Jigs

Restoration Aids for the Restorer

Gary G. Stevenson

For some time I have been trying to find a way to connect my love of mechanical music and my vast collection of *Popular Mechanics* (some 1,500 monthly magazines 1913-present). I have located many articles while browsing through the stacks dealing with various types of machines we now hold dear as treasures of a different time. The October, 1905, article touting the wonderfully NEW self-playing Mills Violino (The 8th Wonder of the World) or the restoration of a Fortune Teller Automaton, that in 1930 dazzled the readers of *Popular Mechanics*, are two such entries located for a possible reprint in these pages at a later date.

Though I could link my two interests with articles relating to history, it is not the history of these machines that I know enough about to write with authority. Historically, articles taken from the pages of *Popular Mechanics* would hardly be more than a case of "collect and reprint."

Mechanical music devices are by design made up of many identical parts. Every note played in the instrument is mechanically played like the note next to it. It is through this sameness that I have found my link.

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.

One of the things learned from *Popular Mechanics* is that our favorite machines were not all built "completely by hand." There were many power tools in existence in those days.*

These tools may not have been like the Black & Decker or Craftsman tools you think of today, but our fathers and grandfathers [and grandmothers] did have power tools. Though much handwork is necessary to finish the restoration, YOU SHOULD NOT TRY TO RESTORE ANTIQUE MUSIC MACHINES WITHOUT ACCURATE POWER TOOLS. It is this author's belief you will do more harm than good with less than satisfactory results.

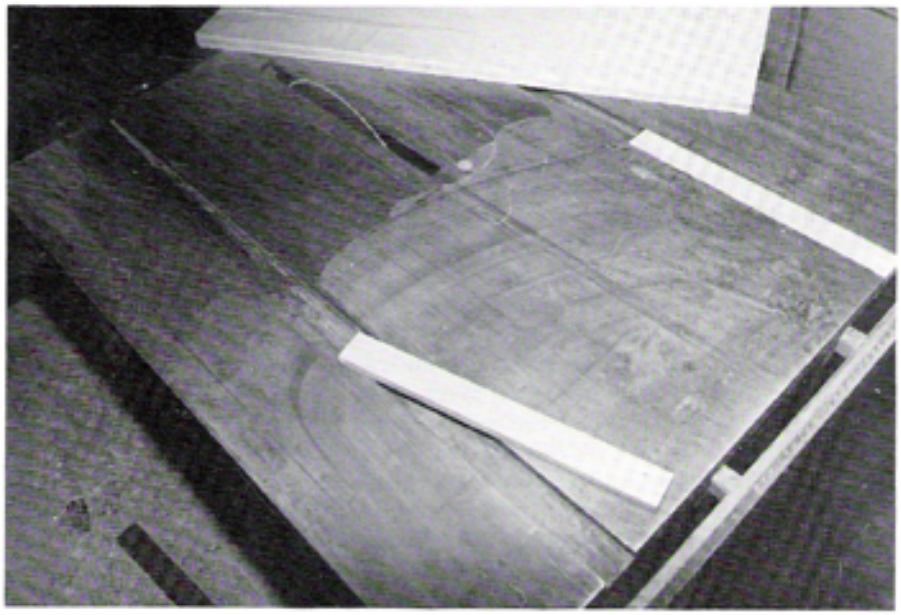

Photo 1. Pieces of wood being sized to fit cross-cut grooves on the table saw. Note the 1/2" plywood at top of photo that will become the base of the jig.

With the first thought stated, it is necessary to push the second; that of SAFETY! Hopefully, if you have a serious basic knowledge of power tools, you know SAFETY IS THE MOST IMPORTANT PART OF ANY JOB!!! You should never fear your

*Do not confuse power tools with power hand tools. The tools in this article are fixed table units such as drill press, band saw, table saw.

