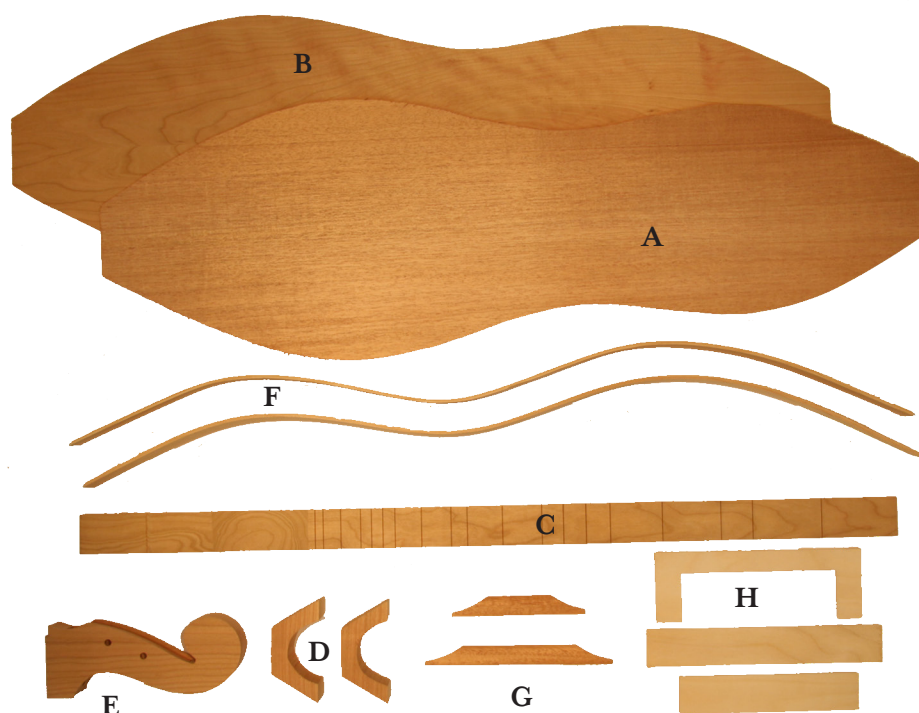




## HOURGLASS MOUNTAIN DULCIMER KIT

### Assembly Instructions

Updated January 2021



#### HARDWARE

#### WOOD PARTS

- ☐ ☐ a) Solid Wood Top
- ☐ ☐ b) Solid Wood Back
- ☐ ☐ c) Fretboard
- ☐ ☐ d) 2 End Blocks
- ☐ ☐ e) 1 Peghead
- ☐ ☐ f) 2 Sides
- ☐ ☐ g) 2 Braces for Back (1 long, 1 short)
- ☐ ☐ h) 3 Spacers

- ☐ ☐ 4 Geared Tuners with Screws
- ☐ ☐ Set of 4 Ball End Dulcimer Strings
- ☐ ☐ 1 Wood Screw, 2"
- ☐ ☐ 1 Cherry Plug, 3/8"
- ☐ ☐ Wood Bridge
- ☐ ☐ Nut
- ☐ ☐ 3' Fretwire
- ☐ ☐ 2 Medium Rosettes
- ☐ ☐ 2 Medium Donuts
- ☐ ☐ 4 Pearl Marking Dots, 1/4"
- ☐ ☐ 1 Flatpick
- ☐ ☐ Assembly Instructions

## BEFORE YOU BEGIN

\_\_\_A. Inventory and inspect all your parts carefully. If anything is missing or defective, please call or email us right away.

**651-439-9120**

\_\_\_B. It is a good idea to read through the entire assembly instructions before you start, just to get an overview of the project. We also recommend checking off each step in the directions as you finish it. You might be skipping forward to another part of the assembly while waiting for something to dry, and it helps to keep track of where you left off.

### A NOTE ABOUT GLUE

We strongly recommend that you use a common woodworking glue like Elmer's Carpenter's Wood Glue or Titebond because they hold the parts more securely than most other adhesives, and they are inexpensive and easy to use. DO NOT assemble the wood parts of this project with 5-minute epoxy or super-glue or hot melt glue. The yellow colored Elmer's or Titebond is best.

When gluing parts together, be sure to put enough glue on the joint to wet the entire surfaces to be joined. A good sign of proper gluing is that a little excess will squeeze out around the joint when clamping pressure is applied. Too little glue may cause the parts to separate later, whereas too much glue makes things messy. Always keep a damp rag handy for quick cleanup, as necessary. It is especially helpful to keep your fingers clean while gluing, because gluey fingerprints have the embarrassing tendency to appear on the finished product in prominent places.

### CUSTOMIZING OPTIONS

If you are an enterprising woodworker who wants to make this project special with decorations, you can add 4 strips of inlay banding for trimming the front and back of your Dulcimer. You may want to order decorative materials now so you have them when you need them.

## ASSEMBLING THE FRAME

### TOOLS REQUIRED FOR THIS STAGE

- Pencil
- Sanding Block
- Spring Clamps or Small C-clamps
- Wood Glue
- Scrap of Wood

\_\_\_1. Mark a centerline on the outside of each End Block. (fig. 1a) It does not matter yet which block you put at which end. The end blocks are identical.

Start the assembly by gluing the sides to the end blocks. Position the end of the side piece just a little beyond the flat of the end block. You can sand it flush after the glue dries. (fig. 1a)

Use C-clamps or spring clamps to hold the parts together until dry. It is always smart to add a scrap of wood under the clamp to protect the instrument from being dented by the pressure of the clamp.

