left to right: the drilled and cut sound holes. Starting to chip carve the rose. more detail added.
There are 2 identical roses evenly spaced from the sound board center line.
The roses are then re-inforced by glueing small sticks of myrtle to their underside. The following photos show the placement of these re-enforcement sticks and under soundboard Piezo pickup positioning.

The soundboard was then glued to the body with PVA glue. This needed carful bending of the soundboard as to not crack it.

Go to table of contents

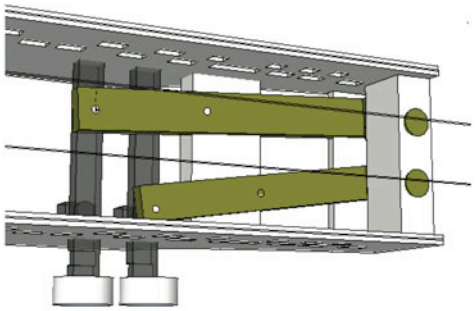


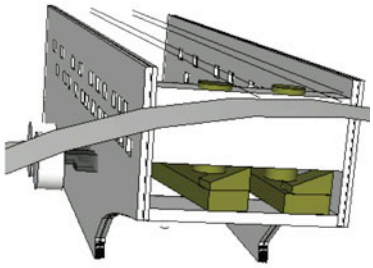





Go to table of contents

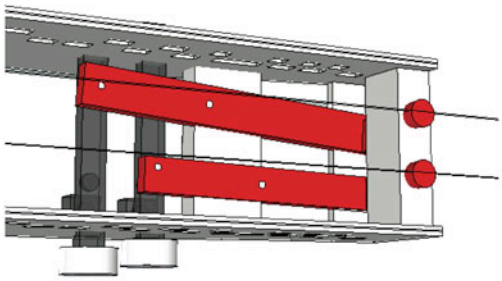
The chanter string lifting mechanism prototype

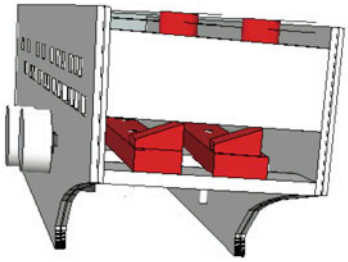
Make up a prototype of the lifter mechanism to see if it is feasible.



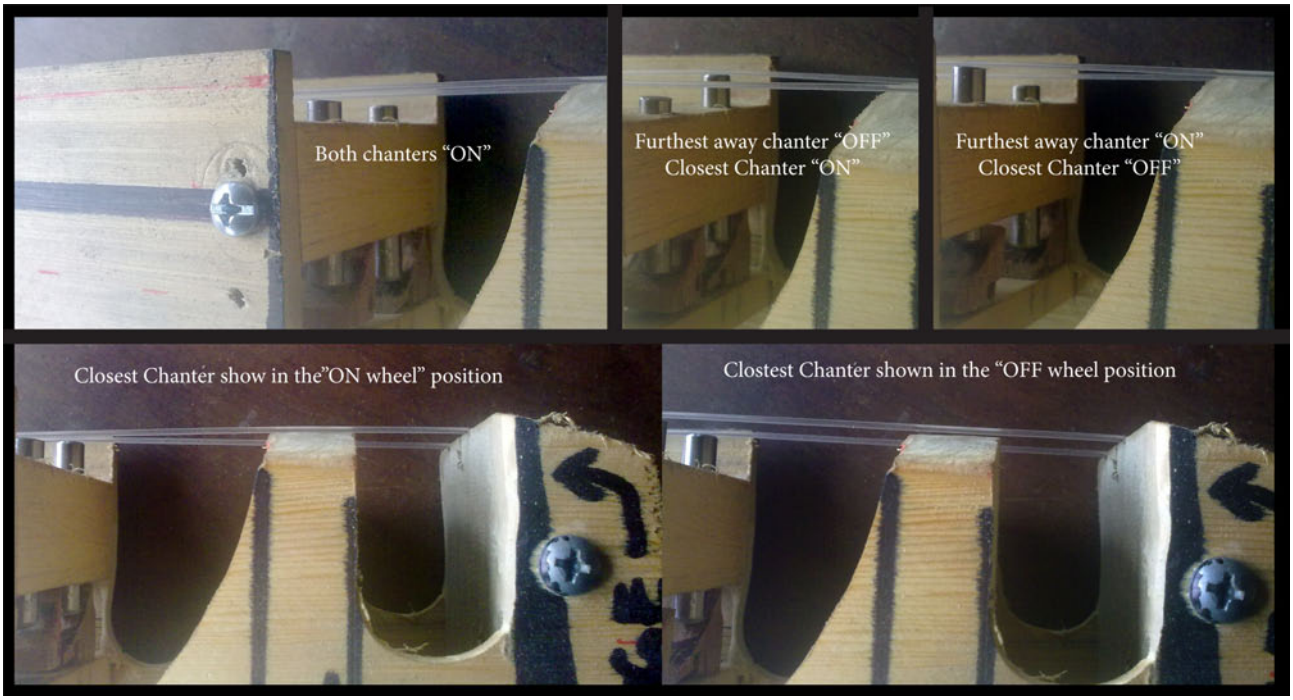


Green depicts the strings in the " on wheel" position. While Red depicts the strings in the " off wheel" position.