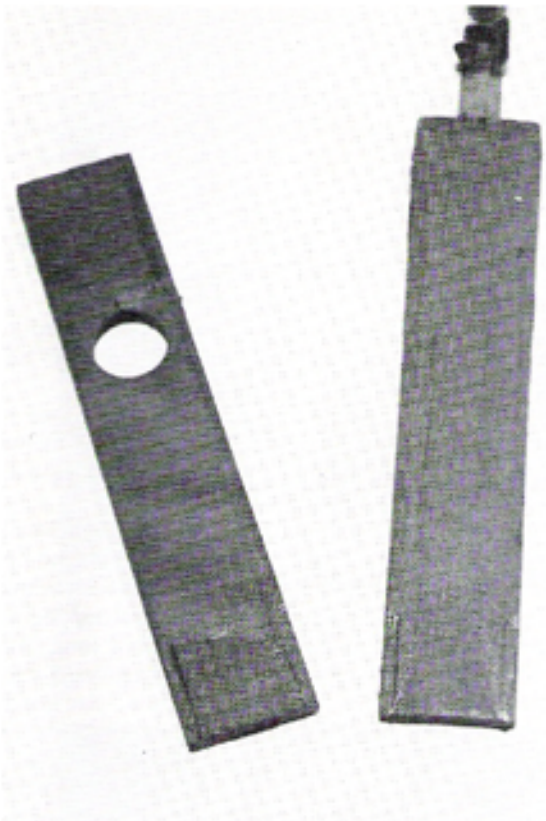

Photo 2. Original Aeolian Duo-Art pneumatic boards. Note one end of each board has a relief cut on each side.

wooden parts to make the totally new striker pneumatics, I built three jigs. The first was designed as a cut-off tool. The second was designed to relieve the hinges. The third was designed to aid in drilling the vacuum evacuation hole (one side only).

Keeping in mind that we are using fixed table equipment, it is a good rule of thumb that the design of your jig be size related to the equipment you are using.

For example, my drilling jigs are normally smaller than my table saw jigs as the bed of my drill press is 8" x 8" (20.32 cm) while the bed of my table saw is 15" x 20" (38.1 x 50.8 cm). To take this one step further, my thickness planer jigs are usually larger than the table saw jigs. I have found the size of my table saw jigs are usually related to the width of the existing slide grooves in my saw for the cross-cut slide. My planer is 18" (45.72 cm) wide, limiting the width of jigs, but I can plane boards much, much longer than 18 inches.

The first two jigs were designed for my table saw using the slide grooves of the existing saw for the cross-cut slide **(Photo 1).**

This made them movable jigs. The last unit was clamped to the bed of my drill press making it a fixed jig **(Photo 11 on page 13).** In order to determine which type of jig is needed, you must first decide what you want the jig to help you do.

You should plan your attack of the problem: look at the part you want to produce **(Photo 2)**, examine the tool you are going to use, then try to figure a way to bridge the two, step by step.

power tools, but always respect them! If for no other reason because they can seriously hurt you.

Like so many other mistreated player pianos, my Stroud Aeolian had plenty of faults. It was improperly stored and allowed to get wet. This destroyed the key tops and some of the veneer. A previous restorer lost some of the roll frame parts, broke too many of the original striker pneumatics (when they were removed for recovering), assembled what had been restored with plastic glue, used plastic pouches and plastic tracker tubing, etc., etc. It was a mess.

The first series of jigs were designed to help make pneumatics for Stroud, then Metro Style, now Duo-Art/Orchestrion. In order to cut and drill the 160

