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Popular Woodworking

Issue #68 September 1992

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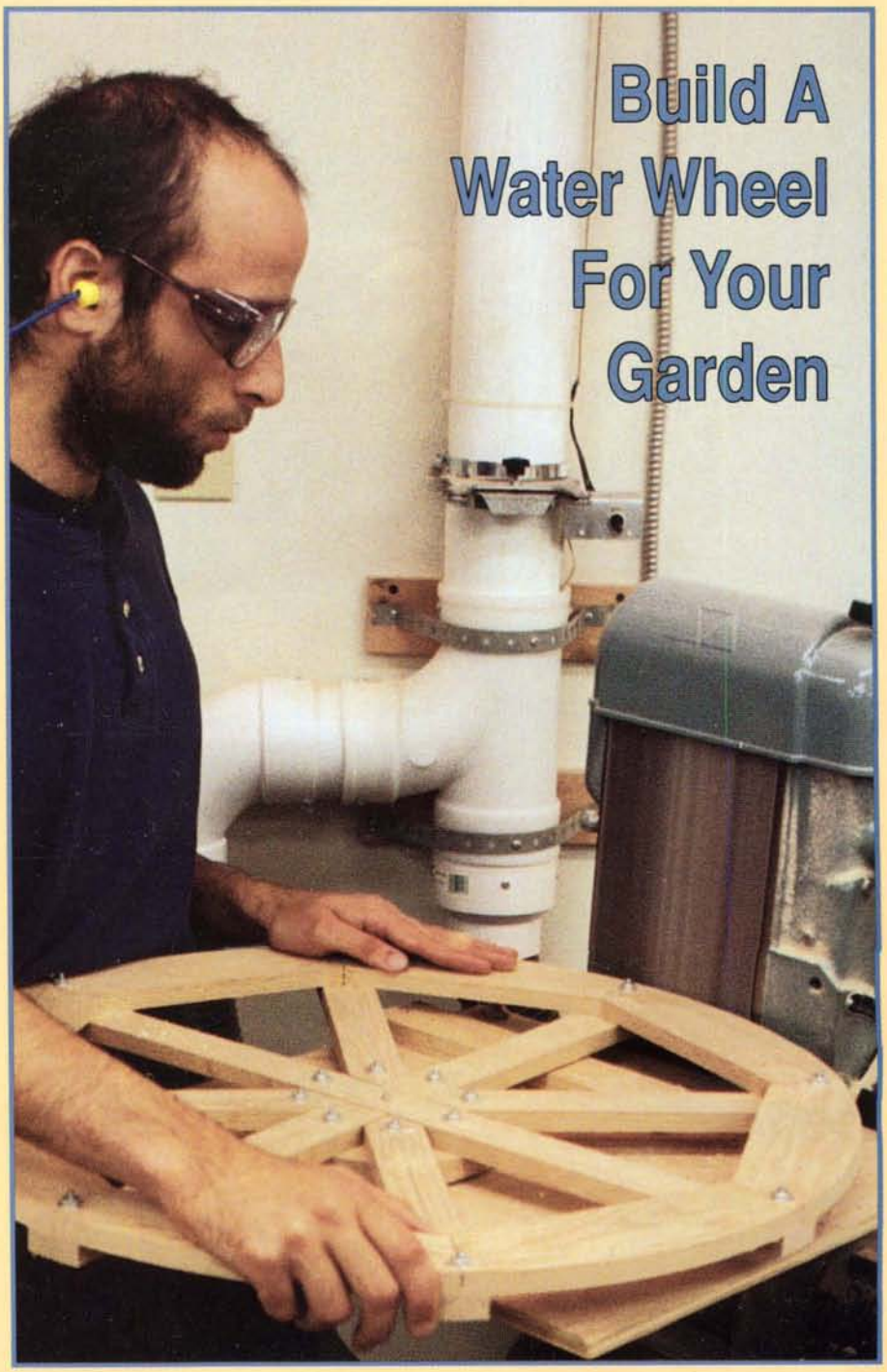

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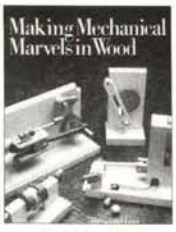

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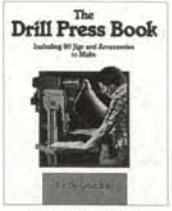

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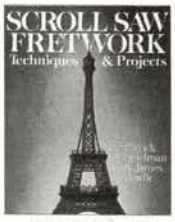

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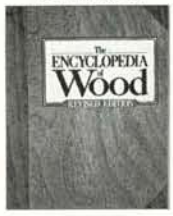

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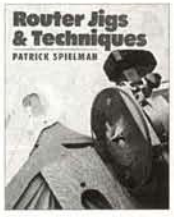

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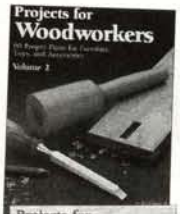

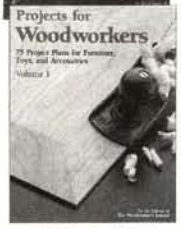

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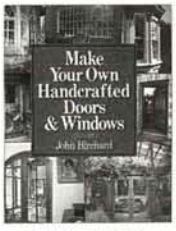

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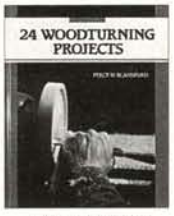

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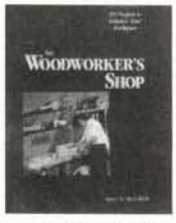

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Mid Region — Tel (415) 681-0738
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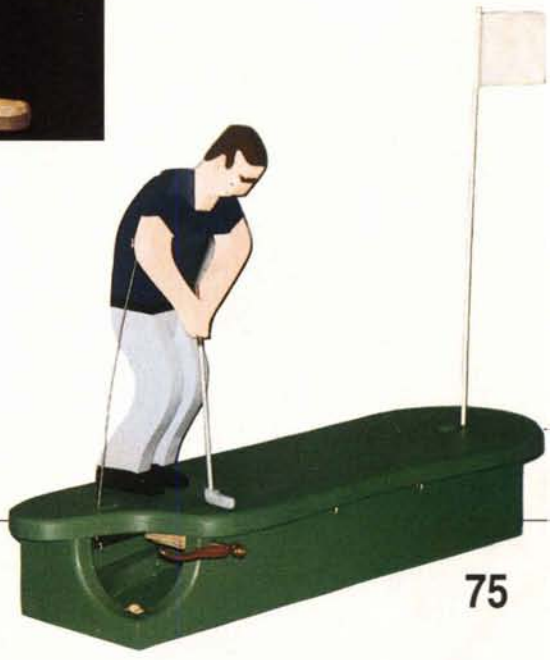

On the Cover

While building Howard French's "Old Mill Wheel," Assistant Editor Ben Green came up with this sanding jig for truing up the wheel halves. Ben's a careful woodworker, but who knows what he listens to on his ear plugs...

Columns

Departments

Clear Cuts

I bought a new woodworking tool last weekend: my first chain saw. I call it a woodworking tool, though it's in quite a different class from the paring chisels and try squares we use in our craft. This loud sputtering beast spews oil and fumes while it cuts—a far cry from the civilized whine of a router or the restrained roar of a radial arm saw. Noisy power tools are nothing new, but this unguarded 18" bar full of grinding turbine–powered teeth made me a little nervous. Feeding a board past a table saw seems a lot safer than waving around this snarling tiger.

But I quickly became comfortable with my new tool as I came to understand it. In the process of removing a big dead tree from my front yard, I gained an appreciation for what the tool was capable of and how simple it was to use. I had to learn how to sharpen the chain and maintain the tool just as I have with my other equipment, but that's all it is now—just another tool.

It's actually the first tool used in every woodworking project. Somebody somewhere carries a chain saw into the woods and cuts down a tree to make our lumber. Sometimes it's the last tool used, as when shaping the rump of a huge carved bear. I used mine for an intermediary stage: preparing bowl blanks for turning.