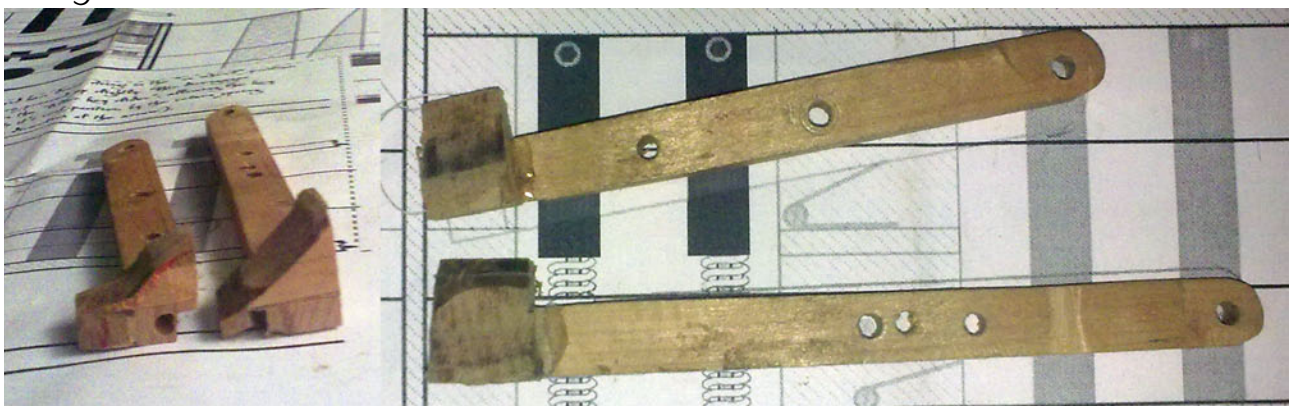
The prototype works well. I have discovered that the slots in the key sliders that lock the string lifters in the



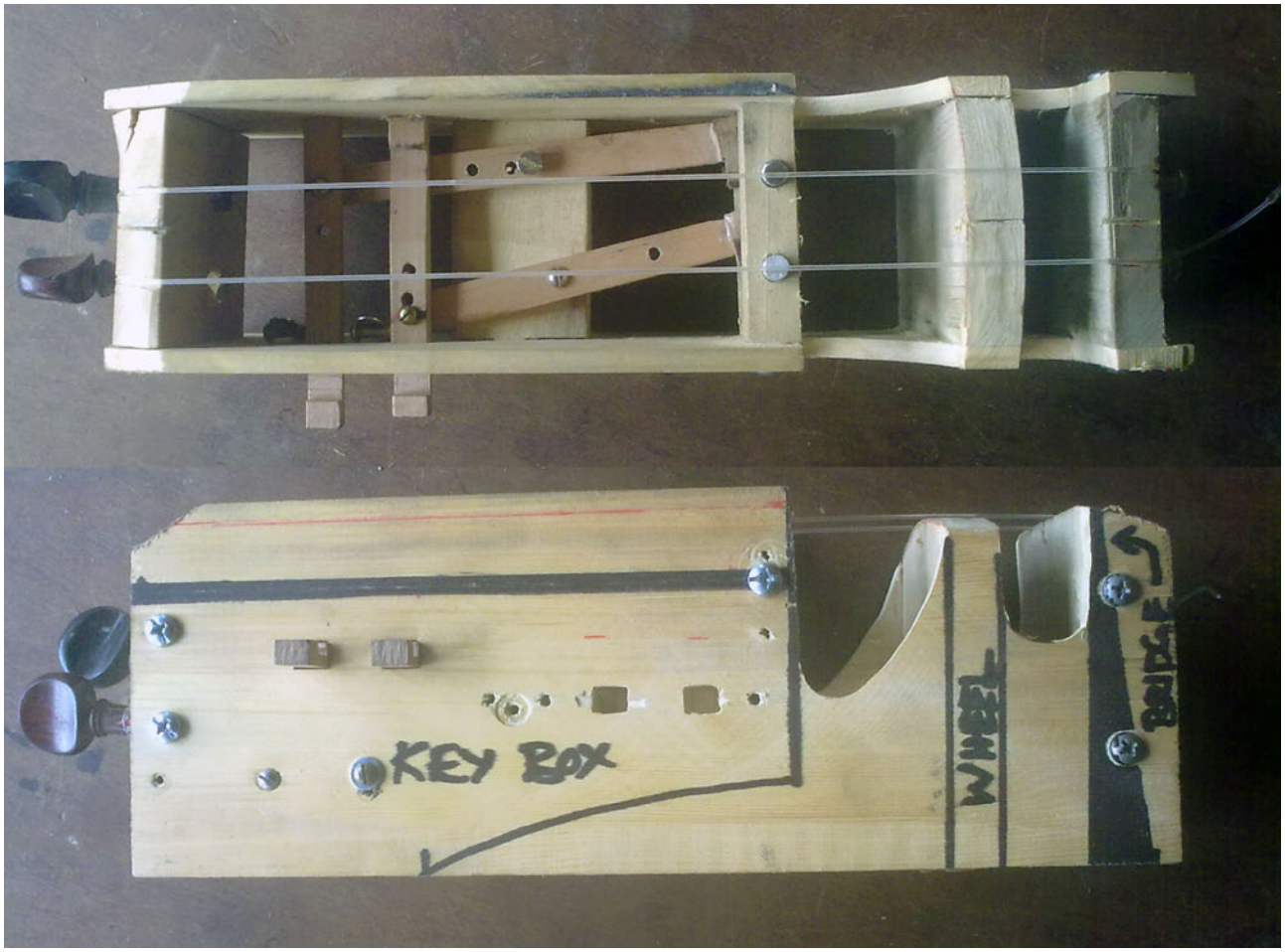
" UP" position, work best facing up. i.e.. you push the buttons in and up to lift the string of the wheel. I had designed it to go the other way, but that kept

Go to table of contents

slipping due to the configuration of the pivot point and the pressure at the string lifter.

