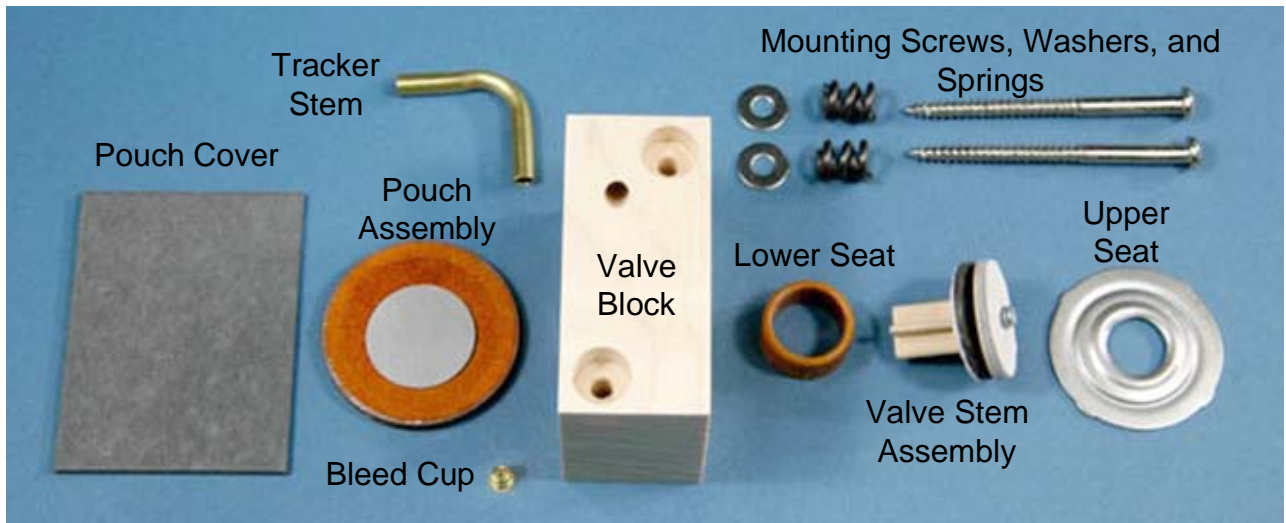
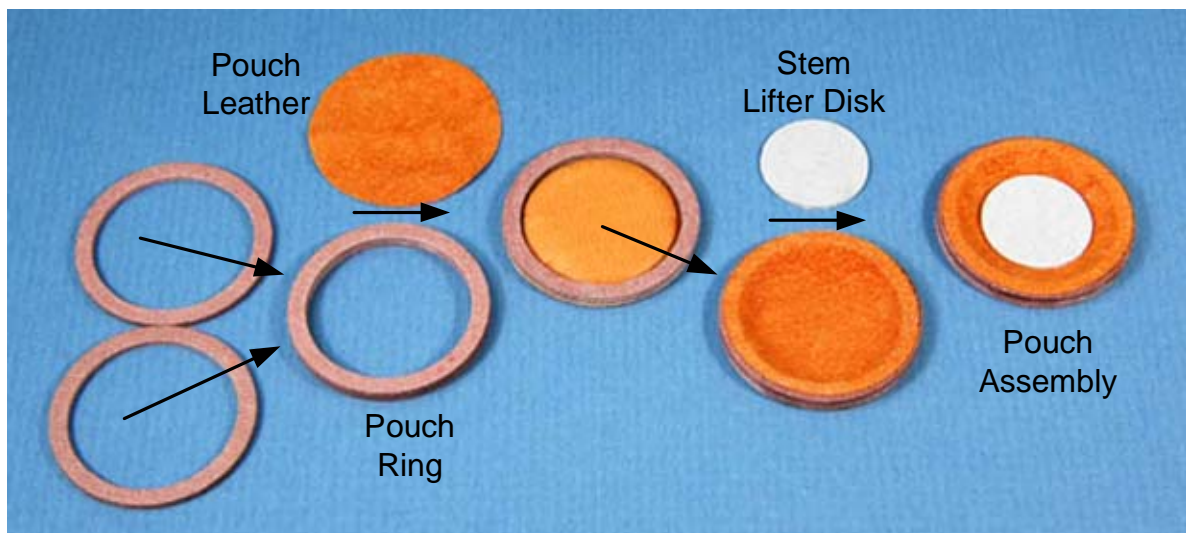


Notes on Making the Wurlitzer Unit Valve Part 2



Here are all of the parts of the valve.