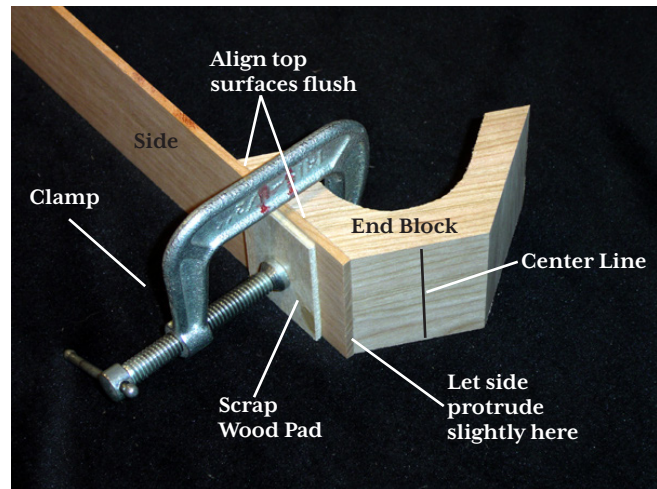


FIG. 1A



**CAUTION:** It is possible to glue these parts at odd angles if you are not careful. We like to press the parts down against a flat work surface to make sure they are level and straight.

**IMPORTANT:** While making the hourglass shape, there is one mistake you want to avoid. The side pieces are bent to shape already to form a large bout at one end and a smaller bout at the other. Make sure the two sides are oriented the same way when you glue them to the end blocks. (fig. 1b)

These parts will be under some stress. Make sure to use enough glue so some squeezes out when the clamps are applied, and leave them clamped for 8 hours.

You can proceed to steps 2 & 3 immediately **ONLY** if you leave the clamps in place.

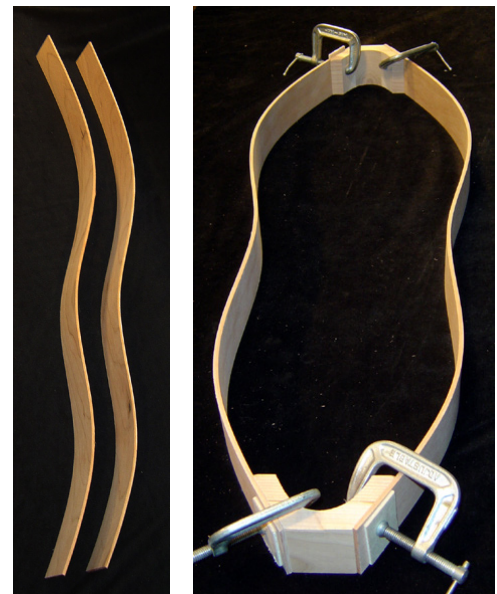


FIG. 1B

- \_\_\_2. Find the spacers for your kit and position them to hold the shape of the instrument. (fig. 2) The three spacers for this kit will force the sides into position without much room for adjustment.

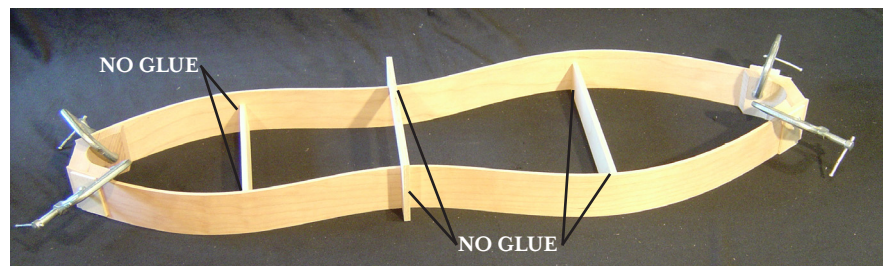


FIG. 2

- \_\_\_3. Take a minute to clean off any excess glue residue from around the end blocks. Also sand the sides level with the end blocks so the top and back can be glued firmly to those surfaces.



**HINT:** Use a flat sanding block for this purpose and try to avoid rounding the End Blocks.

## TOOLS REQUIRED FOR THIS STAGE

### PREPARING THE SOUNDBOARD (TOP)

- Pencil
- Clamps/Weight
- Damp Rag
- Router w/flush trim bit
- Clamping Board
- Glue
- Masking Tape



**NOTE:** The top and back panels of this instrument can be interchanged. Although we like putting mahogany on the top and cherry on the back, you may reverse them. Mahogany has the straighter, more open grain, and often has very interesting color variations. These panels are larger than necessary to fit the frame of your instrument, so you'll be trimming or sanding them down to shape as you progress through the building process.

- \_\_\_4. Select which piece you want for the soundboard. Notice that the centerline has already been drawn onto both sides of the panel. If not, make sure you transfer the line to the preferred interior face. Put a piece of masking tape on the inside face and mark it "INSIDE" so you do not get confused later.
- \_\_\_5. You can position the frame on the soundboard, lining it up on the centerline. You will want to mark the center of your spacers, so you can keep the frame straight. Once the frame is centered, lightly outline the frame with a pencil.

### CUTTING THE SOUND HOLES

- \_\_\_6. Set the body aside so you can plan the placement of your sound holes. Center the Fretboard on the centerline and mark its outline on the inside of the Top as well. The Fretboard need not span the entire length of the body, so don't worry if it seems a little short.

Set the fretboard aside and decide where you want to place your sound holes. Generally speaking, we like to place two fairly large holes at the widest point of the instrument, and then cut optional smaller holes closer to the head end. The holes look best when they are centered between the edge of the top and the fretboard -- thus in the middle of the space outlined in pencil.

Large holes can be up to 2-1/2" diameter, and the small holes look best if they are about 3/4" to 1" diameter.

You can be creative here with shapes for the soundholes (ovals, hearts, f-shapes, leaf shapes, etc.) Make sure your holes are big enough for you to fit a c-clamp through for clamping the Fretboard later (Step 21). The smaller holes are no problem, no need for fitting clamps into them.

