A Treatise on Pipe Chest Rebuilding

Part I

Tim Wagner

The set up

Ever since hearing my first band organ on the merry-go-round at Roseland Park in Canandaigua, NY, I was hooked on the merry sounds of outdoor mechanical organs. From my first theater organ concert, when the colorful console of the Mighty Wurlitzer rose from the pit at North Tonawanda, NY's Riviera Theater, I was hooked on theater organs. The intervening years have only served to foster my appreciation and interest in these marvelous mechanical devices. Whether it be their history, their appearance, their music or their mechanics, every facet of these instruments holds interest for me. Through publications, organizations and conversations I have learned much on the subject. I've been fortunate to meet knowledgeable and capable folks, willing to share their wisdom. Keenly interested in the nitty gritty of pneumatics, I've been further blessed to make the acquaintance of Mr. Jim Stetts of Williamsport, PA. A retired electrician/shop manager, Jim's impressive skill set has been employed in designing and building his home, rebuilding and installing a pipe organ therein (actually, two), and rebuilding theater organ pipe chests and components for other installations. I met Jim through the Rochester Theater Organ Society. Upon learning of Mr. Stetts' skills in rebuilding pneumatics and such, I inquired if I could visit his shop and see if I could learn a thing or two about a thing or two. Here's my story.

Figure 1. Stett's residence.

Saturday, January 29th, 2011 found me driving from Rochester, NY to the Williamsport, PA home of Jim and Lorraine Stetts, for a primer on pipe chest rebuilding (**Figure 1**). Members of the Rochester Theater Organ Society, Jim and Lorraine have a lovely home of their own design and construction, featuring a Wurlitzer 3/14 Theater Pipe Organ. Wurlitzer Opus 1203, a style 260 Special, the organ debuted with the Stanley Theater in Camden, NJ in 1926 (**Figure 2**).

Figure 2. Lorraine and Jim Stetts.

After a pleasant lunch I was treated to a personal tour of the organ installation. This installation is not the result of a tinkerer. Every detail speaks to the care and knowledge of a meticulous craftsman. I'm glad I took pictures, 'cause they serve here better than words (**Figures 3 - 6**). During the tour, I learned that the house had been designed and built before Jim and Lorraine were bitten by the organ bug. The portion of the house I was now standing in had been designed and added in 1988, to accommodate their first organ acquisition, a 1936 12-rank Möller church organ. A separate relay/tremulant room comple-

Figure 3. The solo chamber.

Figure 4 (above). The main chamber.
Figure 5 (below). The relay room.
Figure 6 (bottom). The solo chamber.

ments twin chambers under full expression. Regarding their current organ, Jim explained, "We located the start of our Wurlitzer in 1991 in Atlanta, GA and sold the Möller to a church in Clearwater, FL late in 1991. We made trips to Kansas City, Chicago, Youngstown, OH, Bethlehem, PA and New Jersey, buying chests, pipes and many more pieces. The only help I had was when I couldn't move something myself; I rounded up the neighbors or Lorraine to get the piano and chests into the chambers. The Wurlitzer was first played for friends and family by Bob Eyer from Chambersburg, PA on Aug. 8, 1996."

With my mind already overwhelmed, Jim and I settled in his workshop for my education. Jim is helping to rebuild a church pipe organ. It is believed that the instrument was manufactured by the Hope-Jones Organ Company in Elmira, New York, circa 1907-1910. British-born company founder Robert Hope-Jones is historically important for developing the unification of pipe organ divisions. He contributed many technical and tonal improvements and patents to the field and provided the foundation for the Wurlitzer theater pipe organ empire. Wurlitzer theater organs were initially marketed as Hope-Jones Unit Orchestras. Jim Stetts' task is to rebuild the pneumatics and primary valves from a five-rank pipe chest and perform any related repairs to the bottom boards. The chest for each rank is composed of two halves, resulting in 10 bottom boards for the five-rank chest. Four ranks of the chest have 73 notes each and one rank has 66 notes. This totals 358 primary and secondary pneumatics and primary valves that require rebuilding. That's a lot of work. To demonstrate the variety of tasks involved in rebuilding pipe chest components, Jim had prepared work in various stages of rebuilding for me, so, let's take a look.

The Basics

Jim had drawn a cross-section diagram of a typical Wurlitzer pipe chest, which proved indispensable for my education and understanding of pipe chest components and how they work (**Figure 7**). The Hope-Jones pipe chest is similar to a Wurlitzer chest for good reason; after the Hope-Jones company closed in 1910, Robert Hope-Jones was hired by Wurlitzer to head their newly formed

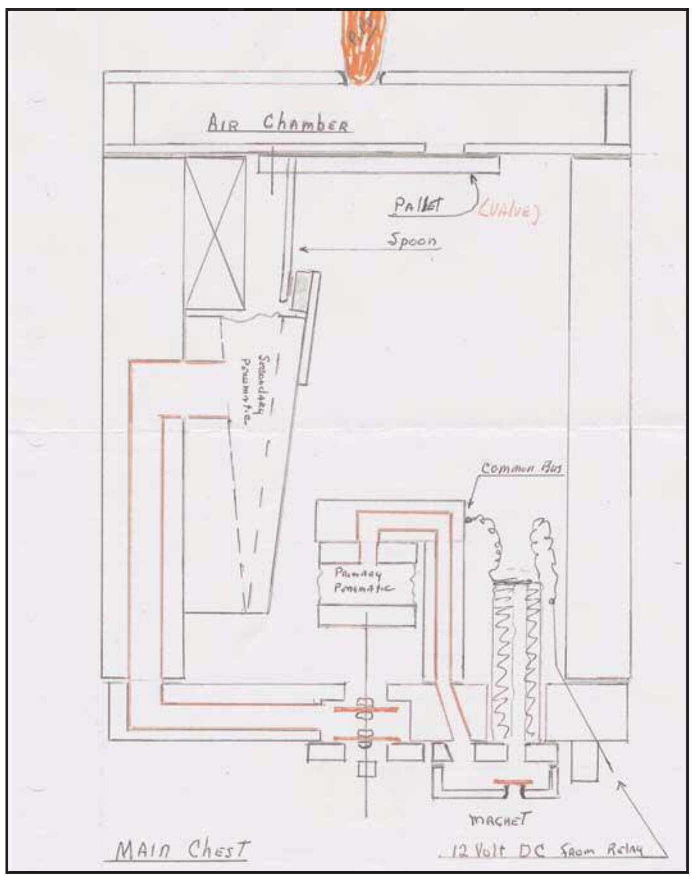


Figure 7. The Wurlitzer pipe chest diagram.

