MAGICAL WOOD WORKING TOUR

CHARLIE BUILT HIS ACOUSTIC GUITAR

Jan – June 2018

Taught by Luthier Bruce Roper, Chicago Luthiers Workshop

(Ravenswood, Chicago IL)

GENESIS OF AN IDEA

GENESIS OF AN IDEA

My father, David S. Silverstein,was an amateur carpenter who constantly did major projects to improve our Budlong Woods (Chicago) house: for example, a curved wet bar in our basement, paneling the rec room, and double desks in my twin brother's and my bedroom.

GENESIS OF AN IDEA

Dad taught us how to use his table saws, planes, chisels and other tools neatly arranged on shelves he built. I carried out my carpentry projects on a work bench Dad built for my brother and me, complete with two woodworker's vises. All-in-all, Dad taught me how to use, care-for and respect carpentry tools and the art of building.

GENESIS OF AN IDEA

Since my guitar playing began during the folk scare of the 1960's and working with wood before then, it made sense to carry out a carpentry project to build a guitar. But where to learn this skill?

GENESIS OF AN IDEA

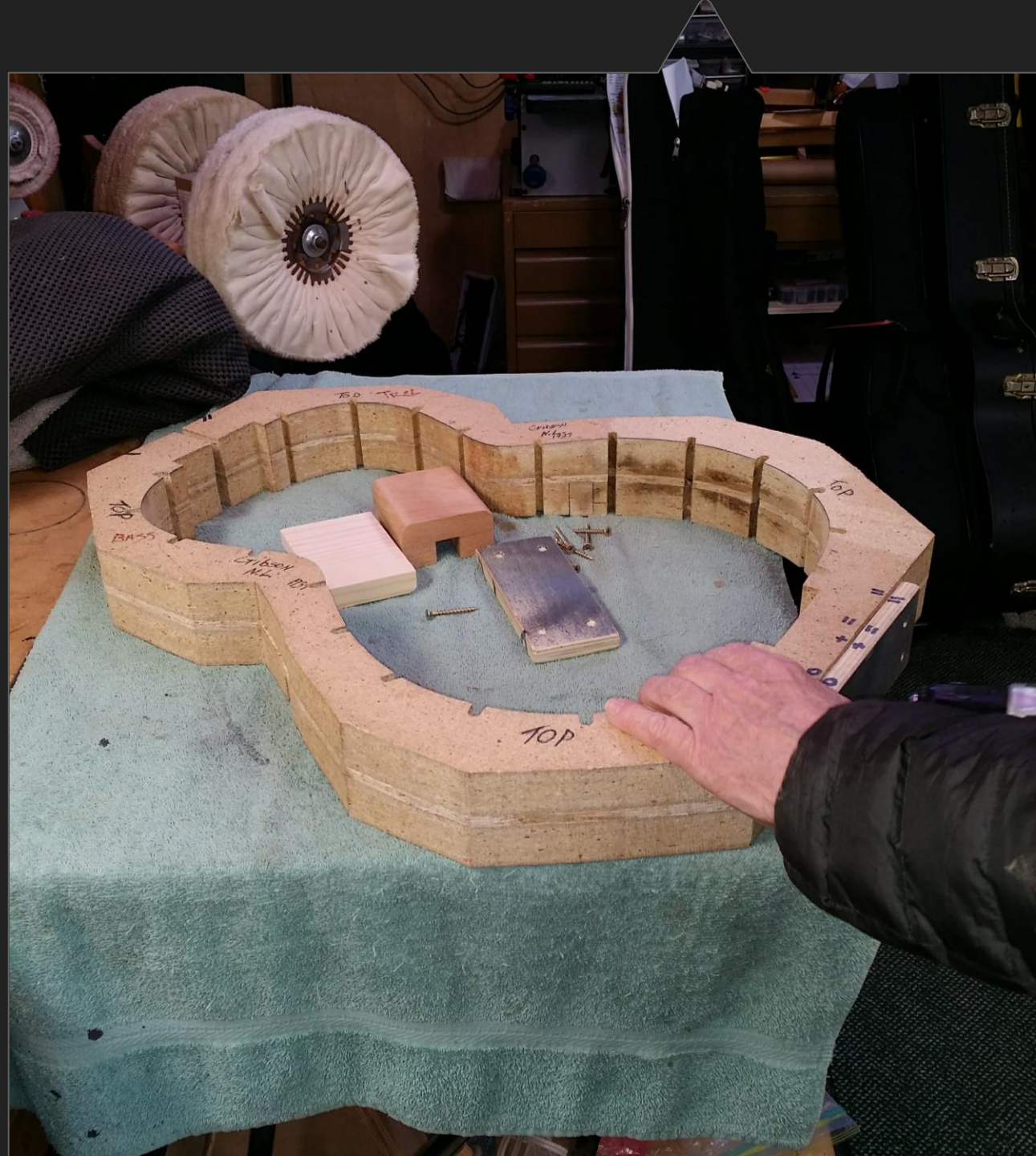
In January, 2018, I purchased a new set of guitar strings from the Old Town School of Folk Music in Chicago. I asked the clerk at the counter if he knew anyone who taught guitar making. He mentioned the Old Town School's long-time repairman, Bruce Roper. (Bruce is also well-known for his 25-year-old band "Sons of the Never Wrong".) I spoke to Bruce by phone and at his workshop. Then and there, I decided Bruce would be my teacher. He is very knowledgeable about wood, carpentry, tools, a perfectionist, an enabler to his students, an intregral part of the Chicago music scene and has my sense of humor.

THE BODY ACOUSTIC

THE MOLD

I modeled my guitar on a 1937 Gibson Nick Lucas special. Bruce made the mold.

This heavy plywood mold was made with a large band saw and a bobbin sander. It separates into two halves to easily release the guitar body.



Selecting Wood at Owl Lumber in Des Plaines, Illinois

Bruce has the eye of a fine furniture maker when selecting wood for projects. The soundboard (top) of my guitar was made from Alaskan yellow cedar, a softwood valued for its **strength**, extreme **durability** and outstanding beauty. The back and sides of my Gibson knock-off were made from Sapele, related to African Mahogany.

Inspecting the Wood

Bruce pointed out the distinct characteristics of cedar and Sapele. But an important aspect is the aesthetic appeal of the finished guitar. So we examined the grain patterns and decided which parts of each book-matched panel of quartersawn cedar and Sapele should butt together to form a perfect whole.

PREPARING THE GUITAR'S BACK

- A drum sander reduced the guitar's Sapele to its final thickness. This is known as "thicknessing." (Below is one half of the back)

When both halves were prepared, I used the mold to help me picture which way to orient the grain for the most pleasing look.

JOINING THE BACK'S TWO HALVES

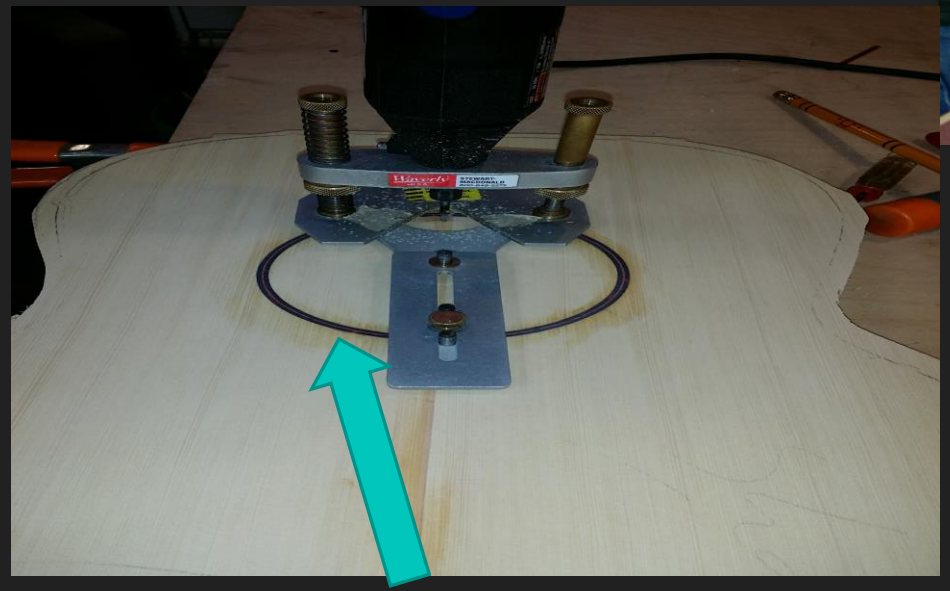
Two sides were matched,

glued, taped and

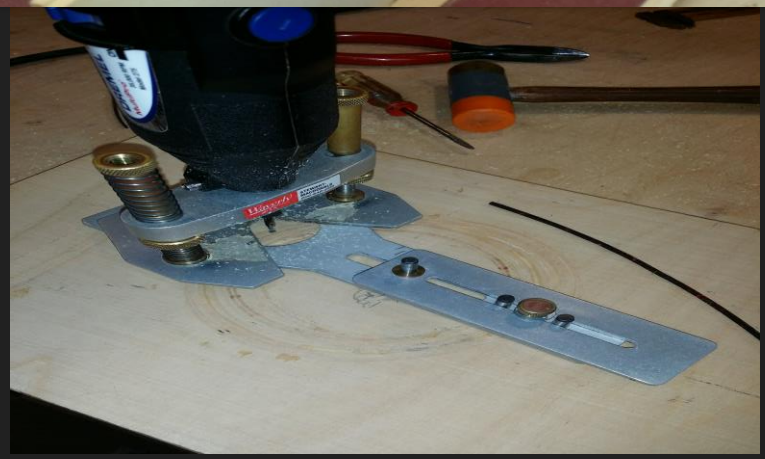
weighted down to dry overnight

MAKING THE SOUNDBOARD- THE ROSETTE

(1-Left) The book-matched panel of quarter-sawn Alaska yellow cedar was marked; then the two halves of the soundboard were glued into a perfect joint.



(4-Above Left) Purfling was cut to length, lightly hammered into the trenched circle and superglued.



(3-Above Middle) A small router cut a trench into the soundboard.

(2-Above) The mold was used to pencil-in the soundboard's outline. It was then cut purposely outside the pencil lines.

MAKING THE SOUNDBOARD

Cutting out the soundhole. After a cabinet scraper was used to scrape the purfling flush with the cedar, it was time to cut out the soundhole. The panel pin was removed and the miniature router reset deeper. Several passes of the bit ate away at the wood. Then an Xacto knife was used to make the final cut.

The hole was hand-sanded along the back.

Note the two book-matched halves of cedar glued together.

BRACING FOR STRENGTH

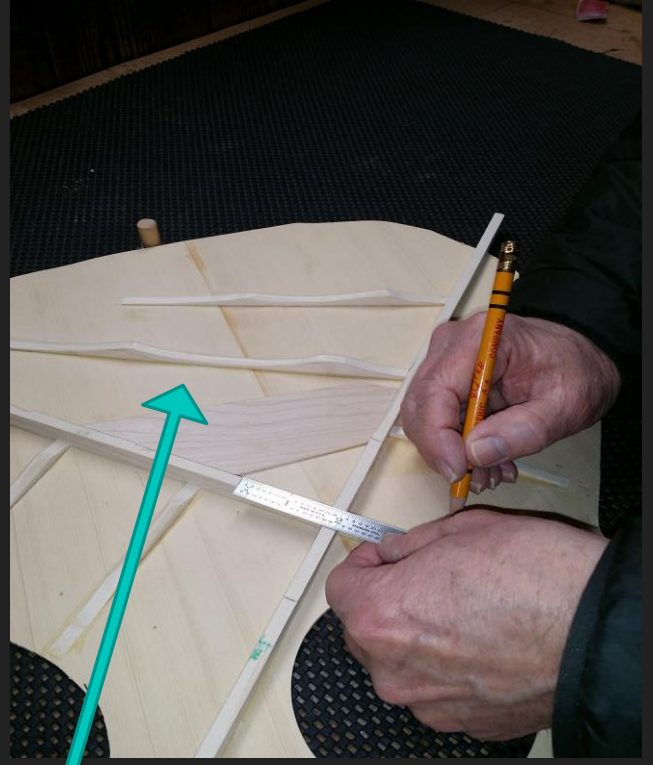
A band saw, power sander and a 15 -degree radius template were used to fashion and cut the bottom curves of the struts.

BRACING FOR STRENGTH

The braces were glued, then clamped into place with “go-bars”, a tried and true system used over the past 400-plus years by master violin makers such as Stradivari and Amati.

BRACING FOR STRENGTH

The Sapele back. Did Bruce wait patiently in his workshop overnight for the glue to dry?



Braces on the inside of the cedar soundboard were marked, then pared away with a Japanese bevel-edge chisel. Sandpaper smoothed the surfaces.
Note that the scalloped braces resembled miniature Brooklyn bridges.

At this point, THE SOUNDBOARD AND THE BACK WERE FINISHED.

BRACING FOR STRENGTH

The X brace shape, primarily developed by C.F. Martin in the 1840s, is now the standard on most steel-string guitars. But Bruce believes – aside from the initial X-position, -- that there is no "right" or "wrong" way to position the other wooden struts. According to Bruce, braces should create a balance between strength and soundboard vibrations that impact sound.

TAKING SIDES

(Left) Bruce's Nick Lucas Side template showed where the Sapele wood was to be bent.

(Right) The tops of the left and right sides of wood were indicated in pencil. Note that the pieces of wood were labeled [Treb] high E-string and [Bass] low E-string to properly position the sides.

TAKING SIDES

(Left) Each side was soaked in water for about one hour.

(Right) The wood was examined to determine if more soaking was needed.

TAKING SIDES

(Top Left) Bruce set up his "side bending" machine: a metal pipe heated by a Bunsen burner.

(Right) Each water-soaked pliable side was bent slowly by hand over the heated pipe.

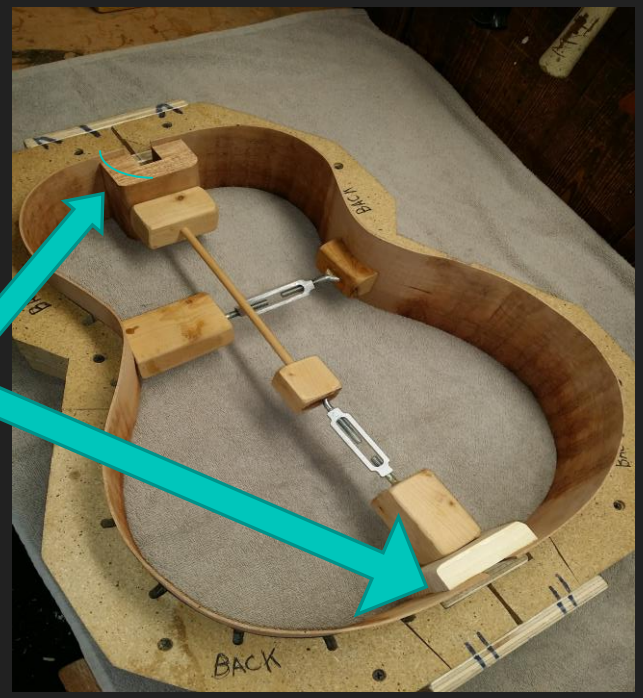
(Bottom Left) The sides of Sapele wood were pressed into the mold.

