

# JIGS — II

## RESTORATION AIDS FOR THE RESTORER

GARY G. STEVENSON

### INTRODUCTION

In my first article, "Jigs — Restoration Aids for the Restorer," *Journal of Mechanical Music*, Volume 37, Number 1, I stated that I had interest in finding a way to connect my love of mechanical music with my vast holdings of *Popular Mechanics* (some 1,500 monthly magazines, 1913-present).

I found such a link in the fact that these machines are made up of many identical parts. Every note played on the instrument is mechanically played like the note next to it. Although I have not found major articles directly relating to mechanical music in my magazines, reading general how-to-do-it articles in my "Pop-Macs" over the past 20 years has helped me formulate strategies for producing all sorts of specific, new, needed, mechanical music parts.

In the summer of 1992, after attending the Mid-Am Chapter band organ rally in Medina, Ohio, I spent two days at the Henry Ford Museum/ Greenfield Village, in Dearborn, Michigan. The museum had an exhibit celebrating the 90th anniversary of *Popular Mechanics* magazine called "Possible Dreams — Enthusiasm for Technology in America."

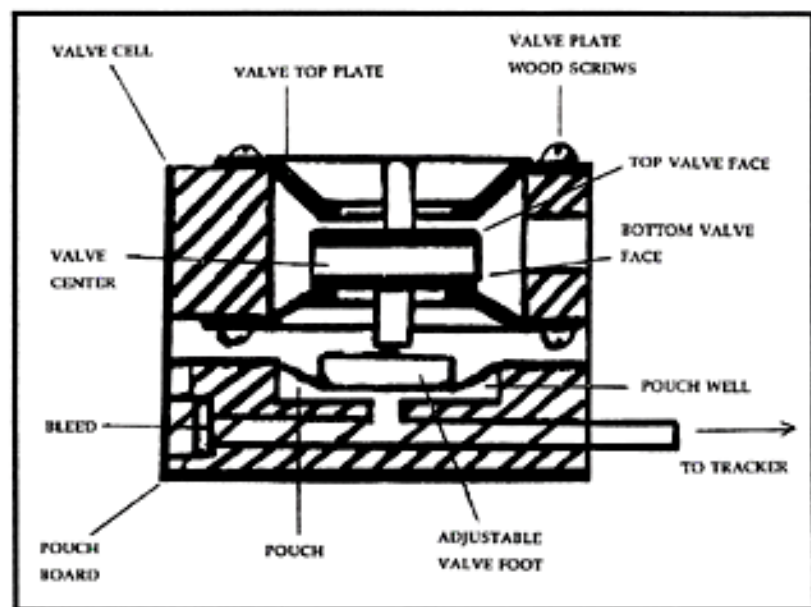
It was there that I picked up the companion book to the exhibit of the same name. In his chapter "Educating the Enthusiast," co-author Joseph J. Corn described the history of the how-to-do-it article since the turn of the last century and its contributions to the transmission of ideas and technology in general and to the beginnings of publications such as our *Journal of Mechanical Music*.

In my restorations I try to use parts made of and with the same design as supplies and materials as were originally used. I just use them in 1992 and not 1902, not better or worse, but differently. I no longer fear being criticized for what I offer: I offer it in the spirit of what made *Popular Mechanics* magazine — a long history of open communication. I welcome constructive critique of my work and hope to see your offerings printed here in the future.

### THE NEED

In "Jigs — I" I dealt with three wooden fixtures that were designed and built to help in the uniform fabrication of Duo-Art reproducing piano striker pneumatics.<sup>1</sup> These jigs were engineered for use with the general purpose table saw and drill press to consistently do a specific job.