### INSTALLING OPTIONAL DECORATIVE ROSETTES

- \_\_\_7. **EASY SURFACE MOUNTING** - Cut a round hole 1/4" smaller in diameter than the rosette so the decoration will rest on top of the soundboard, glued to the rim of the hole. This is especially nice if you don't have a method for cutting a clean accurate hole in the top. The rosette will cover the imperfections of your opening.

Do not glue rosettes in place yet! You'll need access through these soundholes for clamping later.



**EASY INLAY MOUNTING** - Cut round holes a little larger in diameter than the size of the rosette (1/8" or 1/4" larger). Glue a "donut" around the hole on the inside surface to provide a ledge on which to glue the rosette. (fig. 7) The outside diameter of the donut must be larger than the hole, and the inside diameter must be about 1/4" smaller than the diameter of the rosette. Musicmakers has donuts available for each size rosette.

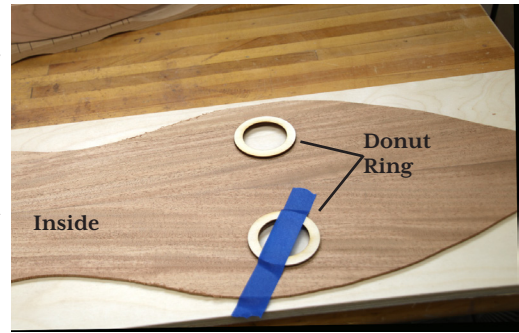


FIG. 7

Glue the donuts to the inside of the top now, as shown, but do not glue rosettes in place yet! You'll need access through these soundholes for clamping later.

- 8. Once the soundholes are cut (or drilled) You can glue the frame to the Top. First, set up your clamping board:



FIG. 8A

Find a nice flat piece of plywood about the size of the dulcimer (10" X 33") to use as a clamping board. A particle board shelf would be inexpensive and ideal. (fig. 8a)

Rest the shelf on a couple of supports to give room for your clamps to fit under the board.

Place the frame of the dulcimer on the inside surface of the top, aligning it with your penciled centerline.

When satisfied with the fit of the soundboard, put a bead of glue on the edges of the sides and the end blocks all around the instrument. Then clamp the entire assembly down on the soundboard, against your clamping board, so that you end up with a nice flat, straight frame. (fig. 8b)

Place clamps all the way around the box, making sure the body remains aligned with the centerline at both ends.



**NOTE:** Use plenty of clamps or weights. You don't need great pressure, just **EVEN** pressure all around the frame. Check around the perimeter to ensure there are no gaps.



**CAUTION: DO NOT GLUE THE SPACERS!** They need to be removed before you close up the box.

- 9. Once the soundboard is installed and the glue is dry, you can trim it flush with the frame using a router with a flush-trim bit. (fig. 9)

Move your router in the same direction as the bit to "climb cut" the thin top material (moving the router clockwise around the frame.) This will help avoid chipping the wood as you cut.

For those who plan to decorate with inlay banding, this will be the first router step. Wait until the back is installed before routing the ledges for the inlay strips.

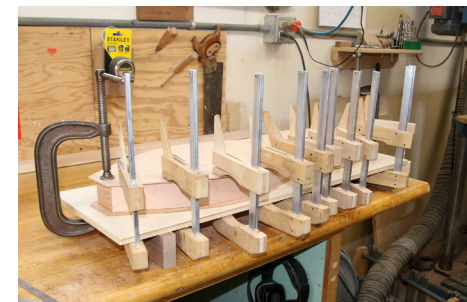


FIG. 8B

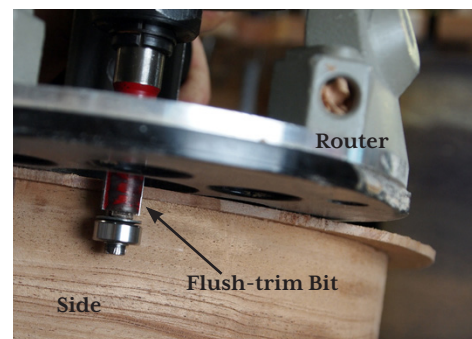


FIG. 9

## INSTALLING THE BACK

### TOOLS REQUIRED FOR THIS STAGE

- Pencil
- Clamps/Weight
- Damp Rag
- Sand Paper (120/150 grit)
- Clamping Board
- Glue
- Masking Tape
- Router w/flush trim bit

\_\_\_10. Before you glue the body to the back panel, you want to glue the braces inside the back of the dulcimer. (fig. 10) First decide which face you want to show for the back. Then install the braces to the inside face of the back panel. Position the large brace 8" from the tail block, and centered between the side edges. The smaller brace should be placed 7-1/2" from the head block, and centered as well. Use masking tape and weights/clamps to hold the braces as you glue them in place until dry.

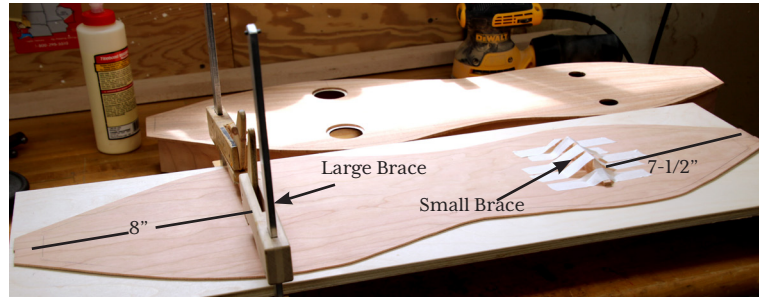


FIG. 10

\_\_\_11. Now you are ready to glue the body to the back panel. You can **remove the spacers**, and set up your clamping board again, as you did for the soundboard.

It is very important to make sure to place the soundboard down against the clamping board (fig. 11a, fig. 11b) This will help keep the soundboard as straight and flat as possible.