TAKING SIDES

(Top Left) The mold is assembled after both sides are inserted. Also note the top neck block and bottom end block that were a separate project to construct. Each block was sawed and planed, then glued into place. The neck block allowed the neck to be bolted to the body. The end block anchored the two sides and provided a solid base for a strap pin to be screwed in.

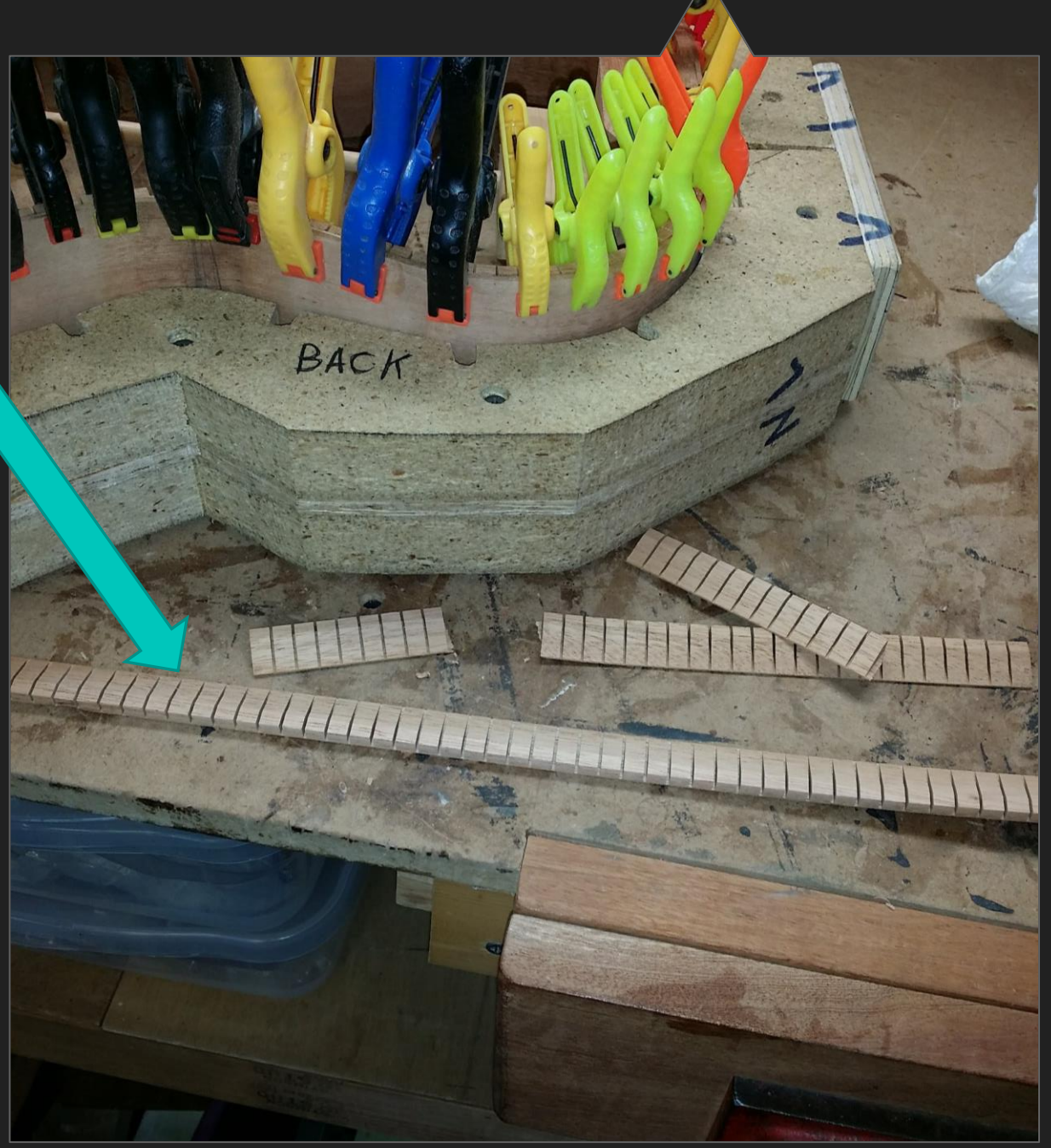
(Top/Bottom Right) Clamps squeezed the sides into shape.

(Bottom Left) See the sides removed from the mold. What a work of art!



KERFINGS

Triangular mahogany kerfed linings increased the gluing areas between the thin sides, the soundboard and the back. Kerf simply means a saw cut. Cuts allow the kerfed linings to bend along the sides. The kerfings were glued to and clamped to the guitar sides.



MARRYING THE SOUNDBOARD TO THE SIDES

I used clamps on protective wood blocks to glue the soundboard to the sides and kerfings.

When the clamps were removed, a hand router was used to cut away the excess yellow cedar.

MARRYING THE SOUNDBOARD TO THE SIDES

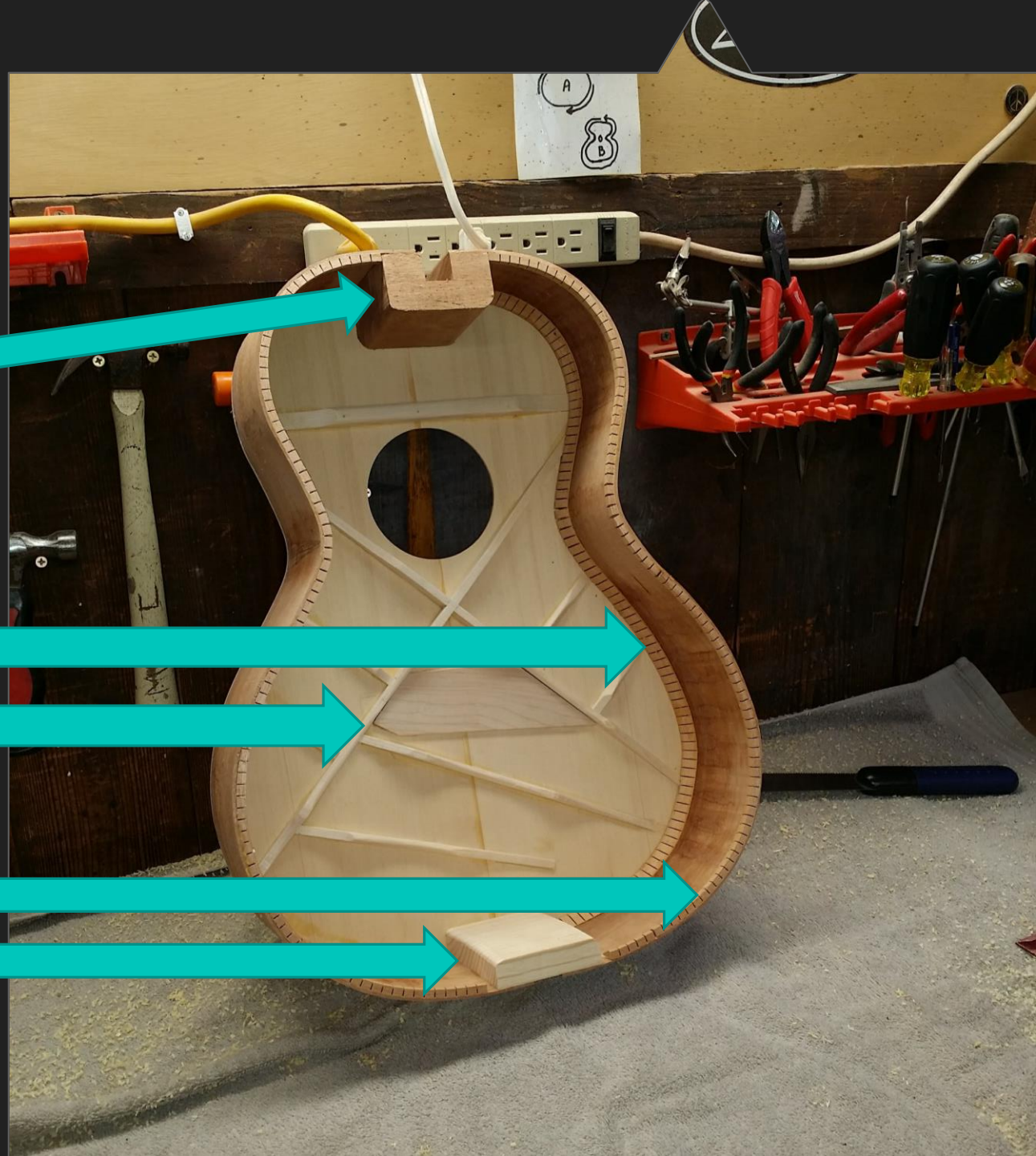
Neck block

The soundboard was glued to the sides and kerfings.

X-Bracing and support bracing.

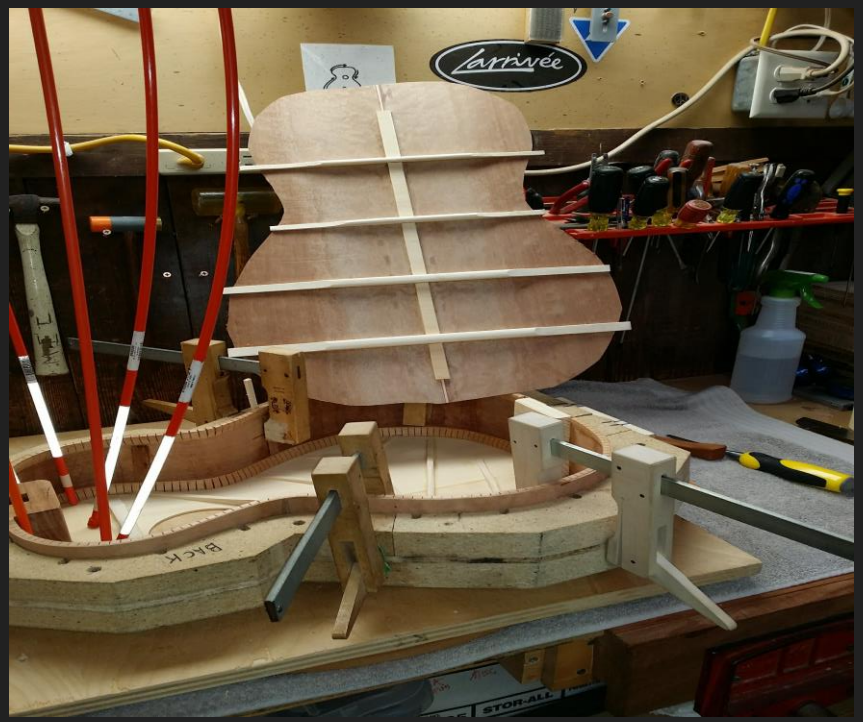
The back of the guitar (not shown here) also was glued to the sides and kerfings

End block



THE ASSEMBLED BODY!

The braces on the interior side of the back were glued into place and sculpted.



The back was glued to the sides and kerfings. Then the excess edges were cut away with a hand router.

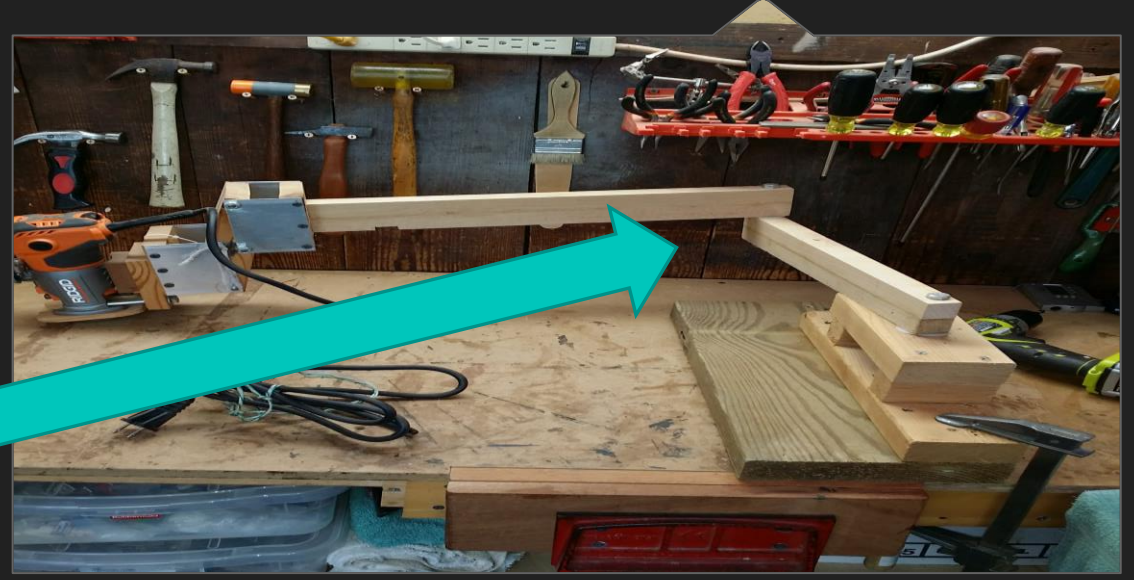
The End Flash

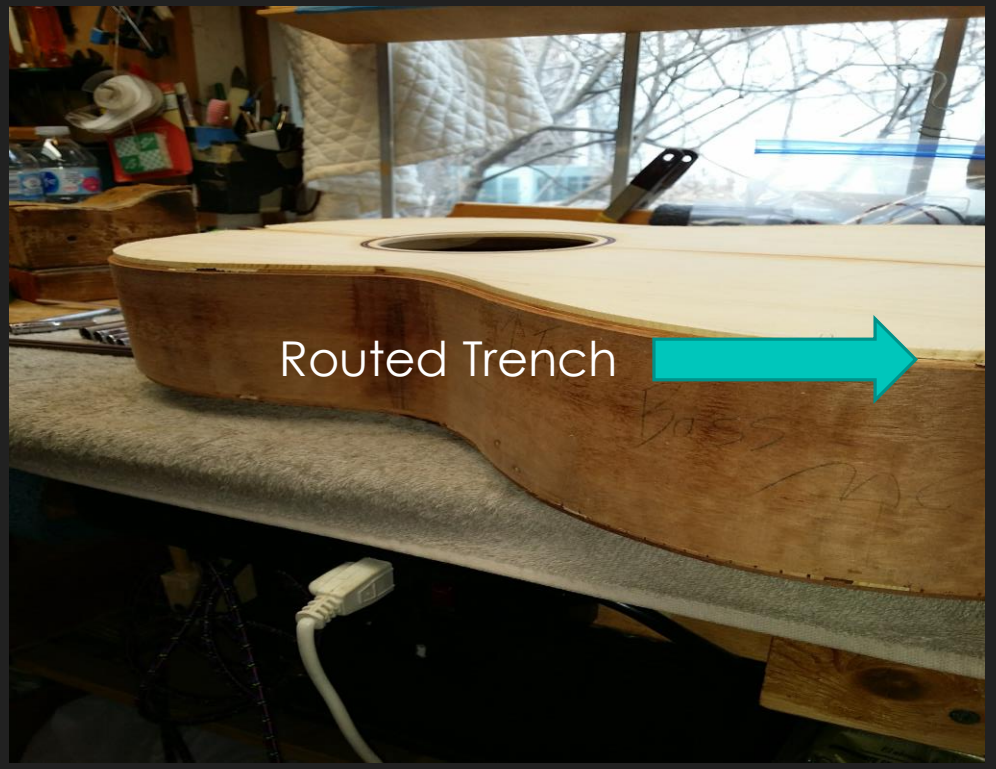
While still in the mold, the overlength sides at the bottom of the body were trimmed short with a gents saw to allow for any expansion.