You may never need a chain saw in your repertoire of tools, but don't forget its initial role in your projects. Your lumber was once a tree confronted by this powerful tool. You owe it to the tree to put it to good use.

David M. Camp

Be Safe!

From time to time we show a setup or a technique that may appear to be unsafe. These procedures are demonstrated by experienced craftsmen who are comfortable using the setups they show.

It is up to you to determine whether or not you can safely perform these operations on your own equipment. There is always another way, and you should choose the method that seems safest to you.

Save a Tree

We at *Popular Woodworking* occasionally make our mailing list available to companies that provide products or services that we feel may be of interest to our readers. If you do not wish to receive mail from these companies, contact:

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If you want all "junk mail" stopped, no matter whose mailing list you are on, contact:

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Letters

Plane Horror

I enjoy Popular Woodworking very much. However, when I received my May 1992 issue (*PW* #66) and saw the picture of the wooden Jack plane on the cover and page 60, I cringed a little. Even though this is not a "real" plane, in order to convey the correct message, it should be laid on its side to protect the edge on the blade—not upright as shown.

Many years ago, when I was in high school, my father, brother and I built a large Colonial home. During those four years my father taught me many things, and this was one.

Howard Fogle
Katonah, New York

We couldn't reshoot the photo, so we turned the original upside down. This is about how the plane would look laying on its side.—Ed.

Horse Applause

Last week I received the March Issue (*PW* #65) and could not wait to go to my shop and make the "Country Clapping Horse." Rocking horses have been a specialty of mine, and this novelty drew my immediate attention. I'd like to thank Barbara Meade for submitting the plan and your magazine for publishing it.

I spent a little time dressing it up somewhat. I rounded the corners and gave the horse a third dimension, added real hair for the mane and tail, and made real leather tack to fit. I streamlined the rockers a bit, and tipped them in about 10°. This gives the rockers a boatlike shape, and I think a little better rocking action. The end result was a very attractive toy and conversation piece (see the photo below).

I have made rocking horses from this miniature toy size to horses that stand about four feet high and will accept riders from 2 to 92. I 'd like to see more articles on rocking horses. I find them not only fun to make, but something almost everyone finds interesting. I have made one for my mother (she is 92) and each grandchild shall have a horse as they come along. My problem is finding a way to market an item that takes considerable time and material. It is fun to make them and give them to family and grandbabies, but it is hard to put a price tag on them that would pay for one's time and material.

Glen C. Frey, Riverton, Wyoming

A Downward Spiral

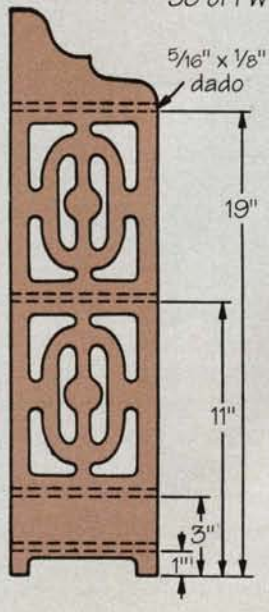
I'm enclosing a photo of some of the stuff I've built. I live in a very small old farming town, and everyone says my stuff is very pretty, but no one has any money to buy anything. I've spent all my money on tools and materials and can't afford to advertise or transport my stuff around the country to sell it. So it just sits there. And I keep building stuff.

This is just some of Gary Branstetter's stuff. Interested parties should bring their own truck.

Gary A. Branstetter, Hepler, Kansas

Knickknack Shelf Correction

Astute readers will have noted that the dadoes are not both located 8" from the end(but they are 8" apart). This is how the illustration on page 30 of PW #67 should have looked.



It's Always Something

Just a few words to let you know that *Popular Woodworking* is very, very expensive. The reason is that you have such good projects in it that I can't resist making them, and that is where the cost comes in—for materials.

Keep up the good work and continue with projects. I am 82 years old and I think I can afford to make the projects as long as I live.

Wilbur H. Bender, Riverhead, New York

We welcome your comments, pro or con, about articles we publish. Send your letters to: Editor, *Popular Woodworking*, 1320 Galaxy Way, Concord, CA 94520. Letters may be edited for publication.

Tricks of the Trade

Tricks of the Trade shares readers' tips for making woodworking tasks easier and safer. Send yours to Tricks of the Trade, c/o Popular Woodworking, 1320 Galaxy Way, Concord, CA 94520. We pay $25 for each trick we publish.

Photography Tip

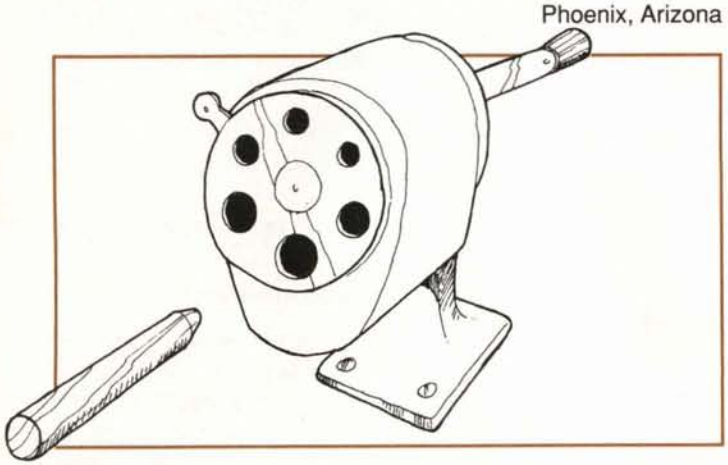
Ordinary black construction paper makes an excellent background for photographing small projects on your bench top. The paper reduces glare and disperses light. The results are attractive, and any seams hardly show. Experiment with lighter colored papers to use as backdrops for darker colored woods. With lighter paper, however, any seams will show in the photograph.

Dick Dorn
Oelwein, Iowa

Rejuvenating Plastic Laminate

Some older styles of plastic laminate begin to look pretty scruffy after years of constant use. We have an old table with a true to life black walnut finish, and no amount of waxing would bring it back to its original lustre. I carefully cleaned the surface to remove all traces of dirt and wax, and sprayed the laminate with a couple of coats of clear lacquer. My wife Esther thought I'd replaced the top with a new sheet laminate.

Don Kinnaman
Phoenix, Arizona



Dowel Tapering Machine

A hand crank pencil sharpener keeps your shop pencils in working condition, and can also be used to taper the ends of dowels prior to gluing.

Dick Dorn
Oelwein, Iowa

Chain Saw Sharpening

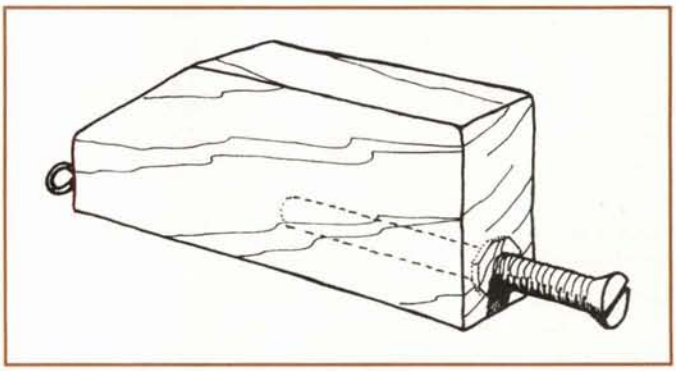
When you sharpen your chain saw, do you have trouble remembering where you started? Take a permanent felt marker (I use bright blue) *and mark* the first tooth you sharpen; you'll never get lost again.

George Earley
Mount Hood, Oregon

Adjustable Stop Block

Start with a 6" piece of 2 X 4 and drill a 7/16" X 3" deep hole 3/8" up from the bottom edge of the block. Chisel an opening to accept a 3/8" nut; then epoxy it in place—don't get epoxy on the threads. When the epoxy has cured, insert a 3" flat head machine screw. You're now ready to clamp the block to the fence you're ready to use. One full turn of the screw gives a 1/16" adjustment.

