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Restoration of 1900-1920 Phonoharp 4/30 Chord Zither

Performed by Ron Cook

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For Colleen Story of Idaho Falls, Idaho

Background

The Phonoharp Company was incorporated on April 27, 1892, in Maine. Within a year the company had opened offices in Boston and in 1897 moved into its factory at 150 Liverpool Street where thousands of instruments were made up to the mid-1920s.

Phonoharp made “chord zithers,” five-sided instruments with several octaves of single or double strings and four to six 4-string sets of chords. They were usually played on a table or on a lap with the long side (chords) facing the player. A player’s left hand strummed the chords while the right hand plucked out tunes.

An advertisement in the "The Folio" magazine for July of 1894 describes a zither-like instrument that produced 6 chords and could play in F and C. Another advertisement, in "Ladies' Home Journal" in 1895, lists the same models of the Phonoharp, but it adds a listing of the Columbia Zither. This is the earliest form of the chord instrument which was produced in such great volume and wide variety by the Phonoharp Co. Phonoharp apparently purchased a license to the patent from another builder, named Menzenhauer, in 1894, because its date appears on the note label of almost all of the Phonoharp instruments, as well as on the Menzenhauer instruments.

The Phonoharp 4/30 (Model 2 1/4)

For 10 years, from 1896 to 1906, Sears sold Phonoharp-made zithers through their catalog. They were sold under various brand names, including Phonoharp and Columbia. Instrument names varied, as did the number and arrangement of strings. Some were called guitar-zithers, mandolin-zithers (or mando-zithers), zitho-harps, and piano-harps.

This instrument is a Phonoharp 4/30 (No. 2 1/4). It is a double-strung chord-zither configured with melody strings paired like those of a mandolin. All of the major early 20th century manufacturers of fretless zithers produced 4/30 chord zithers, including Phonoharp, Menzenhauer, Schmidt, and Marx. The 4, in 4/30, is the number of chords; the 30 is the number of melody strings (15 paired strings= 30 strings). Each manufacturer had their own distinctive decorative decals on the soundboards, so even if the label is missing, as in this one, the decal tells who made it. I found several pictures and descriptions of Phonoharp instruments on the internet, including the one on the previous page. Phonoharp labels were most often black with gold lettering inside a gold circle. Occasionally, the Phonoharp 4/30 showed model number "2 1/4" on its inside label.

Valuation

Chord zithers from several companies were made in the hundreds of thousands and sold by door-to-door salesmen through the depression years and by Sears Roebuck and Montgomery Ward's catalogs up to the 1950s. Because so many have survived, prices are relatively low compared to other stringed instruments. The popularity of online auctions has also kept prices low due to the number of chord zithers that continually show up there. Sale prices range from $10 to over $300, depending on condition and rarity of a particular model.

The Phonoharp 4/30, and similar makes and models, were some of the most popular catalog instruments up through the 1920s. The current average value of the them is around $50. Most haven't survived in very good condition, and very few still have their original display boxes, music, music stand, or cases. The value of a mint condition Phonoharp, with music, would be around $300.

For many people, the value is not monetary, but sentimental. To be able to have a restored piece of family history on display, to know its use, its background, and who played it, and to be able to pass it down to future generations, is priceless.

Day 1: Assessment

On the first day, I always look over an instrument to see how much work is needed to repair or restore it. As soon as I took this chord zither out of the shipping box, I saw right away that it would take a lot of labor to make it presentable and playable once again.

From the amount of wear on the edges, I got the impression that this instrument was played a lot during its early years. However, during most of its life it appears to have been "bumped around" and poorly stored in areas of changing humidity and dampness. The top was very dirty and water stained and pock-marked with small gouges. The strings, tuning pins and metal bridges were very corroded and rusty. A crack from the lower bridge to soundhole had opened, due to excessive shrinkage of the wood. Glue joints were failing, and because the strings were still tight, the frame buckled and was coming apart. Sometime during its nearly 100-year history, the back cracked and a large piece broke off and disappeared.

Note: Glue failure is common in old instruments. The reason is hide glue. Hide glue is derived from the collagen found in animal hides. It is very similar to the gelatin we eat and is not toxic. In the U.S. edible gelatin is made from pork skins and hide glue from beef hides. Hide glue is mixed with water and "cooked" as needed and brushed on to surfaces being pieced together. The mixture has to be made in the correct proportions, and if done improperly or with inferior powdered glue, often won't penetrate the wood very well. As hide glue ages, even the best mixtures, it becomes brittle, and any severe bump can cause a glued joint to fail. Sometimes, extremely dry climates, or even the changes of climates from humid to dry and back again, can cause wood joints to "pop" apart, especially if the strings are always tuned to pitch keeping strain on the instrument's body. If an instrument is to be stored away for long periods of time, it is always best to loosen the strings.