This installment is concerned with the construction and use of a brass fixture designed for the uniform punching of leather valve facings and newspaper shimming stock for that same Duo-Art reproducing piano.<sup>1</sup>

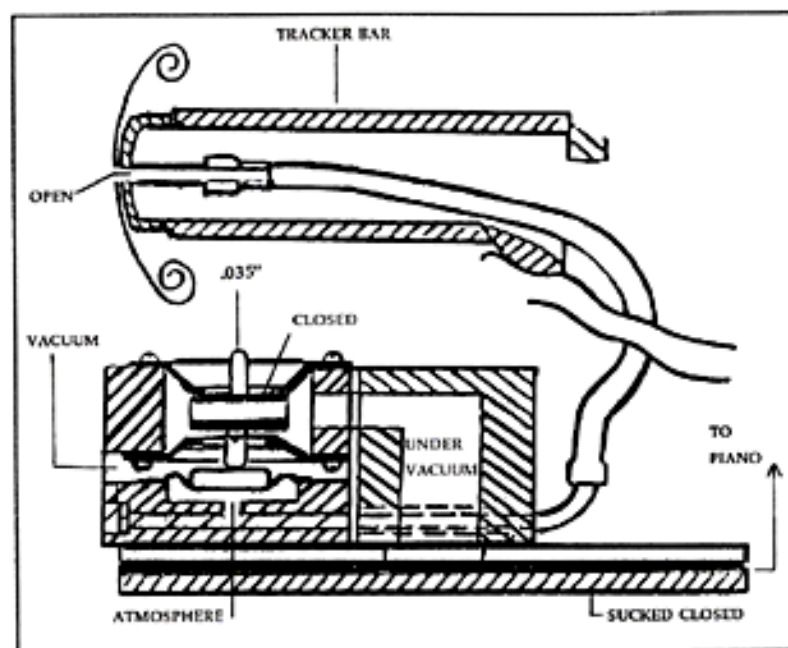


DRAWING 1.

### TOOLS AND SUPPLIES

Access to some power tools is required. These include a metal lathe and drill press. Other items needed include one piece of brass/aluminum (or like soft metal) large enough to become the base of your jig and a drill bit slightly smaller than the diameter of the center pin  $\frac{3}{4}$ " long,  $\frac{5}{32}$ " diameter metal center pin (I use part of a bolt), a  $\frac{5}{32}$ " diameter hand punch for leather (part of

PHOTOS AND DRAWING BY THE AUTHOR



DRAWING 2.

Osborn # K 157), a 9/16" diameter hand punch for leather (Osborn # 245) and one 3" "C" clamp to hold the jig to the drill press table. The only other supplies required are the leather to match what was originally used within the unit and some newspaper.

#### PROBLEM ASSESSMENT

As with the "Jigs — I" article, the restorer must first define the problem to be dealt with, then deal with how the defined problem can be solved. In order to see which parts are perishable and need to be made, I am giving a brief description of how this valve system works. Please follow along. (Further information on different types of valves and valve systems may be found in *Rebuilding the Player Piano* by ART REBLITZ.)

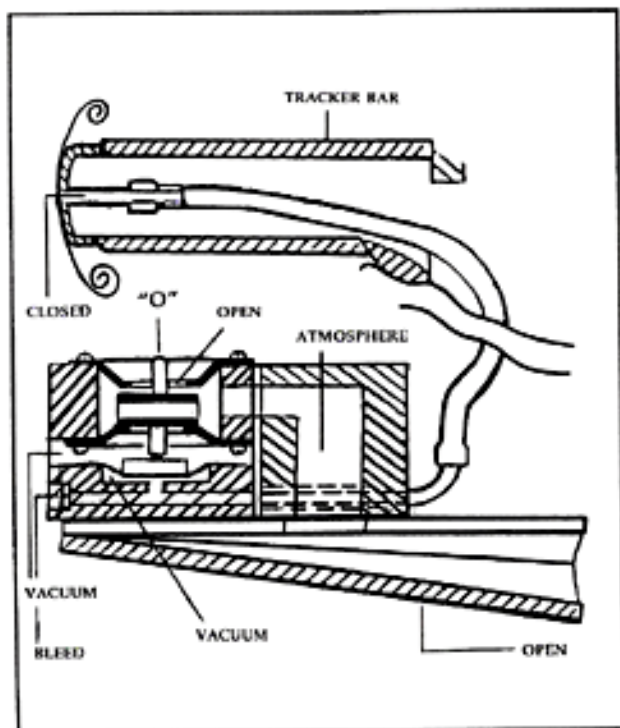
At rest, with the instrument off, or when working with the tracker hole covered by the music roll, the valve center (DRAWING 1) is at rest or held in a closed position by the vacuum present within the piano stack.

