John Smith Universal (20/26) Organ

H. C. Beckman

Before I started this project I had no experience working with organs; I had never made any organ pipes or looked at the insides of any Busker or hand organs. The organ I built and documented is called the "John Smith Universal Organ." (**Figure 1).** It is called "universal" because it will play the standard Raffin 20-note scale and also the Aldeman 26-note scale. Organ plans for this unit are available from www.rollcutter.com <http://www.rollcutter.com/>. They also sell some of the parts ready made, like the tracker bar, crank shaft, etc. but I chose to make all my own parts. The organ can be built with a minimum of woodworking tools. Of course, the more tools you have, the less time you will spend fabricating parts. I would say you probably should have a table saw, a band saw, a scroll saw, drill press, table or disc sander, and router.

Figure 1. A complete John Smith 20/26 Universal Organ. Note xylophone in the bottom of the case, unusual for a small hand-cranked organ.

Since I do not have a wood lathe, I made all the circular parts by using a band saw, and used a table disc sander to smooth up the parts. I have not explained every process, but have focused on some of the parts I modified and spent the most time constructing. I do not have a complete set of pictures of the process because I neglected to photograph the beginning stages of building the organ.

The first thing I dealt with was the feeder bellows. I had worked some with feeder bellows in player pianos using vacuum, but had no experience with bellows using pressure. Because stiffeners are needed inside the material, the first mistake I made was placing the stiffeners too close to the edge so they would bind when the bellows were collapsed. On my first try I used heavy bellows cloth. It was way too stiff and would not allow the bellows to collapse completely. John Smith recommended leather, but because it is so expensive and I didn't know if the organ would work, I chose to use the same material you would use to cover reed organ bellows (PPC #56 Reed organ Bellows cloth).

I reinforced all the corners with leather. If I were to do it over again, I would probably use leather.

The next challenge was the three-lobed crankshaft that connects the three feeder bellows. I made it from 5/16" steel rod and 1/4" aluminum bar. (**Figure 2**). I glued it all together first with Loctite 680 I purchased from Graingers. It is available in other locations. To insure that there was no slippage I inserted spring pins through each joint. I used a protractor to set the lobes 120 degrees apart. You first run the rod all the way through and glue before cutting out the rod between the lobes.

Figure 2. The crankshaft.

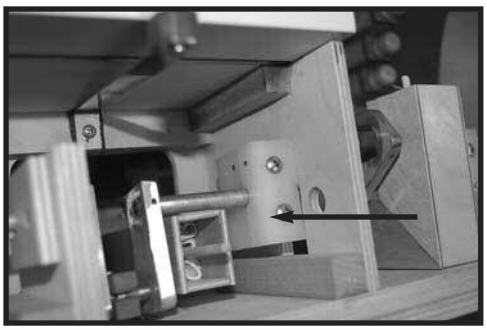


Figure 3. A view of the UHMW block with crankshaft in place.

Some of the bearings for the crankshaft are sealed ball bearings that are recommended in the plans. The bearing blocks within the case I used were UHMW (Ultra High Molecular Weight) material available from Rockler (and other wood working outlets) instead of the suggested wooden blocks (**Figure 3**). It is real slick and requires no lubrication and works well for bearing blocks.

Constructing a tracker bar with the hole spacing the correct distance apart caused me to try several attempts at using a mechanical indexing method. I finally made a plan on paper and taped it to the drill press table and then with a fence on the back I moved the tracker bar to the center of each mark. Then individual holes were drilled (**Figure 4**). The holes still were not exactly in a straight line. Later, while talking to Yousuf Wilson who has made several organs, I learned the best solution is to take the blank piece of wood and make a real thin, shallow saw cerf all across the wood before drilling the holes. After drilling you can sand off the thin groove you put in