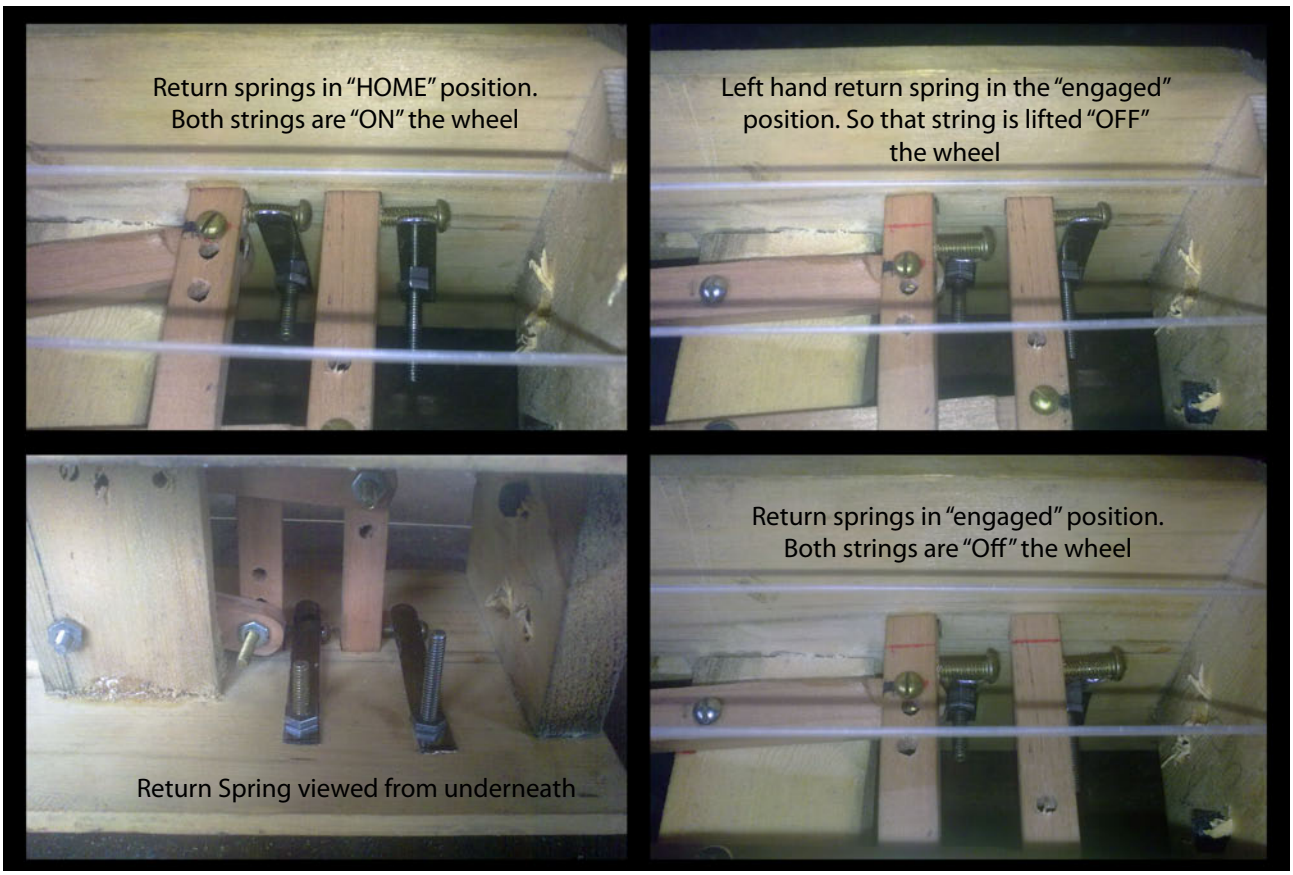


String lifter pivots



Showing the "mock up" of the Chanter string lifters

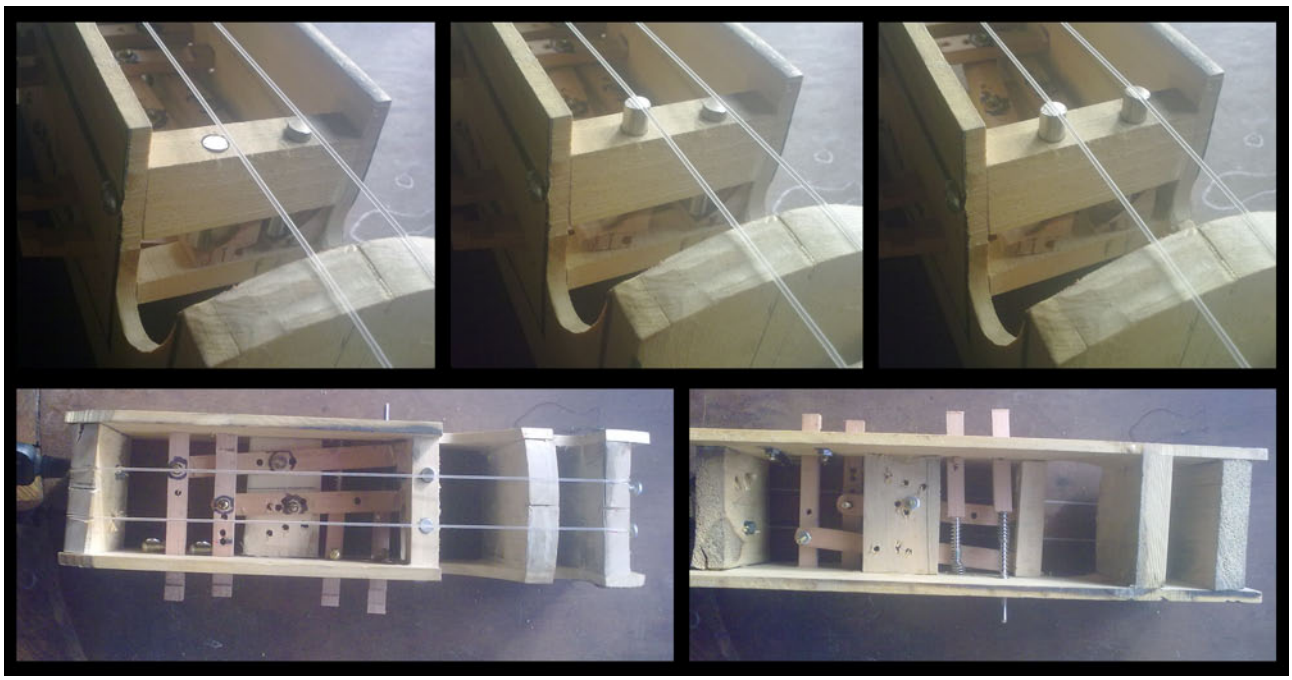
Go to table of contents



Showing the return springs in action

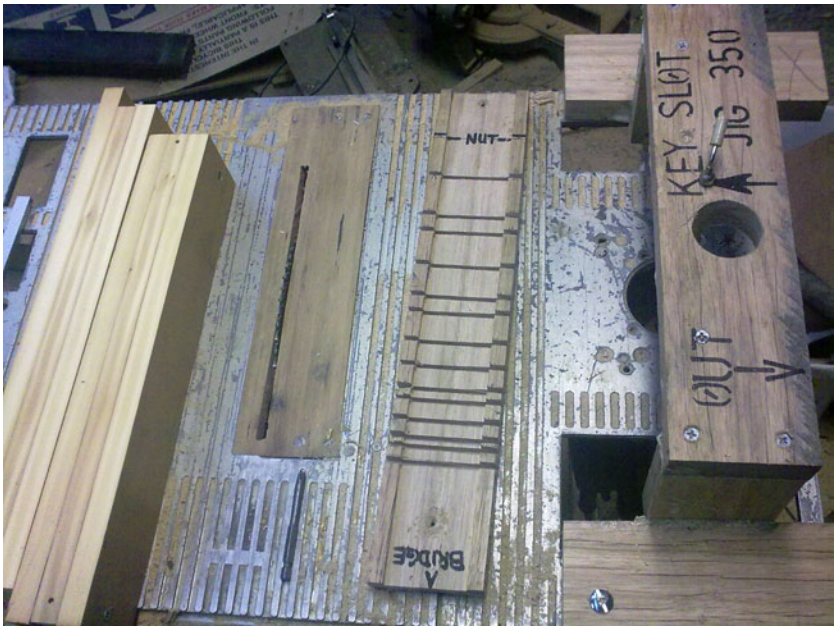
The bass string lifters are more straight forward. I have turned their slider slots to face up so they lock more efficiently. That way all the four buttons for the string lifters will work in the same fashion to engage and disengage the strings from the wheel.