Day 2: Dismantle

Taking the zither apart was easy, since most of the glue joints were loose. The back "popped" right off with very little coaxing, which made it possible to repair and strengthen the frame and fix the soundboard crack both inside and out.

Before taking it apart, I removed the remaining strings (several were missing), numbered them, and packaged them in paper CD envelopes. (Perfect size for rolled-up strings.) I also removed and packaged all the tuning pins and hitch pins. Fortunately, all the tuning pins were still in place, but several of the hitch pins were missing.

Day 3: Cleaning and Starting to Glue Frame

I spent most of day 3 cleaning the zither's surface and removing a lot of the hide glue that coated most of the inside.

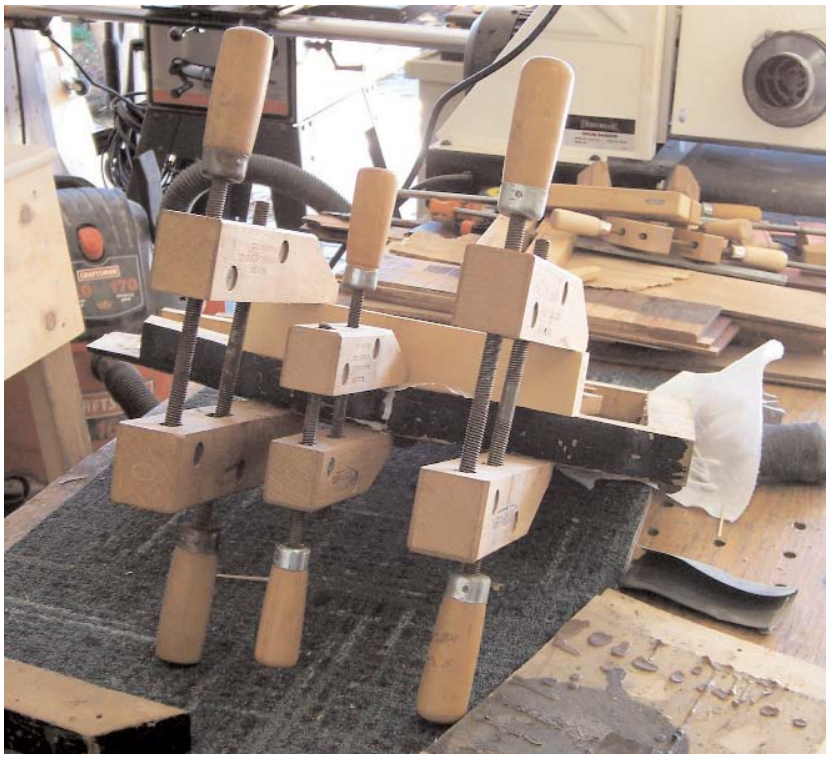
It appears that when this zither was manufactured, probably around 1910, hide glue, usually "cooked" in large pots, was thickly painted on the surfaces to be glued. Because hide glue takes around 24 hours to cure, a lot of the glue dripped, leaving both globules on the inside top and drips on the inside bottom. It looked sort of like stalactites and stalagmites. Hide glue is known to cure and harden for months, even years. However, hide glue on older pieces can crystallize. The amount of crystallization depends on the "quality" of the glue mixture. Some early instruments, as well as furniture, still hold up quite well. But all too often, an instrument can "pop" open at a joint, or the rungs on an old chair can come out, just from continuous use or from getting dropped or bumped.

I ended up scraping off nearly all the hide glue residue from the inside of the soundboard. I figured the glue was inhibiting the soundboard from vibrating very well when the strings were plucked, so taking the glue off should improve the sound.

I cleaned the entire surface three times using soapy water (mild dish soap) and cotton swabs. This is a technique often used by painting restorers. You clean small areas at a time so as not to damage the surface from too much moisture or excessive rubbing. The lower three pictures show the progress.

Once everything was cleaned, I started gluing back portions of the frame.

Day 4: Gluing the Frame



The next day, day 4, I continued gluing the frame. As I mentioned earlier, over the years the string tension warped, or rather racked, the frame as the glue failed. To straighten it back out, I used a very strong white glue in the side and top joints and clamped them together with large wooden clamps fastened over a straight edge. To keep the glue from attaching the clamps and straight edge to the zither, I put waxed paper between everything.