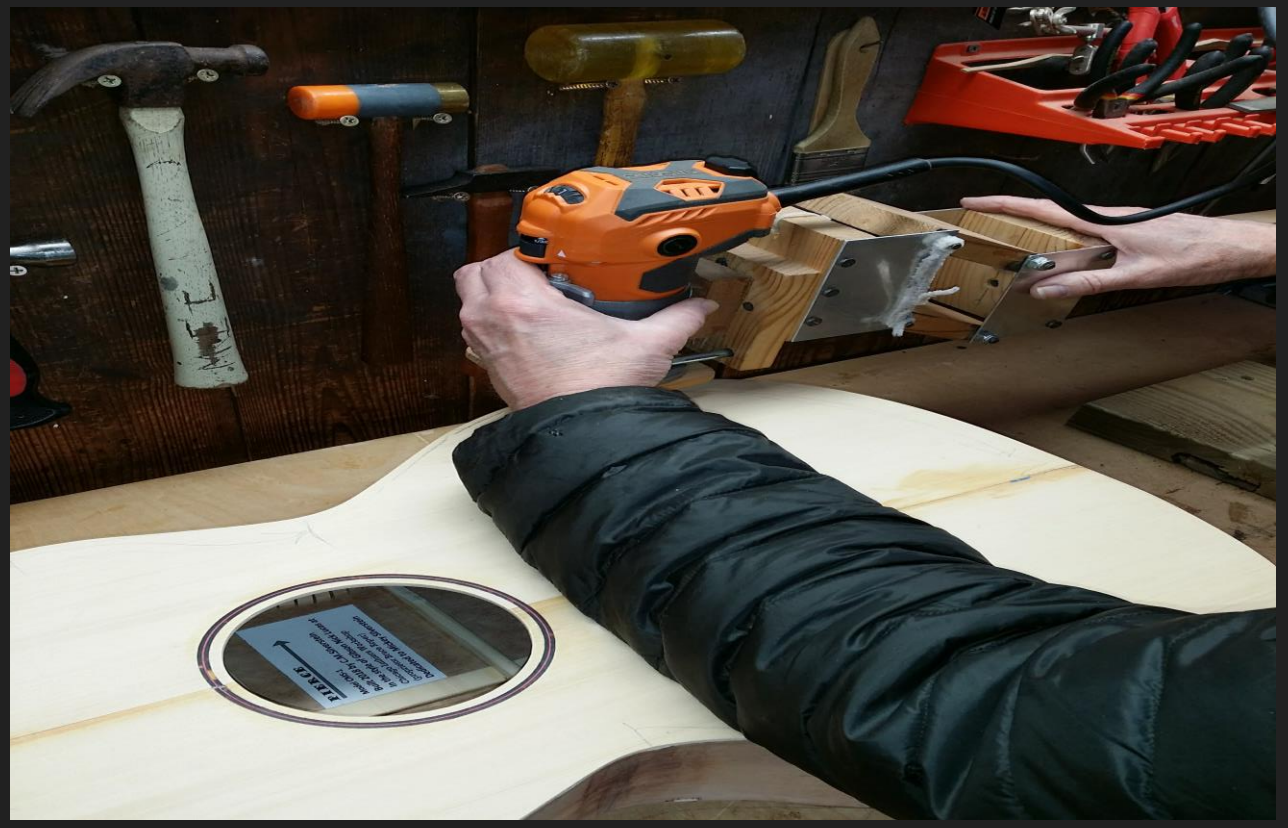
An end flash detail was created by chiseling out unwanted wood then gluing in a piece of Sapele with a purfling strip on either side.

BINDING THE BODY

Guitar bindings are used to protect the body's edges from knocks and moisture. The set of wood bindings with decorative purflings were glued into trenches cut by a small router. Bruce built a routing jig that made the job much easier than doing the task by hand with chisels.

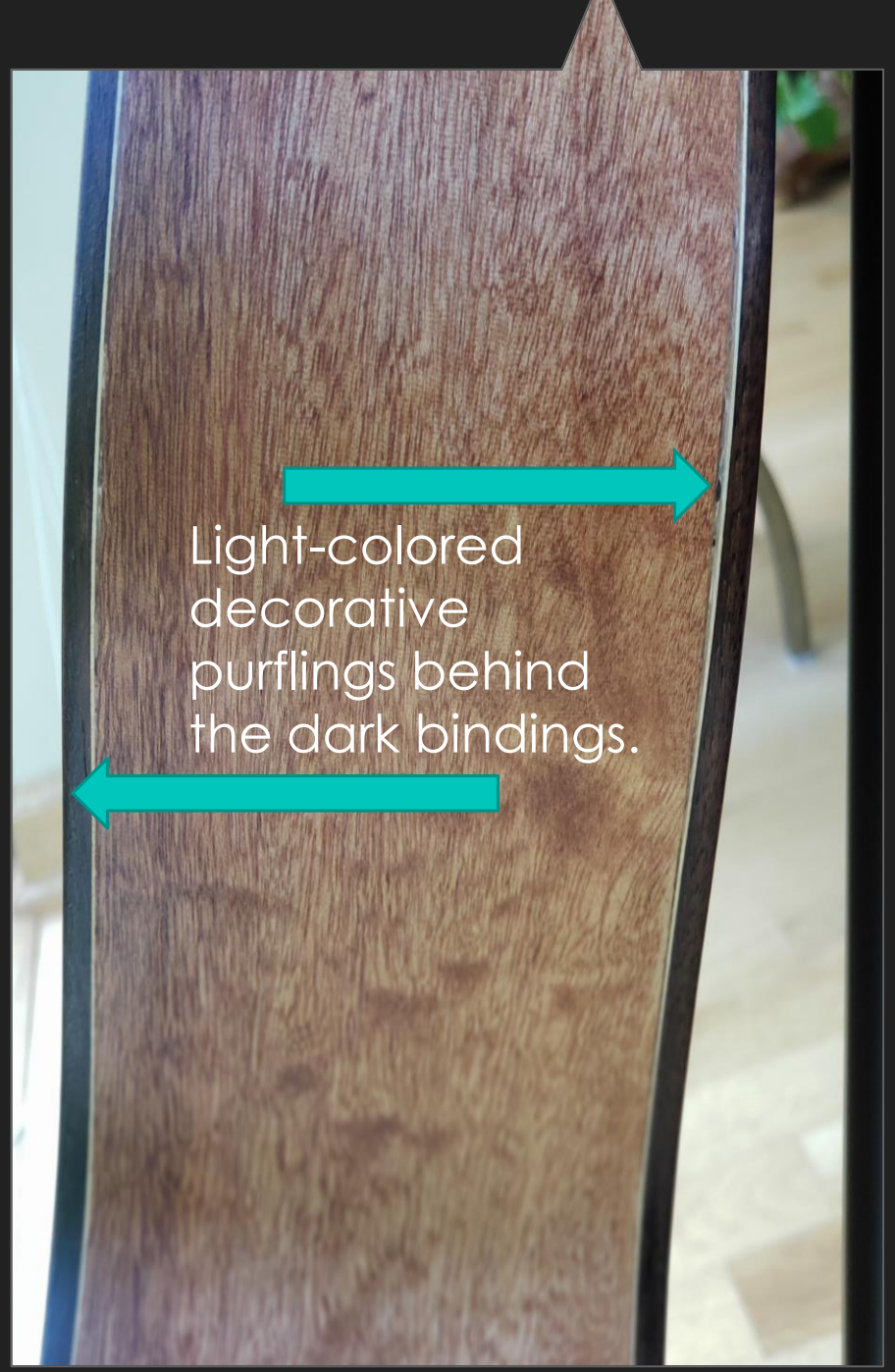






BINDING THE BODY

When the combined wood bindings and purflings were glued into the trenches, masking tape was used to exert pressure. The tape was removed after the glue dried. Voila! Perfect seals.



CONSTRUCTING THE NECK AND HEADSTOCK

(Top Left) A mahogany board was carefully measured.

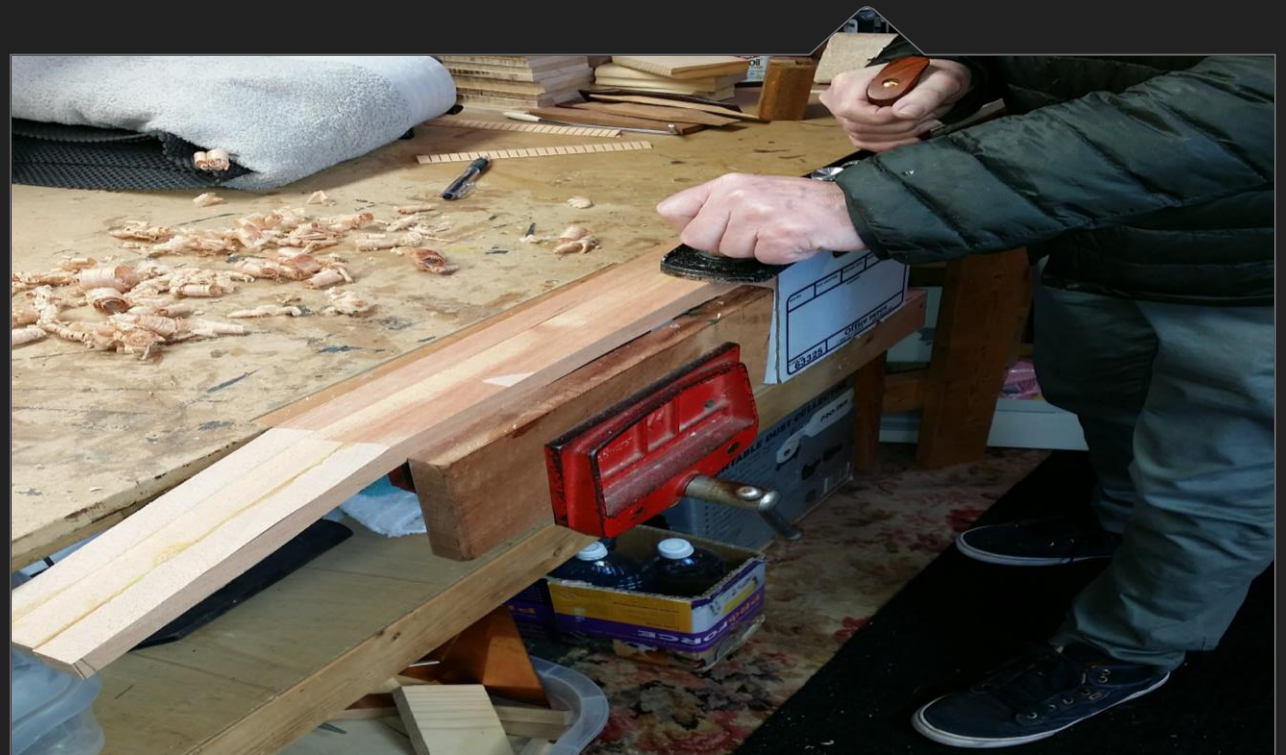
(Far Right) Then Bruce's Nick Lucas neck template was used to mark out three pieces.

(Bottom Left) A band saw cut out the pieces as well as the headstock angle on each piece.

CONSTRUCTING THE NECK AND HEADSTOCK

(Right) The pieces of mahogany were glued tight.