Apply glue to the edges of the sides and end blocks, just as before. Then clamp the entire assembly down to the clamping board, and remember to pay attention to having even pressure around the entire body, without any gaps.



FIG. 11A



FIG. 11B

\_\_\_12. When the glue is dry, you can trim the back the same as you did with the soundboard.

Use sandpaper (120-150 grit) to clean up all glue residue around the joints and make sure the end blocks are flat and square at each end. (fig. 12) This is another time you'll appreciate having solid wood construction -- you don't need to worry about sanding through a thin layer of veneer!



FIG. 12



## OPTIONAL INLAY BANDING

- \_\_\_13. If you are interested in really customizing the appearance, you can use a router to cut ledges around the perimeter for inlay banding.

Inlays are very thin (about 1/16"), so they do not weaken the joints appreciably when inlaid around the top and back. This is not as scary as you might think, and you might learn some tricks with the old router, or maybe you've been looking for an excuse to purchase a new router.

A nice inexpensive way to begin is to adapt a 1/2" flush-trim router bit with a 3/8" roller bearing so the cutters extend 1/16" beyond the roller. (fig. 13a)

When you put this type of bit in your router, you want the cutting edge to stick out beyond the router base just enough to fit the width of your inlay banding. (fig. 13b)



**NOTE:** You will be cutting with the side of the router bit, not the end. (fig. 13c) It may take a minute of study for you to see how this works

Your router bit will cut a ledge along the side of the Soundboard (and/or back) to fit the inlay banding. **Make a test cut in a piece of scrap wood and check to make sure the inlay fits just right.** (fig. 13d)



**CAUTION:** When you cut these grooves around your instrument, we recommend pushing the router in a clockwise direction around the circumference. (fig. 13e) This is called "climb cutting", and is opposite the normal direction for routing, which is to move the router against the spin of the bit.

By moving the router with the spin of the bit, you eliminate any chance of chipping the grain as you cut. This may seem odd, or even unsafe, but it works easily and beautifully because the cut is so shallow. You may want to run the router around the instrument two or three times, just to make sure you cut the ledge to full depth. Remember that the roller prevents the bit from cutting too deeply. You can make minor adjustments to the cut by hand if necessary, using a razor knife, a file, or a sanding block to make sure the inlay strips fit nicely all around the body.

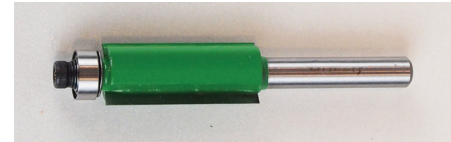


FIG. 13A



FIG. 13B

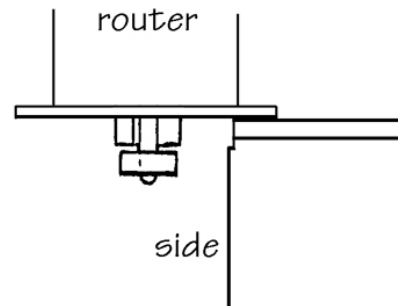


FIG. 13C



FIG. 13D

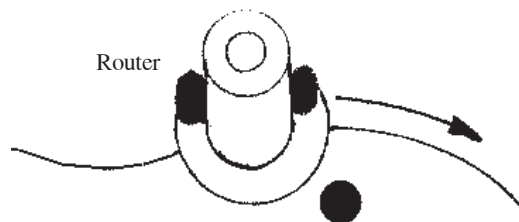


FIG. 13E

- 14. Once the ledges are cut, you can glue the inlay strips in place. If your inlay bands are made of wood, use regular woodworking glue. If they are plastic strips, then you'll need an adhesive that works with both plastic and wood (Duco Cement and Sig-Ment are commonly available, but we like Weld-On #16 best for acrylics).

Use short strips of masking tape to hold the inlay in place until dry. This job is easiest if you cut a bunch of masking tape pieces ahead of time and stick them to the edge of the table so you can grab them quickly. Then spread glue in about 8" - 12" of the ledge at a time as you move around the instrument. (fig. 14a)

If you want to miter the corners of the inlay strips when you reach the end blocks, you can either use a sharp razor knife to cut the bevels, or a little flat sanding block to sand them. (fig. 14b)



FIG. 14A



FIG. 14B

When the glue is dry, peel off the masking tape and sand off the glue residue to clean up your decorations. If you installed plastic binding, you'll find a cabinet scraper to be the best tool for working the plastic down flush with the surrounding wood.

You can sand the wood inlay strips a little as well. the color goes through the full thickness of these pieces.

## PREPARING THE FRETBOARD

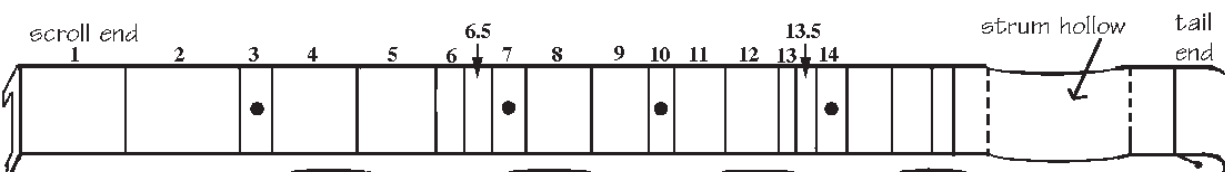
- 15. (OPTIONAL) Most people like to mark certain spaces on the fretboard to guide their playing. We provide 1/4" diameter pearl dots for this purpose, but you may choose to do something more or less ornate if you like. Here's how to install the dots:

Find the centers of the spaces in your fretboard corresponding to the dots in the diagram below. Punch-mark the wood to help keep your drill from wandering off-center. Then simply drill a shallow hole in the wood for each dot. The hole can be a little deeper than the thickness of the pearl.

