

Making a Fretted Monochord Using the Tempered Scale

EQUIPMENT and MATERIALS

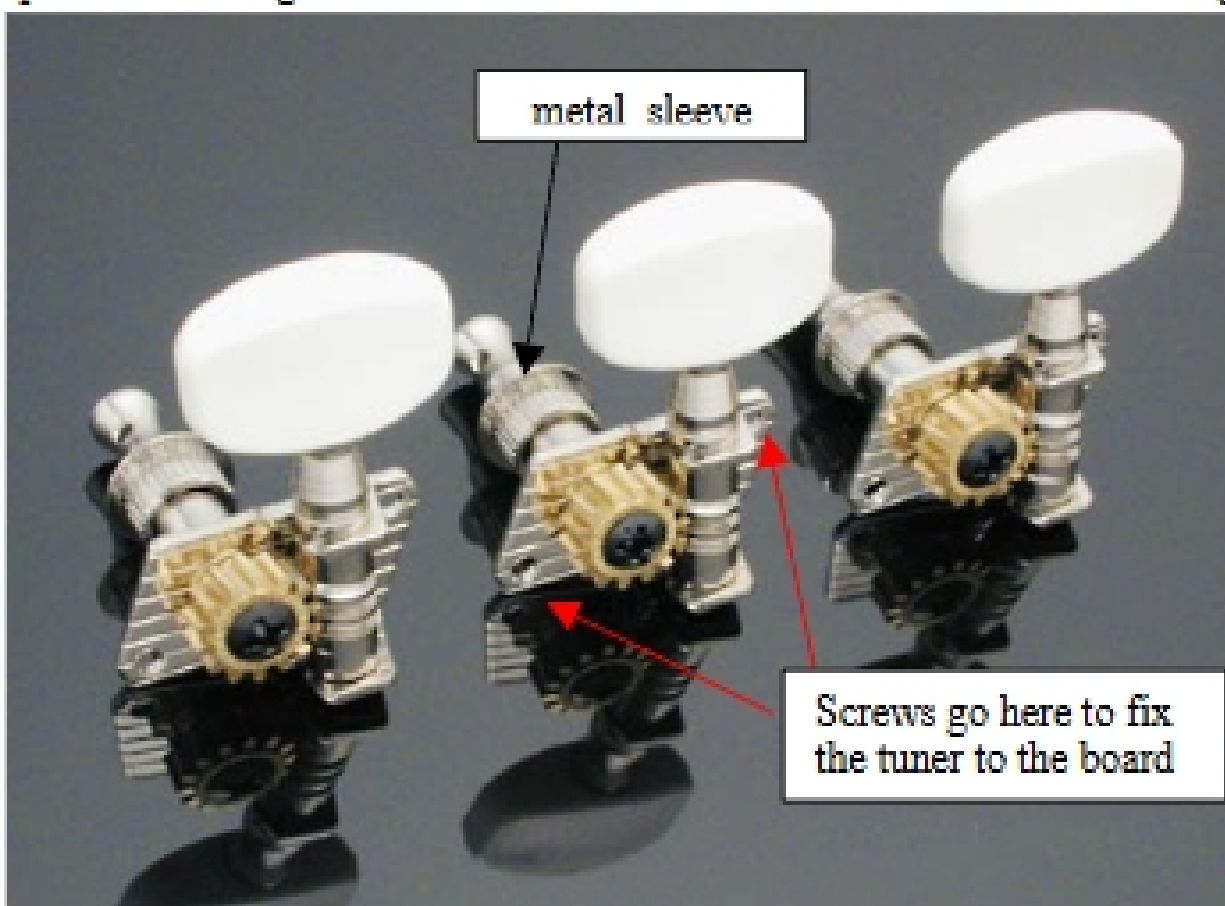
- Guitar pegs (Economy guitar tuners)
- Wood board 8' x 1.5" x 3/4" (hardwood)
- Guitar strings
- #6 flat washers to hold string end
- Pieces of wood, plastic and rubber to make bridge and nut pieces
- 1" diameter drills, hand drills
- Miter boxes, files, rulers, clamps, vices
- Fret wire, Fret saw (that has width the same as needed for the fret wire)
- Snippers for cutting fret wire flush to the neck.
- Digital Tuners
- Small screwdrivers, extra tuner screws
- Utility knives
- Hand saws
- Example monochords from last year

Materials 1 monochord per lab group. I ordered the fret wire, saws, snippers and economy tuners from Stewart McDonald. I am still not sure what the best materials are for the bridge and nuts. Popular seems to be 1/4" x 1/4" wood (pickup at hardware or hobby shop) and same in plastic (ordered from Plastruct?). Also slightly smaller squares are good in plastic. The 3/4" poplar does bend, affecting the pitch. I have recently ordered rectangular files from Stewart McDonald for making grooves for the bridge or nut.