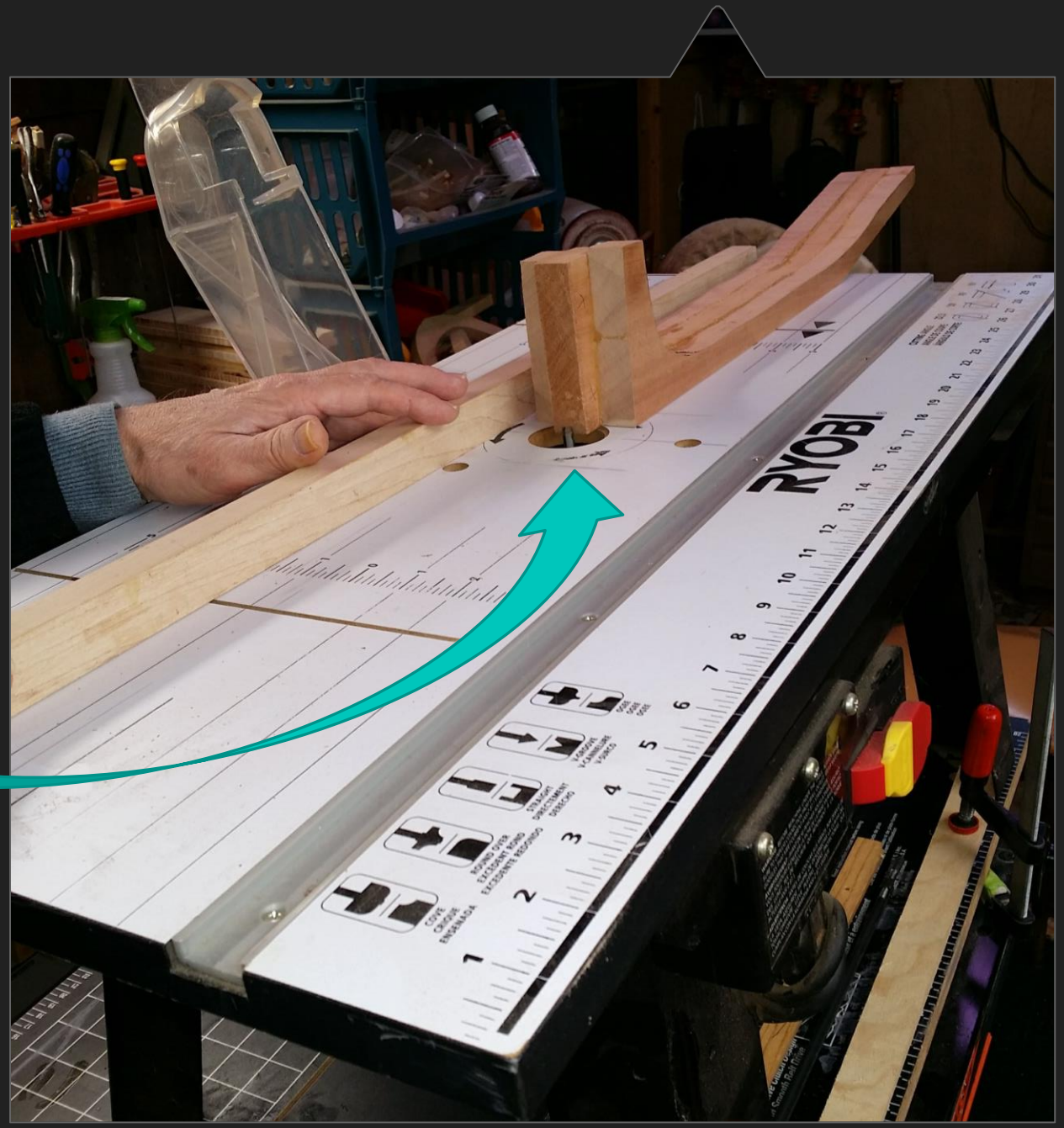
(Below) The next day, the three pieces were planed and sanded so the neck and headstock became one surface.



INSTALLING THE TRUSSROD

The metal trussrod is used to straighten the neck should it bow over time under tension from the strings. It is inserted in a channel in the neck underneath the fret board.

To cut the channel, the neck was turned upside down, centered and pulled across a router bit that cut upward from under the table.



INSTALLING THE TRUSSROD

(Left) Bruce used his keen eye and experience to make sure that the trussrod channel was deep enough so the fingerboard would lay flat.

(Right) Under Bruce's direction, I made sure the trussrod extended two inches into the headstock so, if eventually needed, adjustments to the neck could be made through a hole in the headstock veneer.

FRETTING

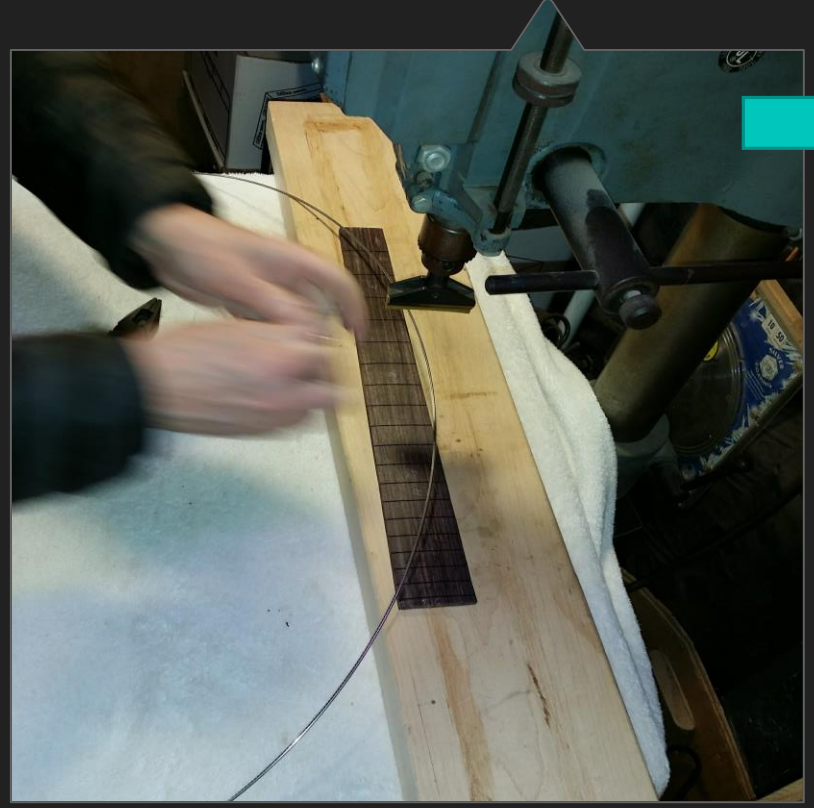
My Gibson Nick Lucas was made 13 frets to the body, one fret shy of many acoustic guitars.

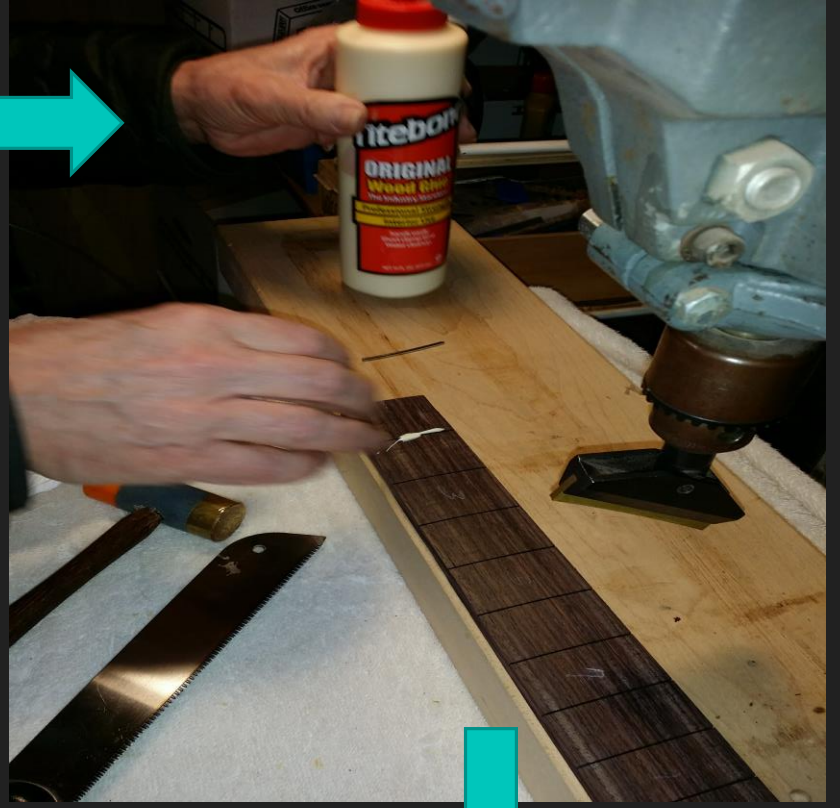
(Top Left) I bought 30 inches of medium thick fret wire and a pre-slotted Indian rosewood fingerboard.

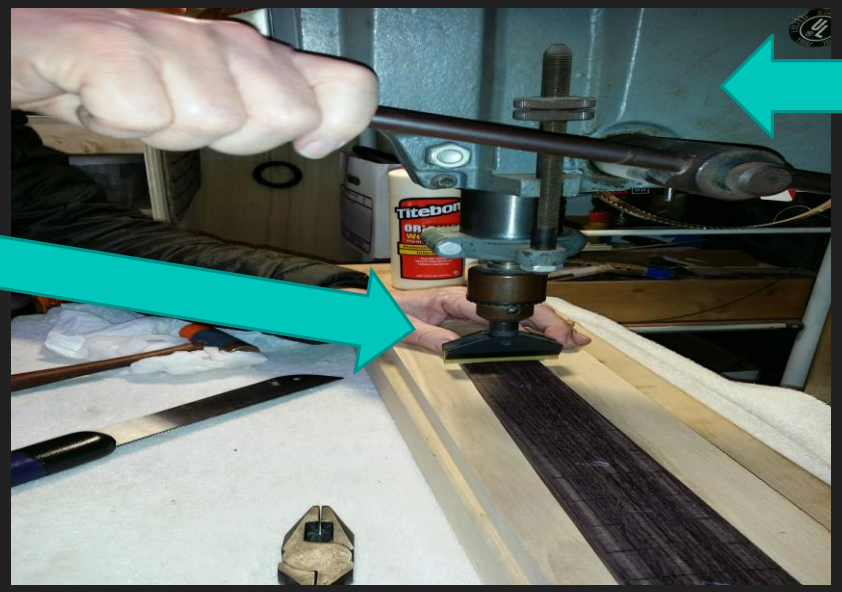
(Top Right) The fret wire was cut and placed into each slot filled with Titebond glue.

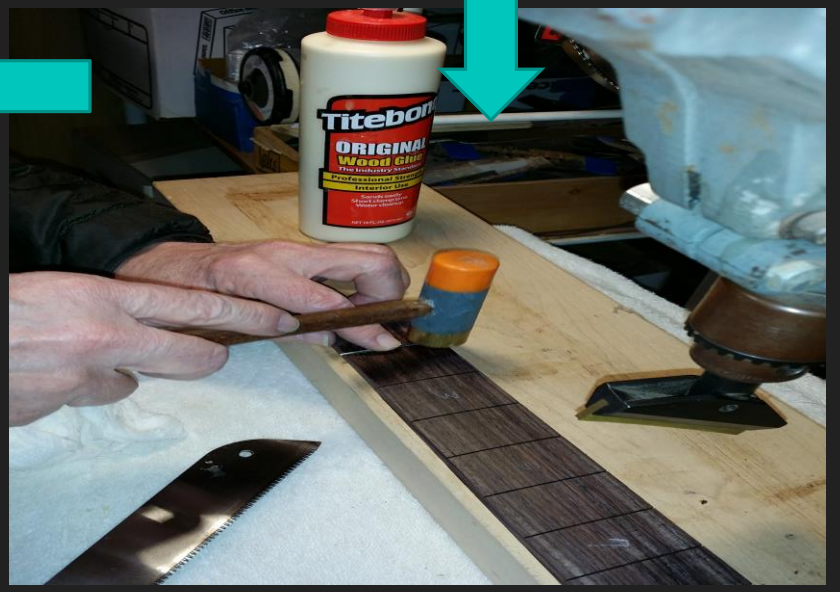
(Bottom Right) I used a fretting hammer to tap down each piece of wire.

(Bottom Left) Then a fret-press pushed the wire home. After that, a piece of wood was placed over the fingerboard and clamped tight overnight.









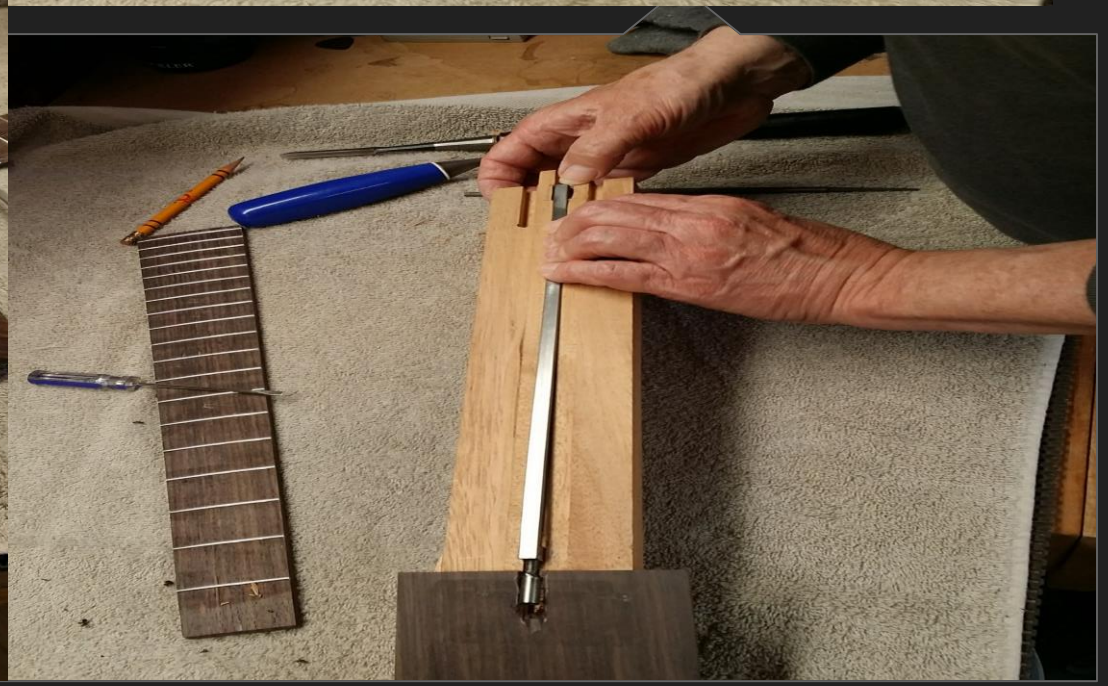
PREPARING THE HEAD VENEER

The headstock was slathered with plenty of Titebond glue

Then the veneer was pressed into place and clamped tight.

PREPARING THE HEAD VENEER

A slot was chiseled so the trussrod could be accessed by removing a cover (not pictured here) should the neck ever need to be straightened.



GLUING THE FINGERBOARD TO THE NECK

The fingerboard was purchased with a 16-degree radius (arc) to give the most comfortable playing action.