To inlay the pearl, use 5-minute epoxy or thick superglue to fill the hole, then push or tap the pearl dot down almost flush with the wood, being careful not to push it below the level of the surrounding wood. When dry, you can sand the dots flush to the wood.



**CAUTION:** Notice the numbering system with 6.5 and 13.5 spaces! That means #7 dot is actually in the 8th space, #10 is in the 11th, and #14 is in the 16th.





- 16. Now you are ready to install the frets. Place your fretboard on a good firm surface for this operation. A flimsy table top will not do. Better to work on a concrete floor or a cement block. Otherwise, your wood will just bounce around as you try to pound the frets into place.

Begin by placing the long length of fretwire over one of the slots cut in the fretboard, so the end hangs over the edge of the wood just 1/16" or so. Position the fretwire so that the 'tang' will be driven down in the fret slot. (fig. 16a)

Use a hammer to lightly tap the fretwire into the slot, until the crown of the fret contacts the wood surface.

HINT: Tap one end of the wire in, then the other end, finally the middle. Be sure to not overwork the wire. You should be able to install each fret with four or five taps, total.



NOTE: The fret-wire is fairly soft metal, so if it bends the wrong way or gets kinked, you can easily straighten it again with a pliers.

When the fretwire is securely held by the wood, use a wire cutter to clip off the excess, as close to the wood as possible. Proceed to the next fret slot in the same way, and so on until all frets are installed. (fig. 16b)

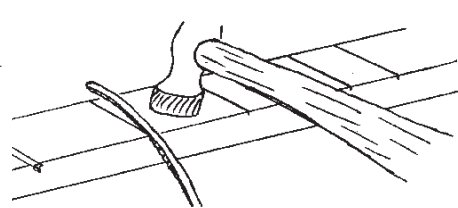


FIG. 16A

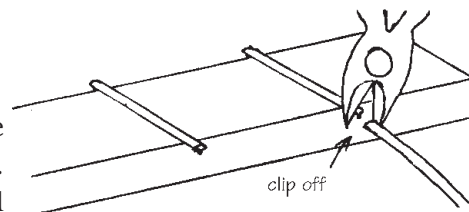


FIG. 16B

- 17. After the frets are installed, look them over carefully to make sure each one fits all the way down against the wood. If one fret stands higher than another, it may cause buzzing problems later when playing the dulcimer. Now is the time to take care of the problem. We find that a few good taps from the hammer are sufficient to seat any frets that are too high. But make sure you are working on a very firm surface. A bouncy table will make this job impossible.

- 18. File (or sand) the ragged ends of the frets down until they are smooth and flush with the sides of the fretboard. If you have access to a belt sander, you'll find it very helpful for this part of the project. The fretwire is soft enough metal to work easily with a sanding belt. Be careful, however, not to gouge the edge of the fretboard!

File (or sand) a 45 degree bevel at the ends of the frets; working the file in a downward motion only, to avoid lifting the frets up. (fig. 18a)

Use a flat mill file to level the tops of the frets now too. This will prevent problems of buzzing strings later. Lay the file on the frets and work it back and forth until each fret shows some sign of wear.(fig. 18b)

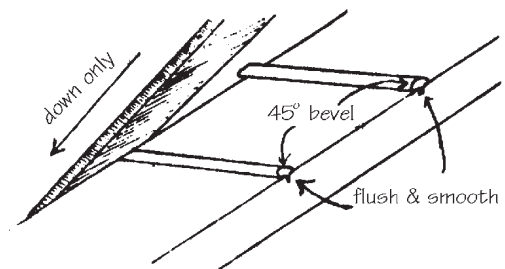


FIG. 18A

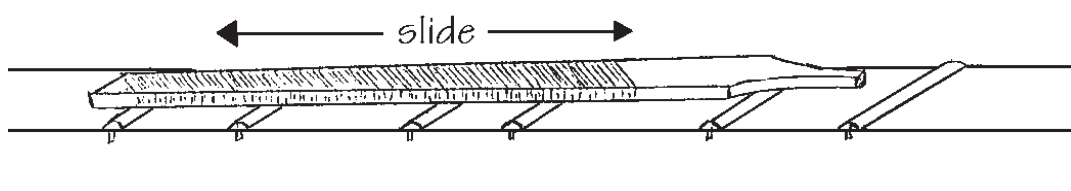


FIG. 18B

## INSTALLING THE PEGHEAD

- 19. Check the peghead so see how it matches the width of the fretboard. The instrument looks best if these two parts meet with the same dimension, and that may require a little tapering or extra shaping on the peghead. (fig. 19a)

It also looks best if you sand the sharp corners to make the peghead feel smooth and nice in your hands. Use fairly fine (180-220 grit) sandpaper for this. Be sure to leave the end square and flat that will be attached to the instrument body.(fig. 19b)

If you are adventurous, you may try making your Peghead fancier with hand carvings, routing, or inlays. Be careful not to interfere with the space where the geared tuners will be mounted.

- 20. Now you are ready to install the peghead onto the body. Here is where you could embarrass yourself if you are not paying attention. The peghead will be glued first and then screwed to the narrower end of the body. If you install it at the wider end, it will work just fine, but other dulcimer players will tell you, hopefully in a quiet voice, that you assembled it backward.

A.) Test the fit of the peghead to the end block. The important thing is to keep it centered and square on the end block.

The small ledge for the nut stands about 1/8" above the surface of the top panel. You should raise the peghead to approximately this height on the end block. Perfection is not necessary here, however, because the nut is purposefully tall, and you'll be trimming it down later.