Day 5: Finish Gluing the Frame

It took 3 days to glue the frame back into shape. The final piece to glue, at the top, was originally so loose, it literally fell out when I removed the back. It was thickly coated with crystallized hide glue, so I had to use my stationary belt sander to remove it. Once removed, the piece had a good, all-wood gluing surface.

This particular piece is part of the pin block--that section of the instrument where all the tuning pins are set. I had to make sure it lined up with all the drilled holes in the top the same way. Unfortunately, after removing the glue, the piece lined up with the holes off a little. A few were almost 1/16” off, which is a lot for a 3/16” thick tuning pin. Several days later, I was able to carefully re-drill some of the holes, and it all turned out fine.

Day 6: Back and Top Repairs

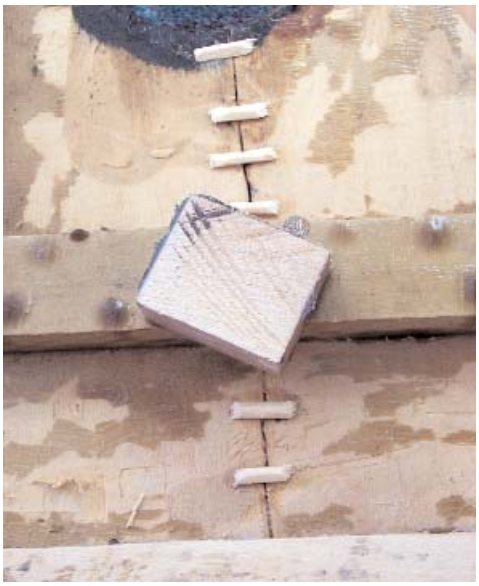
Now that the frame and top were back together, I could start repairing the back and the top crack.

Usually, stringed instruments have a soft wood top and hard wood sides and back. This zither, however, has only a hard wood frame. The sides and back are both soft woods. The frame is maple, which is standard for its strength and ability to hold tuning pegs and hitch pins well. The top and back appear to be pine. Tops on stringed instruments are more often spruce, but old first-growth pine can make a decent soundboard too.

I had an old piece of scrap pine that I was able to cut to fit the missing piece in the back. I ran both edges of the old back through my jointer to make very straight, glueable edges, then glued all the pieces together, clamping down the middle to keep the back from bowing under clamp pressure.

I also used “slivers” of pine to fill the top crack. Because this was a shrinkage crack and not a stress crack, I was unable to clamp it closed and had to fill it with the pine pieces. Once shaved down to the surface, it almost disappeared. The lower right picture shows all the results.

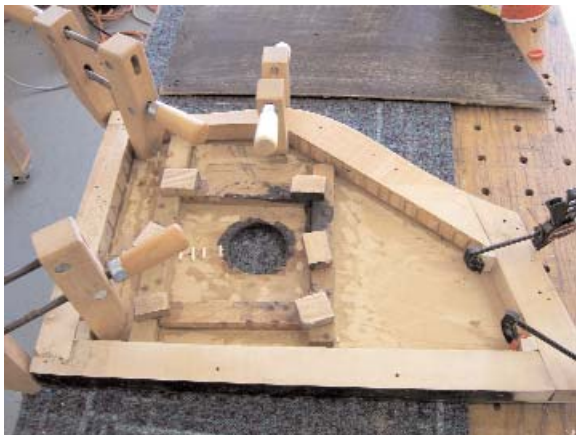
Day 7: Adding “Cleats”



On day 7, I turned the top and frame over and glued tiny cleats across the back of the top crack. These cleats help to strengthen the top and to keep the crack from opening again. I also added a few cleats to the back of the small crack on the treble end of the instrument. It is such a small crack that it barely shows on the top, but to keep it from opening any more, the cleats will protect it.

The upper left picture shows the cleats being glued, and the upper right is the result. The lower picture also shows the back with the new piece in place and partially sanded.

Day 8: Adding “Strengtheners” and Gluing on the Back



Before gluing the back to the frame, I decided to add a few small maple “braces” in the corners. These small triangular pieces lap over all the side frame joints and will help keep them from ever opening again. It helps strengthen the frame to protect it from warping from the string tension.

Around four hours later, after the glue for the corner braces set well, I re-attached the back. I put on a fair amount of yellow glue and clamped the back onto the frame using several cam clamps and around 25 spool clamps.