Pouch Assembly

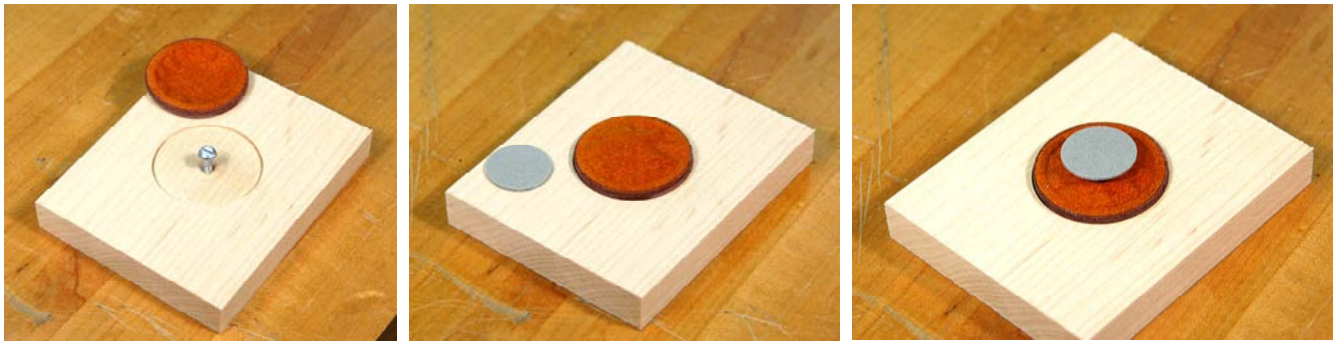


After completing the Valve Blocks, the next step was making the pouch assemblies, each of which includes a pouch ring, a pouch leather, and a valve stem lifter disk. Each pouch ring is made of two 1/16" thick fiber rings glued together. I had a pouch dishing tool from a previous project. This one shown on the next page is made of aluminum and was turned on a metal lathe. These are easy to make on a wood lathe using hard maple.

With the vacuum cut off put the pouch leather in the center of the dishing tool and turn on the vacuum. I just kink the hose to cut off the vacuum. With a very weak vacuum applied you can "push" the leather pouch around on the tool and smooth out any wrinkles in the leather. The leather shiny side is out. Put a very thin coat of hide glue on the face of the disk and seat it on the pouch leather. Release the vacuum and make another.



I used a small piece of wood with a screw in the center of a 1-3/8" diameter indentation as an aid to glue the lifter disk. I ground a small flat on the top of the screw. The screw holds the pouch up so that it contacts the disk only in an area of about 1/8" diameter at the center of the "fuzzy" side of the pouch. I put a dot of hot hide glue at the highpoint of the pouch and positioned the disk over the dot. Lifting the center keeps the glue from spreading out and gluing a large area of the disk to the pouch which limits the upward movement of the disk. Let the glue "gel" before moving to the next assembly.