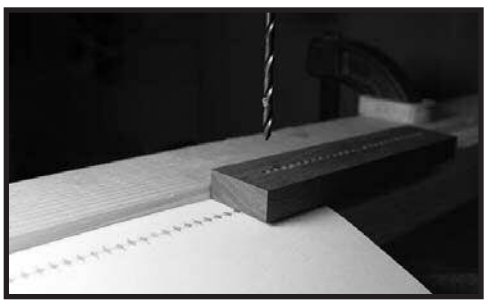
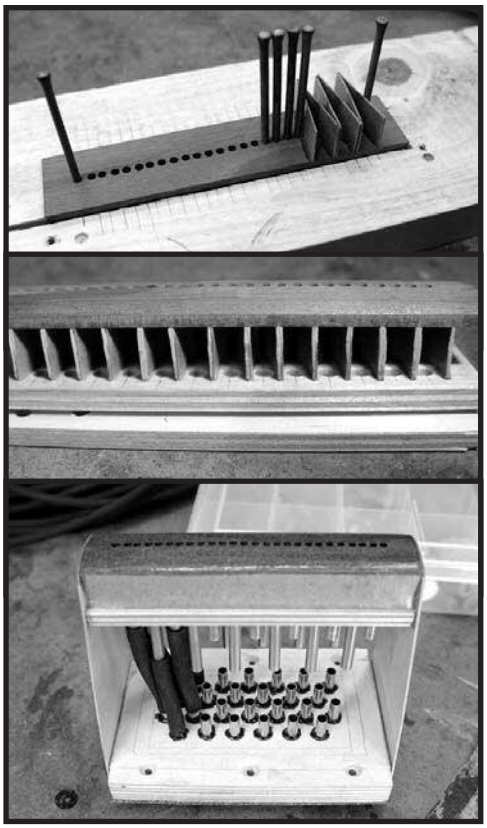


Figure 4. Drilling of the tracker bar.



the tracker bar. Underneath the tracker bar you need to make a honeycomb so you will have enough room for the nipples. Otherwise, there will not be ample space to hook directly to the holes in the tracker bar (**Figures 5 - 7**).

Figure 5 (above). Honeycomb jig.

Figure 6 (middle). Partially finished tracker bar.

Figure 7 (bottom). Completed tracker bar.

The valves were made of ½ " poplar dowel and the pictures show the jig I used to cut each dowel to make the valve (**Figures 8 & 9**).

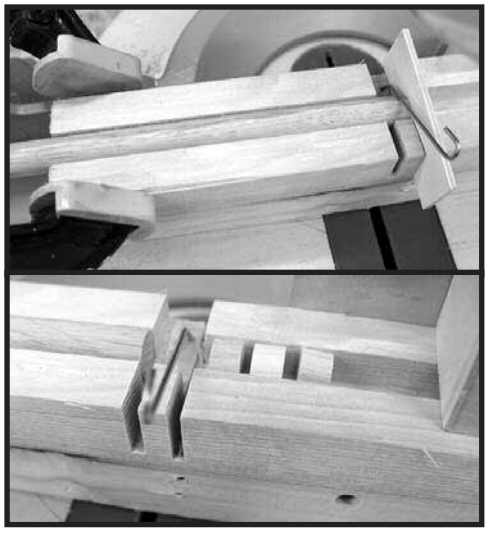


Figure 8 (above) and Figure 9 (below). Two views of the valve jig.

The valve was then glued to a leather punching (**Figure 10**).

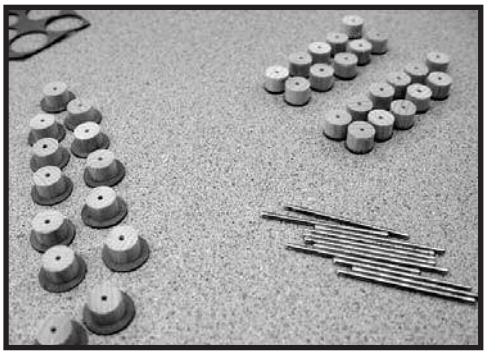
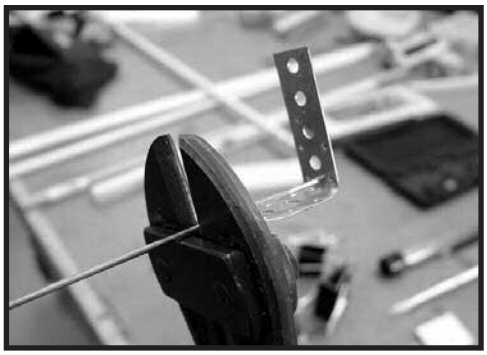
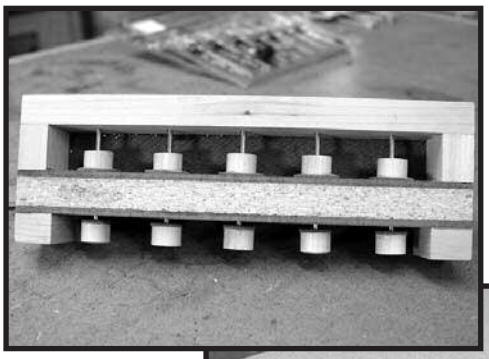