B.) When satisfied with the position of the peghead, pencil the outline of it, and then glue it in place. Don't install the screw yet. We just stand the instrument on end and let the peghead dry first. (fig. 20a)

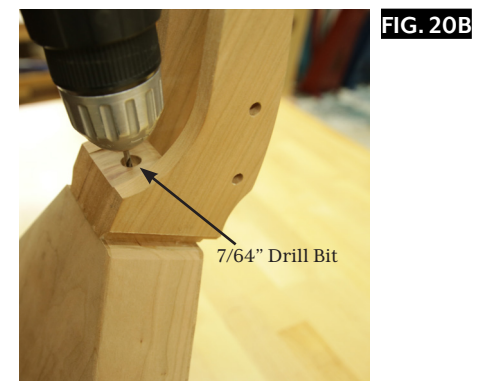
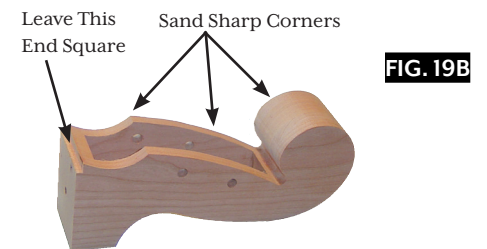
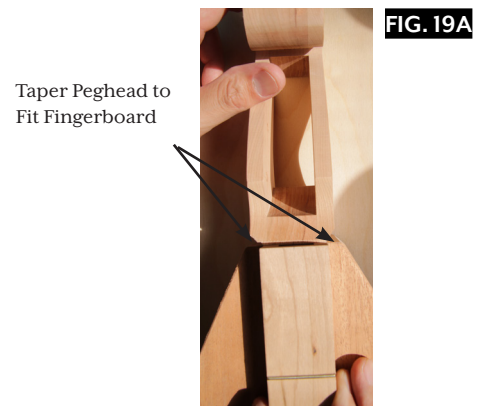
C.) Once the peghead is glued in place, you'll want to reinforce it with a screw. Use a 7/64" drill bit to bore a pilot hole into the end block. (fig. 20b) Then install the screw provided.

D.) You can cover the screw head with the wood plug provided. Put a little glue into the hole first, and then tap the plug into place and let it dry.

E.) Sand off the excess portion of the wood plug, making it flush with the surrounding wood.

## INSTALLING THE FRETBOARD

Now you're ready to install the fretboard on top of the instrument. It must be oriented correctly, with the squared end against the peghead. This leaves a slot for the nut that we mentioned earlier.



- 21. Carefully line up the fretboard on the center of the instrument at each end, and mark its location so you can return it quickly and accurately when you apply the glue. We like to use masking tape to mark the outer edge near the tail end. (fig. 21a) The head end is easy to align with the peghead by eye.



FIG. 21A

Find three clamps and make a test run of clamping the fretboard before applying the glue.



**CAUTION:** Do not be tempted to add more clamps to the middle of the fretboard! There will be too much pressure added, and will make the fretboard and top concave. This is all the clamping pressure you will need. (fig. 21b)

When you have everything ready, apply glue to the underside of the fretboard, only on the flat areas that will contact the top of the instrument. (fig. 21a) Then clamp the fretboard in place until dry. If you are using c-clamps, use a scrap piece of plywood to help protect the fretboard while clamping. (fig. 21b)

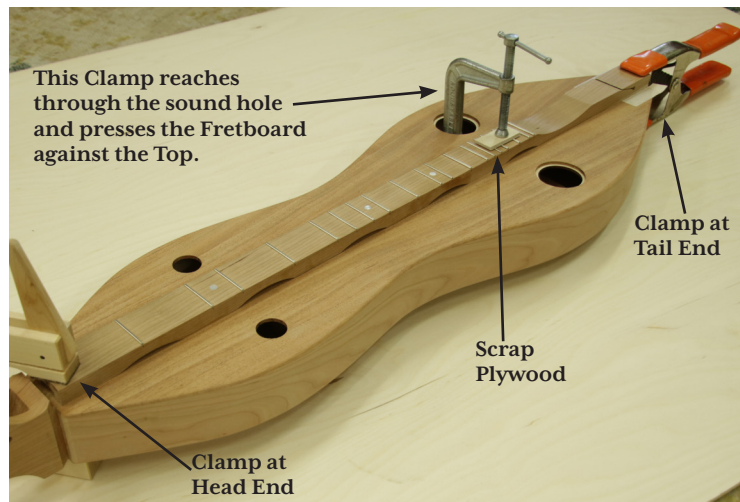


FIG. 21B

### INSTALLING A PICKUP (OPTIONAL)

- 22. If you plan to install a pickup in your dulcimer, this is your last chance, before covering the soundholes with rosettes. A single Piezo pickup from Musicmakers works beautifully in this instrument for amplification. You'll need to drill a 1/2" diameter hole through the tail end block. Then you can fish an electric patch cord through that hole and out one of the sound holes, plug it into the pickup jack, and pull the jack into the instrument to the end block where it can be permanently fastened with the nuts and washers provided with the pickup.

Once the jack is secured, you can reach a finger into a soundhole to adhere the sensor inside the top near the sound hole.

### INSTALLING ROSETTES (OPTIONAL)

- 23. If you prepared your sound holes for rosettes, now is a good time to glue those in place, before applying the finish. Dry fit the rosettes first, orienting and centering them as you like.

Then apply a thin bead of woodworking glue to the rim of the donuts, and hold the rosettes in place with masking tape and weights until dry. (fig. 23)



FIG. 23



## THE NUT AND BRIDGE

\_\_\_25. The last item to glue into place is the nut, which is a small piece of maple that holds the strings at the peghead end of the fretboard. We like to trim it to size and round over one edge before gluing it into place, although you may find it easier to fasten it to the instrument and then work down the excess with a file or sanding block

We like the nut to stand about  $\frac{3}{32}$ " above the playing surface of the fretboard. Then you will only need to file shallow notches for the strings. Glue it with epoxy or superglue. (fig. 25)

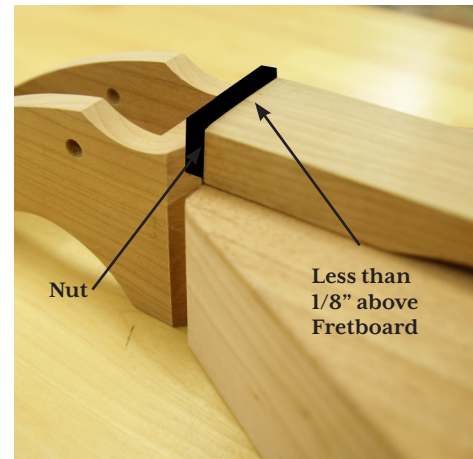


FIG. 25

\_\_\_26. Use a small triangle file to make shallow grooves in the nut for the strings. (fig 26) Please note that the view is from the peghead. If you wish to make a left-handed dulcimer, you would reverse the image.