pipe organ division. Regarding pipe chest operation, here's the skinny. Each pipe in an organ requires an electromagnet, primary pneumatic, primary valve, secondary pneumatic, pallet valve and air pressure to allow it to speak. All these components are housed in the pipe chest, upon which the pipe sits. When the organ blower is powered up, air pressure fills the pipe chest. The amount of pressure, measured in inches, is regulated by regulators (of course), which are spring-tensioned mechanical devices located between the blower and pipe chests. Air pressure fills the cavity of the pipe chest, as well as the primary and secondary pneumatics within. The inflated primary pneumatics serve to keep the primary valves in the lowered position, allowing air pressure into the secondary pneumatics. When the organist presses a key on the organ console, electric current (12 volts DC) is supplied to the electromagnet, which attracts (raises) the armature (circular metal disc). In the raised position, the armature cuts off air pressure to the primary pneumatic and opens it to atmosphere. The air pressure inside the primary pneumatic is now less than the pressure surrounding it, so it collapses. This raises the primary valve, which cuts off air pressure to the secondary pneumatic and opens it to atmosphere. The air pressure inside the secondary pneumatic is now less than the pressure surrounding it, so it collapses. As it collapses, the spoon tab attached to the top of this secondary pneumatic pushes against the spoon of the pallet valve, forcing the pallet valve to open, allowing air pressure to pass into the air chamber, thus allowing the pipe to speak. This all happens in the blink of an eye. Of course, for all this to work properly, the components need to be initially manufactured and sealed properly and, as time goes by, rebuilt and sealed properly. This is where Jim Stetts comes in, with an inquisitive Tim Wagner along as an extra added distraction.

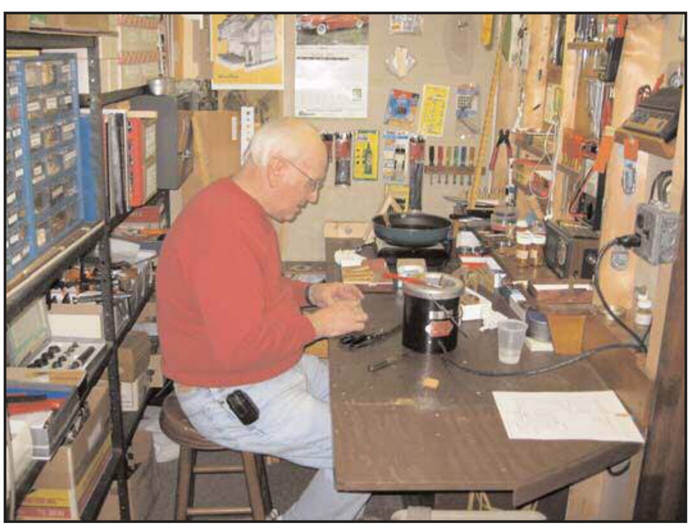


Figure 8. Jim's workshop.

Within arm's reach of the Wurlitzer organ console in the Stetts' music room, Jim accomplishes wonders in his compact but well-stocked workshop (**Figure 8**). Along with boxes of leather, pre-cut gaskets, sorted small parts and hand-tools, Jim has assembled numerous custom jigs (or fixtures) designed to accomplish specific tasks. A collection of empty containers allows Jim to store and organize screws, washers and other hardware removed from pipe chest components during the rebuilding process.

Figure 9. The pipe chest bottom boards.

Disassembled bottom boards, removed from the 5-rank pipe chest, lean against one wall (**Figure 9**). One look at these boards reveals their complexity, functioning not only as a base for the magnets, primary pneumatics and primary valves, but also containing multiple air channels necessary for component operations and connections. These bottom boards are attached to the bottoms of pipe chests with spring-tensioned screws. To create an airtight seal around the perimeter of the bottom boards, cowhide (rough on both sides) is glued to the bottom of the pipe chest walls (with hide glue), forming a gasket along the perimeter. The combination of spring-tensioned screws and cowhide gasket assures an airtight seal.

Figure 10. Removing the valve cover from the bottom board.

To begin disassembly of the bottom board components, one bottom board is supported, bottom side up, several inches above the workbench. Two wood blocks, a bit taller than the components projecting from the bottom board, support the board on both ends. The valve cover (made of wood) can now be unscrewed and removed (**Figure 10**). A cowhide gasket provides an airtight seal between this valve cover and the bottom board. With the valve cover out of the way, the primary valves can be removed.

Figure 11. Removing primary valves with a keyless chuck drill.

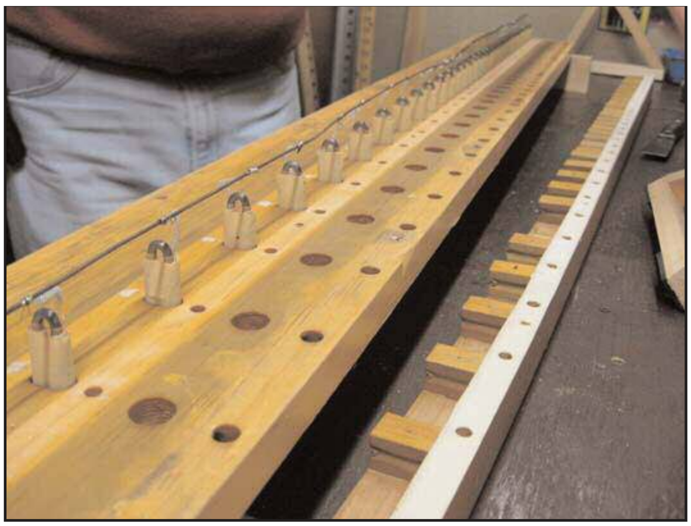
A drill with a keyless chuck provides an efficient method of unscrewing the dozens of valves from their pneumatics. This process is accomplished most easily with the bottom board resting on an angle, thanks to a couple of custom, angled wood supports and clamps (**Figure 11**).