When a hole in the music roll allows the tracker bar to be opened to the air, the pouch below a specific valve (normally in vacuum via the bleed) engorges with atmosphere and forces the adjustable foot and valve center up, closing off the outside atmosphere to the striker pneumatic and channels the bulk vacuum setting below the valve into its corresponding pneumatic (DRAWING 2).

This results in a swift evacuation of air from the striker pneumatic and pressure against the piano action sounds the note for that specific valve.

When the note is no longer needed by the music roll, it covers the tracker bar hole once more. A small bleed sucks the atmosphere from below the pouch and at the same time vacuum within the stack pulls the valve center down, closing it off from the source and reopens the top of the valve to the atmosphere allowing the vacuum trapped within the striker pneumatic to escape to atmosphere, relieving the pressure that played the note (DRAWING 3).

It is easy to see how important the leather facings and proper clearance are to the efficient operation of the piano.



DRAWING 3.



## THE PROBLEM

It would be quite simple to produce the required  $176 \frac{9}{16}$ " diameter valve facings, but with this style of valve there is the added need to have a  $\frac{5}{32}$ " diameter hole punched into the exact center of each and every one.

In restoring player pianos I have experienced the frustration of not being able to find the proper type or thickness of prepunched leather facings needed for the unit I was restoring. This caused me to later have problems pertaining to valves within units I restored.

Not wanting to have to do repairs on instruments I had just restored, I felt it was very important for me to first find a source for new leather like the old material used for valve punchings. I could then acquire a hide of that stock in the thickness that originally had been used in the unit.

## A SOLUTION

I sent a sample of an old valve facing to International Organ Leathers of South Bend, Indiana, and it was matched in both type and thickness. I also bought a  $\frac{9}{16}$ " diameter punching tool for leather to make the parts of the proper size.

I first tried to make the parts by punching a  $\frac{9}{16}$ " diameter disc and then punched the  $\frac{5}{32}$ " diameter hole into the exact center. This turned into an exercise in frustration. I discarded more than I could use. I had to find a new way to make the needed facings.

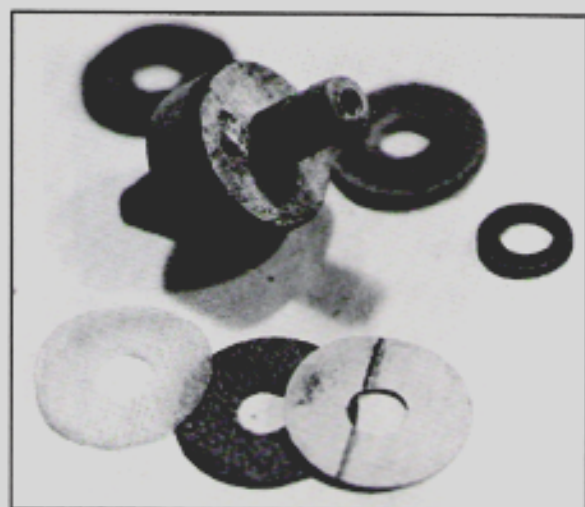


PHOTO 1. THIS IS ONE OF THE 88 VALVE CENTERS USED WITHIN THIS REPRODUCING PIANO. PLEASE NOTE THE TWO LEATHER FACINGS ABOVE THE VALVE, THE SMALLER FORCE-FIT WASHER TO THE RIGHT AND THE USE OF THREE DIFFERENT THICKNESSES OF PAPER USED AS SHIMMING WASHERS.