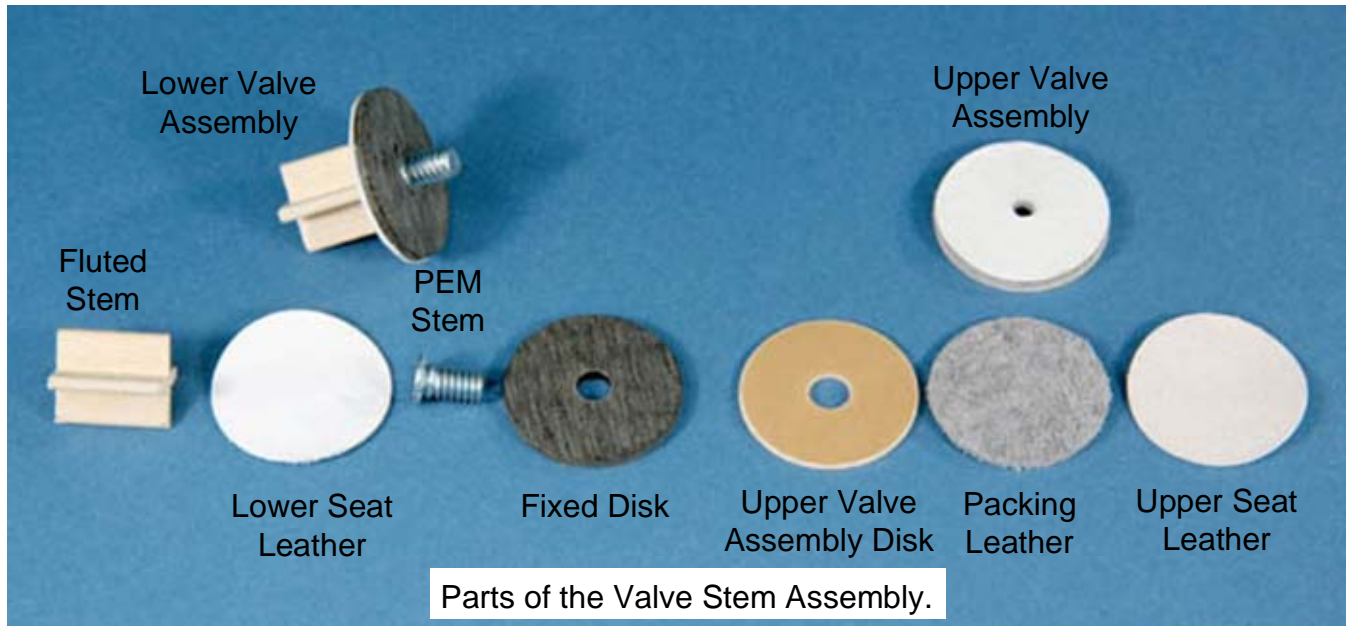


Sealing the Pouch Leather-

I sealed the leather pouches after they were glued into the block. Some people put the pouch under a vacuum to help pull the sealant into the pores of the leather. I used a solution of Best Contact Cement diluted with Best Contact Cement Thinner (1 part Cement to 3 parts Thinner). I used a small artist's brush to apply the sealant. It will take 2 or 3 coats to get a good seal. I used a small makeup brush to brush talcum powder on the sealed surface to eliminate any tackiness on the surface. Much is written in the MMD archives on methods and alternatives for sealing pouch leather. I used a flow meter shown below to test my pouches and to evaluate the various alternatives for lower valve seats.