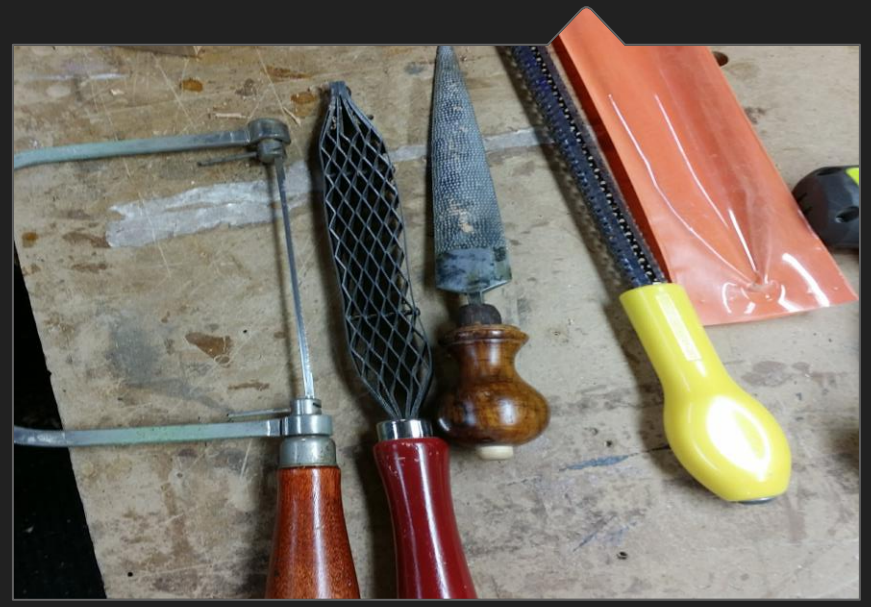
The neck was hand-sanded before gluing the fingerboard. A space was left between the fingerboard and the head veneer where the bone nut blank will be seated and slotted for the strings.

SHAPING THE NECK

(Top Left) As Mr. Natural sez, use the right tool for the job.

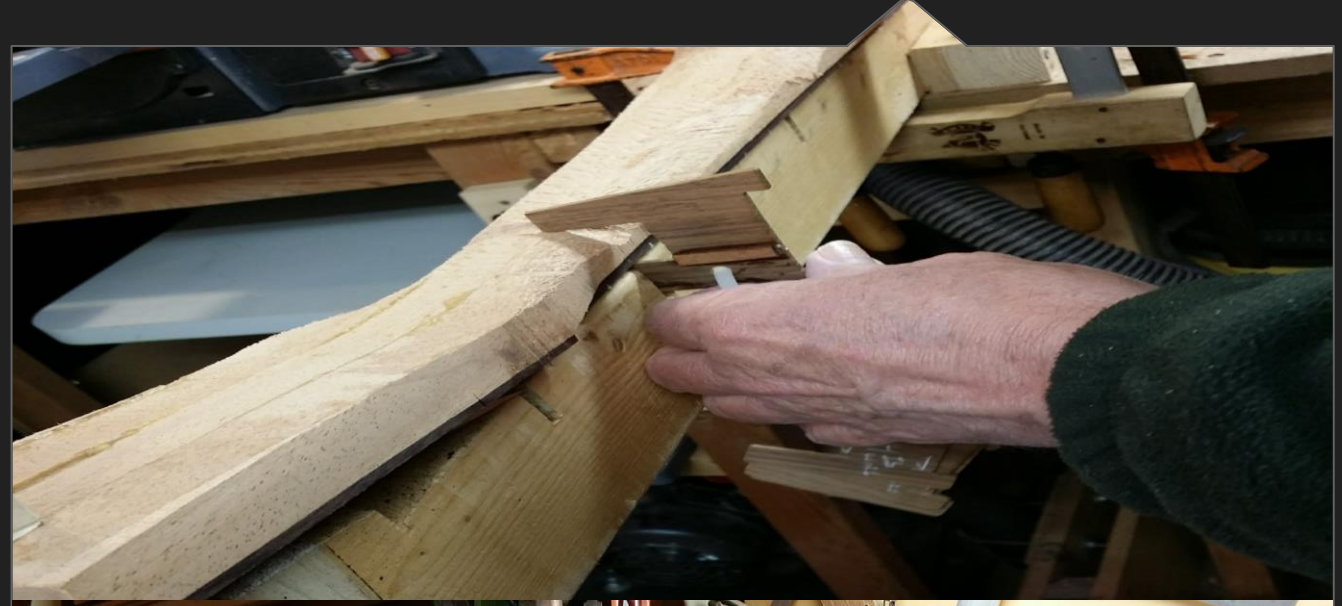
(Bottom Left) Bruce used a coping saw to shape the neck's heel which would then be bolted to the body.

(Right) I used a rasp to carve a "C"-profile neck. Care was taken to blend in the edges of the attached fingerboard.



SHAPING THE NECK

Bruce's home-made caliper checked the depth dimension and proper profile of the neck.

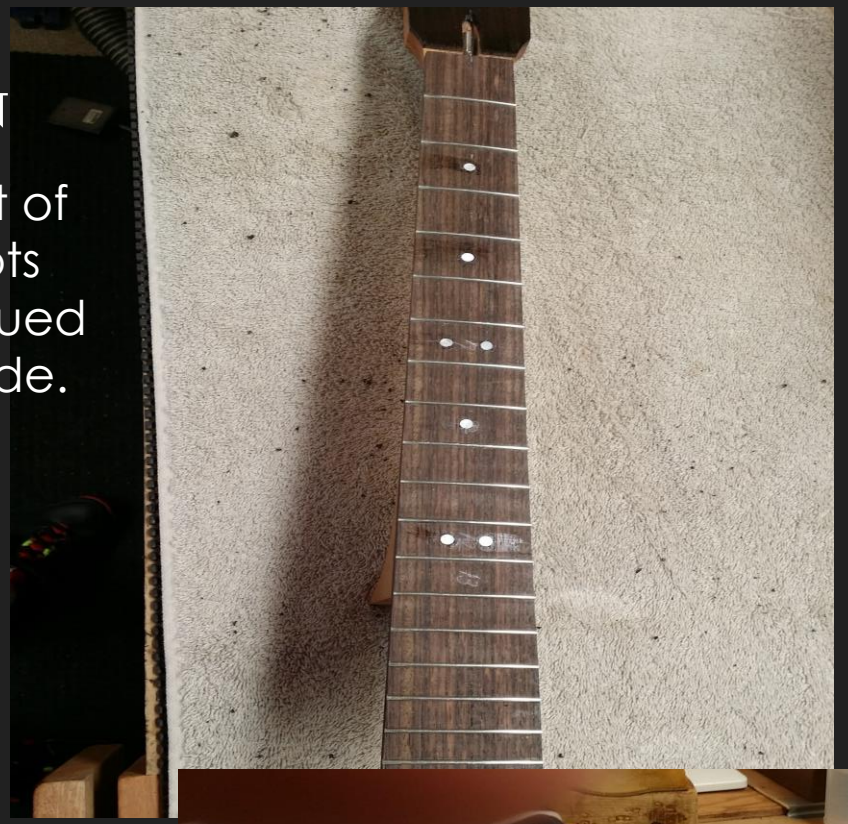


A bobbin sander finished the headstock so the three pieces of the neck looked like a single board.

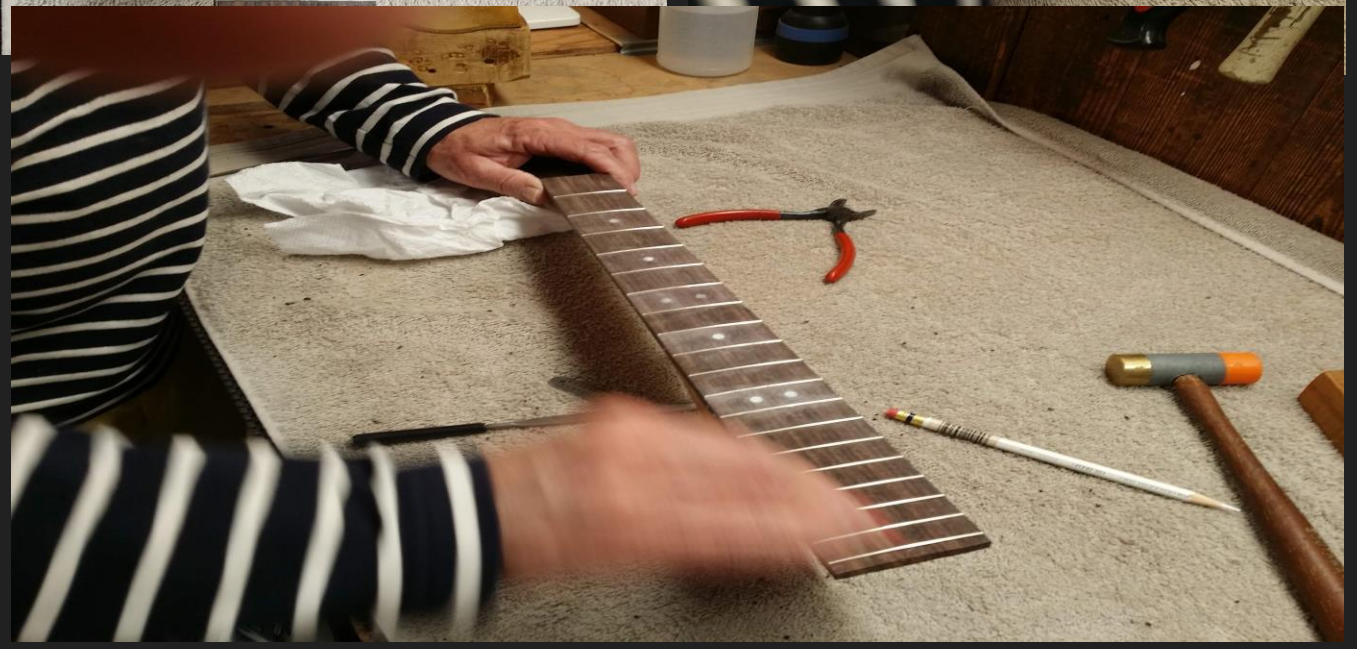
FRET DRESSING

(Top Left) Holes were drilled into the front of the fingerboard where 5mm abalone dots were glued. 2mm abalone dots were glued into holes drilled into the fingerboard's side.

(Top Right) The fingerboard's fret ends were filed smooth with a single-cut file, then beveled to an angle of about 35 degrees. This made the guitar comfortable to play.



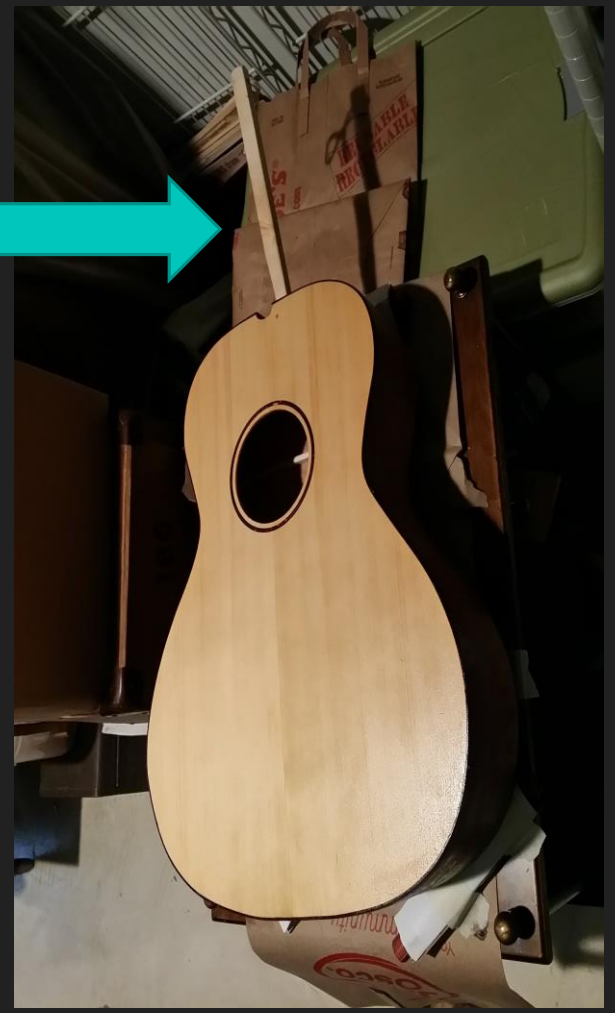
(Bottom) The fret tops were ground down flat with a sharpening stone making them smooth to the touch. Then, some of the frets were "recrowned" with a file to restore the half-round profiles to the flattened tops.



OILING THE BODY

The entire body was meticulously hand-sanded to bring out the grain before applying 4-5 coats of Tru-Oil on the back, sides and soundboard. This process took three days. The same was done on the neck before it was attached to the body. No lacquer was used.

The body hung from this stick while the oil dryed.



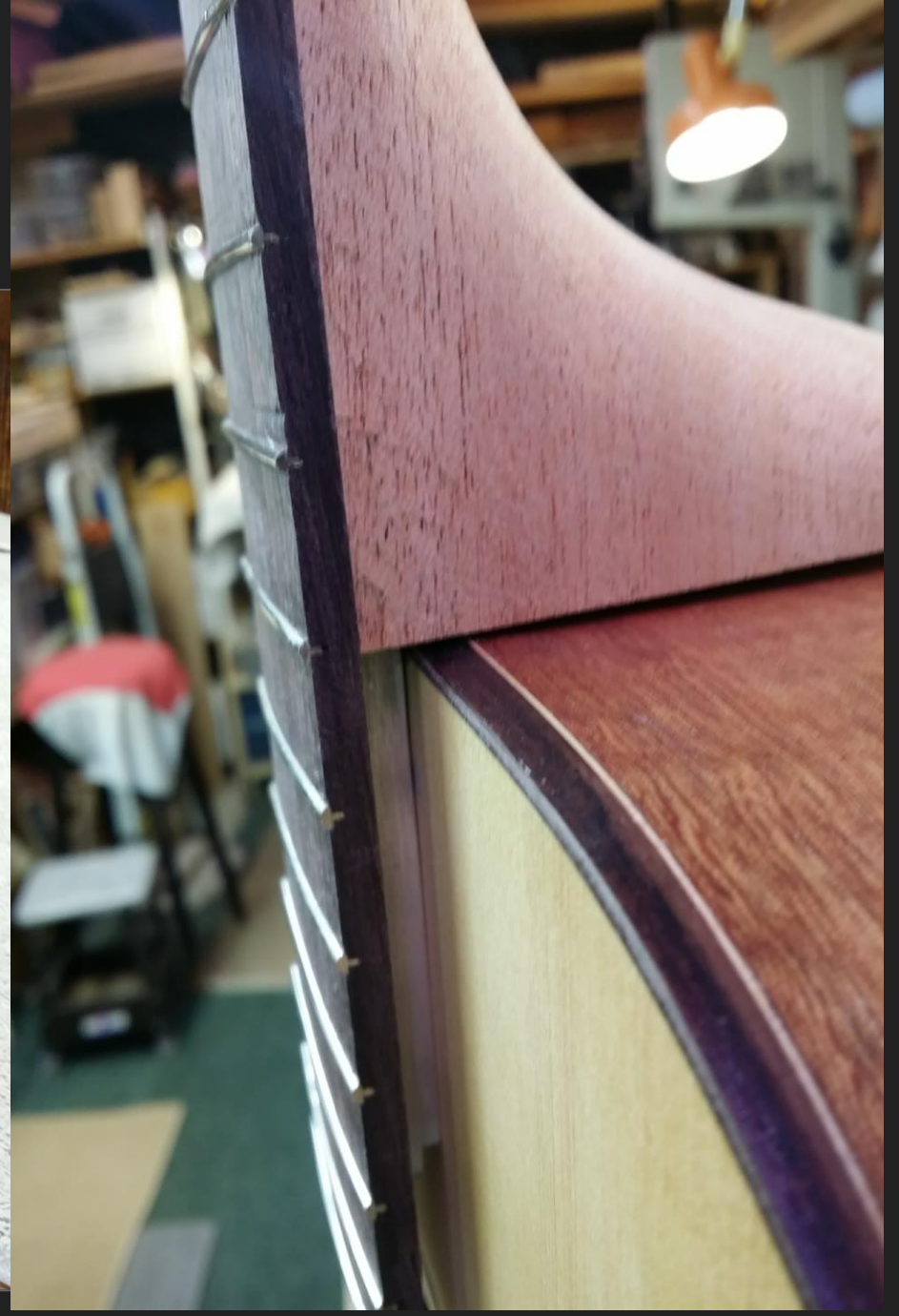
JOINING NECK AND BODY

At this point, I sat back and watched master luthier Bruce shape the tenon joint on the electric sander. He fitted, cut, chiseled, sanded and pulled apart the neck from the body about five times until it fit properly.