Go to table of contents



Go to table of contents

The KeyBox

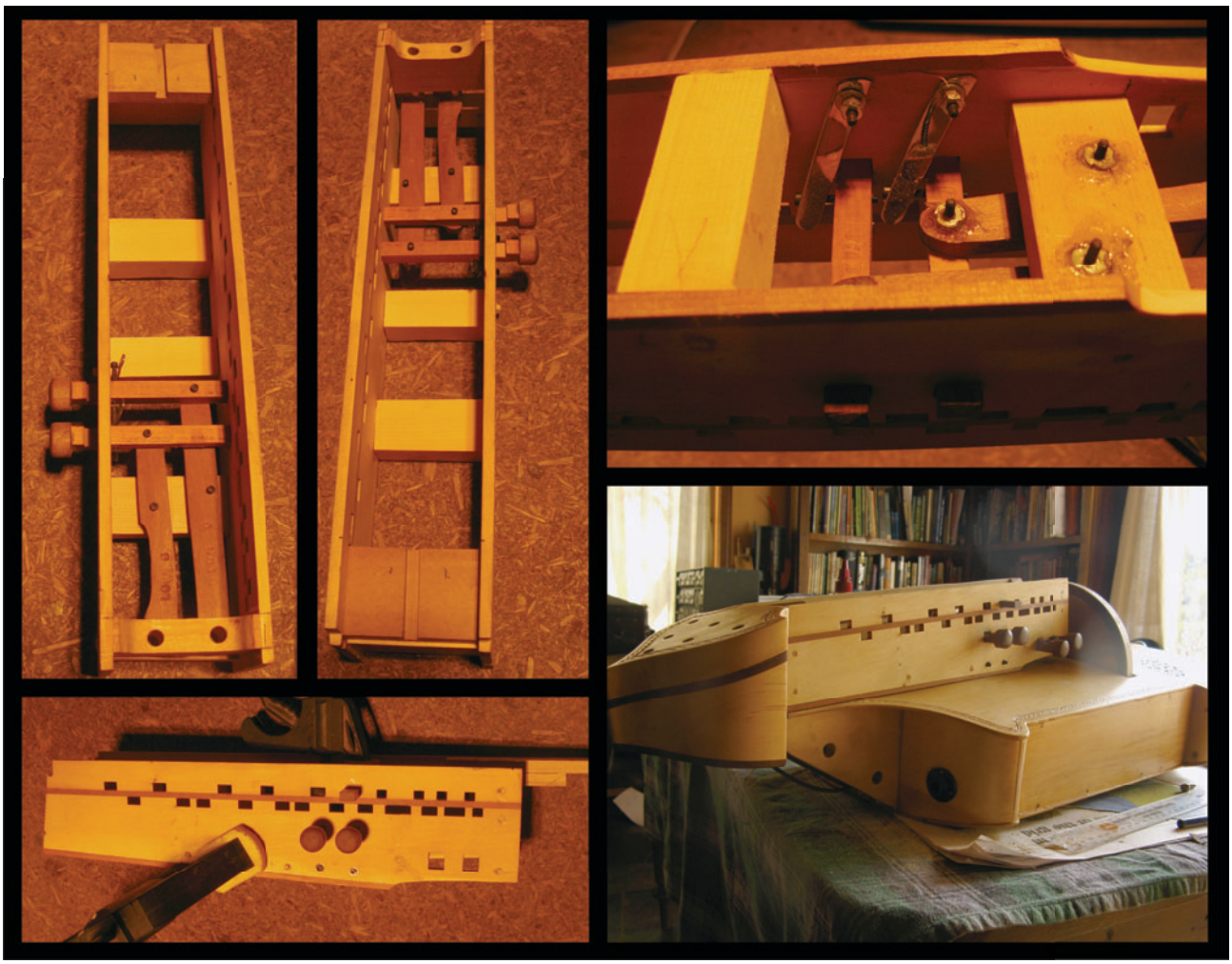


The key box is made up of 3 parts. The top and bottom parts have key slots routed in them using the key slot jig. They are then glued together with a separation piece of contracting wood. Key slot cutting jig is made such that it will position the slots in the correct key pattern for the top and bottom key box sides.