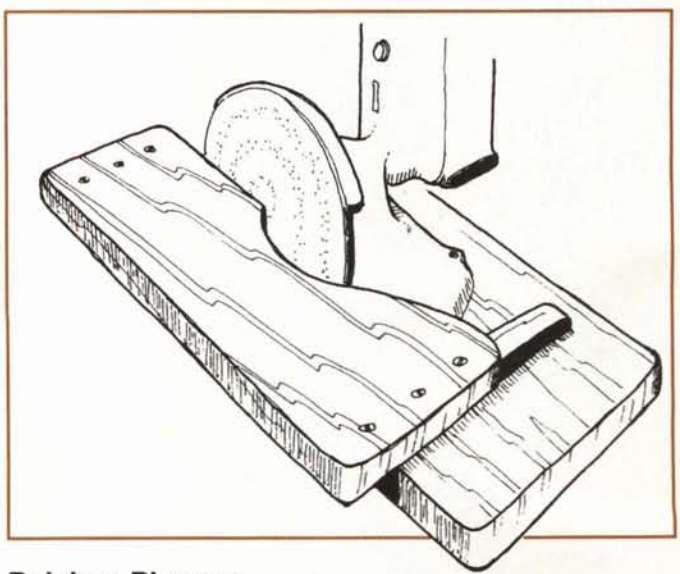
John Rynbrandt
Zeeland, Michigan



Disk Sander Table

I tossed the old table on my disk sander and replaced it with a wooden design that's large enough to be workable. It always remains at 90° to the disk. The design reminds you to stay always to the left of center, and it's easy to remove to replace the sand paper.

Dick Dorn
Oelwein, Iowa



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George Earley
Mount Hood, Oregon

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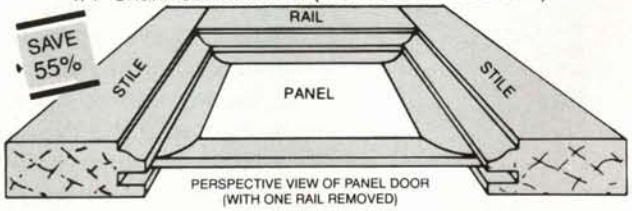
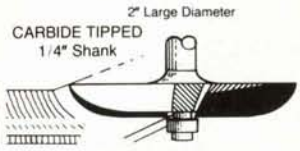


PERSPECTIVE VIEW OF PANEL DOOR (WITH ONE RAIL REMOVED)

RAISED PANEL BIT SUPPLIED WITH BALL BEARING



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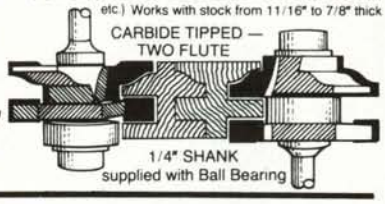

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#530		3/16" **Edge Beading**	3/16" Dia. of Circle		1/2"	1/4"	$15.00
#531		5/16" Edge Beading	5/16" Dia. of Circle		1/2"	1/4"	$15.50
#350		1/8" **Round Over**	1/8" R	3/4"	3/8"	1/4"	$11.00
#351		3/16" Round Over	3/16" R	7/8"	1/2"	1/4"	$11.00
#230		1/4" Round Over	1/4" R	1"	1/2"	1/4"	$12.00
#353		5/16" Round Over	5/16" R	1 1/8"	1/2"	1/4"	$14.00
#209		3/8" Round Over	3/8" R	1 1/4"	5/8"	1/4"	$15.00
#355		1/2" Round Over	1/2" R	1 1/2"	3/4"	1/4"	$17.00
#655		1/2" Round Over	1/2" R	1 1/2"	3/4"	1/2"	$17.00
#656		3/4" Round Over	3/4" R	2"	7/8"	1/2"	$21.00
#199		**Multiform Moulding**	Unlimited Patterns	2 1/4"	2"	1/2"	$40.00
#205		1/4" **Cove**	1/4" R	1"	1/2"	1/4"	$12.00
#206		3/8" Cove	3/8" R	1 1/4"	9/16"	1/4"	$13.00
#207		1/2" Cove	1/2" R	1 1/2"	5/8"	1/4"	$14.00
#643		1/2" Cove	1/2" R	1 1/2"	5/8"	1/2"	$15.00
#208		3/4" Cove	3/4" R	1 7/8"	3/4"	1/2"	$26.00
#231		5/32" **Roman Ogee**	5/32" R	1 1/4"	15/32"	1/4"	$16.00
#232		1/4" Roman Ogee	1/4" R	1 1/2"	3/4"	1/4"	$17.00
#506		1/2" **Pattern**	Flush Trim	1/2"	1"	1/4"	$15.00
#508		3/4" Pattern	Flush Trim	3/4"	1"	1/4"	$17.00
#366		1/8" **Slot Cutter**	3/8" Deep	1 1/4"	1/8"	1/4"	$14.00
#368		1/4" Slot Cutter	3/8" Deep	1 1/4"	1/4"	1/4"	$14.00
#204		3/8" Rabbeting	3/8" Deep	1 1/4"	1/2"	1/4"	$13.00
#670		3/8" Rabbeting	3/8" Deep	1 1/4"	1/2"	1/2"	$14.00

ITEM NO.	BEST CUT BEST PRICE	DESCRIPTION	ANGLE/DEPTH/RADIUS CIRCLE DIAMETER	LARGE DIA.	CUTTING LENGTH	SHANK SIZE	PRICE
#211		3/8" **Core Box**	round nose	3/8"	3/8"	1/4"	$10.00
#212		1/2" Core Box	round nose	1/2"	11/32"	1/4"	$13.00
#418		3/4" Core Box	round nose	3/4"	5/8"	1/4"	$15.00
#213		1" Core Box	round nose	1"	3/4"	1/2"	$17.00
#548		**Lockmitre**		2"	7/8"	1/4"	$32.00
#214		1/4" **Straight**	plunge cutting	1/4"	3/4"	1/4"	$ 6.50
#216		3/8" Straight	plunge cutting	3/8"	1"	1/4"	$ 6.50
#474		1/2" Straight	plunge cutting	1/2"	1"	1/4"	$ 7.00
#219		3/4" Straight	plunge cutting	3/4"	1"	1/4"	$ 9.50
#779		3/4" Straight	plunge cutting	3/4"	1 1/2"	1/2"	$10.00
#462		1/2" **Bull Nose**	1/2" Dia. of Circle		3/4"	1/4"	$16.00
#464		3/4" Bull Nose	3/4" Dia. of Circle		1"	1/4"	$21.00
#764		3/4" Bull Nose	3/4" Dia. of Circle		1"	1/2"	$21.00
#545		**Tongue & Groove**	Straight	1 5/8"	1"	1/4"	$29.00
#845		Tongue & Groove	Straight	1 5/8"	1"	1/2"	$29.00
#546		Tongue & Groove	Wedge	1 3/16"	1"	1/4"	$29.00
#846		Tongue & Groove	Wedge	1 5/8"	1"	1/2"	$29.00
#450		1/8" **Beading**	1/8" R	3/4"	3/8"	1/4"	$11.00
#233		1/4" Beading	1/4" R	1"	1/2"	1/4"	$13.00
#454		3/8" Beading	3/8" R	1 1/4"	5/8"	1/4"	$15.50
#455		1/2" Beading	1/2" R	1 1/2"	3/4"	1/4"	$17.00
#500		3/8" **Flush**	**Trimming**	3/8"	1/2"	1/4"	$ 7.00
#501		3/8" Flush	**Trimming**	3/8"	1"	1/4"	$ 7.50
#503		1/2" Flush	Trimming	1/2"	1"	1/4"	$ 8.50
#221		1/2" Flush	Trimming	1/2"	1 3/16"	1/2"	$ 8.00
#558		**Thumbnail**		1 3/16"	3/8"	1/4"	$18.50
#858		Thumbnail		2 1/2"	3/4"	1/2"	$35.00
#579		**Molding Plane**		1 1/8"	1 3/4"	1/4"	$31.95
#879		Molding Plane		1 1/8"	1 3/4"	1/2"	$31.95