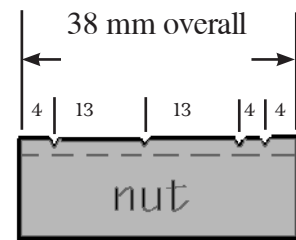


FIG. 26

\_\_\_27. The bridge is a small triangular wood piece that will rest on the fretboard near the tail end. We do not glue the bridge in place. It is much better to leave it as a "floating" piece, held by the strings. That enables you to fine tune the scale length for perfect intonation after the instrument is strung.

You'll need to file identical notches in the bridge that you filed in the nut. (fig. 27)

View from the end of the Dulcimer

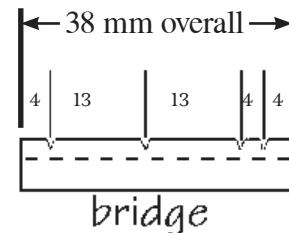


FIG. 27

## FINAL SANDING

\_\_\_24. Clean up all glue residue around the entire instrument. Nothing points to an amateur woodworker more than a project with glue blobs and fingerprints on the surface. They may be difficult to see now, but they will stand out prominently after applying the finish. We recommend wiping the entire instrument with a clean damp rag to help highlight these smudges. When you find one, use a scraper or sanding block to get down to bare wood.

Sand the entire instrument with about 180-220 grit sandpaper to smooth out all surfaces so they feel good in your hands. Sand with the grain whenever possible, to avoid putting scratches across the grain.

We like to knock off all sharp edges too. A slightly rounded corner actually looks sharper than a sharp one, and it feels better too.

Your dulcimer is now ready for the finish. There are several finishes that will work fine for your instrument, and some are easier to apply than others. We give a few suggestions for selecting a nice-looking coat to protect your handy work and enhance the beauty of the wood.

We recommend masking off the top of the fretboard to avoid getting varnish or lacquer on the playing surface because it can get gummy under the fingers as you play. After the finish dries, you can remove the tape and wipe one light coat of linseed oil on the playing surface.

**STAINS or DYES** -- These are coloring agents and should only be used if you want to change the natural color of the wood. We usually do not apply stains to our projects, especially when they are made with naturally beautiful hardwoods such as cherry or walnut. These woods look best with a clear finish. But, if you want to color the wood, your staining should be accomplished before applying a surface finish such as oil, varnish, or lacquer.

**OIL or WAX** -- Oil finishes will give your wood a low luster appearance, bringing out the natural color of the grain, but it tends to soak into the wood and appear dry and “thirsty” after awhile. Some people are fond of a beeswax finish for a natural look, but it can show water spots if it gets wet, so you may end up needing to re-wax or touch up the surface in the future.

**POLYURETHANE VARNISH** -- Any regular varnish will work fine on this project, but we think a wipe-on (gel) polyurethane is the easiest to apply because it does not drip or sag -- just wipe on a thin coat and wipe off the excess. The advantages of this finish are its simple application, minimal odor, good durability, and deep, soft luster.

**LACQUER** -- Many professional instrument makers use lacquer for their finish. The most readily available lacquer is called Deft Clear Wood Finish. It is best to purchase a can of liquid to brush on as a sealer coat first, and then use an aerosol can of the same product to spray on the final coats. The advantage of this finish is its quick drying time, but the disadvantage is the strong odor of the toxic lacquer fumes.



**NOTE:** Our best advice: avoid gloss finishes, unless you are an expert with spray equipment! Glossy finishes show off every speck of dust and irregularity in your sanding. Satin or semi-gloss is much easier for the amateur.

Go ahead and apply the finish of your choice, following the instructions on the container. Sand between coats with fine (400-600 grit) sandpaper, or #0000 steel wool. Consult instructions on the can for proper drying time. If you want to change the sheen of the finish after it dries, you can smooth it out by rubbing with #0000 steel wool or with a Scotchbright scrubber. We often follow this procedure with a coat or two of paste wax (the same product that you would use on a wood floor) to bring out a nice luster.

## INSTALLING GEARED TUNERS

- 28. Install the individual geared tuners to the peghead as shown. Note that two are meant for the right side and two for the left. For best results, be sure to place the tuners so the brass gear is closer to the body of the instrument than the handle with the chrome button. (fig. 28)

Hold the gear in position as you drill two 1/16” pilot hole just 1/4” deep for the mounting screws (two screws per gear) Then attach the tuners with the screws provided.