Safety Warning: use safety glasses when using power tools. Wear protective eyewear when near an operating drill press. If you are drilling and other people are watching the drill, please make sure they too are wearing protective eyewear.

INTRODUCTION

In this lab we will construct a monochord. We will use the tempered scale to calculate the location to place frets along the neck of the monochord. After we make a working fretted monochord, we will



measure the accuracy of our scale. Half notes in the tempered scale have frequency that differ by a factor of $2^{1/12} = 1.05946$. For a string the fundamental mode frequency is proportional to the inverse of the string length.

Figure 1: Our monochord will use one of these economy guitar tuners so that we can adjust the tension on the string. We will mount the tuners perpendicular to their normal orientation so that we do not have to have the headstock (see Figure 2) at a different angle than the guitar neck.

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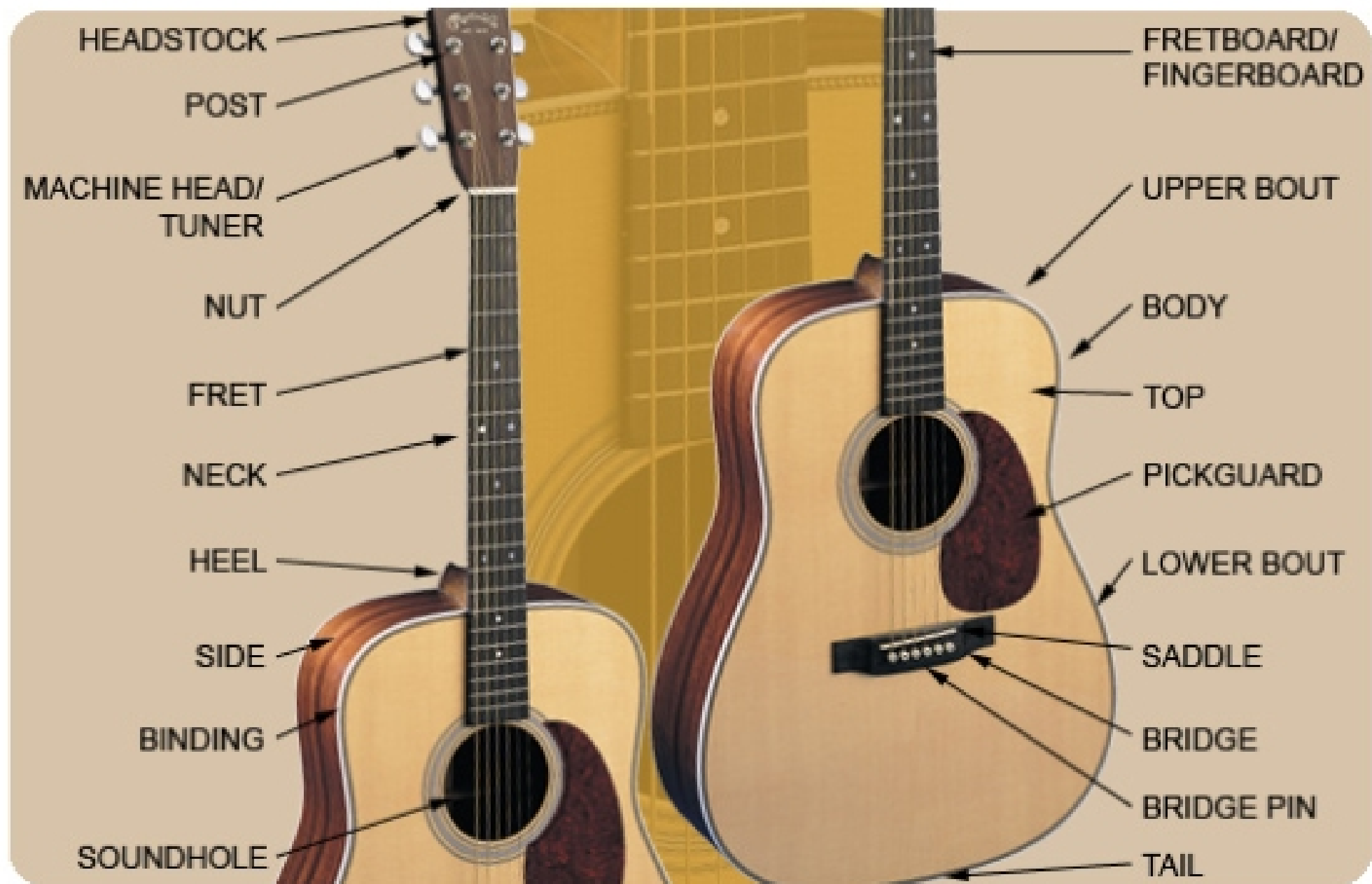


Figure 2. Parts of an acoustic guitar.