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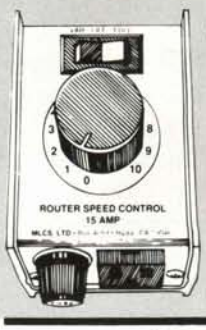

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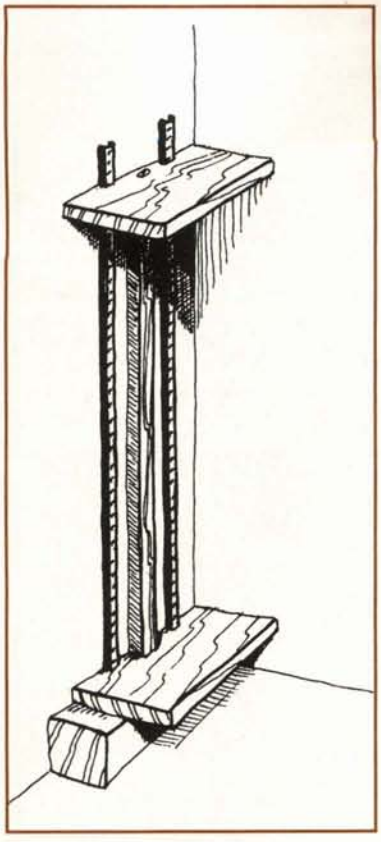
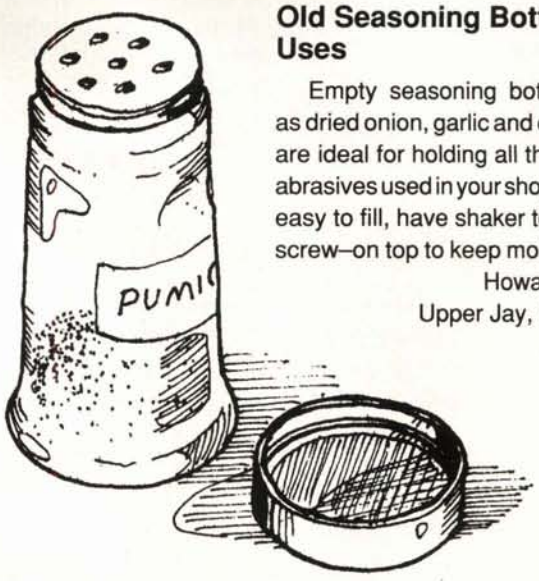


Shelf Track Jig

This simple jig makes sure that the tracks for end supported shelves are parallel and set at equal heights. Clamp the two end pieces together and cut two identical slots the width and thickness of the metal tracks. Set the separation of the tracks and spacing from the front edge and back wall to suit the unit. Attach a piece of 2 X 4 between the end pieces and use a block under the bottom to adjust the height of the tracks. You can now hold both tracks in place with one hand and drill the pilot holes for the screws with the other. Flip the jig end for end to do the other wall.

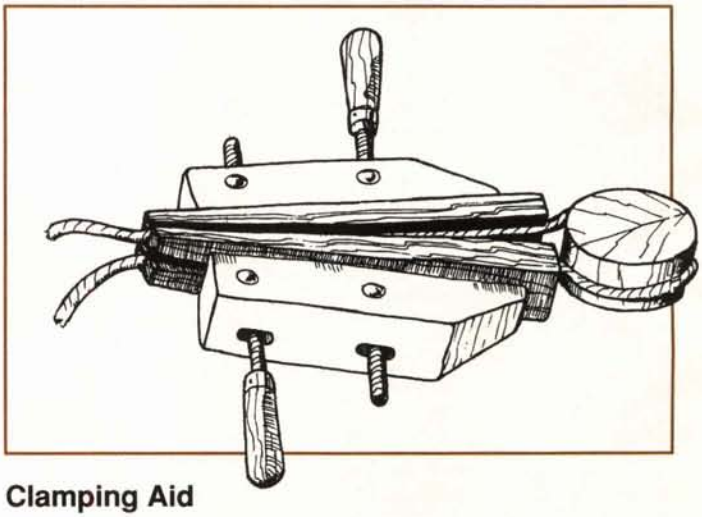
George Earley
Mount Hood, Oregon



Old Seasoning Bottle Uses

Empty seasoning bottles such as dried onion, garlic and celery salt are ideal for holding all the various abrasives used in your shop. They're easy to fill, have shaker tops and a screw–on top to keep moisture out.

Howard Moody
Upper Jay, New York



Clamping Aid

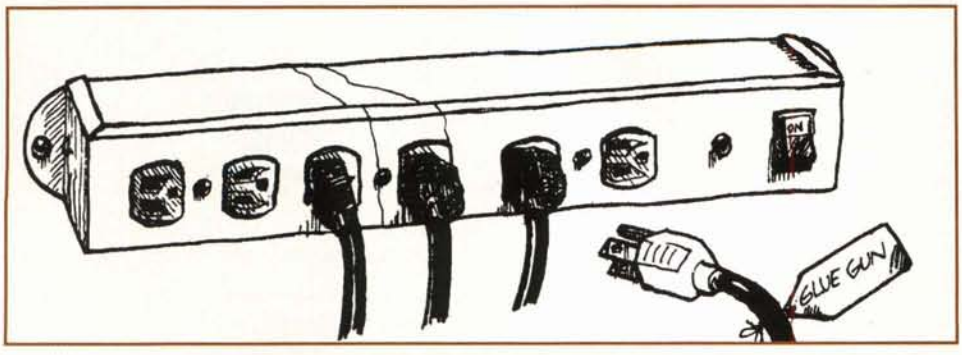
Braided sash cord or other light rope used with a hand screw makes an excellent band clamp. Cut a slot in the aid to fit around the threaded rods of the clamp; then cut a 3/8" groove near the edge to keep the rope under control. Taper the back end of the aid to remove most of the groove. Tighten the rear screw to secure the rope; then tighten the front one to secure the work.

Robert and Alice Tupper
Canton, South Dakota

Scrapers

Used piston rings make excellent inexpensive scrapers for concave surfaces. Engine rebuilding shops will usually give them away.

H. Wesley Phillips
Greer, SC



Safety Painted Plug

When you use a power strip in your shop, it's easy to walk off and leave a glue gun or soldering iron plugged in. Paint these plugs white. When you leave the shop, check your power strips—the white ones will really stand out.

Roy Schoffhausen
New Brighton, Minnesota

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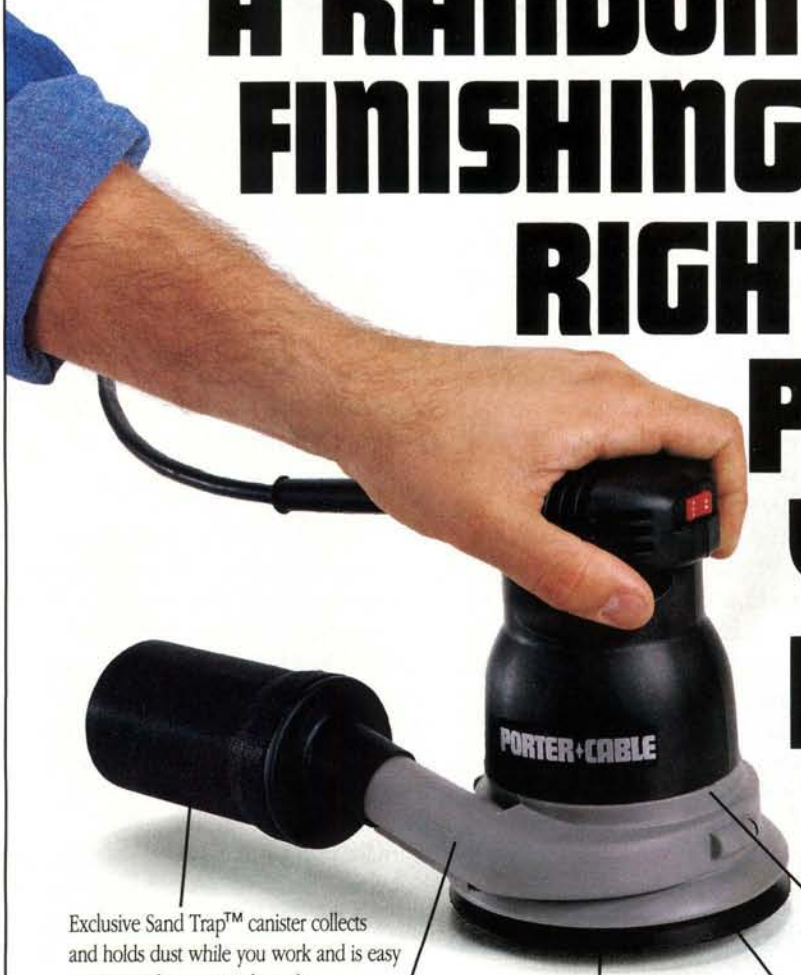