Notice the two aluminum supports Bruce cut and attached to the underside of the fingerboard for strength

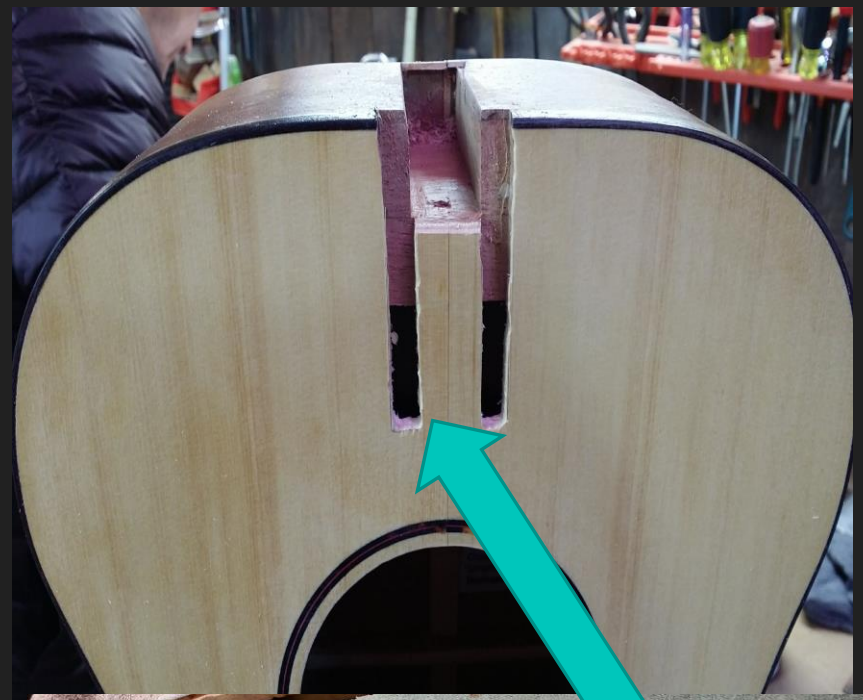
JOINING NECK AND BODY

A chisel ate away at the mortise several times until the proper angle was created for the neck. The neck had to be fitted and removed a number of times during this critical procedure.



JOINING NECK AND BODY

A router dug two slots in the cedar where the two aluminum supports on the underside of the fingerboard nestled. This technique kept the fingerboard straight and strong from the neck to the soundhole.

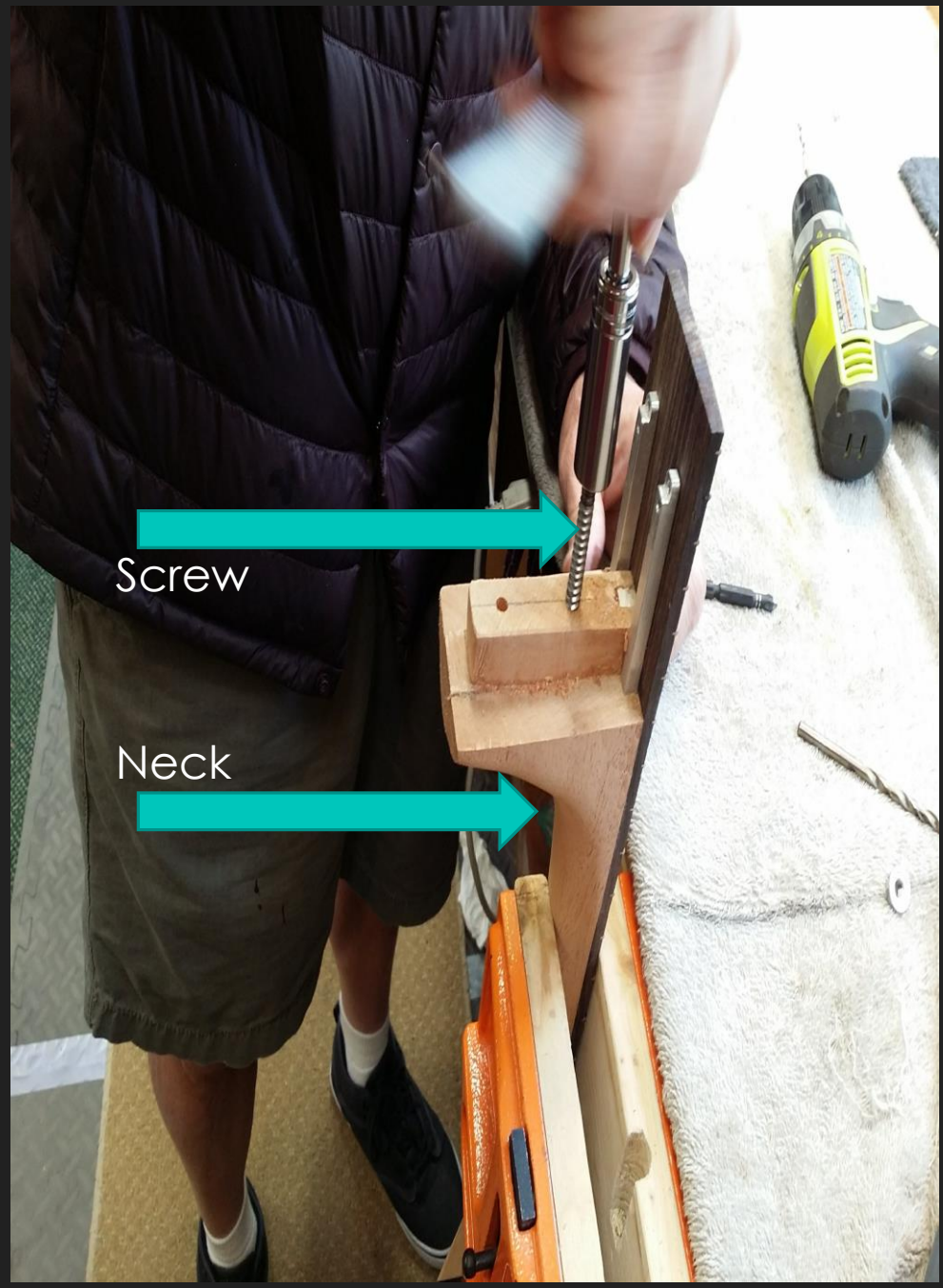


JOINING NECK AND BODY

Two holes were drilled into the mortised recess on the top of the body.

Then lag screws were screwed into the heel of the neck. When the neck was pushed into place, nuts on the screws were tightened through the soundhole.

Bolting the neck to the body without glue made it easier to remove and reset a neck when necessary.



JOINING NECK AND BODY

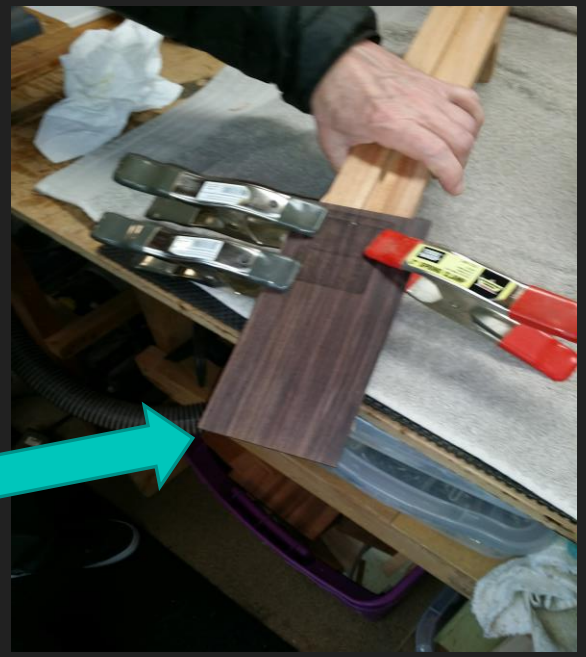
It took a lot of know-how and finesse to join the neck to the body; to make a strong, tight union with the correct angle. Keep in mind, however, that a straight neck is not the most desirable form. The best necks have a slight concave curve in order to get the lowest, buzz-free playing action.

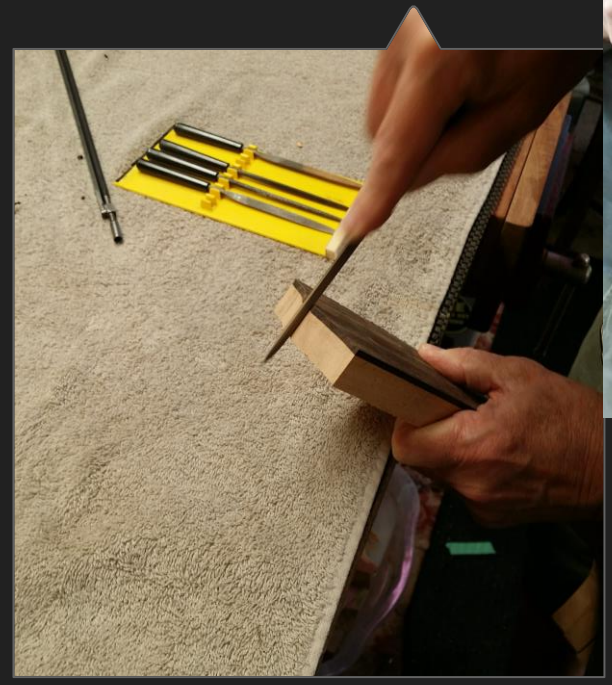
HEAD PLATE VENEER

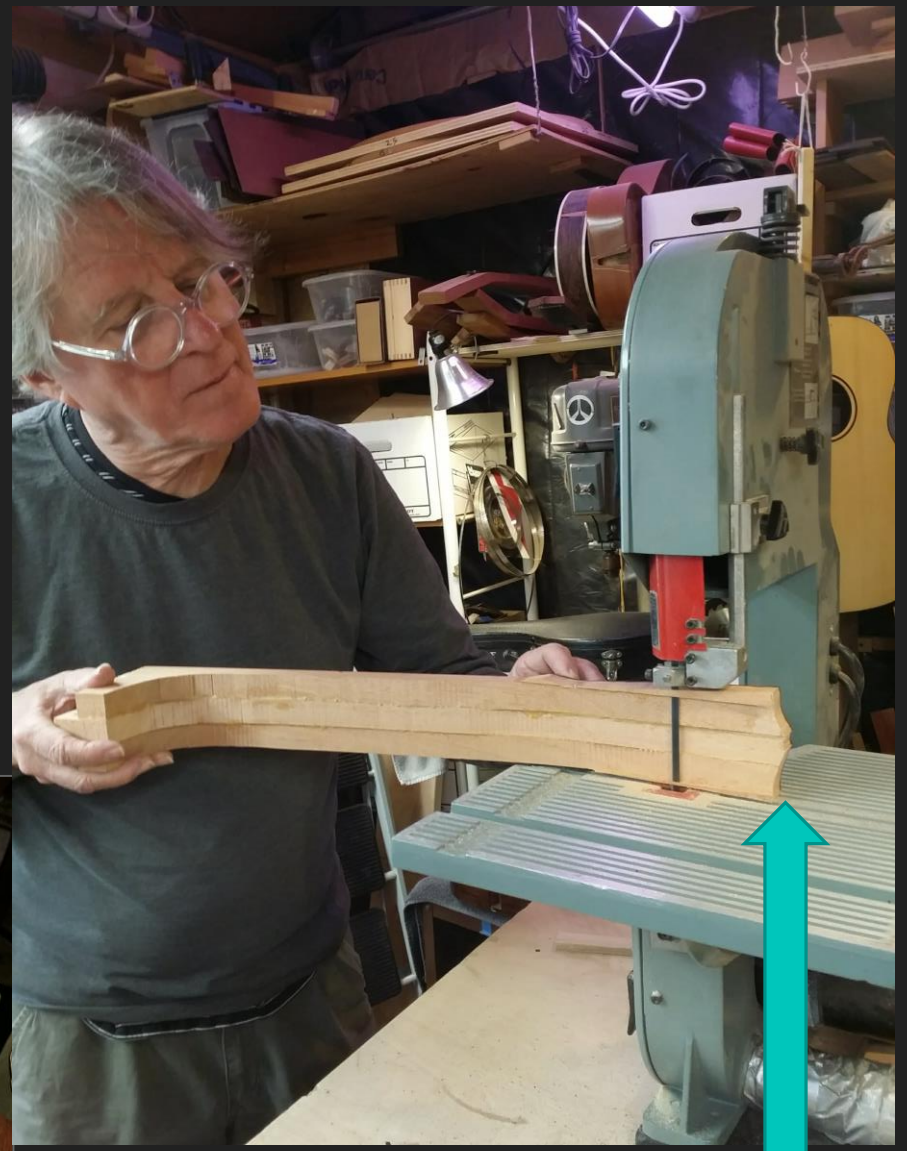
(Top Left) The 1 mm –thick Indian rosewood veneer – a rectangle -- is glued to the head stock.

(Right) Bruce skillfully cuts out the shape of a classic Gibson head.

(Bottom Left) The headstock and veneer lines are refined with a file.