CONSTRUCTION

1. Cut a board. Cut a piece of $1\frac{1}{2} \times \frac{3}{4}$ " (actual size) hard wood to a length of about 2' 8". Guitar strings are only 3' long so your board cannot be longer than that. Please use a **hand saw**, not a fret saw. The fret saws are a specific width to fit the fret wire and are best used for delicate cutting, not sawing boards in pieces. We are using a hard-wood so it is harder to bend and so that the frets will not slip.

2. Installing the tuner

Drill first a $1\frac{1}{32}$ " and then a 1" hole as shown in Figures 3,4. Center the 1" hole so it will be centered on the center of the tuner. Insert the metal sleeve into the $1\frac{1}{32}$ " hole face that is in the 1" hole edge. The metal sleeve will help keep the tuner from tilting. Drill 2 very narrow holes for the 2 tuner screws. Install the tuner. Screw the two holding screws into the tuner.

A note on drilling: Remember to put a piece of scrap wood below the piece you are drilling into when you are using the drill press. Otherwise you will wind up drilling into the metal table. Start by drilling a small and precisely located hole before you drill a large hole. **Use safety glasses.** Be aware that the wood can catch on the drill and start spinning. It is good to drill large holes with the drill press. You can start a large hole by drilling a small well positioned hole first.