Valve Stem Assembly

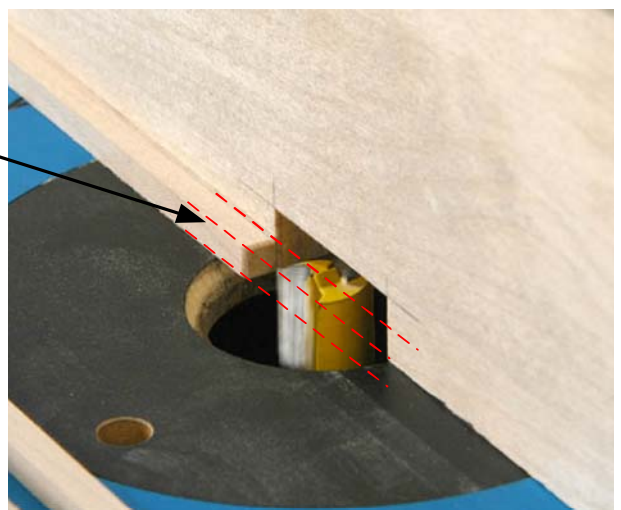


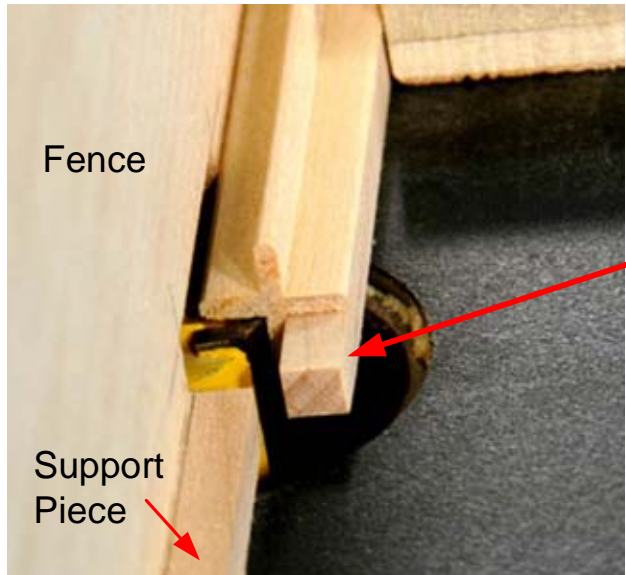
Fluted Stem Material



Stem material was made by routing the flutes from a square cross section of light, low density Basswood. The size of the stem will depend upon the inside diameter of lower valve seat used, and as a rule, the diameter of the stem should be about 95% of the the seat diameter. For the 1/2" diameter Bakelite valve seat I used this works out to about 15/32". I originally had used a size 1/16" less than the seat but later found an MMD posting by Craig Brougner discussing the sizing of fluted valve stems (MMD 1999.11.16 "Clearance for Fluted Valve Stem") which in my case increases the size of my stem to 1/32" less than the seat. Although my valves worked fine with the 1/16" clearance, I feel the tighter clearance provides a better centered valve stem over the seat.

The fins of the stem are 1/16" thick. A router table was used to made the flutes. A support piece is glued to the out-feed part of the fence to support the piece and keep it from rotating while it is being fed through. This support piece is the exact size of the cross section of material removed from the flute during each pass through the router table. Use a straight edge to align the top of the router bit exactly with the top of this support and the edge of the router bit aligned exactly with the front of the support piece.