**FIG. 28**

## INSTALLING STRINGS

- \_\_\_29. Now you can install the strings! Attach each string to the dulcimer by slipping the ball end into the hole near the tail end of the fretboard, and poking it in to about the proper depth to line up with the notches of the bridge. (fig. 29)

We like hiding the ends of the strings this way. It eliminates the need for tail pins that might get caught on your clothing. Thread the other end through the hole in the appropriate geared tuner, as shown. (fig. 30)

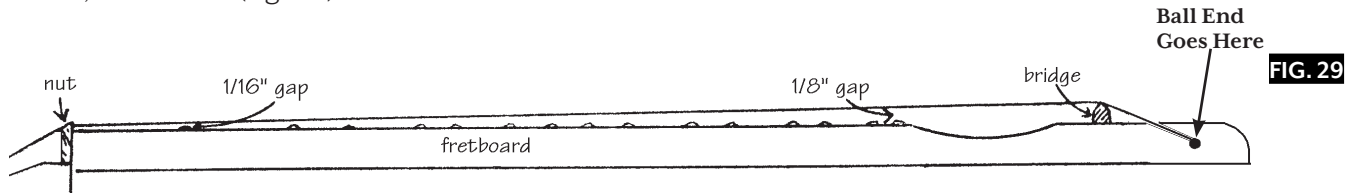


FIG. 29

A.) Begin with the thick wound string (.025" diameter). This is the bass string, and it goes to the far right-hand position. (fig. 30) Push the ball end into the tail end of the Fretboard from the right hand side.

B.) Thread the other end of the string through the hole in the first geared tuner (closest to the "nut" on the right side) and turn the button to wind the string until the slack is taken up. Note that we like to have all the strings wind onto the top of the tuning posts, as shown.

C.) When the first string is installed, slip the bridge into place. The top of the bridge should be about 27-1/8" from the nut (you can make adjustments later).

D.) All the other strings are the same size (.012" diameter) plain steel. Install them into the positions shown.

E.) Tune them to the notes shown at the bottom of the photo.

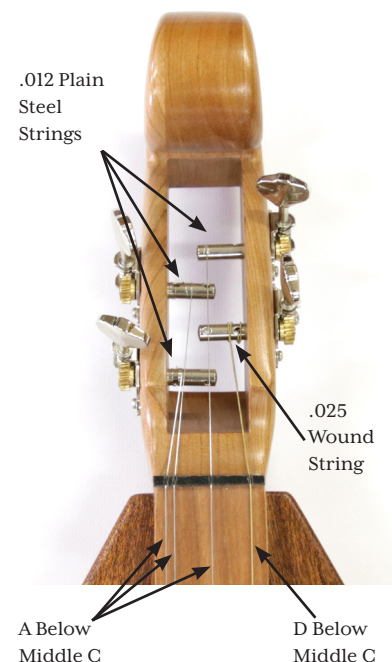


FIG. 30

- \_\_\_30. Once the strings are installed, check their height above the frets to make sure they will be easy to play. The ideal string height would be about 1/16" above the first fret (near the peghead), and about 1/8" above the 17th fret (nearest the strum hollow). We recommend adjusting the height at the nut first. Use a file to cut the notches deeper in the nut to lower the strings, being careful not to cut too deeply, as it is difficult to raise the strings higher again.

The string height at the 17th fret is easier to adjust. You can raise it by adding a shim under the bridge, or lower it by sanding the bridge a little shorter or filing the notches a little deeper. Be careful not to lower the strings too much, or the strings will tend to buzz and rattle against the frets when you play.

- \_\_\_31. (OPTIONAL) Adding a guitar strap to your dulcimer makes it considerably easier to hold firmly on our lap as you play. Install a mounting button to the tail end of the body and use the shoe string provided with the strap to tie the other end to the peghead.

Drill a 7/64" pilot hole for the screw that holds the mounting button. Then screw the button to the end block. (fig. 31)



FIG. 31



## TROUBLESHOOTING

- \_\_\_32. Fine adjustments can be made in the placement of the bridge to make sure the dulcimer plays perfectly in tune. The measurement given earlier (27-1/8") should be very close to the exact placement, but some variations may occur depending upon final string height and string thickness.

The technique for finding the exact location of the bridge requires a good musical ear or an electronic tuner. Test the accuracy of the octave note by plucking a string with one hand while pressing it to the 8th space from the nut with the other hand. That note should sound exactly one octave above the same string when plucked in the "open" position (vibrating at full length).

If the octave note is a little too high (sharp), then slide the bridge a little toward the tail of the instrument. If the octave sounds too low (flat) compared to the open string, then slide the bridge toward the strum hollow. Make adjustments until you find the correct placement, then mark that location on the fretboard with a pencil in case the bridge gets bumped out of position in the future.

- \_\_\_33. There may be some other fine adjustments needed to make your dulcimer work its best. Test each string by plucking it with one hand while you press it down at each playing position (fret) along the neck. Here is what to check for:

A.) If the string is difficult to push all the way to the fretboard, it is too high. Filing the grooves deeper in the nut will lower the string at the head end, and sanding the underside of the bridge will lower the strings near the middle of the instrument.

B.) If a string buzzes when plucked in the open position only (when not held down to a fret), then the notch in the nut is too deep -- the string is probably buzzing against the first fret. You'll need to loosen the strings, knock the nut loose and glue it back with a thin shim under it (even just gluing it back again will raise it a little because of the additional layer of glue build-up).

C.) If your strings buzz and rattle in general as you play, sight down the fretboard first to make sure it is not humped up in the middle. Let us know if you encounter this problem. If the fretboard is reasonably level, then you simply need to shim up the bridge to raise the strings a little more, giving them more room to vibrate.

D.) If a string rattles or buzzes at just one or two positions (frets), or if you discover that two or three frets all give the same pitch, then look for a fret that stands up higher than its neighbors. You will need to either tap that fret back down into its slot in the fretboard or use the long flat file to level the tops of the frets some more. Just loosen the strings, lift them out of the grooves in the nut, and hold them along either side of the fingerboard as you work the file lengthwise along the tops of the frets. You can easily see which frets are the highest, as they are the ones that receive the most filing.

**CONGRATULATIONS:**

You have successfully completed a mountain dulcimer that should give you many years of musical satisfaction. We hope you have enjoyed the project. Don't hesitate to contact us for any further help that you may need. We also appreciate hearing suggestions and hints that you think might help a future kit builder.



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