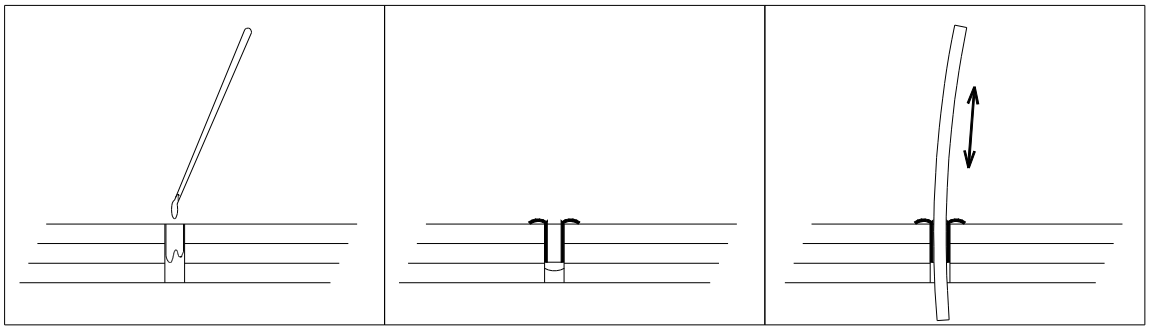
Chapter Eleven

Mounting the hardware and Stringing

Before the harp can be strung, eyelets, bridge pins and tuning pins need to be mounted on the harp and the neck and pillar need to be bolted to the sound box.

Mounting the Eyelets - First I test the eyelets to see how tightly they fit into the holes in the soundboard. Finish drips into the holes making them smaller. If it is difficult to push the pins into position, I may drill them out with the appropriate sized bit. I find it is easiest to insert the eyelets when the sound box is laying flat on the workbench.

String tension puts significant pressure on the eyelet, and if the wood surrounding them is not strong enough, the eyelet tends to migrate upward creating a slot. Sometimes the eyelet will split and/or begin the tilt over or capsize. If the harp does not have an outer string rib, or if the string rib is made from anything softer than rock maple, I dab glue into the eyelet holes with a toothpick. The glue will significantly harden the wood fibers where they are likely to crush or deform over time. The object is not to fill the hole, but to coat the sides with glue. After all the holes have been treated, the first hole is partly dry; I push the eyelet into place. Excess glue pushed down by the eyelet will block the hole, so I chase the string hole and eyelet with a thick harp string.



Applying glue, inserting the eyelet, then clearing the eyelet hole. Scrap ends from steel wound strings work well for removing the glob of glue that can plug the end of the eyelet.

Inserting the Bridge Pins - I find it is easiest to insert the bridge pins with the neck lying flat on the workbench. I place a towel underneath to protect the finish. As with the holes for the eyelets, the edges of the bridge pin hole may have been coated with several layers of finish making the fit too tight. If I can't push the pins in by hand I will re-drill them. The final depth of the pins will vary depending on the types of levers you will be using. Most lever

manufacturers will provide recommendations or a stop block for setting the depth of the pins.

<Insert a pic of bridge pins and stop block>

Inserting the Tuning Pins - As I am inserting the tuning pins, I clamp the pillar in my bench vice so the neck is held vertically. This allows me to push them firmly into place.

When I first built harps, I was frustrated in my efforts to get a nice row of tuning pins that settled to the same depth. No matter how carefully I reamed the holes, I still seemed to have trouble getting the pins even. There are several factors working against the builder. 1). There are differences in the density and hardness of the wood which will result in unevenness as the pin is pressed into place, 2). There are significant differences between pins, 3). As the pin is strung and the pin compresses the wood around it, the pin will move about 3/16" inch farther in - depending on the string tension and the hardness of the neck wood.

<Insert .jpg, tuning pins in place>

To get even pins, I push all of them firmly into place (using a "one and a half grunt" push) with the tuning wrench. There will be some that are too deep and others that are too shallow. Swap the pins that are too high with the pins that are too low. I am shooting to have each of the pins protruding about ½" on the string side of the neck.

You can further refine the level of the pins by using a hand reamer for the pins that are too high. You may have one or two pins that are too far IN the hole. I can bring these out a bit with paper sleeves, about 1¼ long and 3/8 to 5/8 of an inch wide. I wrap the sleeve around the narrow end of the pin and roll it with my fingers in to a conical tube that follows the shape of the pin. I slide the sleeve and pin into place, making sure the paper catches while it is ¼" or so proud. When the pin is pushed into place, the paper sleeve moves with it, and the pin will ride farther out of the hole. With a few tries, you will learn to adjust the width of the paper slip to control the pin depth precisely. This works on older harps with worn holes and is entirely reversible (unlike bushings, glues or other treatments poured into the tuning pin holes).

Stringing

I find this to be one of the most rewarding phases of harp building. After many hours of work, you will at last give voice to the instrument. One warning – As

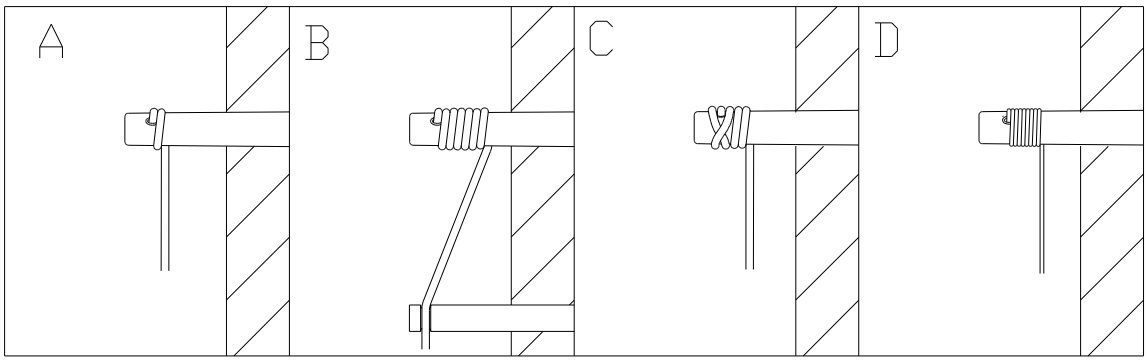
the strings are brought up to tension, the frame will often creak, groan, even pop under the strain. Don't let this worry you unnecessarily. Just push on ahead.