Figure 10. Valve components.

The valve stem is 1/8" brass rod. A picture is included that shows the jig I used to cut the rods all the same length (**Figure 11** — illustrated on the right).





There is also a photo of a valve box (**Figure 12**) which sits down on top of a pillow pouch board (**Figure 13**). The tracker bar assembly is pressurized so when the hole comes up in the paper it swells up the pillow pouch which operates the valve. The pillow pouches are made of zephyr skin. Leather was recommended, but since I had the zephyr skin, I used that.

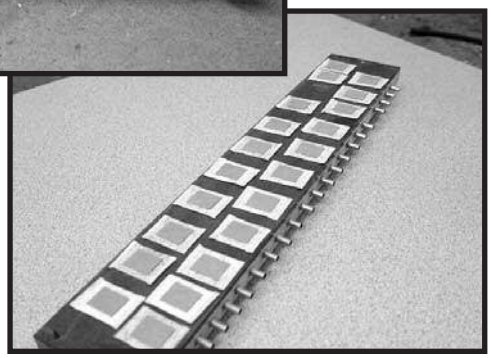


Figure 12 (above). Bass valve box.

Figure 13 (below). Pillow pouch board.

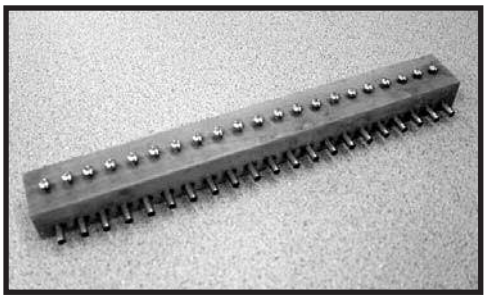


Figure 14. Bleed rail.

The organ has adjustable bleeds which are shown in **Figure 14**.

The original plans called for using vinyl tubing glued directly into each of the holes, but I elected to use brass nipples and neoprene tubing which I obtained from Player Piano Co. in Wichita.

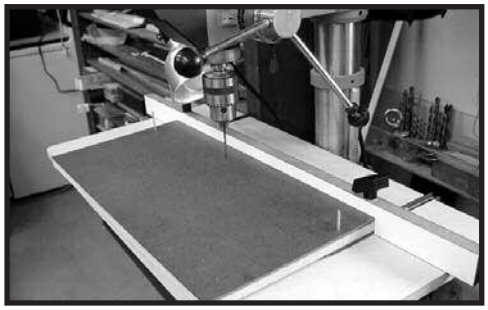


Figure 15. Drilling the top piece.

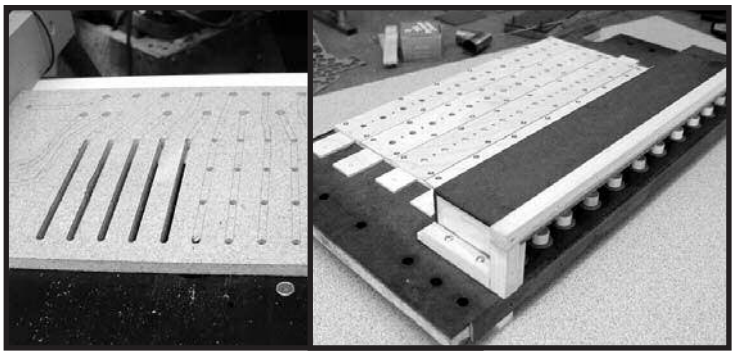


Figure 16 (left). Wind channels being cut.
Figure 17 (right). The glued up chest with valves in place.