Figure 12 (above). Bottom board with magnets, primary rail and primary pneumatics.

Figure 13 (below). Primary rail and primary pneumatics.

The primary valves are set aside for later rebuilding. The bottom board can now be placed, top side up, upon the two wood blocks mentioned above. Magnet caps protrude below the bottom board, while the magnet coils, primary rail and primary pneumatics live "above board" (**Figures 12 & 13**). Unscrewing and removing the primary rail from the bottom board will allow access to the primary pneumatics. A cowhide gasket separates the primary rail from the bottom board. After decades of pressure, gaskets can often stick to their non-glued surface; a putty knife and patience resulted in liberating the primary

Figures 14 & 15. Removing the primary rail



rail with its intact gasket (**Figures 14 & 15**). With the primary rail separated, it can be laid on the workbench, exposing the primary pneumatics, which can be separated from the rail with a putty knife (**Figure 16**). The gasket material between the pneumatic and rail is sacrificed. With the pneumatics removed, remaining gasket material is gently scraped off with the putty knife, being careful not to gouge the wood surface. Jim then applies a hot, wet washcloth to the remaining glue to soften it, scrape it and wipe it away (**Figures 17 & 18**). Fortunately, hide glue had been used to fasten the primary pneumatics and gasket material to the primary rail. Hide glue is removable when moistened. Hot moisture works best. Reversibility is the main reason hide glue is used on organ components which will require rebuilding. Any remaining glue can be removed with a light sanding, if necessary. Wood glue should only be used on components that are not meant to require rebuilding.

Figure 16. Separating the primary pneumatics with a putty knife.

Figure 17. Removing primary pneumatic gaskets.

Figure 18. Removing primary pneumatic gaskets and glue.

Figures 19 (above) and 20 (below). Removing leather, gaskets, and glue from primary pneumatics.

Primary Steps

Now that the primary pneumatics have been liberated, they can be rebuilt. What better way to celebrate liberation than with a nice hot bath! Before we can re-cover these hard working individuals with new, supple leather, we must first remove the old leather. Utilizing an electric hot plate, frying pan and tap water, Jim prepared a hot bath to soak the small, primary pneumatics in. As a first timer, I was amazed at how easily the leather and remaining gasket material separated from the wood components after only a few minutes (**Figures 19 & 20**). Jim is apparently a wizard as well. That wonderful, reversible hide glue was in evidence once again. After soaking, Jim wipes the top and bottom wood pieces of the pneumatics, and sets them out to dry for at least 24 hours (**Figure 21**).

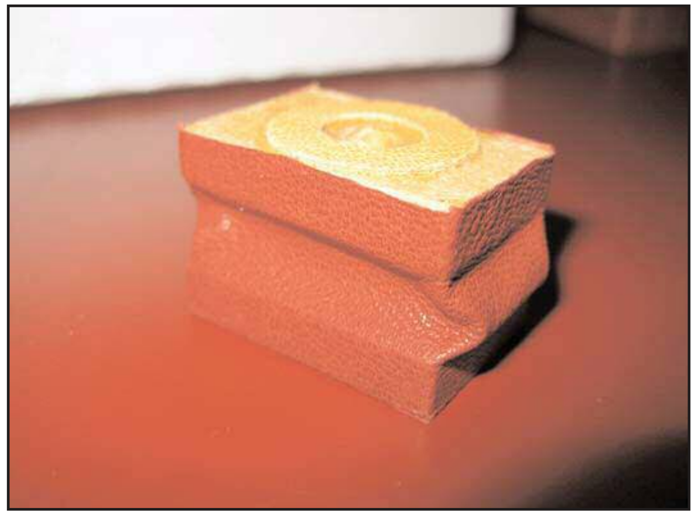


Figure 22. A re-covered primary pneumatic.

Each primary pneumatic is made up of a small top and bottom wood block, spaced apart and wrapped with supple, pneumatic leather, creating a cavity. A hole in the top block allows air to enter/exit the pneumatic (**Figure 22**). The pointed end of the threaded, primary valve wire is screwed into the bottom block. Extra thin pneumatic leather was purchased for recovering the primary pneumatics and smaller secondary pneumatics, while thin pneumatic leather was purchased for recovering the larg-

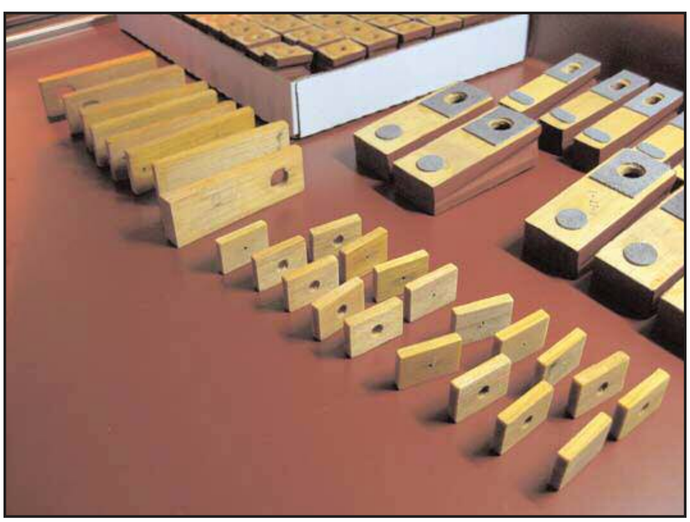


Figure 21. Primary and secondary pneumatic pieces drying.