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PROFESSIONAL POWER TOOLS

by John Watson

Using the Jack Plane

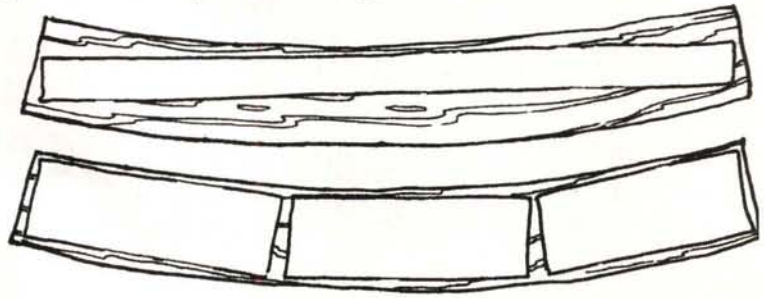
Who wouldn't hesitate at the prospect of working a 2" thick piece of heavy, hairy, twisted oak with only a handsaw and a wooden plane? The idea seems preposterous, suitable only for a period demonstration in a museum village. And given the quality and condition of the handsaws and wooden planes in most shops, the job would likely take all the fun out of woodworking. But it can be done, and more easily than you might believe.

What the Jack Plane is Intended For

We use the word *jack* to describe an object that has many uses, but may not be perfect for any of them. The jack plane can serve many purposes, but is ideally adapted for one specific use—flattening and truing the surface of boards for a project. Before the introduction of thickness planers, power jointers, and table saws, the jack plane was invariably the first tool used after a board was rough–sized.

In the small woodworking shop it's easier to cut pieces to near–length before planing. If the board has any cupping or warping in it, less wood will be wasted if shorter, smaller pieces are trued than if the entire piece is made flat first (see Figure 1). Since at the start of many projects the first task is to flatten and true relatively short pieces, the jack plane, when properly used, can indeed be a viable competitor with its powered descendants.

Figure 1. Cutting Board Lengths

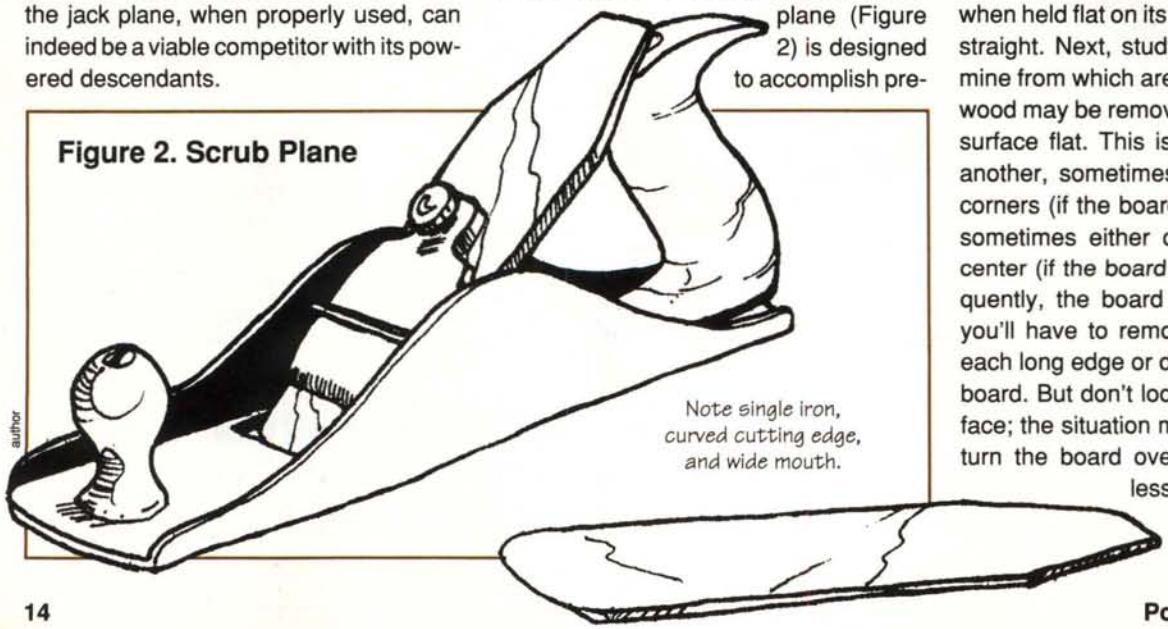


Less waste occurs if shorter lengths are taken from deformed boards.

A Smaller Partner

The hairy oak mentioned above refers to lumber as it arrives direct from the sawmill—undressed, the surface often deeply ridged by the sawmill's large–toothed saw. Not all rough-sawn wood is quite so hairy and can usually be worked directly with a jack plane (or a power jointer). But for excessively hairy material, it's useful to reduce much of the coarness first. It's good practice, even when machining raw material, to clean the surface thoroughly with a wire brush. Bits of grit left among the surface fibers—stone chips and jungle debris accumulated in the log's journey to your shop—can put nasty nicks in any blade. Getting rid of excessive fibrous material is helpful too. The scrub plane (Figure 2) is designed to accomplish precisely this. It's an exaggerated version of the jack plane, with a similarly shaped cutting edge, but with a more pronounced curve and wider mouth, and no capiron. It skims the irregular surface of a very rough and uneven board, removing the worst defects and leaving the board ready for more efficient planing by the jack.

Figure 2. Scrub Plane



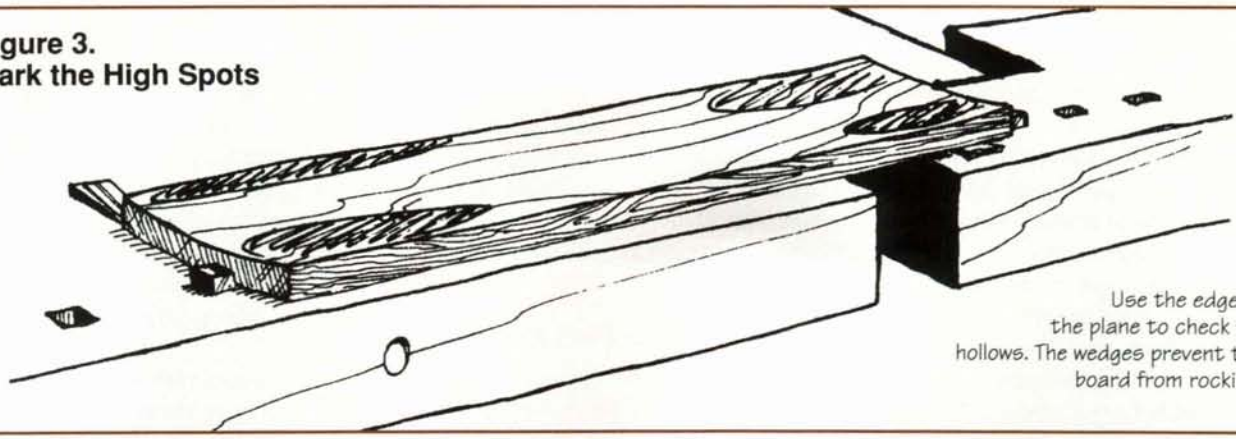
Note single iron, curved cutting edge, and wide mouth.

author

First Strokes

If a board has any pronounced warp, cup, or twist to it, the scrub and jack planes can be used the same way initially. Here's the method: first place the board on the bench—which should be flat, solid and capable of holding the board securely with stops or vises. For maximum comfort your bench should be as high as your hand when held flat on its surface with your arm straight. Next, study the board to determine from which area the least amount of wood may be removed to make the entire surface flat. This is often one corner or another, sometimes diagonally opposite corners (if the board is propellered), and sometimes either opposite ends or the center (if the board is warped). Less frequently, the board will be cupped, and you'll have to remove wood either from each long edge or down the center of the board. But don't look only at the top surface; the situation may be different if you turn the board over—possibly requiring less work. Of course, even at this early stage of stock preparation

Figure 3.
Mark the High Spots



Use the edge of the plane to check for hollows. The wedges prevent the board from rocking.