## THE PARTS

Upon examination of the dissected sample valve center used in this piano (PHOTO 1), you will see two identical leather facings, one on each pin side of the valve center.

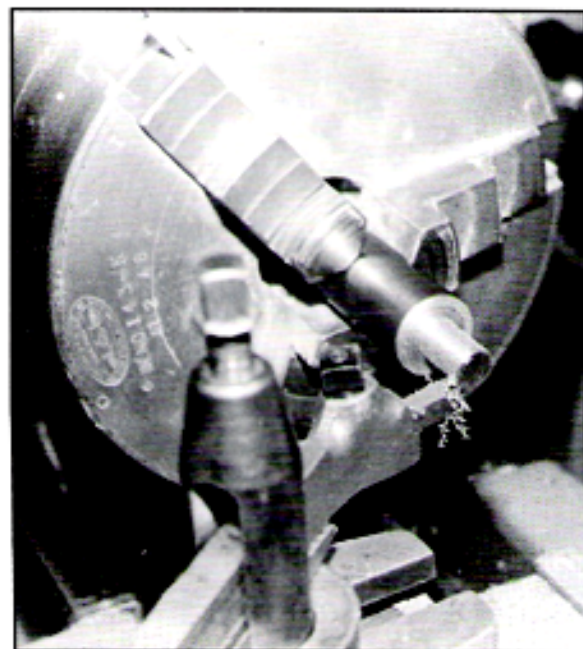


PHOTO 2. TURNING THE END OF THE PUNCH, IN THE LATHE, TO FIT THE DRILL CHUCK OF MY PRESS.

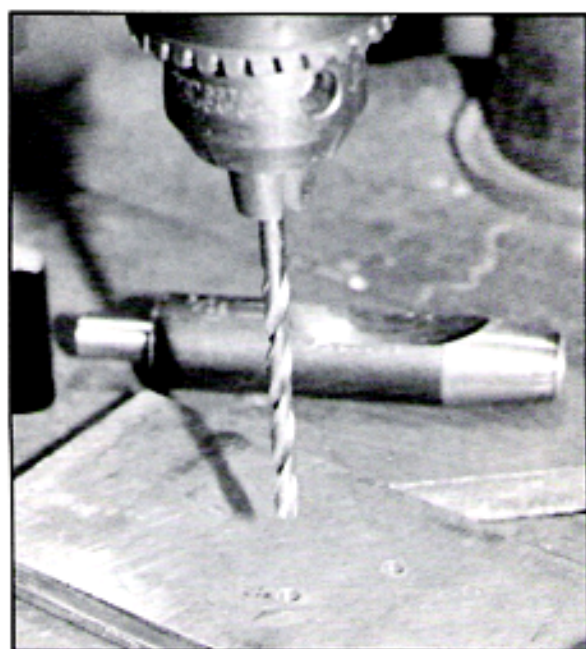


PHOTO 3. DRILL CENTER PIN HOLE INTO BRASS PLATE CLAMPED TO DRILL PRESS BED.

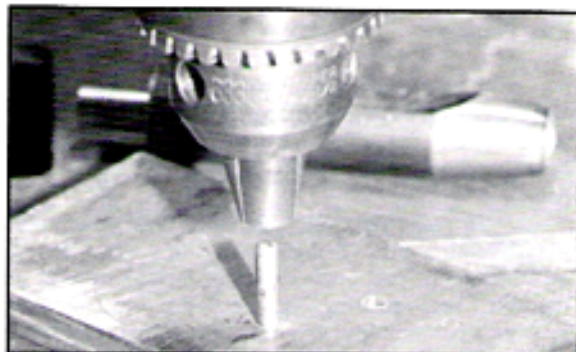


PHOTO 4. CLOSE THE DRILL CHUCK TO USE IT AS THE HEAD OF AN ARBOR PRESS TO INSTALL THE CENTERING PIN.

