From the Workbench of Allen Miller . . .

The Taming of Niagara Falls

Modernizing an Early Wurlitzer Marimba Harp

While this article deals specifically with Wurlitzer harps, the theory and design solution to a specific problem may be of interest and application to other organ devices.

Most Wurlitzer equipment was well designed and built, even though some of the design is not as simple and elegant as that of some of their competition. There are some real "dogs" in the lot, however, and I would like to show in detail how one of these can be corrected.

Wurlitzer and other brand wood marimba harps are most desirable for their musical and very pleasant sound. Early Wurlitzer harps are "dogs," and may be identified usually by their hammers being large piano type hammers (as opposed to wood balls with round felt pads on the striking surface.)

The type of hammer is not detrimental, in fact, I personally prefer the piano type hammer for its ease of "voicing." The flaw in the early harps causes chronic air leaks producing the sound of Niagara Falls.

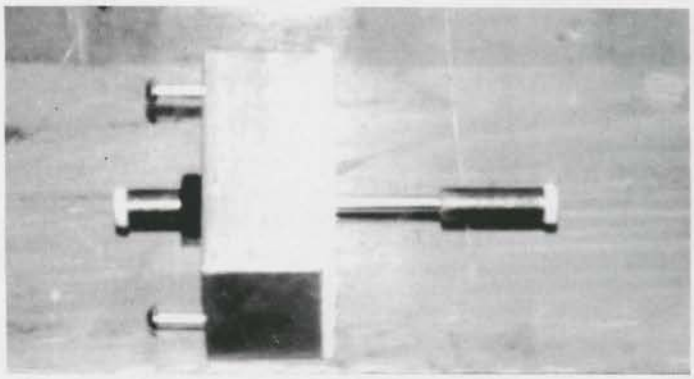
The cause of the problem is an oddity of design not found in any other Wurlitzer action. The pneumatics are inside-out, or more correctly, outside-in. I surmise that the construction came about due to the need for the maximum possible size pneumatic to maximize striking force. External pneumatics requiring space between them for the cloth to blow out were not powerful enough, so Wurlitzer decided to put them inside where the cloth would blow inward and thus allow closer spacing or actually larger pneumatic heads. Internal pneumatics also benefit from the vector forces produced by the leather or cloth initially collapsing, which is lost in an outside pneumatic.

But, how do you get a collapsing internal pneumatic to move an external hammer? Well, Wurlitzer decided that the force could be transferred by a dowel from the top of the pneumatic (inside it) to the hammer, with the dowel simply running through a hole in the action chest. A nice idea, but clumsy, AND when the note is NOT being played, the inside of the pneumatic is pressurized. Air thus blows out the dowel hole for every note **not** being played. Remember that when a note is played, the air inside an internal pneumatic is exhausted to atmosphere.

The "solution" is to bush the dowel hole with felt so that the dowel is snug enough to move freely, yet will not leak. In reality, once you have carefully sized, felted, and reamed all of these bushings, the harp leaks minimally until the next change of weather, at which point the bushing either seizes upon the dowel or goes loose and "Niagara Falls" comes back. It must have been a headache to Wurlitzer, because they found a solution and "fixed" the late harps. From some examples seen, they also repaired some earlier harps.

Instead of bushing the hole, Wurlitzer changed the push-rod to a steel rod with dowels at the ends only. This rod passed through a bearing block which screwed over each chest hole. The particular design was slightly complex, but fixed the problem and worked quite well.

The good news is that you can easily do the same thing, and with an even simpler design which I have found to work flawlessly.

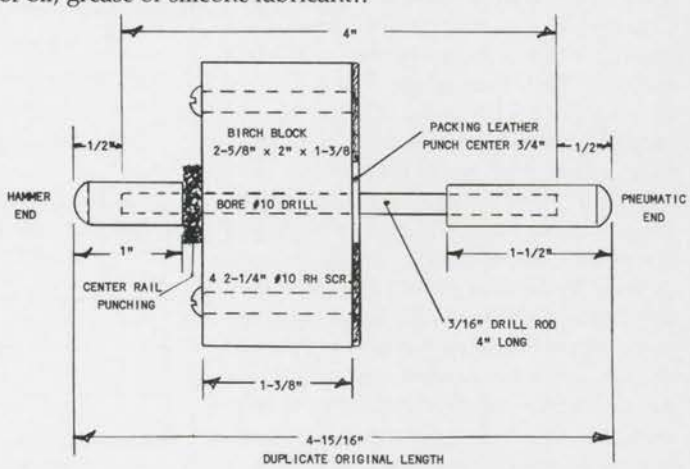


PUSH ROD AND BLOCK ASSEMBLY

For each note, you need a block of maple or birch, a length of 3/16" drill rod, and the original push rods. I bore four mounting screws, and bore a 3/16" hole in the center. This MUST be done in a drill press.

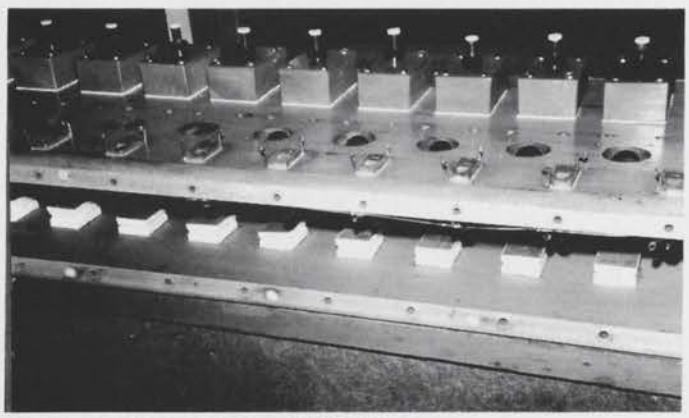
Give each block several coats of shellac on the sides and top. Go back and ream each hole with a #11 drill to give about .004" clearance between the hole and the drill rod. It needs to fit closely enough that there is no slop in the rod, but free enough for the rod to drop through the hole of its own weight. If the rod seems too tight, ream the hole again with a #10 drill. This will give .006" clearance. Of course, working tolerances will vary this "textbook" clearance. You should not have to go larger than a #9 drill.