The valve chest itself is made of ½" particle board sandwiched between two pieces of 1/8" Masonite. I used a router to cut out the channels before laminating the pieces together. The pictures illustrate drilling the top piece and cutting the channels (**Figures 15 - 17**).

The bearings for the rewind are ¼" bronze bushings. I purchased them at a local hardware and cut them in half. I used Locktite 680 and glued them to metal. I used copper, but I think other metals would work as well (**Figure 18**).

Figure 18. Bronze bearings glued in place.

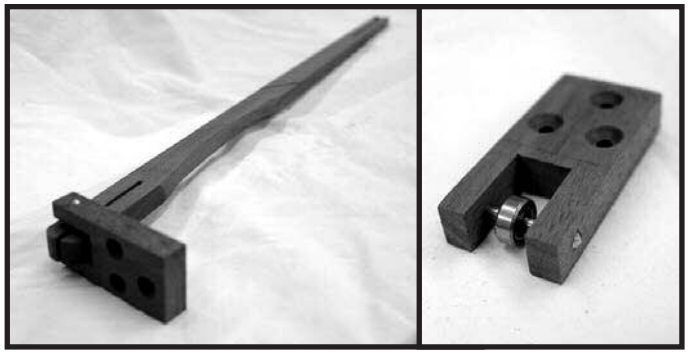


Figure 19 (left). The bellows connecting rod.
Figure 20 (right). Bellows flange and bearing.

According to the plans, the bellows connecting rod was to be made of dowel. I used walnut and inserted bearings which I obtained on line (**Figures 19 & 20**).

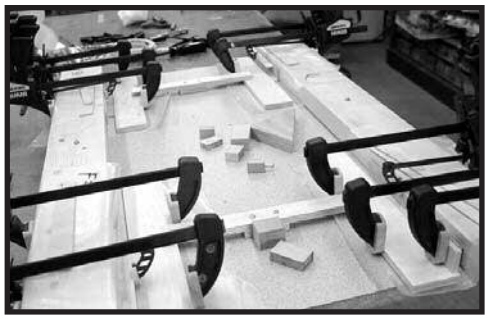
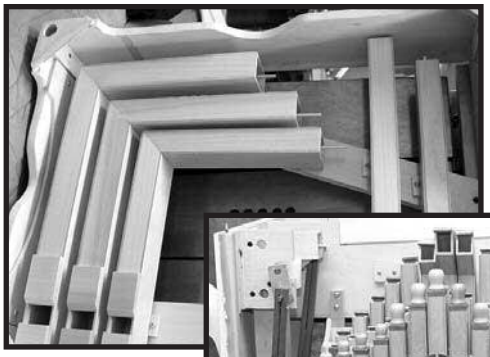


Figure 21. The pipe jig with four pipes being glued.

The pipe jig was made of a piece of Formica counter top sink cut out with a couple of two by fours joined on the jointer and screwed on the sides of the countertop to produce a 90-degree angle for clamping the pipe parts. That allowed me to work on four pipes at a time (**Figure 21**).

The open flute pipes require a cardboard (John Smith recommends cereal box cardboard — I got some cardboard from Office Max, copy department) air deflector that you can see in **Figure 22**.

Figure 22. Open flute pipe construction.



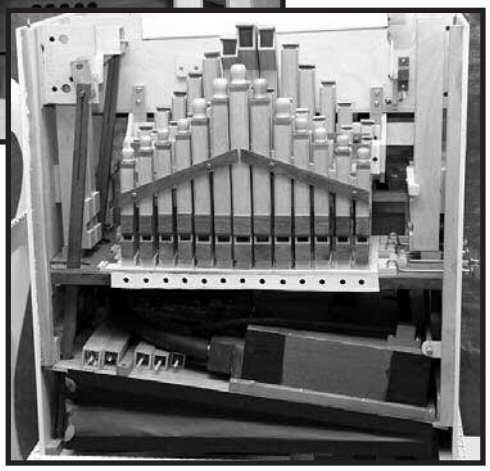


Figure 23 (above). Bass pipes under organ skirt.
Figure 24 (below). The front of the organ without glockenspiel.