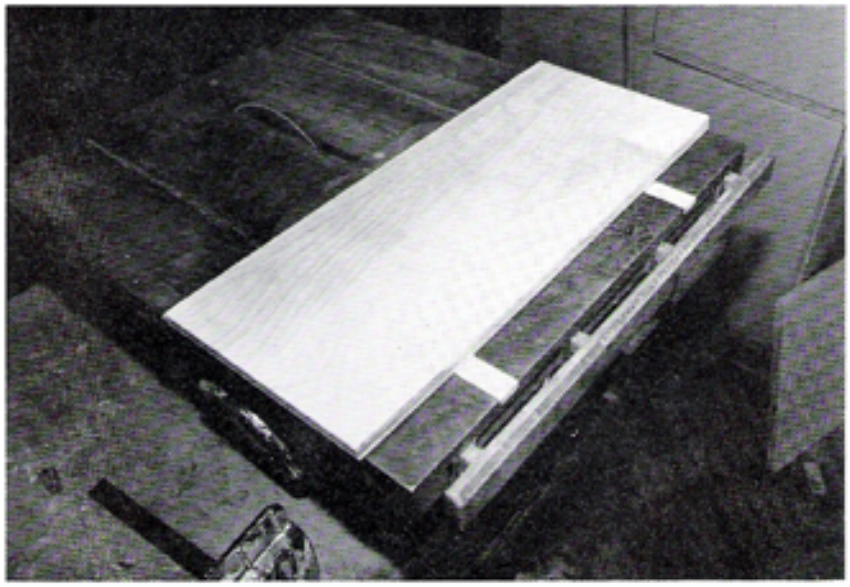

Photo 3. After glue is placed on runners, the 1/2" (1.27 cm) plywood is set in place; small nails hold the plywood in place until it dries.

Photo 4. A candle is used to wax the bottom of the sliding jig.

The top and bottom part of the pneumatic I am going to make are the same size. First I needed to cut blanks 3/16" x 1" x 5" (.47 x 2.54 x 12.7 cm). Second, the hinge ends of each board (two needed per pneumatic) needed to have cuts made in them on each side 1/16" wide x 1/2" long x 1/16" deep (.158 x 1.27 x .158 cm). Third, the top part needed a hole 9/16" (1.42 cm) in diameter drilled through it.

Both of the first two jigs were built the same way. Two strips of wood were cut to fit the cross-cut slides of my saw **(Photo 1)**. Then a 1/2" (1.27 cm) thick piece of plywood was glued and nailed **(Photo 3)**. Nails are used in some cases only to hold the jig parts in place until the glue dries.

Excess glue is cleaned off and candle wax is scrubbed into the wood to help the jig slide easier in the saw grooves **(Photo 4)**. The next step is to set the square of the unit **(Photo 5)**. After putting glue on the bottom of a 1" x 2" (2.54 x 5.08) board, I nailed one end to the plywood and then started a nail in the other end. I used a square to make sure the guide board was 90 degrees from the saw blade. When this was done the other nail was hammered home.

To this point the two saw jigs were built the same way. This unit built is to be used to cross-cut strips of wood into small parts where the second one is used to rip relief cuts into one end.

It is this point that jig number one is brought into the blade for the first time **(Photo 6)**. DO NOT CUT ALL THE WAY THROUGH THE JIG.

The last step is to nail a stop block at one end of the jig to set the length of the uniform blanks and then "C" clamp another stop block to the table saw to limit its travel into the blade **(Photo 7)**. Now we are ready to start making new pneumatic boards blanks.

I planed the three boards of clear, aged poplar from 1/2" thick to 3/16" thick. Then each of these 7" x 36" (17.78 x 91.44 cm). boards were ripped into strips 1" wide and 36" (2.54 x 91.44 cm) long. After these strips were made, each of these "yard-stick" size strips had to be cut into pneumatic-size boards. I could have used the regular cross-cut slide but made it easy on myself by making a jig for the job of cutting 5" (12.7 cm) long parts. I cleaned the end of my strip and checked it for a true 90 degree cut then slid the strip into the jig from point "A" and against rest "B" **(Photo 7)**. I then slid the jig forward to stop block "C". When the cut is made, the jig is moved back out of the saw blade. The cut part is removed from the unit and the strip is slid once more to stop block "B" to cut off the next part. This series of actions are followed over and over again until all the strips are cut into pneumatic boards. Though 160 small boards are needed, more should be cut to insure the required number of boards in the end.

Photo 5. Setting the jig square to the saw blade.