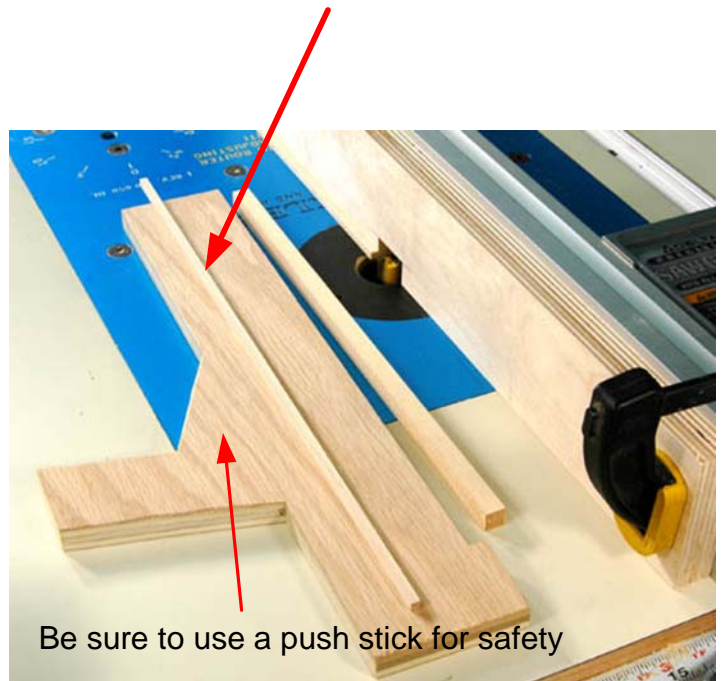




Fence

Support Piece

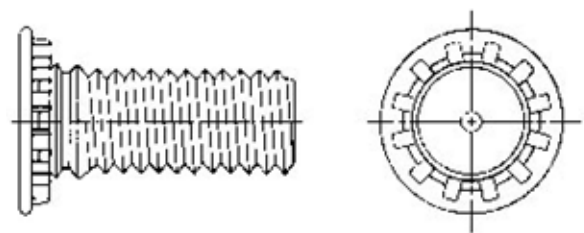
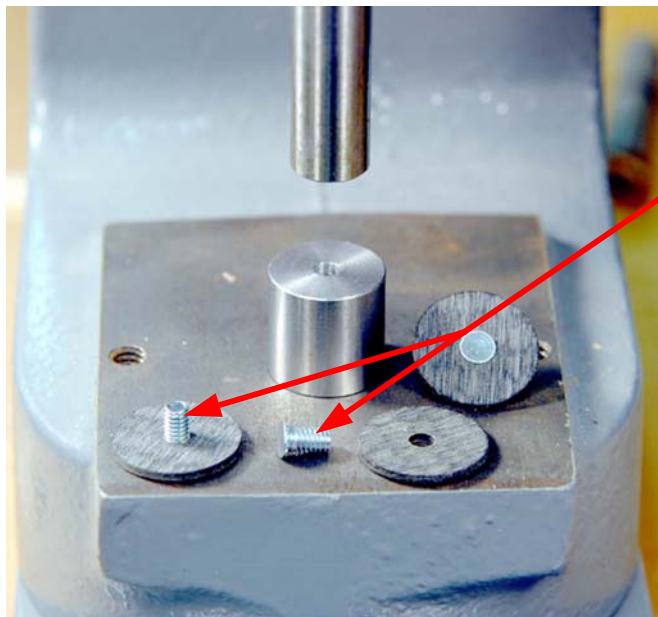
When only the thin fin of the stem is available to contact the router table, use another piece of support material (exactly the same size as the one glued on the out-feed side of the table) under the flute opposite the flute being cut. This provides additional support.



Be sure to use a push stick for safety



Lightly sand the sharp corners off the edges using sand paper glued to a flat surface.

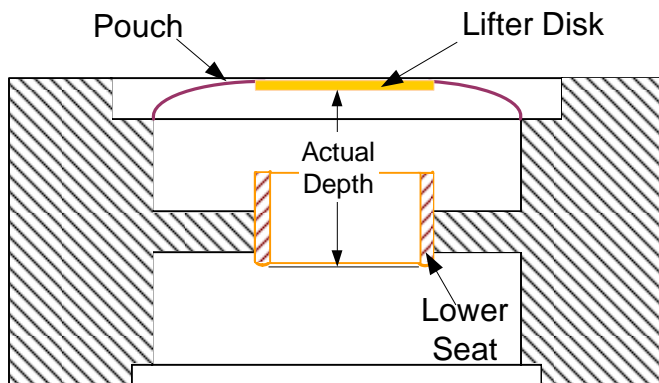
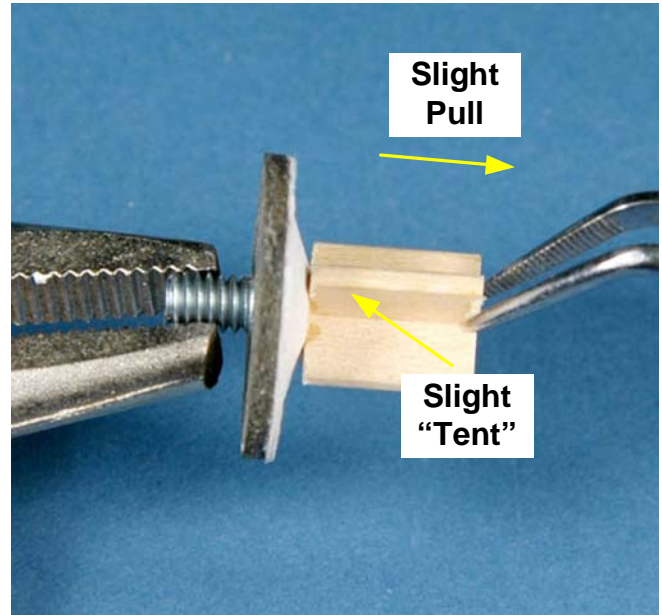


PEM Fastener

The original Wurlitzer valve had a 1/8" threaded brass stem press fit into a fiber disk to provide for the adjustment of the valve. Don Teach made a posting in MMD recommending the use of a PEM fastener as a replacement for this stem, greatly simplifying the manufacture of new valves.

The PEM fastener is press fit into a #19 drilled hole in the 1/16" fiber disk. The information provided by the manufacturer recommends that it be pressed into the hole using an arbor press (a drill press could probably be used) rather than being punched or hammered in. This allows the material to be "squeezed" into the voids in the fastener and provides a degree of "grip". I used a piece of round stock with a #19 drill hole in it as an anvil. The fastener will stick out a few thousandths on the fluted wood stem side of the disk but does not create a problem.