The bass pipes are mounted underneath the bottom skirt (**Figure 23**). There are five of them along with five bass helpers which set on top of the bellows inside of the case. They are tuned an octave higher than the bass pipes. You can see them on top of the feeder bellow in **Figure 24**. The air ways in the pipes are all kept consistent by using a cardboard gasket.

Figure 24 also shows the connecting rods on the left side. In the upper left hand corner you can see the front piece of the drive shaft and behind that the white is UHMW that I used for bearing blocks. Along the front, where you see all the white holes, is where the glockenspiel gets air, and its associated assembly clamps on and off for transporting. The brass rods with hooks turn on the four different ranks of melody pipes that are seen on the front. At the bottom are the feeder bellows that have been covered in organ cloth and the leather reinforced corners are visible. Above the feeder bellows on the right is the reservoir. At the back of the reservoir is a springed flap (any soft leather glued to a block) that adjusts the spill valve. The pipes are 1/8" Baltic wood and the fronts are walnut. The tops on the front row of pipes are candle holders from Hobby Lobby that were inverted and glued to a block on top of the closed flute pipes. The front row of pipes is tuned a little sharp so you get a tremolo or vibrato. There is a set of open flutes, a set of closed flutes, and a set of open flutes that are one octave higher than the ones in the back giving four different choices for stops on this

organ. Quarter-inch Baltic plywood was used on the case and 1/8" Baltic plywood was used on the pipes.

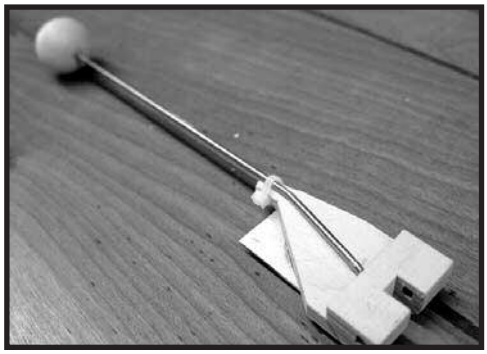
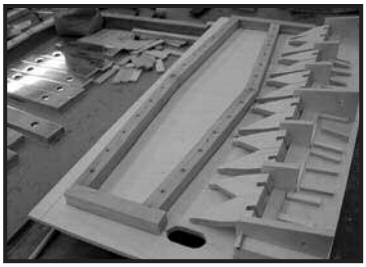


Figure 25. Glockenspiel beater with cable tie.

Figure 26 (below). Glockenspiel spring jig.

Following are several pictures showing the construction of the glockenspiel. I used cable ties to anchor the beater wire (**Figure 25**) although the original plans suggested using thread. Springs were made of .024 mig welding wire, available from TSC (**Figure 26**), and the beater rods are 3/32" stainless steel welding rod. The glockenspiel generates the most comments at organ rallies (**Figures 27 - 30**).



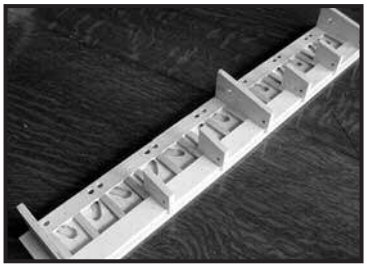
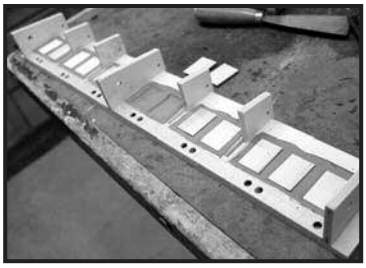
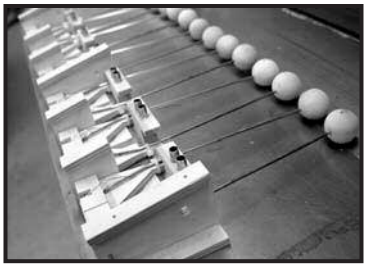


Figure 27 (above, left). Glockenspiel frame.
Figure 28 (above, right). Glockenspiel pouch frame.
Figure 29 (below, left). Glockenspiel pouched.
Figure 30 (below, right). Glockenspiel assembled and ready to install.