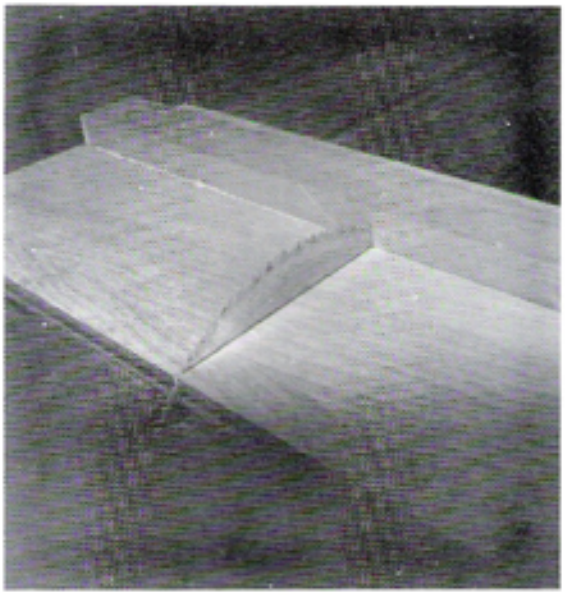

Photo 6. It is important not to cut all the way through your jig. Cut only deep enough to cut the part or the jig will be weakened.

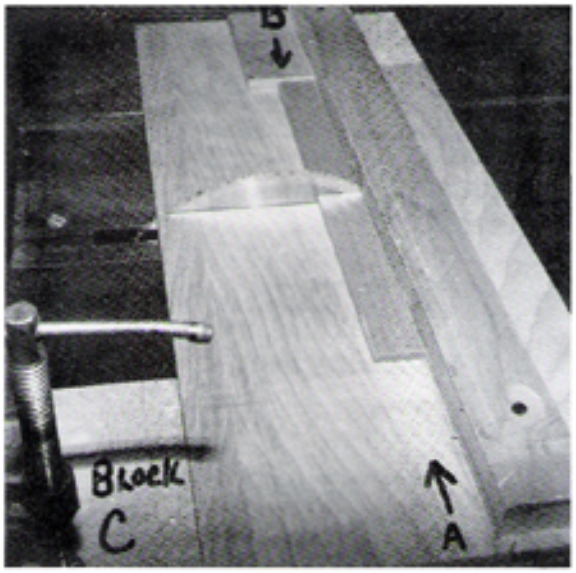

Photo 7. Cross-cut your blank. Move your jig out of the blade, then slide the wood strip to point "A". Then cut the next part.

Looking once more at the original parts (**Photo 1**), you will see the original pneumatic had two 1/2" saw cuts on each side of the hinge end top and bottom in order to keep the pneumatic from being hinge bound* when finished. At this point, jig number two is needed.

*Hard or impossible to totally close the pneumatic after it has been covered with rubberized cloth due to the thickness of wood, cloth, hinge, canvas and glue.

Photo 8. Note how the two jigs are similar in size and design.

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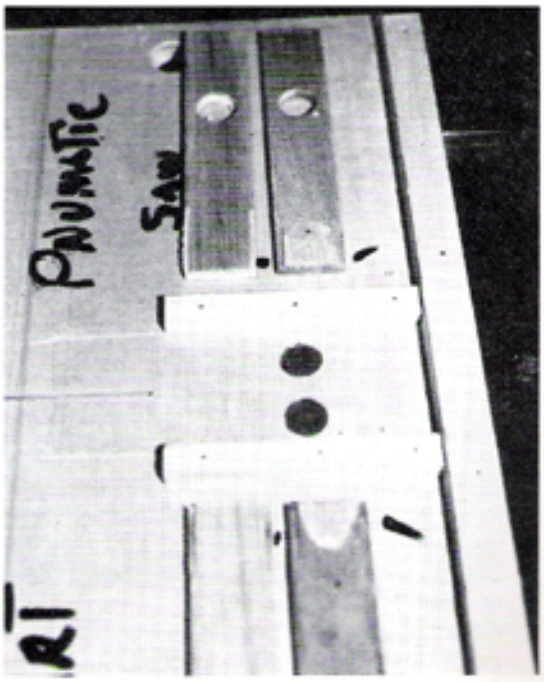


Photo 8B. The rip-cut jig.

Photo 9. Rip the right side of the blank.

Do the same to all the other parts until all the more than 160 parts have been relieved.