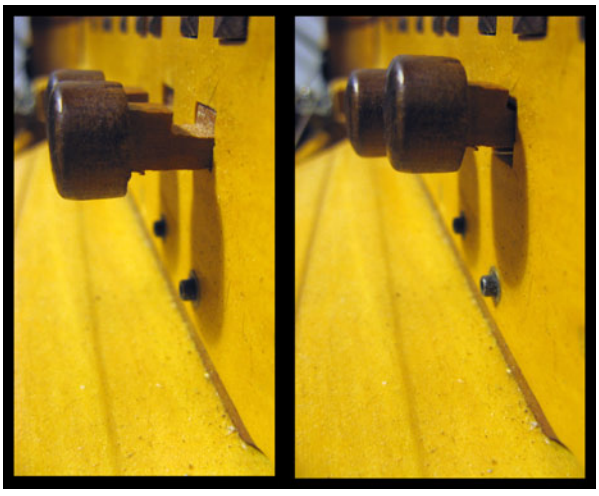
Showing the key slot cutting sequence

The huon side block is screwed into the recess of the alignment jig. There are slots in the alignment jig which run on a pin in the router table jig attachment. This keeps the routed slots parallel to each other. The top and bottom key-box sides are then glued together with the separation strip of wood. Then ripped down on the bandsaw to form the completed key-box side. This produces many key-box side from one routed block.

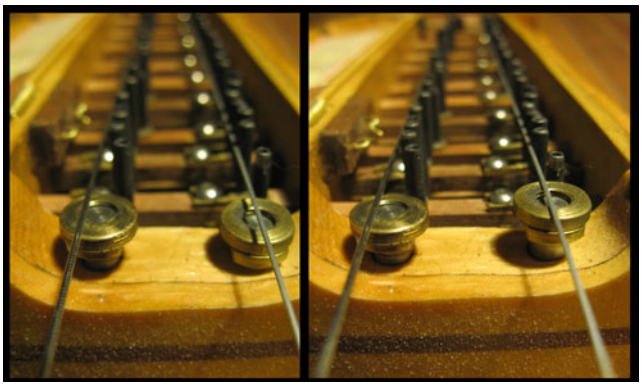
Go to table of contents



Here is the workings of the chanter string lifters. Showing the button sliders, the wedge levers and return springs. The buttons are conveniently located for the left hand thumb to operate during playing.



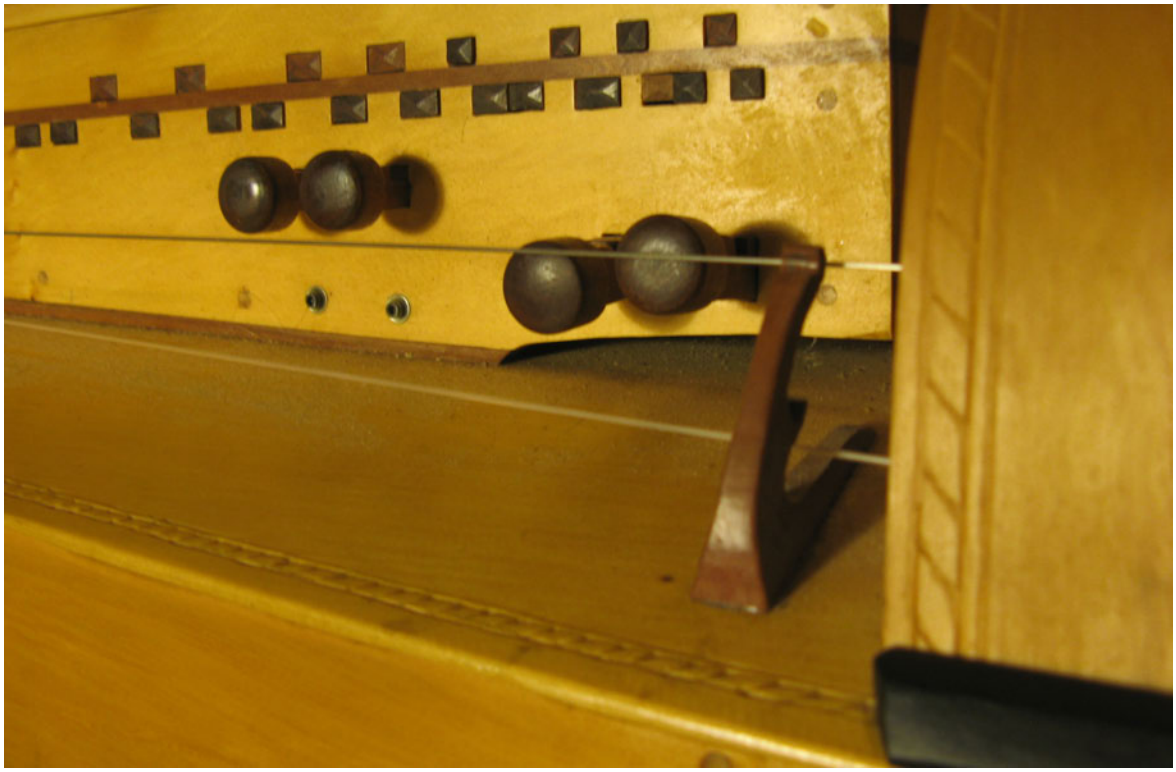
The notch cut out of the button slider locks into the side of the key box and



holds the string off the wheel. The push rods are smooth on top so as not to abrade the strings when lifting up the strings. The have a slightly domed top. The brass part of the push rod is adjusted by means of the brass lock nut.