I find that the hole does not need lubrication, but if you desire, use only DRY graphite or Teflon. Do not use ANY form of oil, grease or silicone lubricant!!



WURLITZER LATE STYLE HARP PUSH ROD AND BLOCK
MAKE 49

Carefully measure the length of the original dowels. If they do not match the length shown here, you will have to make suitable alterations to the dimensions given. Cut off the ends and bore them so that when assembled, they are as shown. Dimensions are somewhat critical. You will have to bore the push rod ends in a lathe to exact depth. Mount the blocks over the chest holes between the hammers and the inside of the pneumatics, making sure the rods are centered on the holes.



PUSH RODS MOUNTED IN PLACE

You need a good quality bushing cloth between the ends of the push rod and the inside of the pneumatic and also the edge of the hammer arm. I have seen this felt both on the ends of the push rods and alternately inside the head of the pneumatic and on the hammer arm. I slightly prefer a rectangle of bushing cloth on the pneumatic and hammer arm, as the smaller round punchings may tend to come unglued from the push rod ends. The example used here had the punchings on the push rods.

Theoretically, when the hammer is at rest, the push rod should be of a length which pushes the pneumatic about 1/8" less than fully open. If you shorten the push rod, you will reduce the striking force, which might be OK except that it also affects reiteration parameters and taken too far, would make reiteration adjustment impossible.

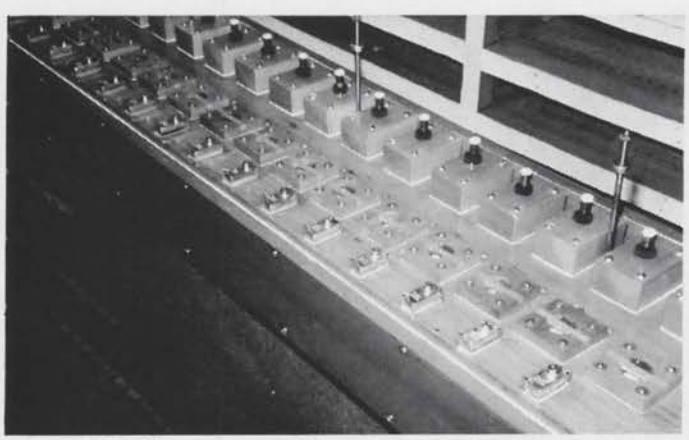
My colleague, David Junchen has pointed out a problem associated with an unenclosed, or prominent acoustical location of the harp, in that it may be too loud. One solution is to enclose the entire harp. Another solution is to move the hammer rest stop felt closer to the bars. This reduces the striking distance and the pneumatic opening at the same time, reducing both the force and acceleration of the hammer. This also may impose some difficulties in adjusting reiteration rates, but I have found it to be very effective. The hammer rest felt is glued to the primary valve muffler cover and is not adjustable. You could either build up the felt or modify the muffler.

With an old style harp, you can shape the hammer striking surface using a wire wheel mounted in a bench grinder. This also cleans the felt and fluffs it to "like new" condition. A flatter, wider striking surface will produce less harmonics and a softer tone. A late style harp could possibly be treated by adding another 1/8" to 1/4" of felt to the hammers. I would use a plastic glue, such as PVC-E or preferably a thin application of Silicone Rubber to apply the extra felt so as not to harden the felt further with glue.

If you are completely rebuilding a Wurlitzer Harp, you should be aware that the top and bottom action construction is precarious. To accommodate the width and channeling, these pieces are made of two or three pieces edge-glued. The pressure over the unsupported width is enough to crack the boards at the blue line, and they leak. At the least, the top and bottom bulge apart slightly, tending to partially operate the primary valves. This is another cause of air noise and also erratic operation.

Make sure the glue joints are sound. You may want to run three 1/8" threaded rods down through the center of the action spaced at each quarter of the length to reinforce the action chest from bulging. Alternately, reinforcement strips could be run externally across the top and bottom boards wherever you can find space to do so. Aluminum or steel angle would also work. The threaded rod is preferable because it can be installed flush and not show.

The results produced by these modifications are well worth the effort.



HARP ACTION READY FOR INSTALLING HAMMERS.

HAMMERS IN PLACE.

Allen Miller is currently nearing completion of the installation of a 3/31 Wurlitzer in the residence of Karl and Barbara Saunders of Zanesville, Ohio. This organ is a fusion of two instruments with several newly constructed Wurlitzer style chests and some new pipework.

All original organ components were disassembled to bare boards, rebuilt and reassembled to "Factory new" condition or better. All phases of reconstruction and installation were given careful consideration and planning, which started when plans for the home were just pencil sketches. Attention to details has gone well beyond "normal" theatre organ restoration and installation.

While this installation will deserve a feature article when completed, many of the details are well beyond the scope of a single article. Since much of the information is technical, we have decided to cover some of it in this and future "From The Workbench" columns.