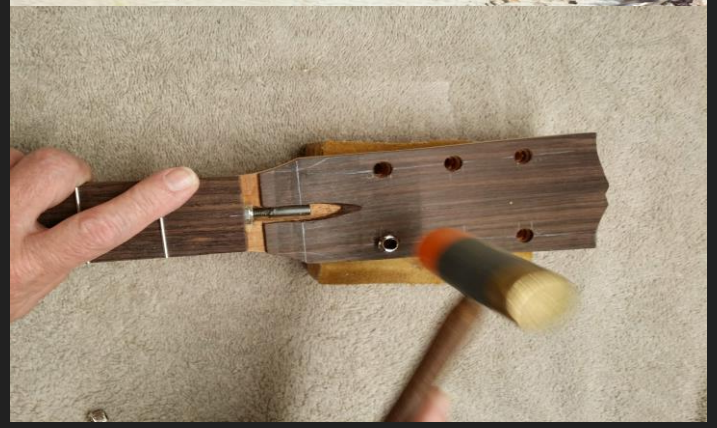






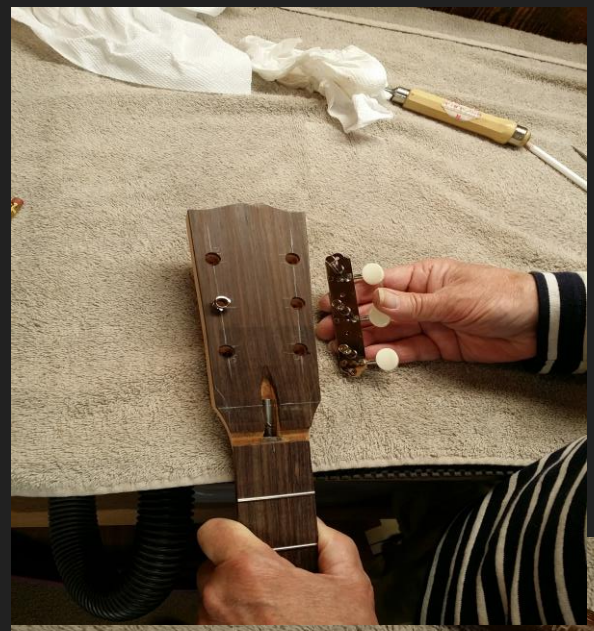
(Above) The Gibson classic shape is cut with a bandsaw.

ADDING TUNING MACHINES



Six holes were measured then drilled in two stages: first for the tuning machine shafts.

Then counterbores on the headstock face were drilled to fit the bushings which were hammered into place.



The Golden Age Restoration tuners in bright nickel were three-on-plate rather than six individual tuners. Each plate with matte cream knobs was screwed in separately.

INLAYING A LOGO

The Pierce-Arrow auto was one of the most prestigious American cars in the early 20th century. My father-in-law, Mort Pierce, created a logo from this famous name for his own unrelated company. To honor my wife, I produced my own logo version.

(Top Left) The guitar's logo was outlined onto the head veneer and then carefully chiseled out.

(Top Right) I painstakingly used a jeweler's saw to cut out the "P" and the arrow symbol from a small piece of mother-of-pearl shell.

(Bottom Left) Both pieces of the logo were set in place with Epoxy glue.

(Bottom Right) An electric disk sander evened the mother-of-pearl logo with the veneer so it felt as smooth as a baby's bottom.

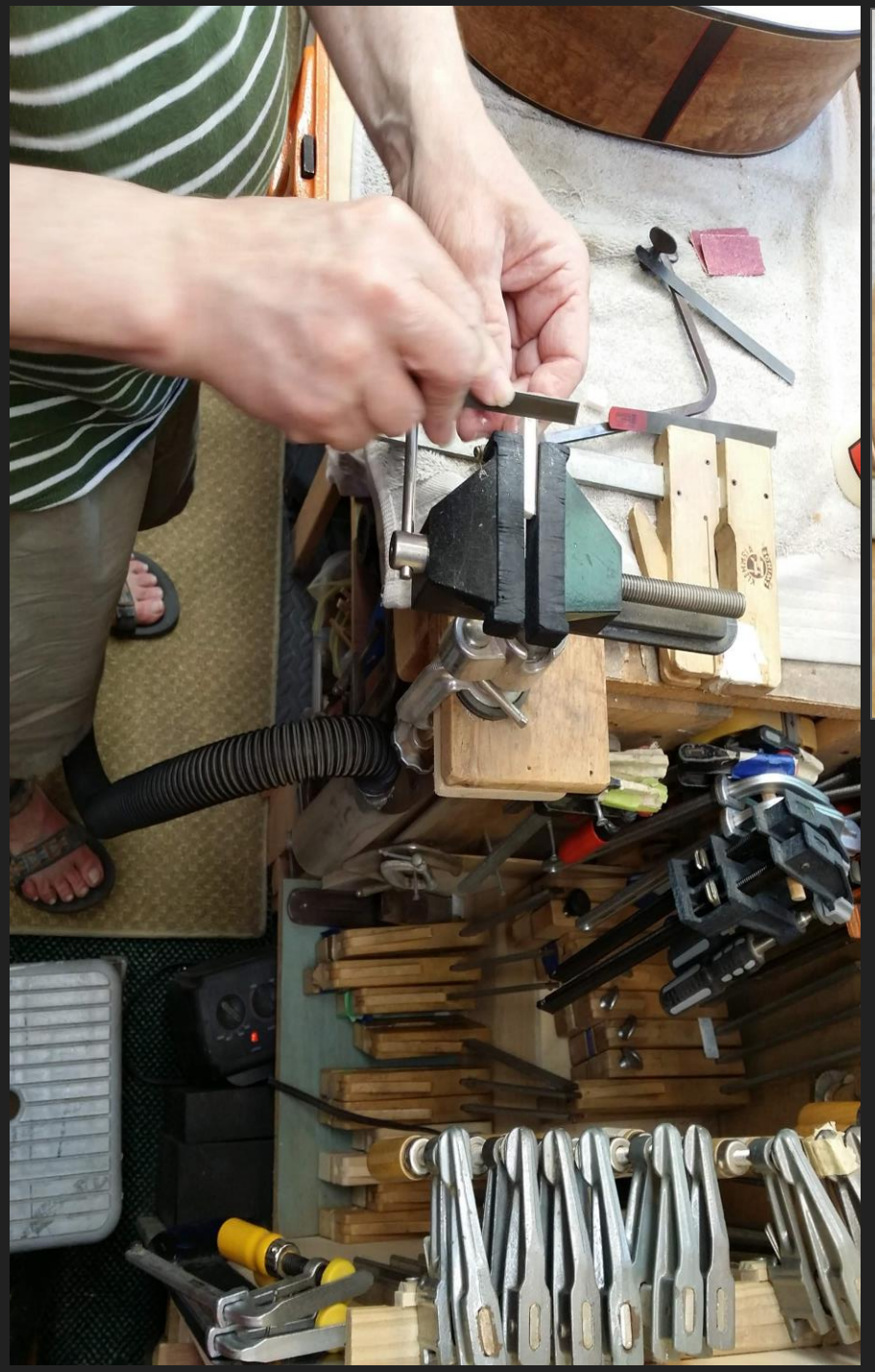
FITTING THE NUT

The guitar's nut, made from natural bone, was slotted between the head veneer and the fingerboard.

(Left) First, the nut was cut to the correct length…

(Top Right) …and glued into the nut seating trench.

(Bottom Right) The high and low E-strings were measured, then a fret file was used to cut slots. The other four strings were done in the same manner.

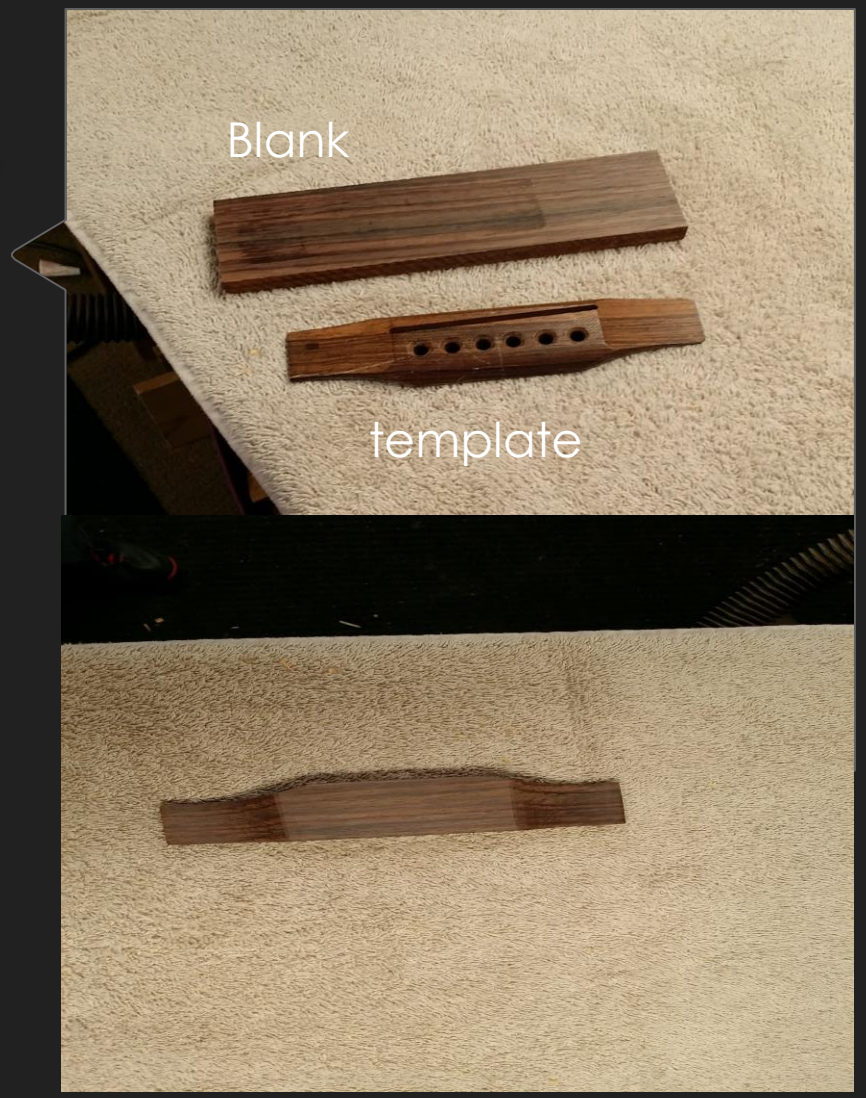


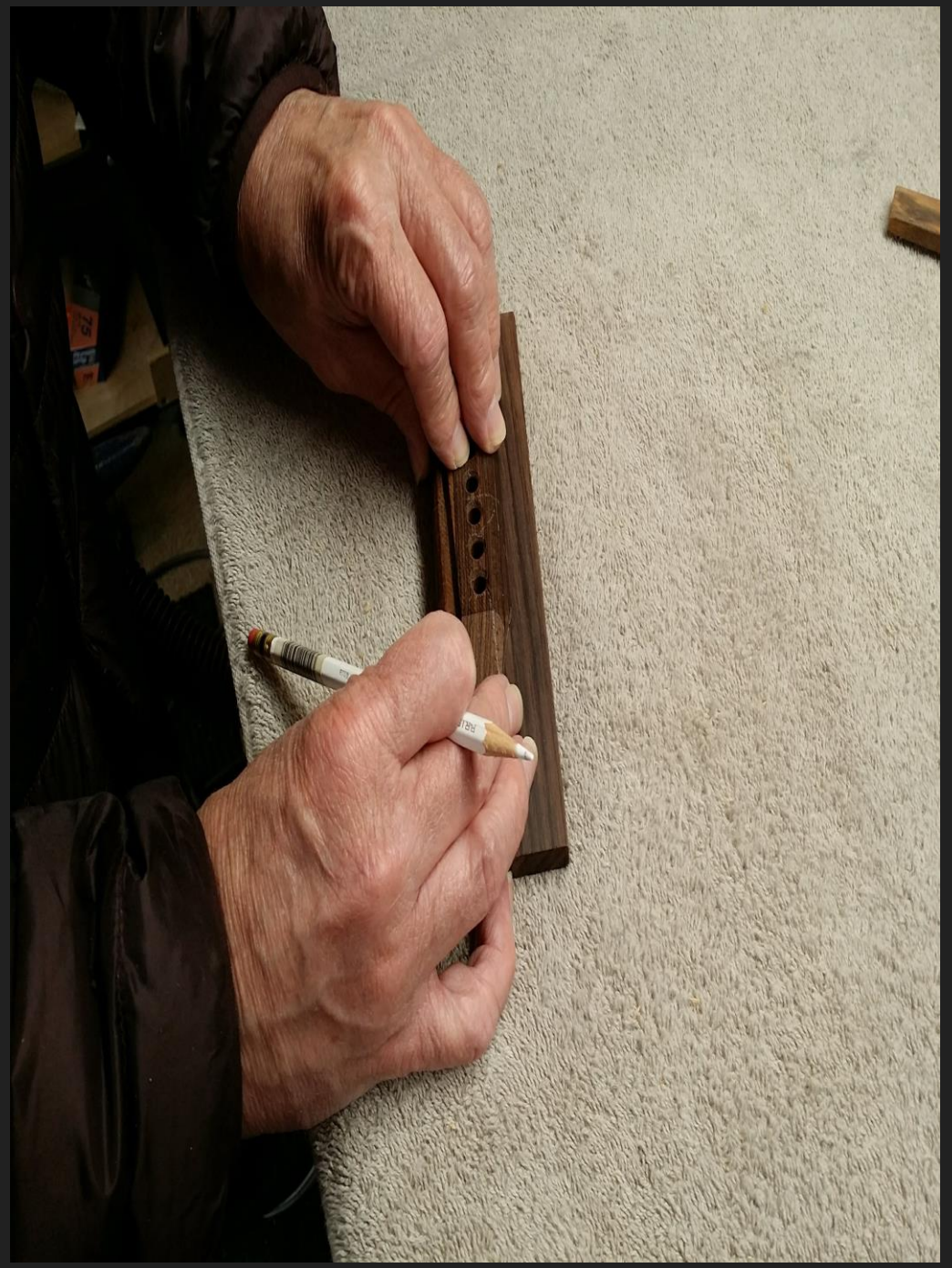
SETTING UP THE BRIDGE

(Top Left) The rectangular piece of mahogany is ready to be transformed into a Gibson bridge.

(Right) The bridge template was used to outline the shape.

(Bottom Left) The shape was cut with a band saw and the edges beveled with a power sander.