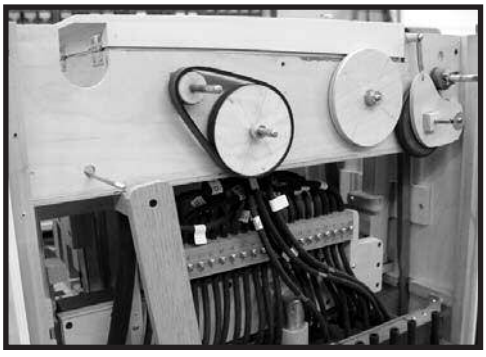


Figure 31. Play and rewind assembly.

The belt on the play-rewind assembly is a Hoover vacuum cleaner belt and the idler wheel is a Panasonic vacuum cleaner belt (I just went to a local vacuum cleaner repair shop and found some belts that would fit). **Figure 31**

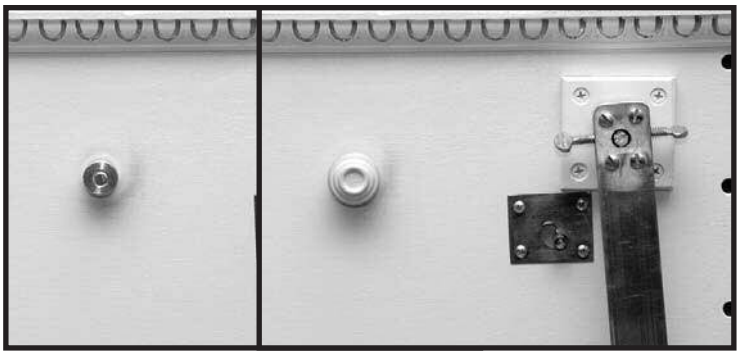


Figure 32 (left). Take-up knob without crutch tip.
Figure 33 (right). Take-up knob with crutch tip.

Plans did not call for it, but I extended the shaft in the take-up spool outside the case, then put a shaft collar on top of that and trimmed down the crutch tip and put on top of the shaft collar so I could roll the paper forward if I wanted to do so without opening the tracker bar box (**Figures 32 & 33**).

The crank was made from ¼" aluminum bar. I used JB Weld and screws to sandwich the top to make it thick enough so I could drill in a couple of holes for set screws to anchor the crank to the shaft. A friend used his lathe to fashion a handle from a piece of walnut (**Figure 34**).

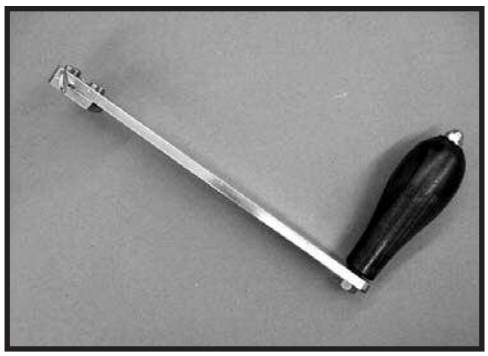


Figure 34. The organ crank.

There were no plans for the cart. I had to come up with my own design. I wish I had made it wider so there would be enough space to store another row of music rolls in the drawer under the cart (**Figure 35**). The wheels are lawn mower wheels (that I sprayed gold) that I purchased from Wal-Mart. They are anchored to a ½" shaft that is threaded on both ends and the end caps are knobs that I got from Grizzly out of Springfield, MO. The cart handle is not as sturdy as I wish. It would probably be improved if made of metal or a stiffer material.

Figure 35. The finished organ with storage cart.

I hope this article gives some readers the enthusiasm and confidence to build their own Busker organ.

H.C. Beckman is a retired public math teacher. He currently teaches part time at Washburn University in Topeka, Kansas. Current projects include restoring his player pianos and building an "O" roll piano for his collection.