#### JIG PARTS/CONSTRUCTION

The punch was placed into a metal lathe (PHOTO 2) and 1" of the soft mallet end was turned down to 3/8" diameter (in order to fit into the chuck of my drill press).

The next step to producing the needed punchings was to construct the fixture. I originally tried to build the fixture base out of maple hardwood but found that it was too soft to cut more than a dozen facings before failure occurred. I thought that with the punch being made of case-hardened steel, I should use a softer base stock than the tool in order to help keep the tool from becoming dull. I finally settled on brass.

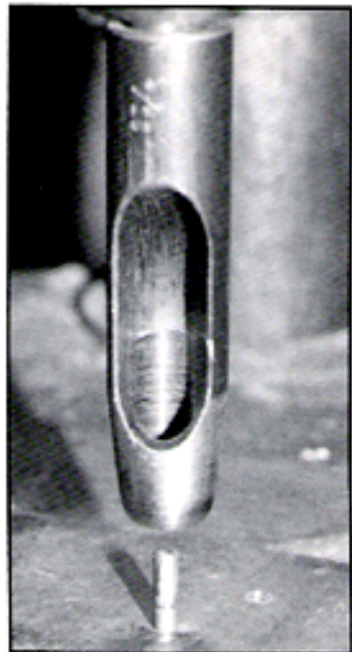


PHOTO 5. OPEN DRILL CHUCK AND SECURELY INSTALL ALTERED LEATHER PUNCH.



PHOTO 6. HAND PUNCHING OF CENTER HOLES, ONE FOR EACH VALVE FACING.

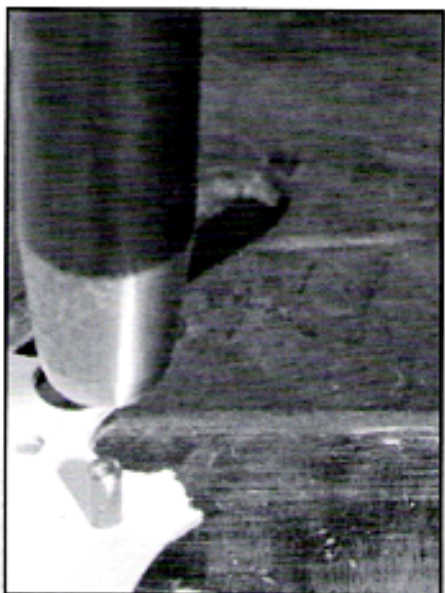


PHOTO 7. THE LEATHER IS PLACED OVER THE CENTERING PIN AND FLATTENED.

I clamp a 4" x 8" piece of 1/4" thick brass to the workbed of my drill press. (To assure continued proper alignment of all parts, this plate should not be removed until all facings and shims have been made.) With a # 24 drill bit in the chuck, a hole is drilled into the brass, then the bit is removed (PHOTO 3).





PHOTO 8. AFTER THE DRILL HANDLE HAS BEEN PULLED DOWN THROUGH THE LEATHER, THE CUTTER IS WITHDRAWN AND THE PUNCHING IS REMOVED.

I then install a  $\frac{3}{4}$ " long,  $\frac{5}{32}$ " diameter centering pin into the hole. This pin is used to locate the center of the new valve facing, as seen in PHOTO 4.

With the center of the punching jig now located on the drill press, I install the altered  $\frac{9}{16}$ " diameter leather punching tool into the drill press chuck (PHOTO 5) and bring it in contact with the brass jig to check the centering and to score the fixture for cutting. Upon confirmation of proper alignment, I am ready for a test run.