Go to table of contents

The brass lock nut can be tightened using the flats provided. The push rod itself is steel and has a rounded end to help it climb the wedge as the wedge is forced under the rod by the wedge lever and button slider.



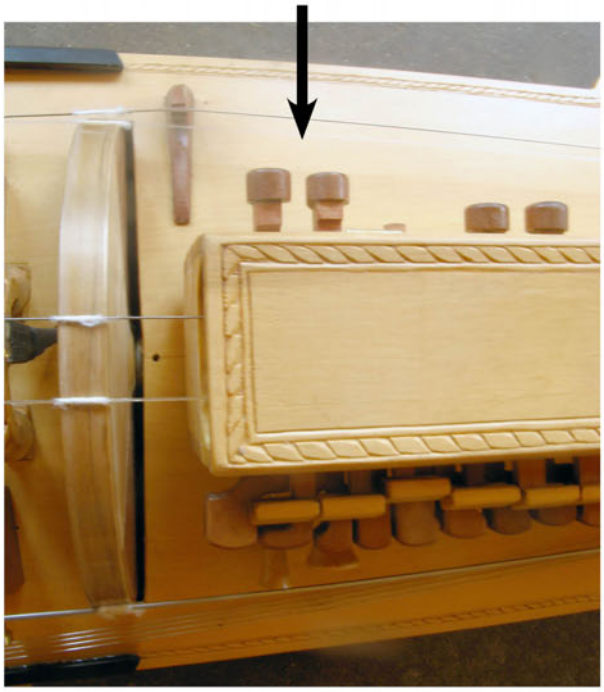
The buttons from right to left are: high chanter, low chanter, bass drone and tenor drone. The alto drone and trompette string lifter is in the foreground. These two need to be lifted by hand up onto their hooks.

Go to table of contents

Tenor and Bass drone String lifters

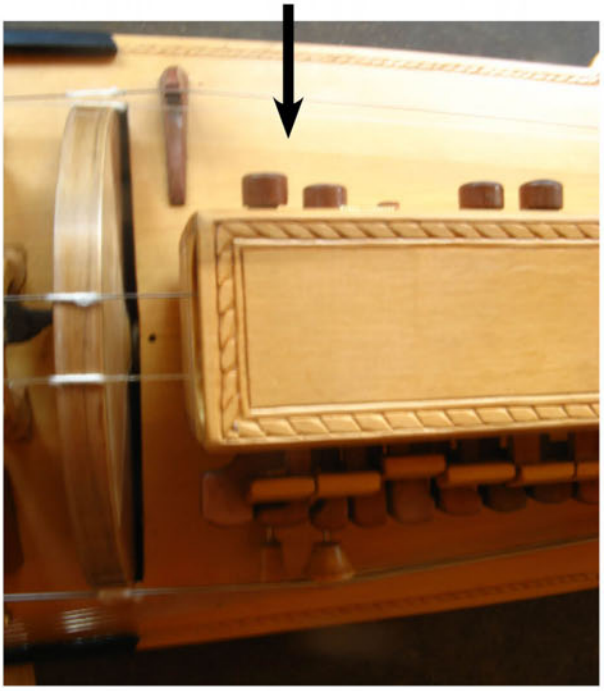
Pressing the buttons in to their locked position disengages the drone strings from the wheel. The position of these buttons in conveniently reached by the left hand thumb. Even while playing.

Drone buttons in "engaged" mode.
-drone play-



Tenor and Bass drone string lifters in playing mode

Drone buttons in "off" wheel mode.
-drones don't play-



Tenor and Bass drone string lifters in "off" mode

Go to table of contents

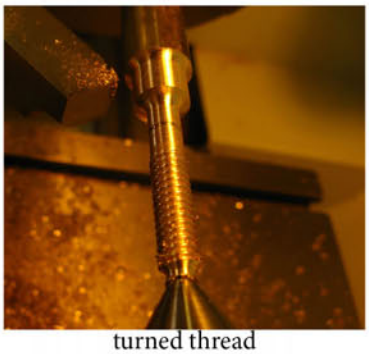
The Bridges

Adjustable Trompette and Alto drone bridges

The drone strings run on bridge bolts in the slot near the head of the bolt.

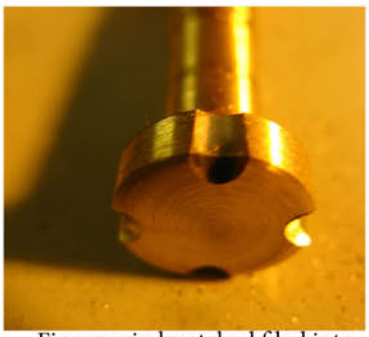
Turning the shape to the adjustable bridge bolt out of brass. The is one for each of the drones (Alto, Tenor & Bass)

Turning the shaft of the bolt



turned thread

Shaping the head

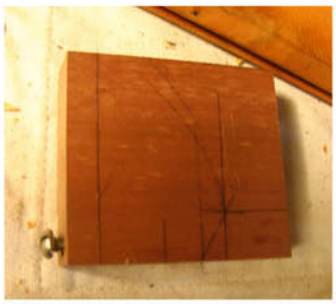


Finger grip knotched filed into the head

3 finished bridge bolts

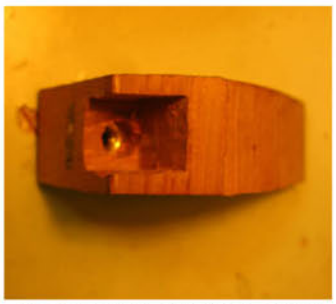
These bolts thread into the wooden bridge base and can be adjusted in or out to give more or less string to wheel pressure. There are 3 needed. One for each drone. The trompette gets the following adjustable arrangement.