Figure 23. Leather hide marked for cutting.

er secondary pneumatics. To maximize output from the leather hide, Jim measures and marks the hide before cutting it (**Figure 23**). Dimensions for the leather strips needed to recover the pneumatics are determined by measuring the primary and secondary pneumatics. Length is determined by the sum of all four sides plus an overlap. Width is determined by the height of the open pneumatic, plus some overage.

Figure 24. Clamp and custom spacer for holding primary pneumatic blocks.

To recover the primary pneumatics with new leather, Jim uses a purpose-made clamp that holds the two wood blocks apart and parallel, allowing the pneumatic leather to be glued to the sides of the blocks. Jim made a custom spacer for this job, to match the spacing of the existing primary pneumatics (**Figure 24**). With a top and bottom block correctly oriented in the clamp, hide glue is applied with a brush to one side of the pneumatic at a time, followed by the application of extra thin, slightly oversized pneumatic leather (**Figure 25**). Look for a glossy surface of the hide glue on the wood surface to assure enough sat-

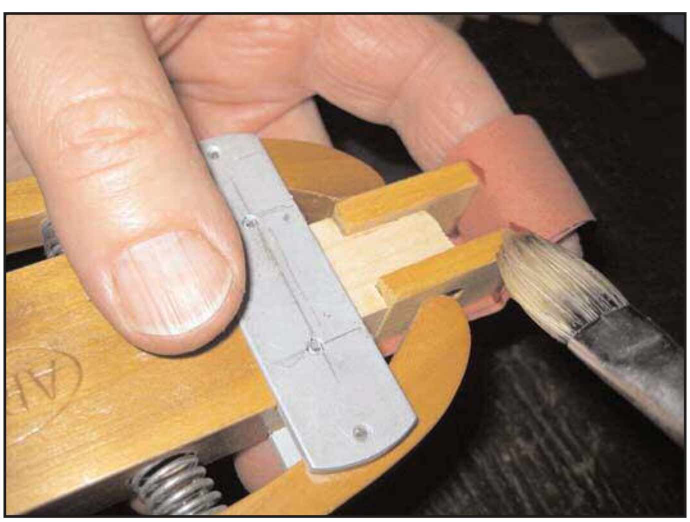
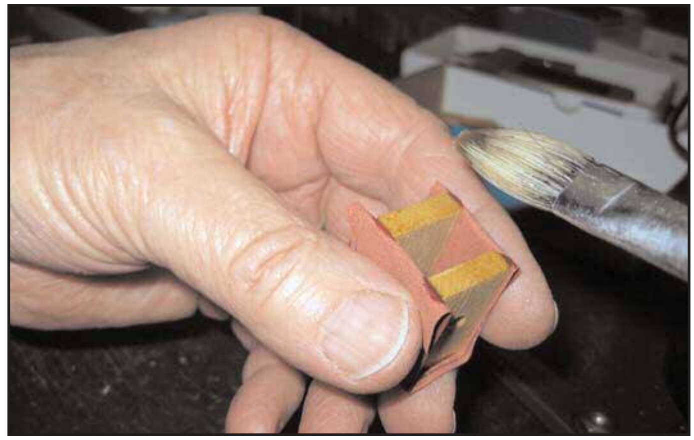


Figure 25. Gluing leather to primary pneumatic blocks.



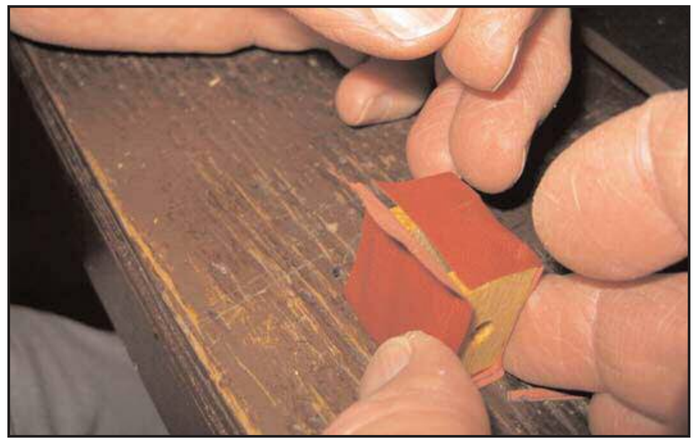
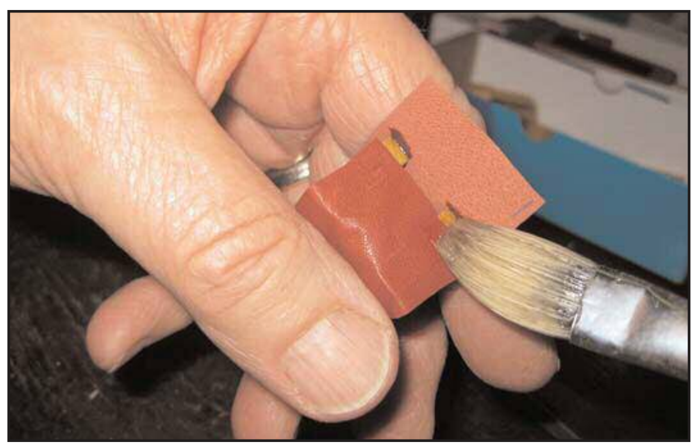
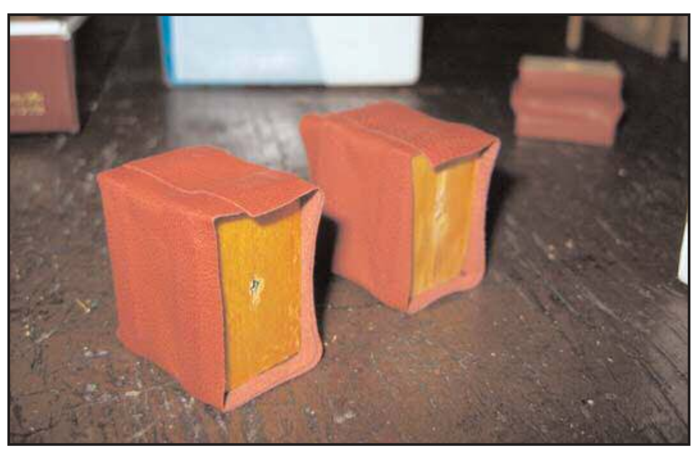


Figure 26 (top). Gluing 4th side of primary pneumatic, 1st stage
Figure 27 (above). Gluing 4th side of primary pneumatic, 2nd stage.
Figure 28 (below). Gluing 4th side of primary pneumatic, 3rd stage.
Figure 29 (bottom). Re-leathered primary pneumatics.