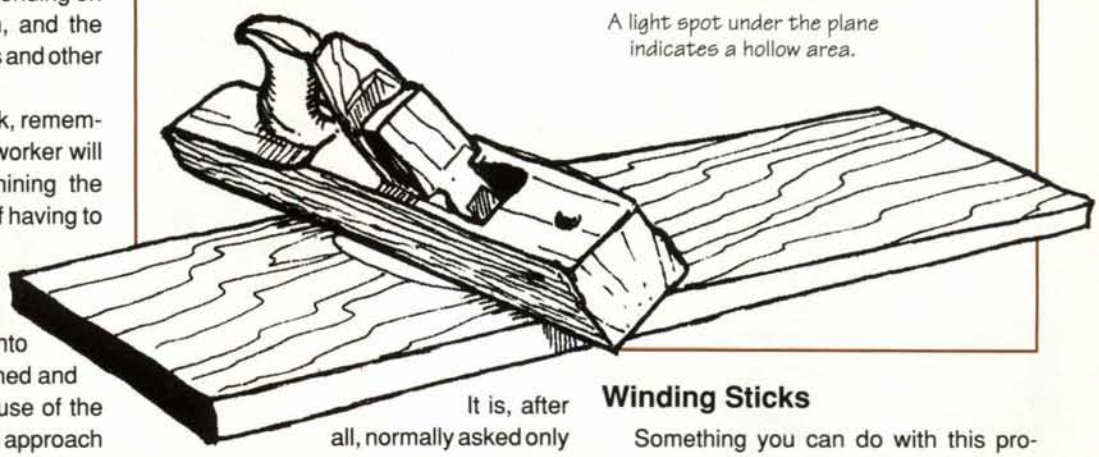
other factors may come into play. You may already have made choices depending on the grain pattern and direction, and the possible presence of knots, burls and other defects or features.

If this sounds like a lot of work, remember it's no more than a careful worker will have performed prior to machining the material—but without the task of having to take into account how to feed the material through the machine to avoid tearout. There is no reason to take grain direction into account with a properly sharpened and set jack plane. In fact, correct use of the jack virtually precludes any such approach since you are working in every direction but with the grain. Any plane that cannot do a passable job unless used with the grain is not up to the mark. For those last few passes with a smoothing plane perhaps there may be reason to work with the grain, but ever since the invention of the double iron—the cutting iron and capiron combination—the failure of a plane to take a smooth cut in any direction is invariably the result of an improperly set capiron, an excessively wide mouth, or an imperfectly sharpened edge. There are other possible causes—such as a warped sole and poor seating for the iron (whether this be on a metal frog as in Stanley–type planes or on the wooden bed of a wooden plane)—but nine times out of ten the fault will lie with a blunt edge and a poor setup.

Before you panic and declare that such a condition can only be expected after much experience and with the help of a master, take comfort in the fact that the jack plane is very generous in this regard.

Figure 4. Check for Hollows

A light spot under the plane indicates a hollow area.



It is, after all, normally asked only to perform relatively coarse work—as fine, certainly, as any jointer or planer—not the perfection of a smooth plane.

At the start, scribble with a soft, broad–leaded carpenter's pencil on the high spots of your board (Figure 3). With time, you won't need this aid. It may be sufficient to hold the plane at an angle so one corner of the sole rests on the board, and then to sight under this edge. If you can see light, there's a hollow spot (Figure 4). This will give you an idea of broad surface irregularities. Plane away these areas with light strokes. You should not have to put much effort into planing. The blade should protrude sufficiently from the sole to take a shaving the thickness of several sheets of paper. When you have removed most of the lead marks, turn the board over and observe whether it rocks a little less. From this angle you'll also be able to see where the high spots are. Don't lose track of them as you replace the board right side up. Mark the spots and repeat the process.

Winding Sticks

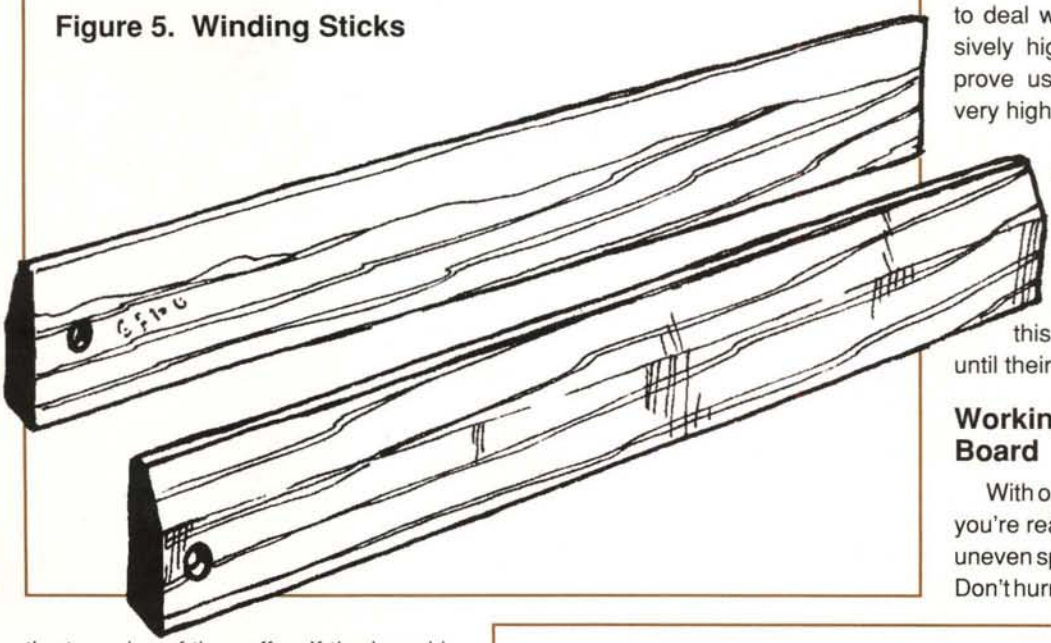
Something you can do with this process, and which is the best way to check for out–of–flatness or winding, is to make and use of winding sticks. Astonishingly—probably because their use has so declined as to have turned them into arcane artifacts from a forgotten past—old pairs sometimes show up at antique tool sales where they are sold for very high prices. Their makers would have been amused at this, for winding sticks are typically user–made, often on the spur of the moment and out of whatever convenient scrap was handy. True, with years of use, they can develop a wonderful patina, and if their owner has found it necessary to stamp his name in them—as was frequently done when several men worked in a single shop—they can possess an attractive quality. But there is no reason why you should not make your own.

You may use as a pattern the pair illustrated (which happen to be very old, having come from the toolbox of a carpenter newly immigrated from England, and

reputed to have worked on the New York state capitol in Albany), or you may design your own with equal success. Notice that chamfering the top edges makes them a little easier to use, as does painting the top edge of the rear stick a lighter color. If you make them from a stable material, they can be as wide as you like.