Go to table of contents



Blank trompette bridge with adjuster bolt in place

Route out the adjustable slider slot and inbed the adjuster nut



Showing the adjustable slider slot and adjuster bolt hole

showing the ebony slider. This is what the dog will pivot on

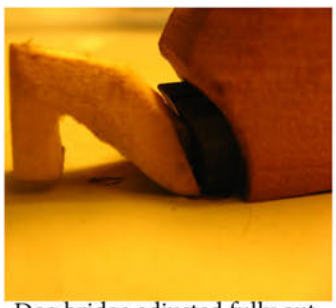
slider adjusted fully out

slider adjusted fully in

showing the dog blank getting fitted to the slider slot. also showing the Alto bridge bolt

the adjustable dog bridge components in place

the alto bridge bolt. It screws in and out for adjustment



Dog bridge adjusted fully out

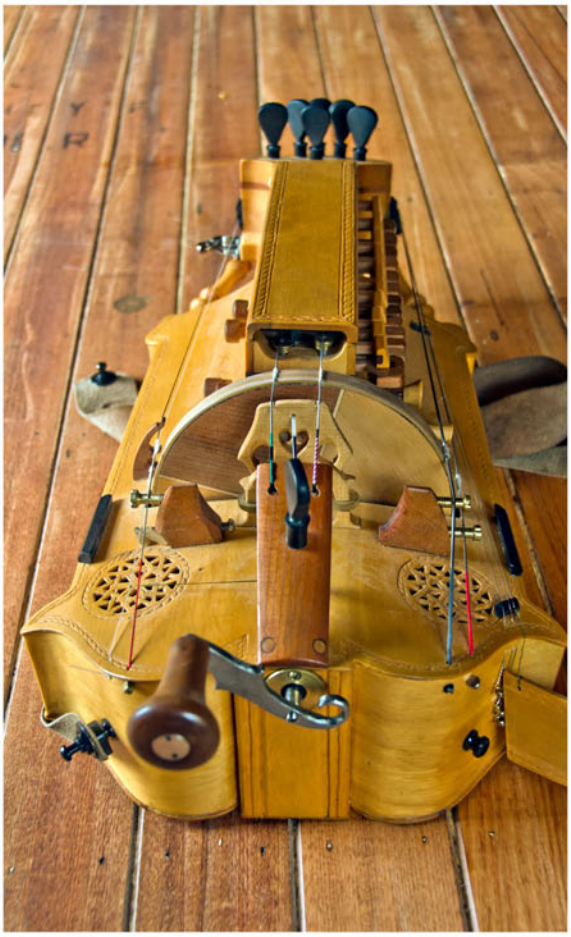
Dog bridge adjusted fully in

trompette and alto bridge in place

Go to table of contents

The finished Hurdy Gurdy

The finished hurdy gurdy



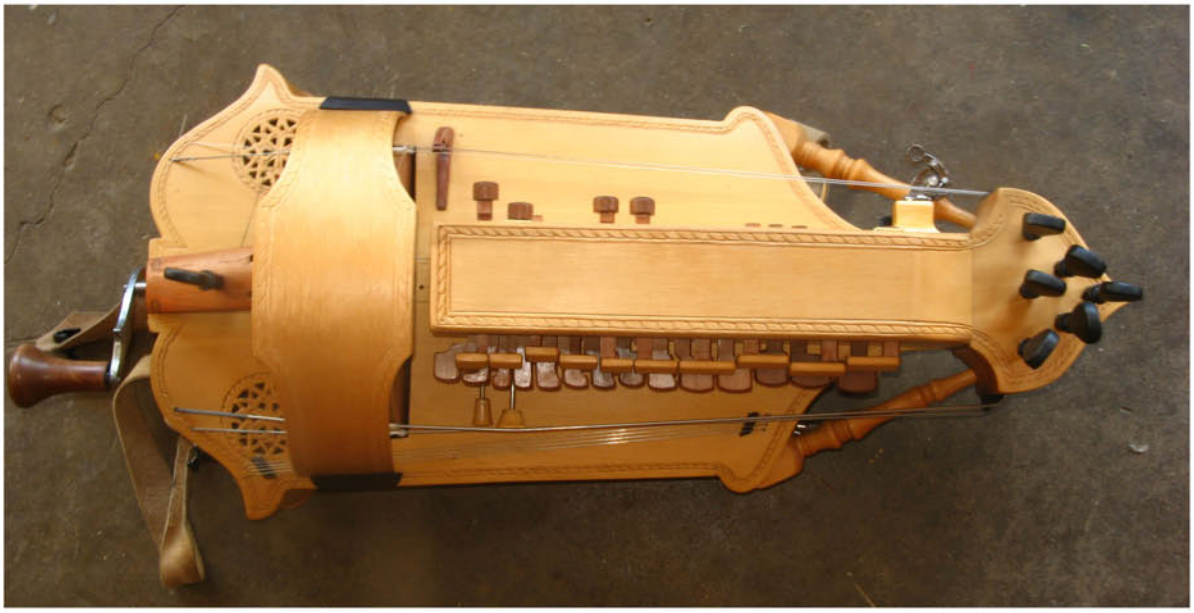
Go to table of contents

Brenka-Drehleier-Vielle à Roue-Ghironda-Zanfona-Tekerőlant-Hurdy Gurdy-Viola de Rodа

Graeme McCormack
Selverata-Tasmania
Australia
Henri III

I was alive in the forest
I was cut by the cruel axe
In life I was silent
In death I sweetly sing