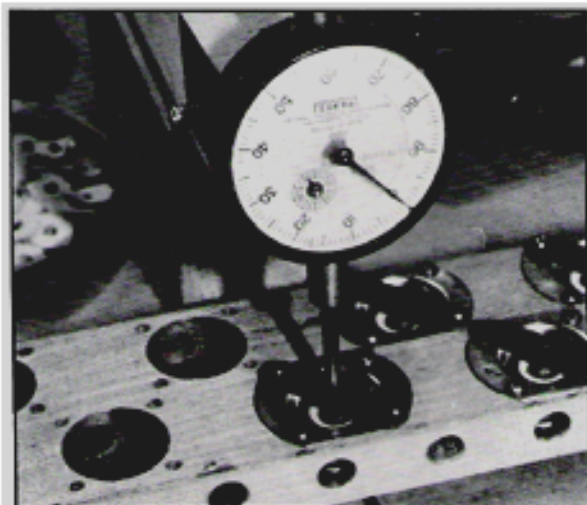


PHOTO 9. HOLD VALVE CELL BOARD DOWN WITH VALVE AT REST TO SET INDICATOR AT "O".

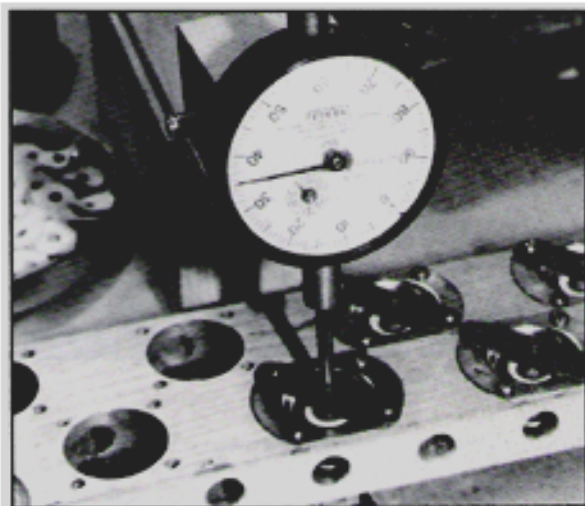


PHOTO 10. USING A PUSH ROD BUILT INTO THE TABLE, THE VALVE IS PUSHED UP AND A TRAVEL READING IS TAKEN.

**RESTORERS NOTE:** IN THE PROCESS OF MAKING THESE VALVE FACINGS I USE MY CRAFTSMAN DRILL PRESS LIKE AN ARBOR PRESS. THAT IS, I PULL DOWN THE DRILL PRESS DRILLING HANDLE BUT INSTEAD OF TWISTING A DRILL BIT THROUGH MY LEATHER STOCK, I FORCE THE CUTTER THROUGH THE LEATHER. IT IS TOTALLY DONE BY HAND. THE PUNCHINGS ARE MADE WITH THE MOTOR OFF IN ORDER TO ASSURE PERSONAL SAFETY! A TWISTING DRILL BIT MIGHT GRAB THE LEATHER AND PULL YOUR HANDS INTO THE DRILL PRESS CAUSING INJURY. (I REMOVE THE SAFETY POWER KEY FROM MY DRILL PRESS.)

With a block of wood as a base sitting near my work areas and a wooden mallet for power, I use a  $\frac{5}{32}$ " diameter hand punch to remove the center hole (PHOTO 6).

The leather with hole punched into it is placed over the jig's centering pin and flattened to ready it for cutting (PHOTO 7).

The drill press handle is pulled down, the facing is cut and liberated from the leather stock. If the punching is not cut clean by the downward action of the punch, the punch can be hand rotated back and forth to help in its cutting and removal (PHOTO 8).

#### THE INSTALLATION

Once all of the facings are produced they are installed on the valve centers. The easiest part to install is the bottom facing. (This is the side of the valve center with a hole drilled into the pin.) This facing is glued to the valve center with hide glue.<sup>2</sup> I install all of the glued bottom facings before continuing.