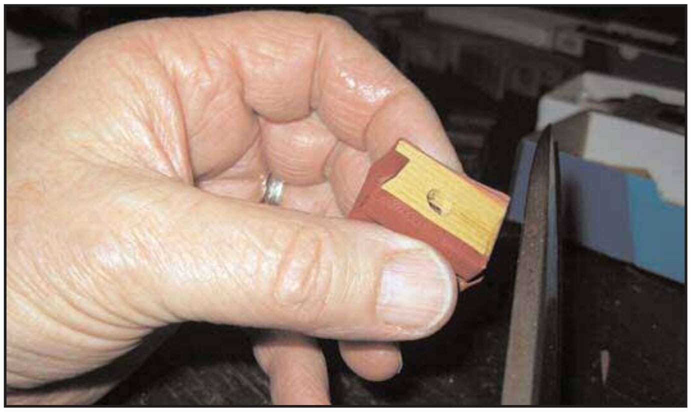


Figure 30. Trimming the leather on primary pneumatics.

uration and pay attention to the corners, as pneumatics must be airtight. When placing leather upon the first side of the pneumatic, it's important to leave some overlap on one end for gluing the fourth and final side. After gluing three sides, each pneumatic is set aside to dry while gluing the remaining pneumatics. When this is done, the fourth and final side is glued on each pneumatic. It's important to securely glue the overlapping leather (**Figures 26 - 29**). Once the glue has had an opportunity to dry (several hours), protruding edges may be trimmed (**Figure 30**). To complete each primary pneumatic, a leather gasket, surrounding the hole in the top block, is applied. Pre-punched gaskets from an organ supply firm were used. (**Figure 31**)

Figure 31. Rebuilt primary pneumatics.

Part II of
A Treatise on Pipe Chest Rebuilding
will appear in the next issue (#49) of the ***Carousel Organ.***

Tim Wagner works as a film technician in the motion picture department of George Eastman House International Museum of Photography and Film in Rochester, NY. Tim and his wife, Ruth, live in Fairport, NY along with *Finster Baby,* Tim's 3-year old Vienna Woods 20-note belly organ.

A Sticky Situation

Hide glue is the fabric that holds the organ-building universe together. Whether you're building a brand new chromatic concert organ or rebuilding an antique band organ, hide glue is your friend and ally. Having read and heard about this mystical substance for decades, I had never had the opportunity to work with it or see it in action. My visit with Jim allowed me to correct this. As I learned, hide glue comes in flakes, which is dissolved in water in a heated glue pot (**Figures 33 & 34**). You control the amount of water to create the desired viscosity of the glue. As Jim explained, different organ components will require different thicknesses of hide glue. As hide glue thickens in the heated pot over time, it can be thinned with water. A wire hook extending from the bottom of the pot provides a rest for your glue brush. Due to the small amount of glue required for the work we were doing, Jim had a small glass jar of hide glue that he placed within the glue pot. Hide glue will solidify in a container after it cools; re-heating in the glue pot will make it workable once more.

Figure 32.(above). Hide glue flakes.

Figure 33 (right). The glue pot.

A Treatise on Pipe Chest Rebuilding

Part II

Tim Wagner

Secondary steps

Secondary pneumatics are the larger pneumatics inside a pipe chest, responsible for opening the pallet valves, which allow pipes to speak. In a Wurlitzer or Hope-Jones chest, these pneumatics are glued to the inside wall of the chest containing the air passages from the primary valves. Each secondary pneumatic is made up of a top and bottom block, hinged at one end and wrapped with supple, pneumatic leather, creating a hinged cavity (**Figure 34**).

Figure 34. Secondary pneumatics prior to rebuilding.

A hole in the bottom block allows air to enter/exit the pneumatic. Small wooden spoon tabs are attached to one end of the top block with screws. It is these felt-covered wooden tabs protruding from the moving end of the pneumatic which press against the spoon of the pallet valve, forcing it open. A putty knife can be used to separate secondary pneumatics from the inner surface of the pipe chest. Before soaking the secondary pneumatics to remove the old leather and glue, it's important to first unscrew and remove the spoon tabs. This is also a good opportunity to replace the old felt on the spoon tabs (with hide glue, of course!). After soaking, cleaning and drying, the secondary pneumatics can be rebuilt (**Figures 35 & 36**).

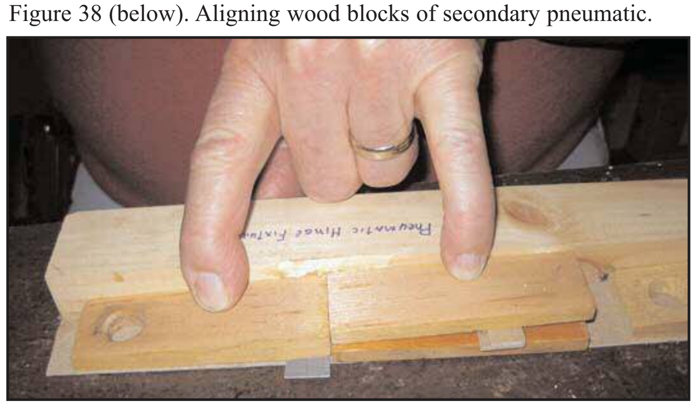
Figure 35. Removing leather, gaskets and glue from secondary pneumatics.

Figure 36. Leather and gaskets removed from secondary pneumatics.