All the parts can then be cleaned and inspected (quality control). It is at this point that having extra parts will make sense. Half of the finished blanks can be boxes and these will make up the bottom boards of your pneumatic. The other half will need to be drilled to allow the air to be evacuated when the pneumatic is pressed into service.

Although you have reduced your work load by half (80+ parts), a stationary-type jig will help make the last part of this job go quickly. The drill press works by forcing the twisting bit down into the wood. This last jig is the simplest yet. It is an "L" shaped guide nailed to a piece of plywood clamped to your drill table that will allow you to drill your holes in the same place in every part **(Photo 11).**

This unit, as stated before, is based on the same design as the first jig: a plywood base board with two slide runners glued to the bottom, a 90 degree support and a stop block clamped to the back of the saw to keep you from cutting all the way through your jig **(Photo 8).**

To complete the next task I needed to make two cuts, one on each of the long sides of each board. This jig is different from the first in that the first was designed to cross-cut the parts. This one is designed to rip-cut your parts **(Photo 8B** can be compared to the jig in **Photo 7).** The 1" x 5" x 3/16" blank was put into the new jig on the "A" side **(Photo 9),** the jig is slid forward to point "C" to make your cut and stopped at the clamped-on stop block. After being removed from the blade, the jig is brought back to the starting point where the blank is slid to the "B" side of the unit **(Photo 10).** Once again, the jig is pushed forward into the blade to point "C". When the cut is finished, the jig is removed from the blade, the blank is removed and another blank is set up at point "A" to start the process over.

Photo 10. Ripping the left side of the blank.

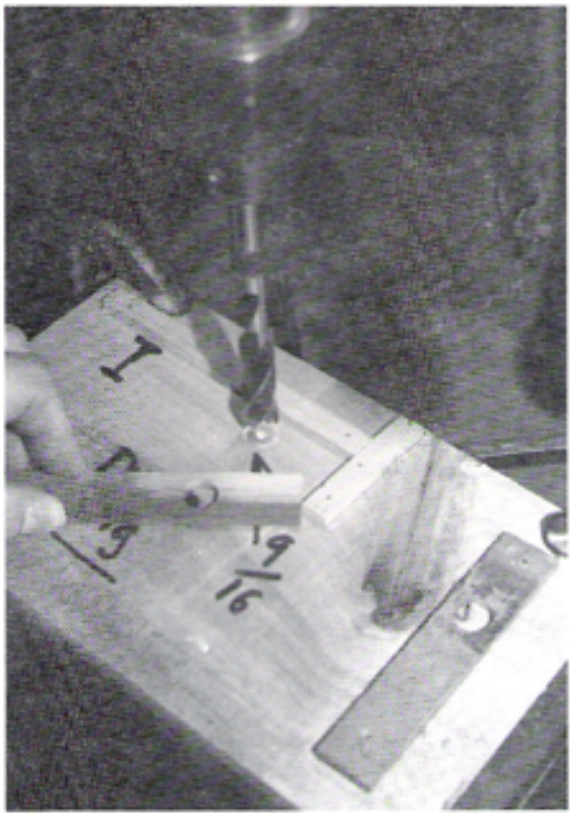


Photo 11. Removing the finished drilled part. Every hole will be in the same place.