Some builders emphasize a need to slowly bring the harp up to tension over a period of days. After trying it both ways, I don't think there are any advantages on the slow approach. The harps that broke did so because of material or design flaws. If it harp is going to break, I'd rather know now, not in two weeks.

I start at the bass end of the harp and feed all of the wound strings through the eyelet holes. I pull them up and wrap them around the tuning pin. When you tighten strings, you will want them to be slack so they wind around the tuning pins 1-3 times before the string begins to stretch under tension. The number of wraps around the tuning pin is going to vary by the string's gauge and material:

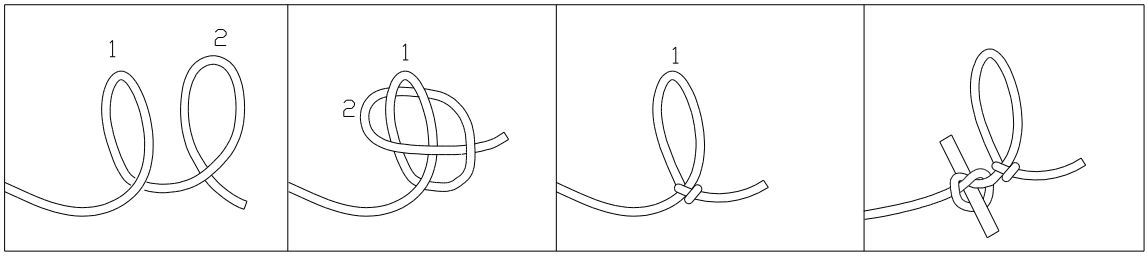
String Type	Pretension wraps	Explanation
Lighter Gauge Nylon/gut Strings	2-3	Thin nylon or gut bends easily tends to slip right out of the hole. Some harpers use a lock wrap, but I find the strings wont slip if I ensure there are three wraps around the pin before the string is pulled taught. The finer gauges are so thin that six or seven wraps fit nicely on the tuning pin.
Heavy Gauge Nylon/gut (>.040),Wound Nylon Strings	0	Heavy gauge nylon kinks around the edge of the hole, and they don't need pretension wraps to hold them in place. I pull the string up so it has about 5 lbs of tension on it before I begin to twist the tuning pin. On most harps these strings will stretch an inch and half before they will hold pitch. This means they will wrap 4-5 times around the pin. Because the string is thick you may run out of room on the pin for the winds.
Plain Wire or wire core	1	Wire kinks on the edge of the hole and will hold itself in place too. A full wrap ensures that the string will wind neatly towards the neck of the harp as the tuning pin is rotated.

After I have the wound strings on, I start to tie on the monofilament strings starting at the treble end. For strings finer than .040", I tie in a snippet of a heavy gauge Nylon or gut string to keep the knot from pulling through the eyelet hole.



A – One-and-a-half wraps for wound metal cores. B - Too many heavy gauge string wraps can overcome the tuning pin, pulling the bridge pin out of position. C. Lock Wrap. D – Fine gauge string.

Some harpers try to tie the knot then insert the string through the back end of the soundboard through the sound box. There is an easier way to do it. Insert the string through the soundboard into the sound box. Pull the string through the sound hole and tie the knot outside, then simply pull the knot into the sound box.



Tying the eyelet end of the string – make two loops (1 and 2). Lift and twist the second loop so it surrounds the first loop. Pull the second loop tight. On fine gauge strings (smaller than .040), I tie in a ½" piece of heavy gauge string using a simple overhand knot. Other builders use beads, finish nails or little brass bars to keep the small knots from pulling through the eyelet.

Once all the strings are tied into place and wrapped around the tuning pin, I bring them up to tension. I use an inexpensive Korg CA-30 tuner ($25 or so), and start in the second octave. The strings here are usually tightened to about 2/3 of their breaking strength, so if you over-tighten the first one (by trying to bring the pitch an octave to high), it will break. This is a minor problem because they are fairly cheap to replace. For the first three tunings, I don't spend any time getting the note spot on. I simply tune the string so it is 20 or 30 cents sharp of its designed pitch then move onto the next string.

At this point the strings will make harp-like sounds, but their tone is usually rather discordant and muddy. Do not fret! It will sound much better once the strings hold pitch and can resonate sympathetically with each other. It takes 4-5

tunings and time for the strings to stretch and adjust to their tension. After the third tuning, I let the harp sit for a few hours.

After the fourth tuning, the harp may hold pitch well enough to play a few lines. I find the top and bottom octaves are the trickiest to tune - a small displacement with the tuning key produces the significant pitch change. The wire core strings in the bass don't stretch much, nor do the short strings at the top of the range. The long nylon strings (3rd and 4th octave in many designs) are stretchy and continue to drop in pitch even after they have been tensioned a dozen times

By the fourth day the harp will usually be able to hold its tuning for an entire practice session. The sound usually continues to improve significantly over the first two or three weeks while the harp's sound board bellies out and the wooden frame bends and adjusts to the string tension load.

I keep the harp tuned morning and night for two weeks before adding the levers.