Unlike their primary counterparts, these pneumatics are hinged, requiring extra steps and material for rebuilding. Using measurements from the secondary pneumatics removed from the pipe chest, Jim built one jig to properly align both wood blocks for gluing the inside hinge, and a second jig to properly size the opening of the pneumatic when re-leathering (**Figure 37**). Jim used boat canvas material for the inside hinge and muslin cloth for the outside hinge. To begin, each pair of wood blocks is aligned on the hinge jig, inside faces up, using shims for a smooth alignment if necessary (**Figure 38**).

Figure 37 (above). Jig for sizing the secondary pneumatic gap.

Figure 38 (below). Aligning wood blocks of secondary pneumatic.



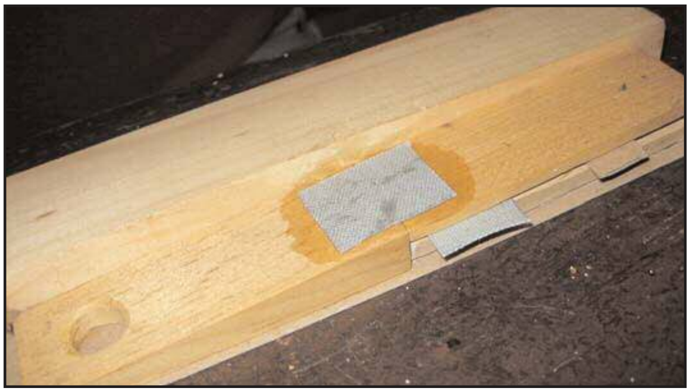
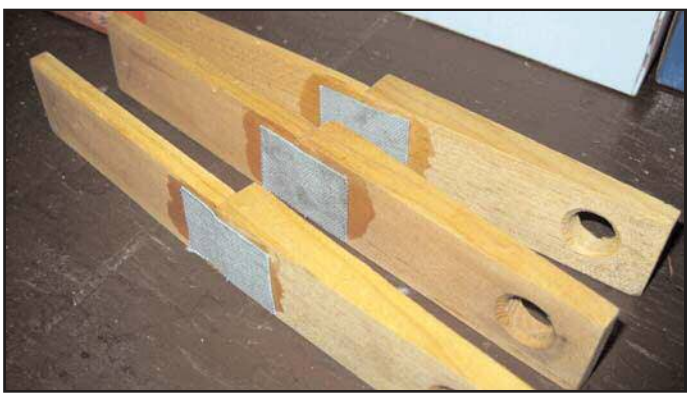


Figure 39 (top). Applying the hide glue.
Figure 40 (above). Inside hinge (boat canvas) applied
Figure 41 (below). Inside hinges of secondary pneumatics drying.



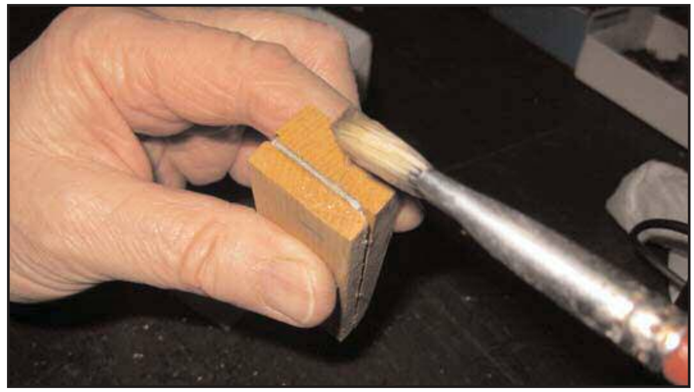


Figure 43. Applying hide glue for outside hinge (different view).
Figure 44 (below). Applying muslin for outside hinge.
Figure 45 (bottom). Outside hinges of secondary pneumatics drying.

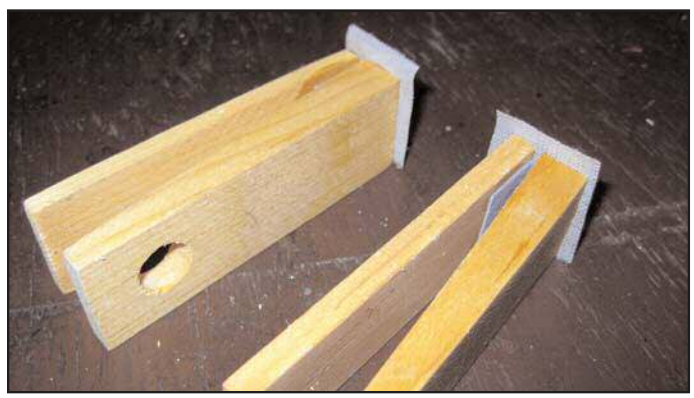


Figure 42. Applying hide glue for the outside hinge.

Hide glue is applied on either side of the join, then a pre-cut piece of boat canvas (slightly narrower than the board width) is applied as the inside hinge (**Figures 39 - 41**). Once an entire set is completed and allowed time to dry, the outside hinge can be attached. Jim folds the hinged boards closed, applies hide glue to the exposed ends and attaches pre-cut pieces of oversized muslin to the glued ends. These are set aside to dry, after which the excess muslin material is trimmed (**Figure 42 - 45**).

With pre-cut strips of pneumatic leather at hand, Jim is now ready to re-leather the secondary pneumatics. One of the hinged pieces is placed in the second jig, with the wedge inserted to hold the pneumatic in open position (**Figure 46**). Hide glue is applied with a brush to the exposed side of the pneumatic, followed by application of the slightly oversized pneumatic leather strip (**Figure 47 - 49**). Remember to pay particular attention to the surface coverage of the glue and the corners, as pneumatics must be

Figure 46. Secondary pneumatic placed in jig.