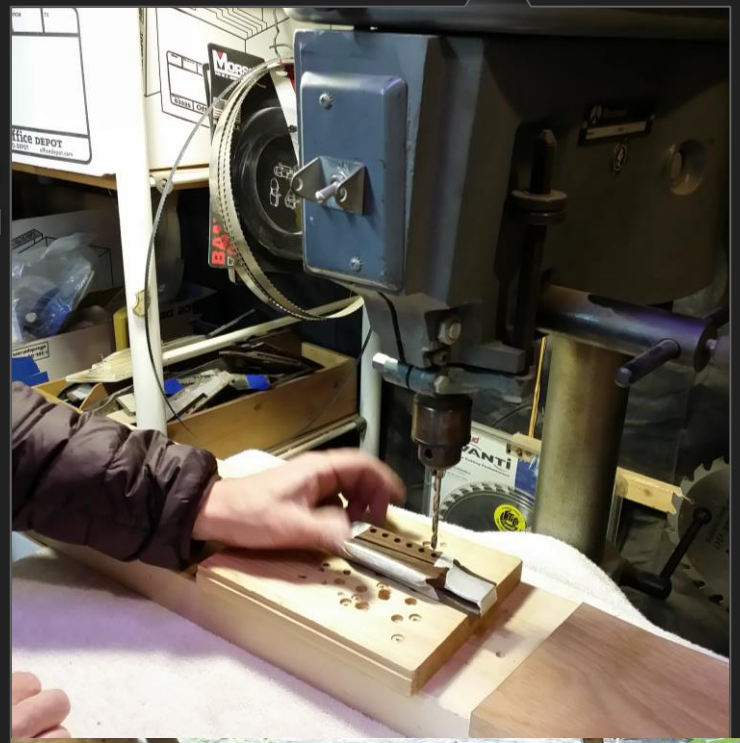




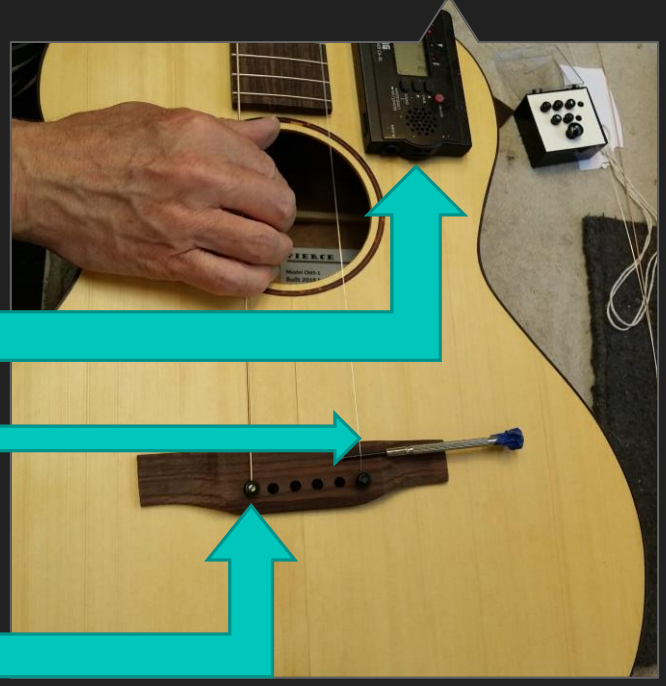
SETTING UP THE BRIDGE

(Top Left) I used Bruce's bridge template to accurately mark and drill the positions of the pinholes. This is crucial so the strings would end up in the correct position.

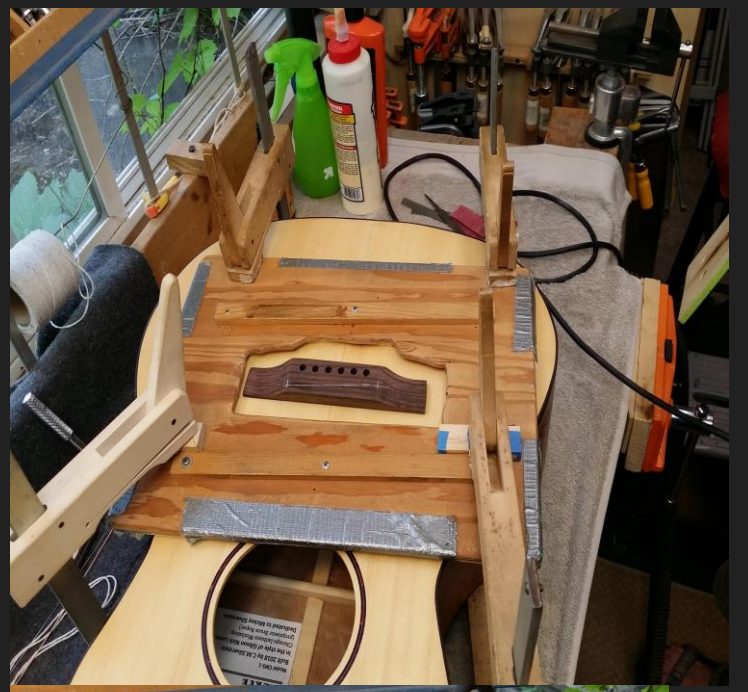
(Top Right) & (Bottom) Locating the bridge in its proper place was one of the most important stages in building the guitar. If the bridge wasn't located correctly, the guitar wouldn't play in tune.



MAKING THE SADDLE

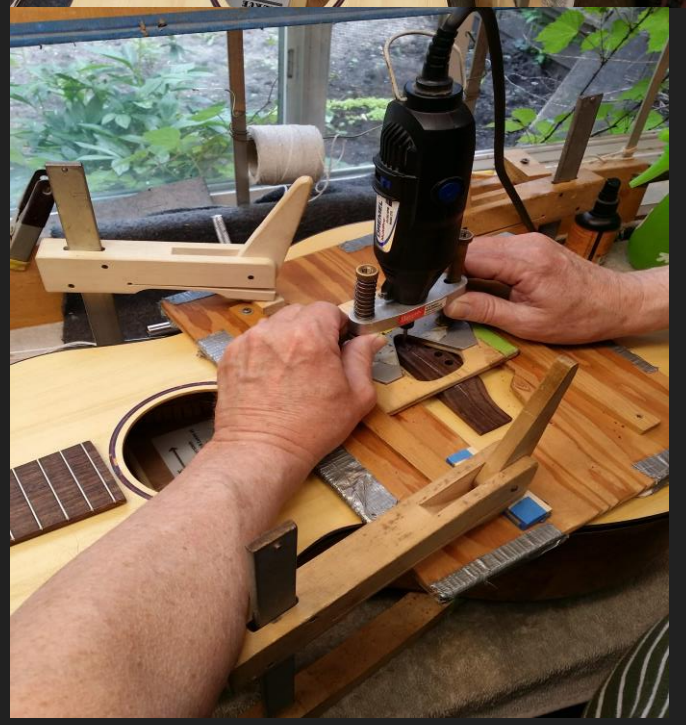


(Top Left) An electronic tuner and small screwdriver wedged under the high E-string helped determine where the saddle was to be positioned. After the bridge was glued, the high and low E-strings were locked in place with bridge pins.



(Top Right and Bottom Right) Now the angle of the bone saddle is measured and the saddle slot routed out.

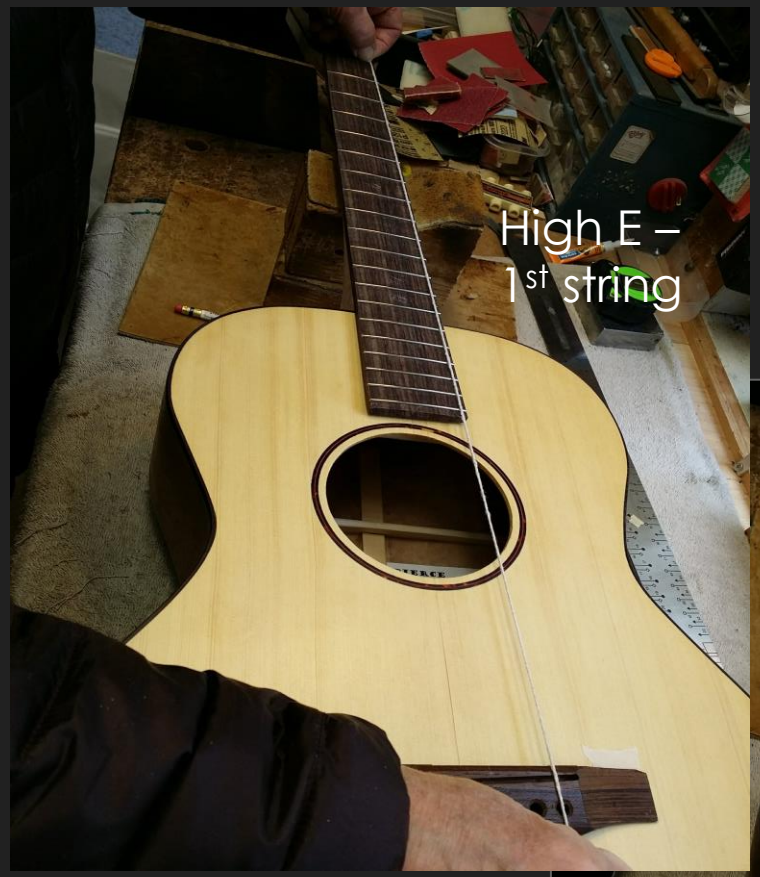
(Bottom Left) The saddle bottom was sanded flat and squared to its sides. The slightly arched saddle gradually raises the string action from the first to the sixth string.



A NOTE ABOUT STRING TENSION

It was crucial when stringing the guitar to ensure not only that the bridge was correctly positioned, but to obtain an "equal tempered" scale. The geometrical key to the equal tempered scale is 17.817, a number used to calculate the positions of the frets.

The Greek mathematician Pythagoras around 500 BC worked out how long lyre strings needed to be to create certain notes. When a musician pressed a string at the 12th fret, the string was half as long as its full length so the note was an octave higher.

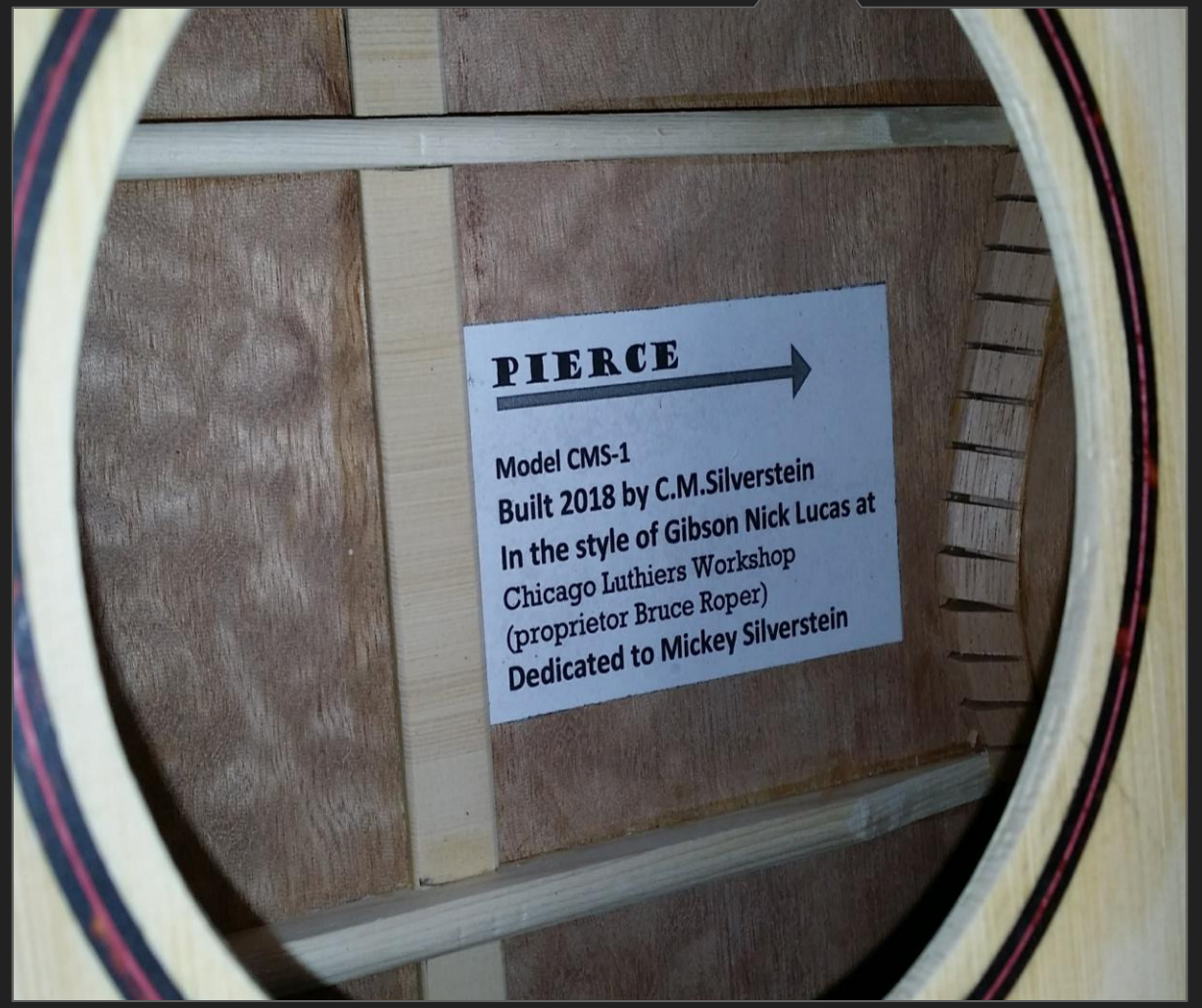


A one, a two,
a one-two-three-
four (downbeat)

During my guitar building project each week, I had two powerful experiences: working with wood and overcoming my impatience. Wood working and aspects of carpentry have always held a mystical place in my imagination. Alas, during my peripatetic life, I didn't try hard enough to gain access to a good wood working shop on a regular basis. But I've always admired hand-made wood products and the craftsmanship that brought them to life.

The second wonderful aspect of my journey was meeting Bruce Roper, a masterful luthier, who actually helped me understand how to be patient. Now when I find myself rushing to finish a task, I imagine Bruce working on my Gibson which mentally gets me into the "now" of a task and slows me down.

This presentation is incomplete. I wasn't able to photograph everything Bruce and I did, nor was I able to remember many of the tiny tasks and fixes Bruce conjured up to make my Nick Lucas guitar what it is.



A final comment: I deliberately chose not to glue a scratch plate (aka pick guard) onto my soundboard. This would have destroyed the aesthetic beauty of the guitar.