To use them, place the rear stick at the far end of the board and the front stick or gaffer at the near end. Take care to see that they are parallel to each other, and then by sighting across the ***gaffer***, your eye level with the top of the stick, attempt to align the top edge of the rear stick with the top edge of the gaffer. If the board is even just a little ***in winding*** this will prove impossible, and it should be obvious which part of the board to plane further to permit the sticks to align.

Figure 5. Winding Sticks



You can take successive sightings—moving the rear stick closer to the gaffer each time to ascertain the truth of the board at any given spot. You can decide that the rear stick represents the ideal plane, and instead of planing away the near end of the board until the two sticks come into alignment, cut a rabbet or shelf bit by bit until the same end is achieved (Figure 4).

The jack is your partner in all this. At first you'll use it on certain parts of the board—the high spots. But sooner or later you'll reach the stage where, when the board is turned over, there is little perceptible rocking. This assumes, of course, that your benchtop or work surface itself is flat—properly flat. If it isn't, and its legs and feet are secure and not susceptible to being raised or lowered, make it so by using the jack plane and the winding sticks.

Thicknessing or Flattening

You now have two choices: either to thickness the board—to make the other side flat and parallel to the first at the required thickness—or continue to smooth the first side into perfect flatness. If the board you have been working on is fairly substantial and the width you require is considerably less, it may make sense to resaw it, assuming you have a band saw at your disposal. But if the board is close to the thickness you want, then gauge a line around all edges to the finished thickness and repeat the process you just completed on the first side, paying close attention to the line.

If you choose to follow the latter course, your job will be made easier since the first side now rests securely on the bench. Depending on the amount of warp or cup to start, there may be greater discrepancies to deal with, such as one corner excessively high. If so, the scrub plane may prove useful in quickly removing these very high spots.

Since there is a gauged line around all edges, it's often useful to work down to it at one end first in order to create a reliable reference when using the winding sticks. Place the rear stick on this end and work from the near end until their tops align.

Working the Length of the Board

With one (or two) flat surfaces achieved, you're ready to remove all roughness and uneven spots, and make the board smooth. Don't hurry—it's tempting to reset the plane

Figure 6. Checking the Center of the Board with the Rear Winding Stick

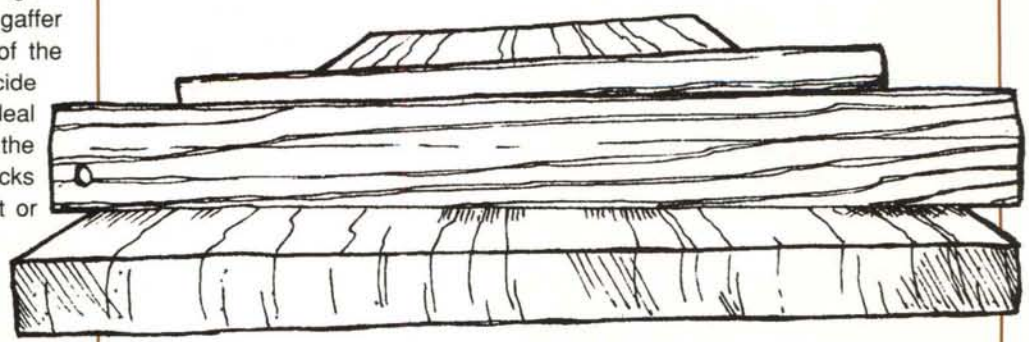
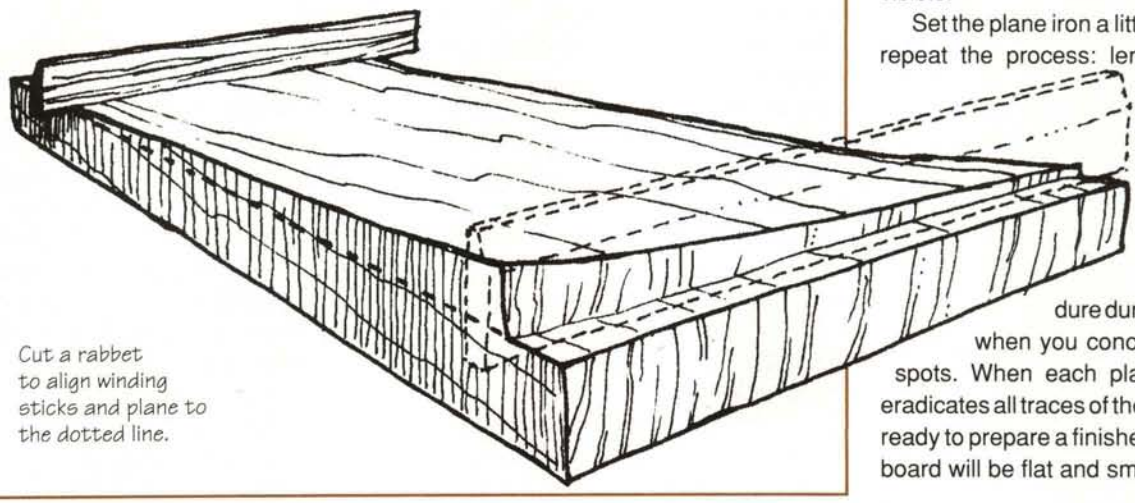


Figure 7. Aligning Winding Sticks



Cut a rabbet to align winding sticks and plane to the dotted line.

iron, take thinner shavings, and start making the board smooth to reveal the grain and a fine surface, but unless the first stage has been properly finished this is a waste of time. Sooner or later you'll discover that you have to return to a coarser setting and remove the fine surface you have just made because that particular area is still a little too high.

Begin by planing the length of the board from end to end, working back from the far end with long strokes. This should produce a smoother surface than your previous cross–grain strokes. Depending on the set of the iron, this will produce deeper or shallower grooves, representing the width of the iron.

When the entire board has been planed, start again at the far end, but this time plane across the grain, with slightly diagonal strokes. It should be very easy to see what has been planed and what has not, and so keep track of your process as you work your way down the board. You want to remove the high ridges left at the edge of each longitudinal pass.

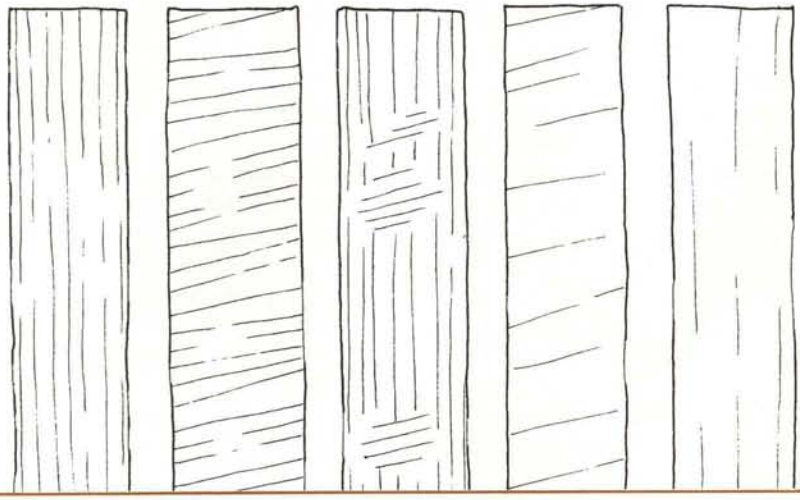
When you've accomplished this everywhere and left a new set of transverse ridges, you'll have brought the entire board closer to perfect flatness. This may not be possible with the first diagonal planing; chances are that after you have worked your way down the board, there'll be a few spots where the longitudinal ridges are still visible.

Set the plane iron a little shallower, and repeat the process: lengthwise planing followed by cross planing. Complete each planing along and across the entire board—unlike the procedure during the first phase when you concentrated on high spots. When each planing completely eradicates all traces of the previous, you're ready to prepare a finished surface, for the board will be flat and smooth.