Cam and spool clamps are a luthier’s favorite and most used clamps. Cam clamps can apply a lot of pressure, but can’t be overtightened like screw clamps. Spool clamps are commonly used to gluing tops and/or backs on guitars, mandolins, and violins, or any instrument where a top or back attached to sides.

Day 9: Stain the Crack Repair and Clean Tuning Pins

It looked to me like the top color was an old light walnut stain under a shellac top coat. So I applied a light walnut stain to the little splice in the crack repair using a fine-point artist's paint brush. It blended in very well.

At this point I decided to clean all the tuning pins. Because the zither seems to have been stored in a moist environment at one time, the tuning pins were heavily corroded and rusty, as were the steel strings. On day 9, I spent several hours wire brushing each of the 46 pins, holding them with a small pair of vise grips against a spinning wire wheel. This removed the rust and corrosion. Afterwards, I used a fine wire brush in a Dremel tool to finish up the cleaning.

Day 10: Sanding, Preparing, & Painting

On day 10, it was time to start the finishing process. To even out and smooth out most of the scratches and gouges in the back, I sanded it down as much as possible using an orbital palm sander. I cycled through three grades of sandpaper, down to 220, then did a final rub-down with 0000 steel wool.

After cleaning off the sanding dust, I put painter's tape all around the top edge, turned the zither over and began applying three coats of black semi-gloss enamel, similar to what was originally on it. Of course, back at the turn of the 20th Century, they used non-environmentally friendly oil paints, and they were often lead-based paints, which is very hazardous to remove. (Gloves and masks or respirators, should be used when removing old paint.) I used a much safer water-based enamel. It took the next two days to paint the three coats.

Day 11: Painting the Bridge

After the back paint dried thoroughly, I removed all the tape and touched up any edges where the paint either bled through or missed.

On day 11, I again used painter's tape to tape around the upper and lower bridges. Originally, the bridges had a gold gilt paint on them. Nearly all the gilt had flaked off. Only the "trough" where the metal bridge inserts sat had some of the old gold paint still there.

I purchased a couple of different "liquid gold" paints from our local artist supply store to try out, but they didn't work well. My wife found another type and ordered it for me through the same store. This liquid gold worked great. I used an artist's brush and put two coats of the gold paint on both bridges.

Day 12: A Very Busy Day

Polishing

Installing Tuning Pins

Stringing

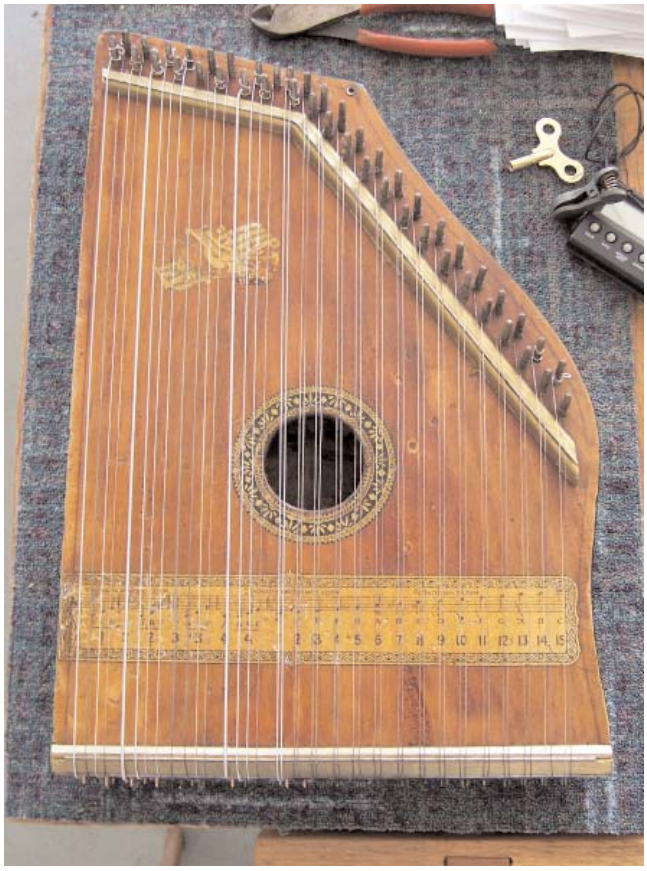
Day 12 was a very busy day. It started with a final cleaning and polishing of all surfaces. I applied several coats of a fine, non-abrasive paste wax called Antiquewax. I use this on nearly all my finished instruments. After polishing the back, I installed new “feet,” four small plastic pieces screwed into holes in each of the four corners, where the original feet had been. (The new feet are similar to others I’ve seen on similar instruments.) To protect any surfaces this zither might sit on, I also put felt pads on the bottom of the feet.