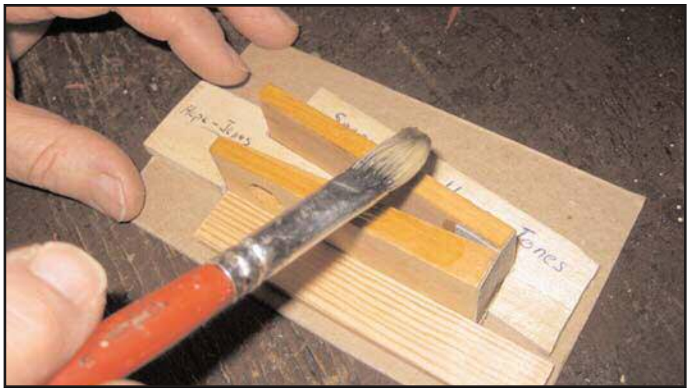
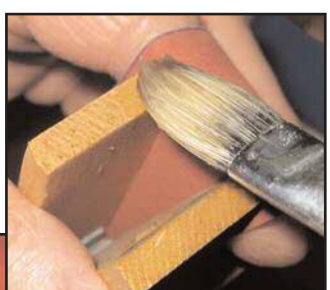


Figure 47 (above). Applying hide glue.
Figure 48 (below). Applying leather.
Figure 49 (bottom). Securing leather on the hinge.

airtight. When placing leather upon the first side of the pneumatic, it's important to leave some overlap for gluing the fourth and final (hinged) side. Once the first side is done, the pneumatic is removed from the jig and hand-held (in the open position established by the jig) to allow gluing and leather application of the second and third sides (**Figures 50 & 51**).

Figure 50. Gluing the second side (right).

Figure 51. Gluing the third side (below).



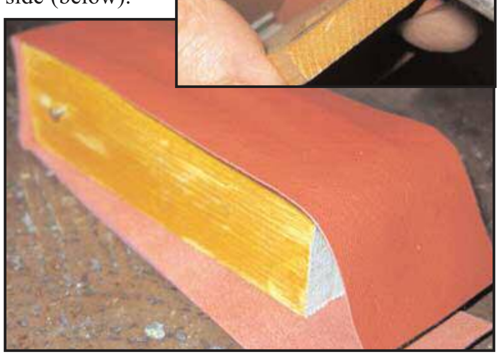
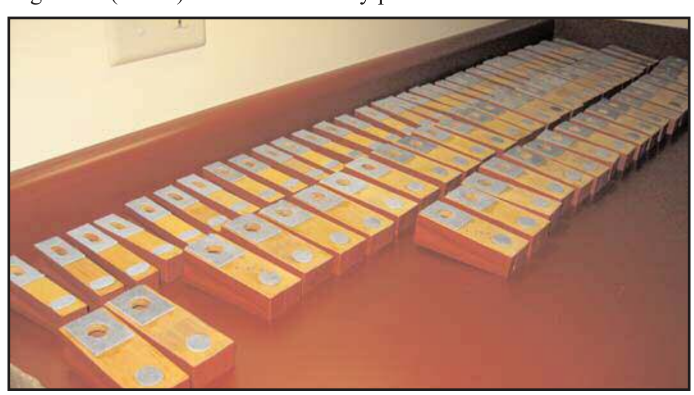


Figure 52. Re-leathered secondary pneumatics drying

After allowing the glue an opportunity to set, the pneumatic leather is glued and overlapped on the final, hinged side. Trimming of excess leather can be accomplished after the glue has dried (**Figure 52**). To complete the secondary pneumatics, pre-punched cowhide gaskets from an organ supply firm were glued to the bottom of each pneumatic, surrounding the air hole. Jim then glued the removed center circle from each gasket to the opposite end for balance when remounting these pneumatics to the pipe chest. No waste! (**Figures 53 & 54**)

Figure 53 (above). Gasket and balance leather on secondary pneumatics.
Figure 54 (below). Rebuilt secondary pneumatics.



Back to the Primaries

You may recall that Jim removed the primary valves when disassembling the bottom board. The function of these valves is to allow either air pressure or atmosphere into the

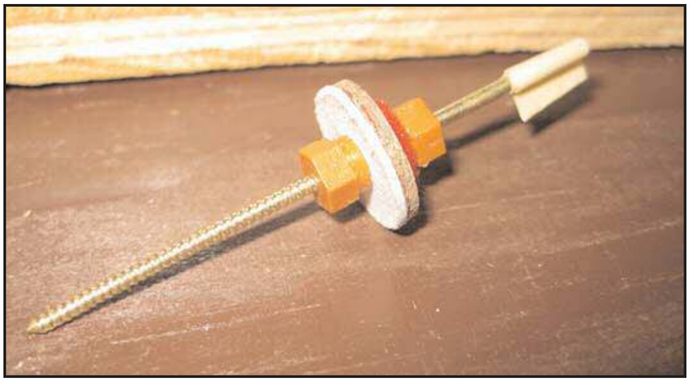
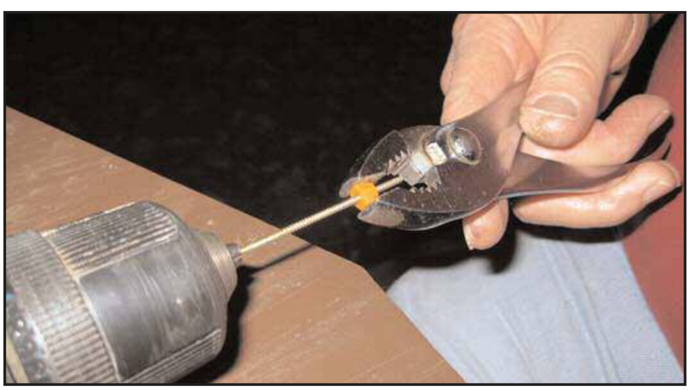


Figure 55. Primary valve wire.

secondary pneumatic. The primary valve consists of a threaded brass wire (the valve wire) which hosts a valve (a fiber disc with thin leather glued to one side) and a small felt disc, held in place by nuts above and below (**Figure 55**). The pointed end of the valve wire is screwed (slightly) into the bottom block of the primary pneumatic. The inflation and deflation of the primary pneumatic causes the valve to lower or rise, thereby allowing air pressure or atmosphere into the secondary pneumatic.

Figure 56 (above). Drill jig for threading nuts onto valve wires.