PHOTO 11. MY WORK TABLE LAYOUT.

After all the valve bottoms are glued in place and stored, I start the installation of the top facing (the rounded solid pin side of the valve center).

This side of the assembly was designed to adjust the valve clearance or valve travel.<sup>3</sup> In order to establish proper valve clearance, it is necessary to install thin newspaper shims under the top facing.

I have found old newspaper punchings under every valve of this type I have ever refaced with leather. To a lesser degree, I have also found thin card stock and tissue paper punchings. Examples of these can be seen in PHOTO 1. The same jig used to cut our leather facings can be used to produce the paper shim punchings.

In order to determine the number of shims, I built a fixture to hold a dial indicator I purchased at a flea market for \$2.00. (A complete magnetic base dial indicator can be seen on page 89 of *Rebuilding the Player Piano* by ART REBLITZ.)

I made the job of pushing the valve center up to check its travel easier by installing a push rod into my work table. I can operate it with my knee, freeing my hands to hold the valve cell board flat to my work table. This makes the task of setting the "0" base line on my dial indicator easier (PHOTO 9). By pushing the rod upward, I can determine if I have obtained a proper clearance of  $\pm .035$ " (PHOTO 10). After making a reading I can then adjust its travel, adding or subtracting shims as needed.

When the proper valve clearance is reached, a force-fit fiber washer is bushed onto the shank to hold all the parts in place. The valve center assembly is placed into one of the valve cells and a cleaned valve top plate and fiber guide is screwed in place.

After all the new valve parts have been remade and/or, if needed, cleaned, I lay out my work table in compartments with all the parts necessary to finish the job on the valve cell board (PHOTO 11).

On the right side of PHOTO 11 you see the valve cells with some of the valve units installed and ready for service. You will also see, top to bottom: valve guides (on wire), a block of steel with holes drilled into it (larger than the valve center pins for pushing on force-fit washers), my dial indicator mounted on a shop-made base (top, taller round pan), cleaned valve top plates with blotter paper gaskets, punched top valve facings, valve centers (with bottom leathers installed), newspaper shim punchings, a small open box of force-fit washers, a cigar box of adjustable valve feet and a box of valve plate wood screws.

## CONCLUSION

This article is my way of helping the hobbyist-restorer do the cleanest, most concise and safest job of building, restoring or repairing the damage that time or a less-patient person has created. Good luck and enjoy!

## ADDITIONAL NOTES

<sup>1</sup> Though the jigs were assembled for making Duo-Art reproducing piano striker pneumatics, lessons learned could be translated into designs for similar parts in other brands and instruments.

<sup>2</sup> Hide glue is used to install the facings so they can be as easily removed during the next restoration as they originally were.

<sup>3</sup> In the case of this action, valve travel is .035".

## REFERENCES

*Rebuilding the Player Piano*, ARTHUR REBLITZ, The Vestal Press, New York, 1985.

"Jigs, Restoration Aids for the Restorer," GARY G. STEVENSON, *Journal of Mechanical Music*, Volume 37, Number 1, 1991, MBSI.

*The Duo-Art Reproducing Piano*, The Aeolian Co., AMR Publishing Co., reprint, 1983.

"Possible Dreams — Enthusiasm for Technology in America," John L. Wright, Henry Ford Museum/Greenfield Village, Dearborn, Michigan, 1992, for information about the history of *Popular Mechanics* magazine, "How-To-Do-It" and "Do-It-Yourself in America."

GARY STEVENSON, St. Louis, MO, is a collector and restorer of all types of mechanical musical instruments and a Contributing Editor to the *Journal*. He edited the *Master Index of the MBSI Technical Bulletin*, 1967-1985. This is his sixth major article for the *Journal*.

GARY and his wife ROSE have four children and GARY is an administrator in the St. Louis Public Schools.