Next I re-installed all the tuning pins. Because of the age of the instrument, some of the tuning pins were too loose to keep strings up to pitch. I added paper and wood shims inside some of them so they would tighten much better. At the bottom of the zither, I re-installed the hitch pins. Several of the originals were missing, so I replaced them with newer copper hitch pins that were approximately the same size.

Finally, I began stringing. I was able to salvage nearly two-thirds of the old strings. I cleaned them with 320 grit sandpaper and 0000 steel wool. A couple broke when I tightened them, but I had a few newer strings of the same gauge to replace them.

Day 13: Completion

Before



After

Early on day 13, I made a trip to my local music store and picked through hundreds of strings to find the sizes I needed to finish up the zither.

A full set of zither strings can cost around $200. That's why I salvaged what I could from the old ones, and purchased bulk banjo and guitar strings for those that were missing. The hardest to replace were two of the largest bass strings. I found the equivalent size in round-wound bass guitar strings. The size, however, was too big to fit through the tuning pin holes, or to fit onto the hitch pin. I ended up cutting an end, and unwound the steel wire windings for several inches to expose the single internal wire, which fit through the tuning pin quite easily. I did the same for the hitch pin end, then wound that end into a loop to fit over the hitch pin. It worked great, and sounded bright and wonderful.

With those final two bass strings, all I needed to do was tune it. Once done, I tried it out. Beautiful! I'm sure removing all the glue from the inside of the soundboard improved the tone. It's a very lovely sound much like the psalteries I build. I'm very pleased with the results.

Additional Notes

One thing that is missing, and appears to have been lost a long time ago, is the metal cover over the hitch pins. The picture below shows the one on my Marxophone, which was made around 1910-1920 by Phonoharp, the same company that made your zither. My Marxophone is the same exact size as your instrument and has the same 4/30 string setup (four 4-string chords and 15 doubled melody strings).

The cover is thin, stamped steel, painted gloss black. Because it's steel, it has a tendency to rust, and many of these old instruments have lost them because they just rusted away, broke off, and thrown away. But there are many still out there on old instruments. While checking the internet on Phonoharp Chord Zithers, I came across a large listing of various old instruments for sale on e-bay. One gentleman I repaired a Marxophone for purchased his on e-bay. He also bought a second one for parts, and I was able to combine the two into a restored, fully functioning instrument.

I mention this because it is very possible you can find and purchase an instrument like yours on an online auction site for very little money. Some of the zithers in very bad shape were going for less than $30, and I saw some nearing the close of bidding at less than $10. It's possible you can find one in the future with a hitch pin cover you can put on your newly restored zither. That would complete the restoration.

String Charts for Phonoharp 4/30 Chord Zither

Below are string charts for the chord and melody strings of the Phonoharp 4/30 Chord Zither. Many of the strings under 0.48 can be purchased at music stores. A few carry the round-wound bass guitar strings (0.85 and 0.81), but those require modifications, like I mentioned in this repair log.

If you need to replace any strings, purchase loop-end strings, like banjo strings. Those come in sizes up to around 0.52. If a gauge isn't available, the next size down is fine. For example, if a 0.23 is not available, a 0.22 will work. I had to do this with several replacement strings because many odd-number-size strings are no longer available anymore. *(Caution: Do not go up in gauge size to replace an unavailable string. Higher gauged strings tuned up to a higher level can possibly break and put too much strain on instruments.)*

Chord Strings		
Chord	Note	Size /Type
1 [C]	C	0.48 wound
	G	0.34 wound
	C	0.24 plain
	E	0.24 plain
2 [G]	G	0.85 wound
	G	0.38 wound
	B	0.18 plain
	F	0.20 plain
3 [F]	F	0.48 wound
	A	0.34 wound
	C	0.23 plain
	F	0.23 plain
4 [Am]	A	0.81 wound
	A	0.38 wound
	C	0.26 plain
	E	0.23 plain

Melody Strings (2 each)	
Note	Size /Type
1 C	0.35 wound
2 D	0.25 plain
3 E	0.25 plain
4 F	0.23 plain
5 G	0.23 plain
6 A	0.21 plain
7 B	0.21 plain
8 C	0.19 plain
9 D	0.19 plain
10 E	0.19 plain
11 F	0.17 plain
12 G	0.15 plain
13 A	0.15 plain
14 B	0.13 plain
15 C	0.12 plain