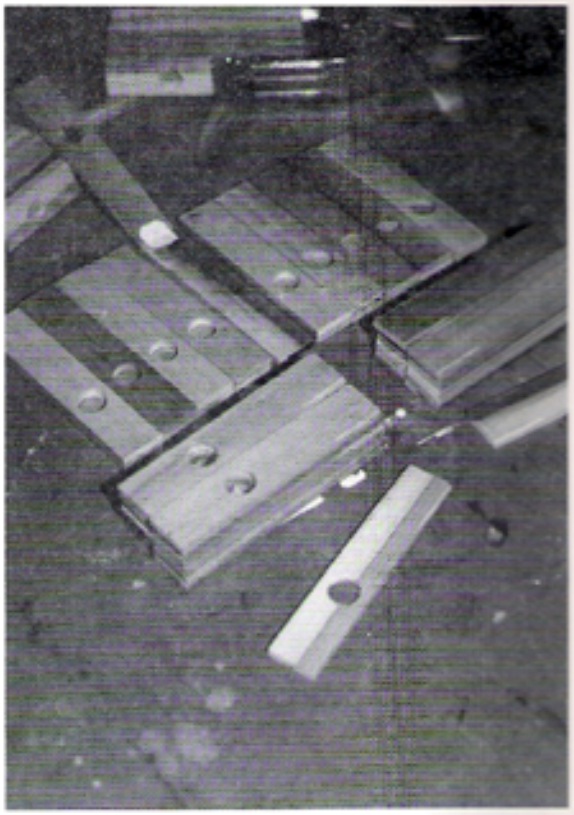
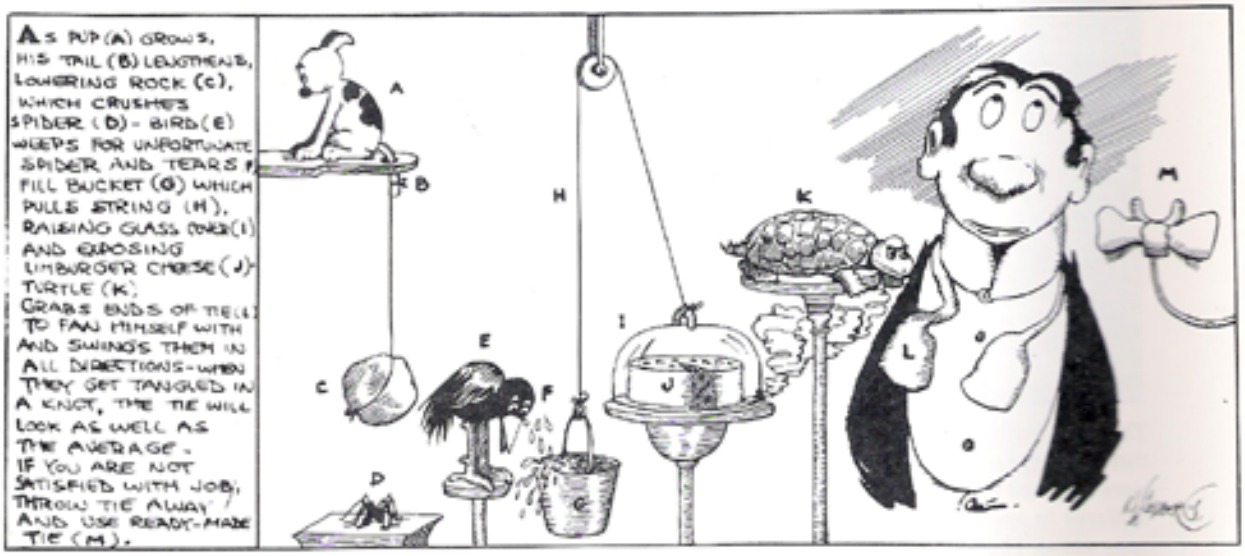


Photo 12. Finished set of pneumatic boards with hinges installed awaiting pneumatic cloth.



The pneumatic blank is placed in with the proper corner of the blank set in the "L" shaped guide. The 9/16" drill bit is brought down into the part withdrawn and replaced with the next.