Forgólant-Bauernleier-Draailier-Nyenyere-Wheel fiddle-Lira Tedesca



Go to table of contents

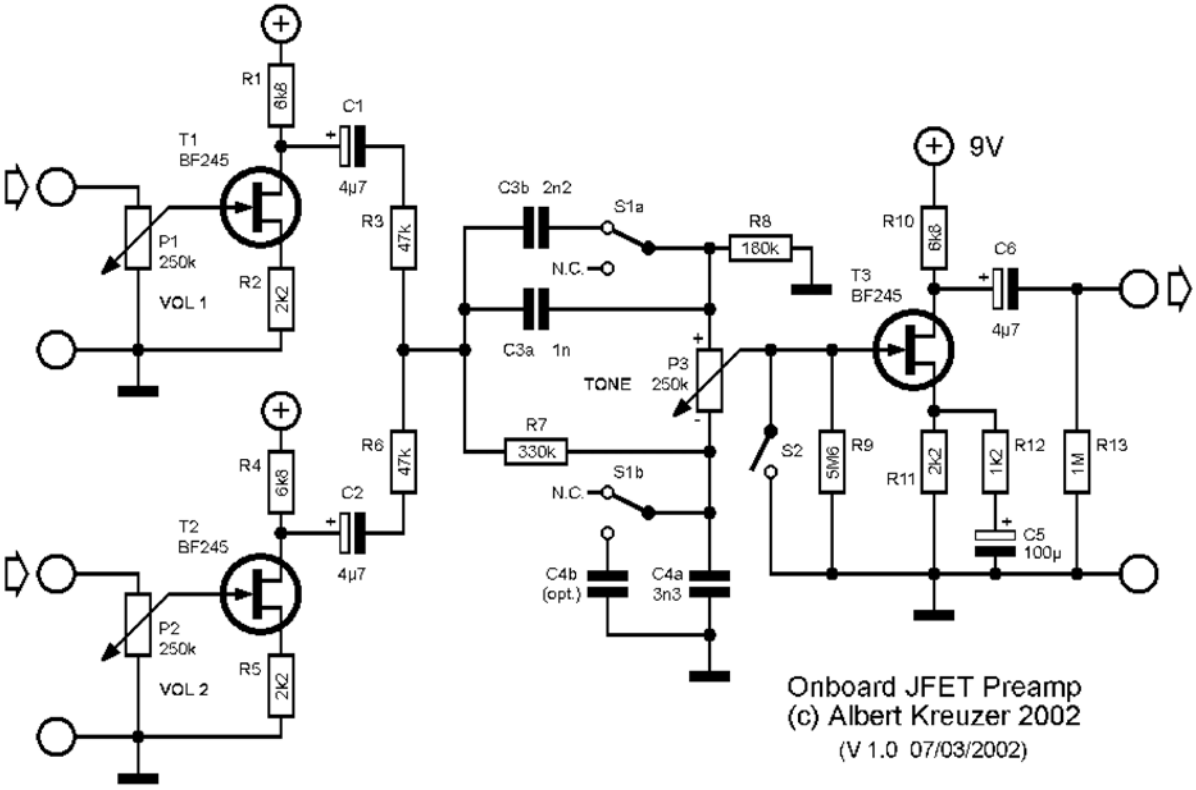
I then made a case. I will add the info soon in a update

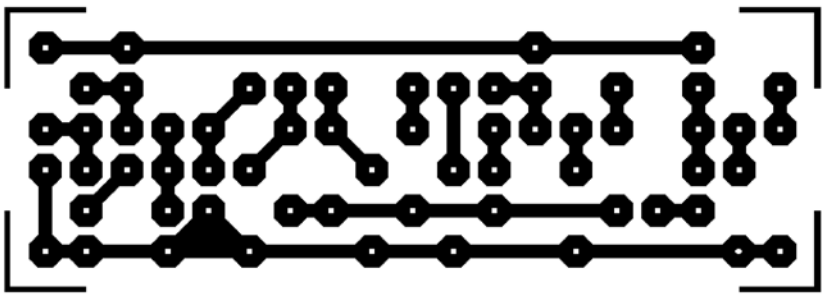
Go to table of contents

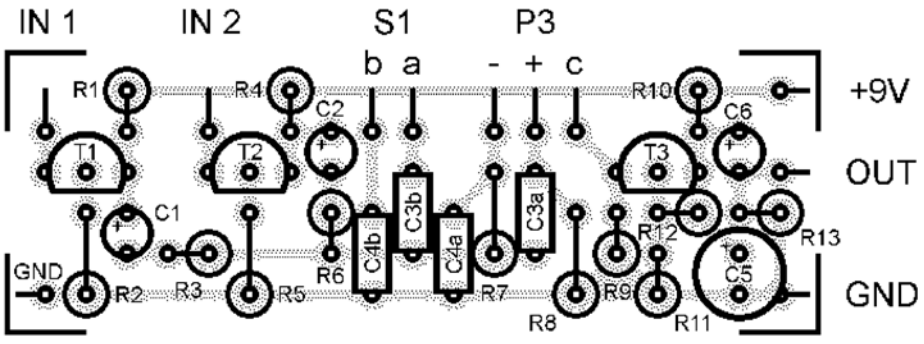
Electronics Still under optimisation

I will update the preamp info when I have optimised it

Onboard JFET Preamp







Thanks to Albert Kreuzer http://www.albertkreuzer.com/index.htm for the circuit design.

Go to table of contents

I have sourced piezo strip from Experimental Musical Instruments https://windworld.com/ and intend installing a 6" strip under the soundboard parallel to the wheel on the bridge side. While attaching a 1" strip to the chanter bridge. I'll run coax prior to installing the soundboard and then temporarily try for the sweet spot on top of the strung instrument. I can then remover the wheel and instal the strip in the sweet spot under the sound board permanently. I will build the preamp into the peg head end of the key box, under the keys. The volume and tone pots will protrude through the trompette side wall of the key box for easy but discrete access.