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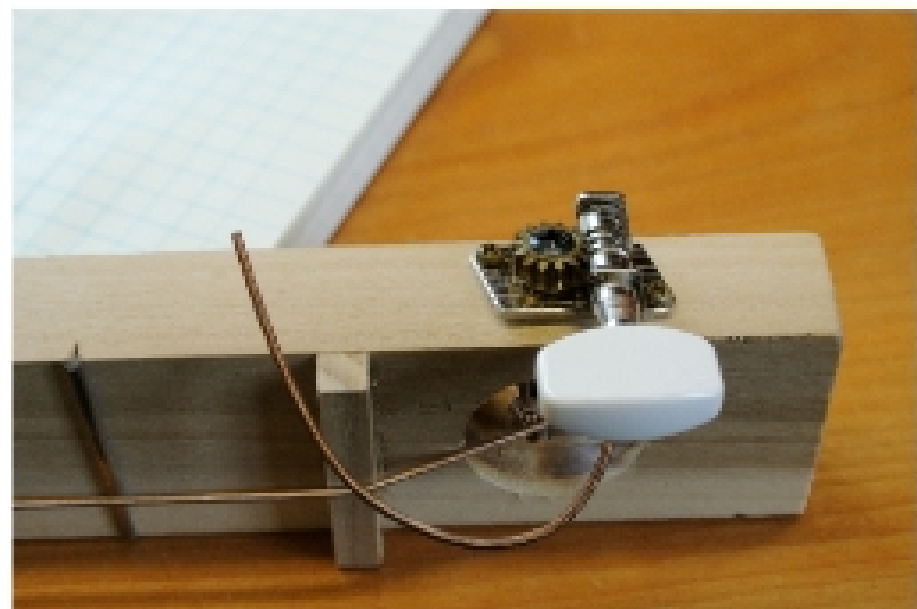
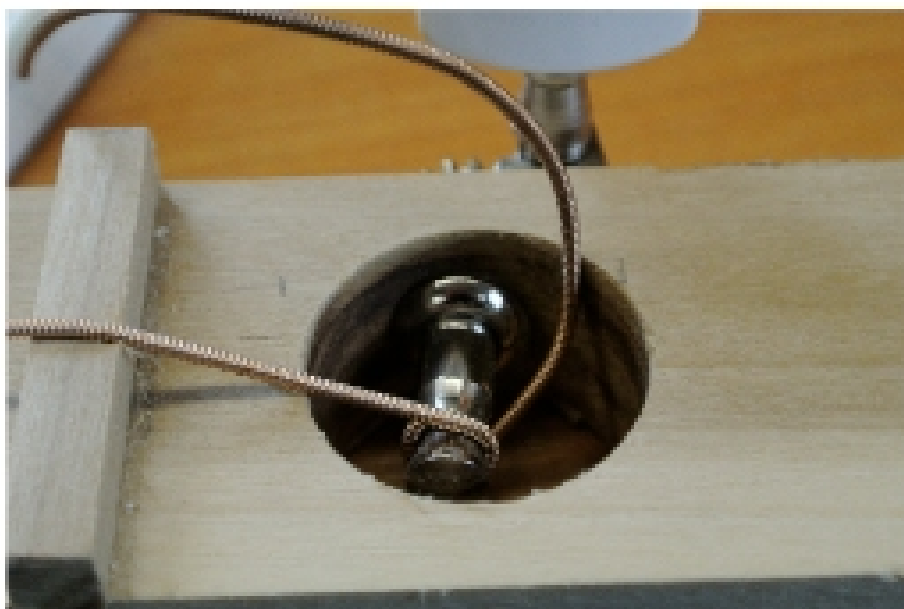
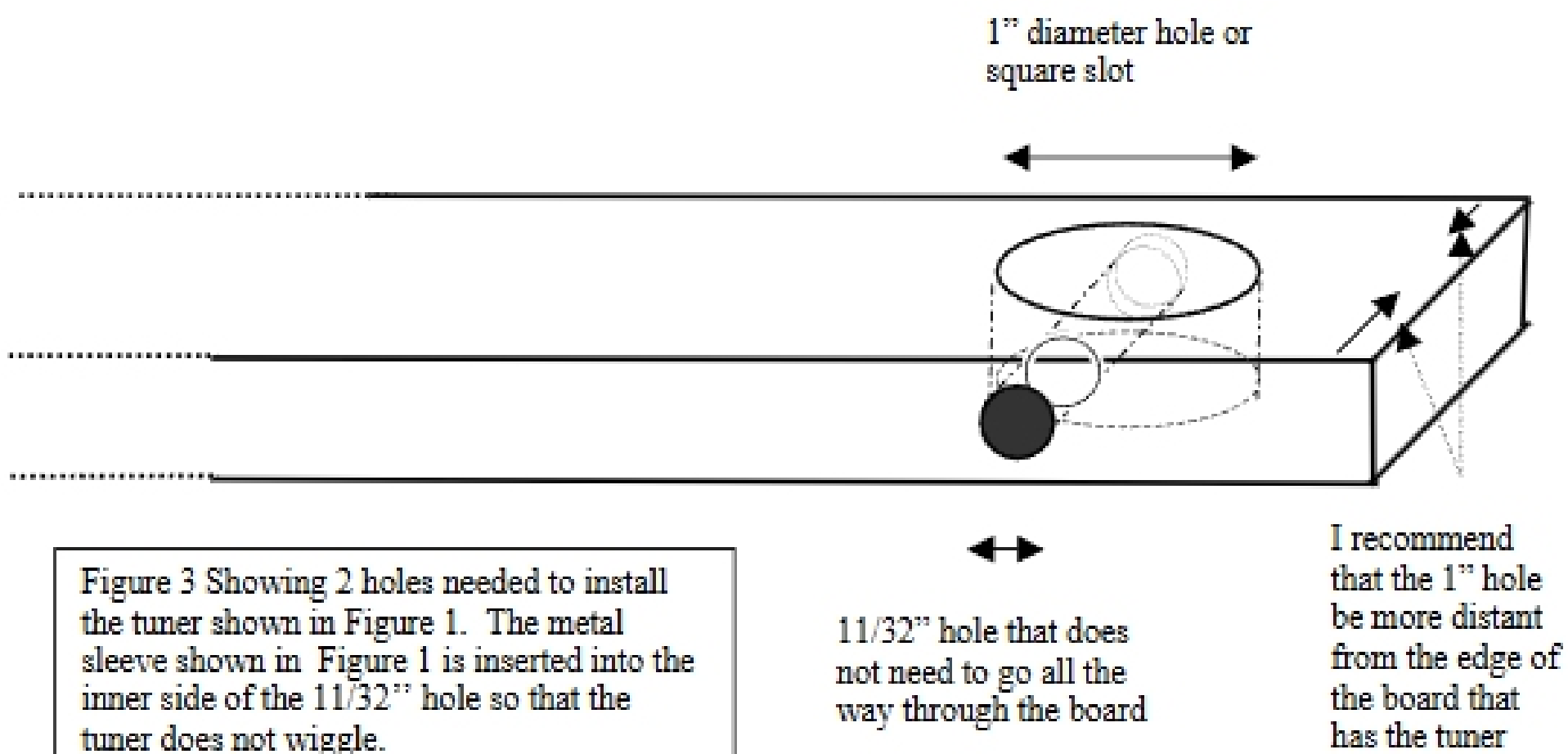


Figure 4 We are side mounting the tuner so that the monochord will lay flat on a table top.