Figure 57 (below). Threading the nut onto the valve wire.



To recondition the primary valves, Jim removes the multiple components from the valve wires and uses a wire wheel to remove the dirt from the threaded brass wires. New valves and felt discs replace the old, being careful to match the thickness and diameters of the originals. New plastic nuts replace the rotting leather nuts. Jim has built a drill jig to assist with the task of threading the nuts onto hundreds of primary valve wires (**Figures 56 & 57**). If any of the old valve wires prohibit reconditioning, new brass valve wires can be purchased.

A Cover Up

Before adding the primary pneumatics and valves back to the bottom board, Jim needed to make a new gasket for the valve cover, which attaches to the bottom of the bottom board. You may recall that this valve cover is the first piece that Jim removed from the bottom board when disassembling it (**Figure 58**).

The valve cover on the Hope-Jones pipe chest functions as the bottom seat for the primary valves (slightly different from Wurlitzer); therefore, it has a row of circular holes which line up with the primary valves. The circular holes in the valve cover are slightly smaller than the fiber disc on the valve wire that seals this hole. Attached to the valve cover is a rail, containing a series of small holes which act as guides for the primary valve wires. The valve cover gasket is made of cowhide, rough on both sides. Jim had pre-cut leather strips which are longer and slightly wider than each valve cover. The wooden valve cover is secured to the work bench, inside up, and the leather is laid atop it, offset from the edge and held in alignment with a straight edge. After measuring the distance from the center of the valve holes to the edge of the valve cover, a straight edge is used to draw a line on the

Figure 58. The valve cover is on the left.

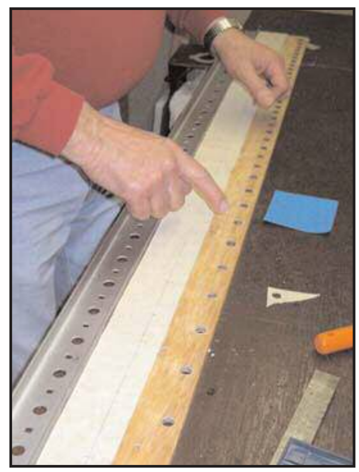


Figure 59 (above). Measuring and marking the valve cover gasket.
Figure 60 (below). Punching holes in the valve cover gasket.

leather, marking this distance (in actually, Jim draws the line a bit further in from the edge, to allow for some excess leather, a safety margin, which can be trimmed later). Now, the positions of the centers of the holes in the valve cover need to be marked on the leather, along the line just drawn. Rather than estimating the measurement to the exact center of each hole, Jim simply uses a combination square (tool), running along the edge of the valve cover, to mark the left side of each hole on the leather (**Figure 59**). Since the leather strip is longer than the valve cover, it is then repositioned to the right for alignment with the hole centers. Before punching the proper diameter holes in the leather gasket, Jim first punches a 1/16" hole where the marks cross, so that the centering pin of the large leather punch is precisely aligned. The holes can then be punched (**Figure 60**).

When rebuilding any instrument that is 100 or so years old, it's not unusual to come across challenges that have been created by previous work that has altered the instrument. The valve cover that Jim was addressing was such a case. When measuring the new gasket material, Jim thought it odd that the valve holes were so close to the edge of the valve cover, providing not much gasket material between the holes and the edge. Upon looking at the bottom of the bottom board (to which the valve cover attaches) it was clear that the valve cover was originally wider, but had been cut down to accommodate new magnets. The footprint of the original magnets had been smaller. Jim explained that failed magnets do not have to be replaced; the coils can be rebuilt with new windings. Had this occurred, the valve covers would not have required alteration. This provided Jim an opportunity to show me a couple examples of Wurlitzer pipe chest magnets (**Figure 61**).

Figure 61. Wurlitzer pipe chest magnets: white and black cap.

These electromagnets are composed of three pieces: the coil, the armature and the cap (**Figure 62**). The coil assembly is attached to the bottom board, with the coil protruding inside the pipe chest through a hole drilled in the bottom board (this hole allows air pressure to reach the primary pneumatic). The armature, a thin metal disc, is sandwiched between the coil and the cap. The function of the magnet in a pipe chest is to control the passage of either air pressure or atmosphere to the primary pneumatic. When the armature in a magnet is at rest, it allows air pressure to enter the primary pneumatic. When the organist presses a key on the organ console, electric current is supplied to the coil, which attracts (raises) the armature. In the raised position, the armature cuts off air pressure to the primary pneumatic and opens it to atmosphere. Early Wurlitzer magnets with lead caps, referred to as "white cap" magnets, were discontinued in 1927 in favor of Bakelite cap magnets, known as "black cap."

Figure 62. The bottom of the magnet coil, cap and armature.

With Thanks

My day at the Stett's household was educational and rewarding, but flew by too quickly. Jim planned to address pallet valve re-leathering as well, but we ran out of time. He did relay that pallet leather is delivered double thickness (it's glued by the supplier). It is purchased in the width needed (determined by the length of the pallet valves) by the linear foot.

I am most thankful to Jim and Lorraine for their hospitality and friendship. I'm very grateful for Jim's patience, thoughtfulness and generosity. As someone who teaches my own trade to students, I feel blessed to have the opportunity to learn from a skilled craftsman. I'd also like to thank Russ Shaner and Allen Miller for providing information for this article.

For reference, I'd like to add that organ parts and supplies are available from the following firms:

Arndt Organ Supply Company, 1018 S. E. Lorenz Drive, PO Box 129, Ankeny, Iowa 50021, 1-877-964-1274; http://www.arndtorgansupply.com/

Organ Supply Industries, Inc., 2320 West 50th Street Erie, Pennsylvania 16506-4928, 1-800-374-3674; http://www.organsupply.com/

Tim Wagner works as a film technician in the motion picture department of George Eastman House International Museum of Photography and Film in Rochester, NY. Tim and his wife, Ruth, live in Fairport, NY along with *Finster Baby,* Tim's 3-year old Vienna Woods 20-note belly organ.