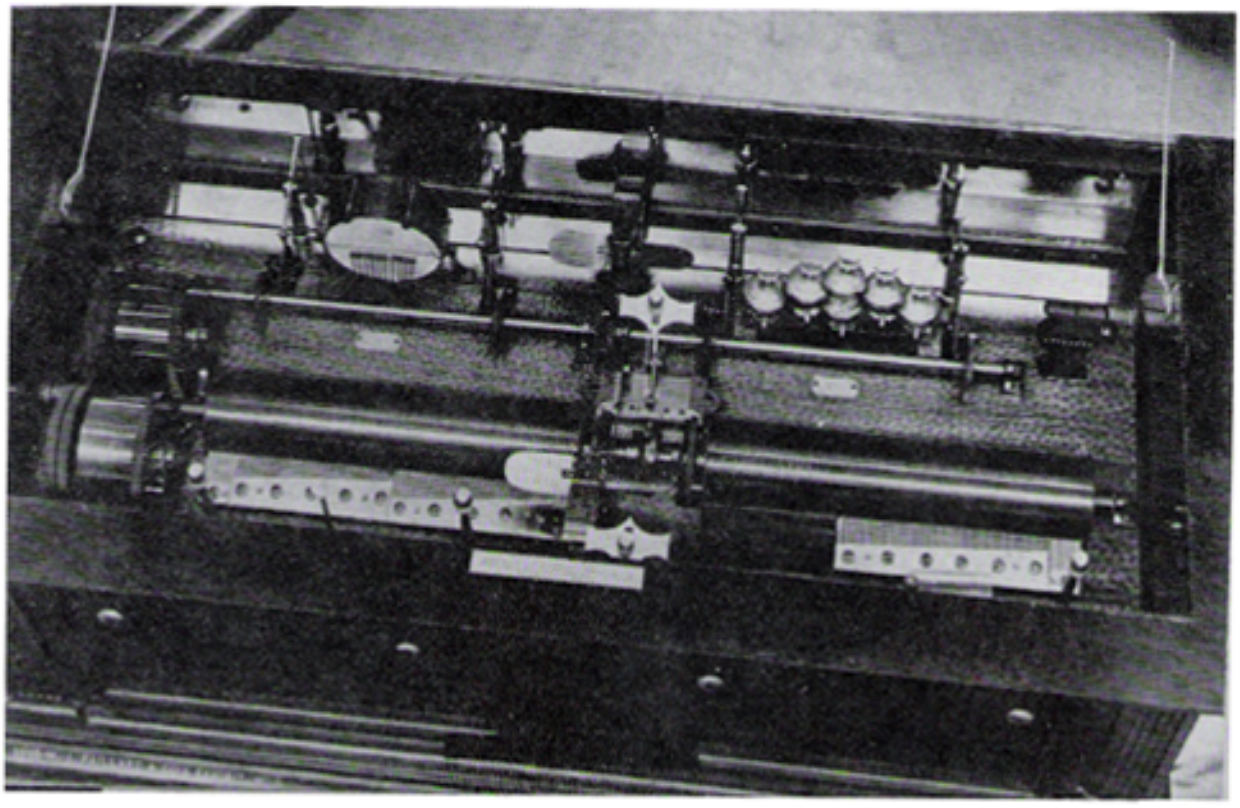
Remember, the idea originally put forth in this article is to do the cleanest, most consistent job of reproducing the parts that you can do, not necessarily the fastest.

Mr. Rube Goldberg (1883-1970) was an artist who gained popularity in the 1930s by designing "better mousetraps." In essence he would find the hardest way to do the easiest job. As you can see in the illustration, the artist ended his chain of follies with the acquisition of a ready-made part. Mechanical musical instruments, for the most part, are not the kind of thing one can get off a shelf. Although it is easy to try to design your jig to do it all—keep in mind the adage, "less is more." The reason you are building your jig is that you need the tool to do a specific job. The power tools you are using are designed to do it all. Let one jig do one job, the best that can be done; then design the next jig to do its job, the best that can be done. It is easy to think your way into a trap like that of Mr. Goldberg.

In the last photo (Photo 12), the finished parts are very uniform and will enhance the machines they are installed within. An important thing to keep in mind is "good jigs are simple and safe."

Recommended reading:
Fine Woodworking
Popular Mechanics

Gary Stevenson is a Contributing Editor to the *Journal*.



This M.J. Paillard cylinder box was part of the Paillard exhibit at the 1876 Exposition in Philadelphia, Pennsylvania. The photographer removed the lid for a better view. Note the rather complex drive train with two governors and two cylinders. The auxiliary governor, with its own spring barrel, works the four arms that move the bellows to operate the reed section. The control levers are across the front of the box rather than on the side, as was usual. The On/Off lever is in the center front, with the Change/Repeat lever directly behind. Both cylinders shift using twin stepped cams while the combs appear to be the sublime harmony type. Does anyone know the whereabouts of this unique musical box? Photo courtesy of the Philadelphia Free Library.

Courtesy of member Philip Jamison III