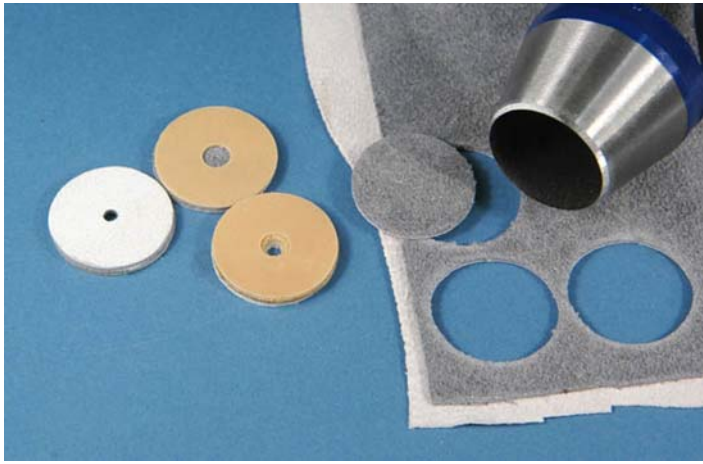
For the leather facing the lower valve seat use a thin pouch leather glued only on the very edge of the fiber disk with the fuzzy side glued to the disk. Glue the fluted stem at the center of this leather with a dot of glue at the middle. The stem should wobble and a slight pull on the stem should pull the leather away from the disk in a slight "tent". This will allow the leather to pull down and conform to the lower valve seat when the valve is closed, providing a better seal. This turns out to be very important in making a tight seal. Using a flow meter to measure the leakage of the lower seat shows that this step can cut the valve leakage in half over gluing the disk over the entire surface.



The clearance between the bottom of the fluted stem and the pouch lifter disk should be about 1/16". This is a compromise between too much lost motion before the lifter disk contacts the bottom of the stem, and the need to make sure any shrinkage over time of the pouch leather does not lift the valve disk off the lower seat, creating leakage.

This clearance also helps reduce resistance when the valve closes and therefore helps valve response time to some degree. This clearance results in a fluted stem length of about 7/16" depending on the thickness of the pouch leather, thickness of the lifter disk, height of the lower seat above the valve floor, and tolerances of the valve block. So, with so much possible accumulation of various errors, it is not a bad idea to measure the actual depth between the top of the lower seat and the pouch lifter disk on several valves (as a check for consistency) and then cut all the fluted stems 1/16" less than this distance.

The upper valve facing assembly is a sandwich made of a thin fiber disk with a 3/16" hole in the center, a piece of fairly thick (.050") packing leather, and a piece of thin valve leather. I use Barge glue from Columbia organ supply to glue several square inches of valve leather to the same size piece of packing leather and then use a punch to punch out sandwiches after the glue dries. Then the packing leather side of a sandwich is glued to the disk. If the disk is shiny, scuff it up on a piece of fine sand paper on a flat surface to provide some "tooth" for the glue to bond to.



Barge glue remains flexible and bonds very well to fiber disks. After this sandwich is dry, use a 3/32" (#1) leather punch to punch a hole in the center of the sandwich to accept the threaded PEM fastener. Thread the sandwich onto the PEM fastener with the valve leather shiny side facing out to mate with the upper valve seat. If you screw the disk all the way down so that the two fiber disks are in contact and then turn another half turn, the leather on the movable disk will

pull down flat on the thin fiber disk and the adjustable disk sandwich will align to be parallel to the PEM fastener disk when you unscrew it to adjust valve travel. Note that this adjustable disk is held in place only by the threads of the PEM fastener in the leather.



The hole in the thin fiber disk is large enough so that it never comes in contact with the PEM fastener. This allows this sandwich to "wobble" slightly to guarantee that the valve leather facing will align to the upper valve seat providing a tight fit when the valve is open.

Part 3 Includes notes and information on sealing the block, selecting/making valve seats, bleed installation, assembling the valve, setting valve travel, and finishing.