Finishing

How far you take this last stage depends on the next step. If there's a lot of layout to be done, cutting of joints and further refining of the surface, leave the surface as it is. Any further finishing will only have to be repeated later on. But if the work to be done on the board will make it difficult to plane after completion (such as if the board is to become part of a structure that makes it inaccessible by plane), then set the jack plane's iron to the finest setting. Make a series of final passes designed to leave the finest, smoothest surface possible before using the smooth plane, scraper, or if you have none of these, the final sanding.

Figure 8. Stages of Smoothing Nearly Flat Boards



Other Uses

If the curvature of the iron is made less pronounced, it can be used for increasingly finer degrees of finish planing. You can also use it as a fair substitute for a jointer plane to produce perfectly matching edges to be joined. It's also invaluable as an all–purpose general plane whenever a board needs to be reduced in width quickly and efficiently, when an edge needs to be trued, especially when this edge is not parallel to the other side, and in producing beveled planes (such as around raised panels) or smaller chamfers along finished edges. PW

***John Watson** is a custom furnituremaker in Inverness, California.*

Book Reviews

by Hugh Foster

Albert LeCoff has probably done more for wood turning in America than any other individual. Dedicated to preserving and teaching the art and craft of turning, LeCoff's Wood Turning Center offers exhibitions, shows and demonstrations. Its bookstore may well hold the most complete collection of woodturning books in the world. Many of the Center's volumes are self–published works and are readily available only from them, so I will devote attention to two newer publications.

Lathe–Turned Objects (The Wood Turning Center, Inc., P.O. Box 25706, Philadelphia, PA 19144) 168 pages, paperback ($29.95), hardcover ($40), slide set ($150), $2 shipping ($5 overseas)

You might think these books are overpriced, but they're a very good value because they contain priceless inspiration. *Lathe–Turned Objects* includes 104 pages of color photos. Pages without photos present commentary by the artists, judges and curators of the show. Turners will spend time absorbing this volume's treasures—I've just begun to study it! Slide sets are available for each volume at good prices even without the 10% member discount. 197 slides for Lathe–Turned Objects cost only about $.75 per slide—about what I pay to have slides copied.

International Lathe–Turned Objects: Challenge IV. (The Wood Turning Center, Inc., P.O. Box 25706, Philadelphia, PA 19144) 68 pages, paperback ($16), slide set ($110)

The Challenge IV volume contains only black and white photos. If you order the slide set, your money buys a color slide of each of the 140 objects presented plus the volume. Brief commentary by artists and curators present fascinating glimpses into the active imaginations of turning artists. Unless those showcased move around more than their equipment might seem to permit, the addresses provided should enable you to convey any questions, comments or proposals (Send a SASE to increase the chance of getting a response.) *Challenge IV* offers one thing that Lathe–Turned Objects doesn't offer, a ballot/price list. If you have been turning pieces for pay, you should study it to help keep you from undercutting the going rate for such work. I studied the volume, then read through the price list and, after a bit of hard breathing, re–studied them together. They were very interesting! Now that the volume *Challenge IV* is a year old, I'd like to know what percentage of the pieces sold and at what prices.

Both volumes offer a wide variety of projects. They range in size from Ed Moulthrop's 40" banded bowl to Stephen Paulsen's collection of diminutive pieces framed in a wall–hanging entitled "Civilization as They Knew It #5: Catacombs & Fusion Chamber." It's fair to call most of the pieces here *objets d'art.* Both volumes should be of interest to turners of all levels, to lovers of beautiful handmade objects, and particularly to intermediate and advanced craftspeople seeking inspiration for future projects. As you study these volumes, your imagination will take hold of an idea or two.

Woodworking with Your Kids by Richard Starr (Taunton Press, 63 South Main St., Box 5506, Newtown, CT 06470-5506) 205 pages, paperback ($14.95)

Woodworking with Your Kids contains "over 30 projects for all ages," but better yet, it's fun to look at. Kids will love to build these projects—if we present woodworking to them as well as Starr presents it to his students. He gives them attention and affection—letting them know that adults care about what they make of their spare time and of themselves.

The woodworking techniques shown here are all safe and designed to make competent, happy woodworkers. Starr teaches his kids classic hand woodworking rather than power tool technique. Hand tool experience is sure to make them better users of power tools later on—and will help prevent shop accidents in the future. The kids shown look like they want to be there—a desire I hope they can take to their jobs someday, whether they're in woodworking or not.

Short Log & Timber Building Book: A Handbook for Traditional and Modern Post and Beam Houses by James Mitchell (Hartly & Marks, 79 Tyee Dr., Point Roberts, WA 98281) 282 pages, paperback ($14.95)

This book is not as pretty as a coffee table post and beam book. You might actually *use* this one while planning and executing a post and beam structure. I would have enjoyed another twenty pages of color photos, but then again more photos would have hiked the price. This volume shows how to cut and shape logs in order to erect structures quickly and efficiently. Chain saws and power mortisers are used throughout, with Mitchell emphasizing safety. He describes house construction from design to furnishings, including foundations, longs, floor systems, walls, notched corners, timber–working, wall infills, openings, and roofing. Appendices discuss specifics like pigmentation mixing, structural beam loading and sizing, truss specifications, and log and frame dimensions. I can't imagine beginning a post and beam project without this handbook.

The Steel Square by H. H. Siegele (Sterling Publishing Co., Inc., 387 Park Avenue South, New York, NY 10016-8810) 192 pages, paperback ($12.95)

When I read Robert Paral's piece about "The Essex Table" in issue #65 of Popular Woodworking (March 1992, pg. 42), it helped me recall that an older generation of woodworkers could do darn near anything with a decent steel square. Just a few days later I picked up a copy of Sterling's new re–issue of H. H. Siegele's classic book about the steel square. It was originally published by Drake in 1951. Siegele was one of the greatest carpenters of this century, a good writer, and a patient teacher. Here he shows how to estimate lumber and flooring, mark and true frames and joists, determine rise and run, build forms and windows, and put up rafters, roofs, and interior walls. The book's 500 illustrations make it an excellent reference book for rough and finish carpentry or solutions to real problems. PW

Hugh Foster *is an English–teaching woodworker in Manitowoc, Wisconsin, and the author of* The Biscuit Joiner Handbook *(Sterling Publishing, 387 Park Ave. South, New York, NY 10016).*

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Videoscene

by Alan Marks

Hand Tool Basics with Mike McNabb, ©1988 by PhotoCom Productions (available from DRW Educational Systems, P.O. Box 2941, Costa Mesa, CA 92628) $85.00, 19 minutes.

This video is an introduction to hand tools for people who have no experience with them. This implies both adolescents and adults who are entering a woodshop for the first time.

Mike McNabb begins with an introduction on safety, continuing with an overview of hammers, screwdrivers, pliers, and vises. He then groups tools into three categories: cutting tools and their operations, shaping tools (including bladed tools and abrading tools), and drilling tools.

Under cutting tools, he covers the back saw, miter box, keyhole saw, coping saw, and both crosscut and ripsaws, drawing distinctions between the latter two.

The section on bladed shaping tools includes block, jack, and jointer planes and their adjustments, plus three types of chisels and the gouge. He demonstrates the various types of files, rasps, and the surform file. The drilling tools covered are the common eggbeater drill, the bit brace, and the push drill. This tape serves its purpose, covering the whole territory of hand tools.

Portable Sanders Safety and Operations, ©1991 (Shopware Educational Systems, 101 Hill Rd., Aberdeen, WA 98520) $59.95 plus shipping, 10 minutes.

Shopware specializes in vocational education materials and markets tapes covering many aspects of industrial education. This tape is visually professional, informative and impersonally produced. It covers three types of portable sanders: the belt sander, the vibrator sander, and the disk sander or side grinder.

The same information about each type of sander is relayed via dubbed–in commentary while an on–screen operator demonstrates pertinent operations. The commentary starts with a rundown of parts and controls. Next, speed specifications for each sander (surface feet per minute, orbits per minute, rpms), how to mount the belt, sheet, or disk, and tensioning are covered. Lastly, he explains alignment, how to use the sander, its most advantageous uses, and necessary safety precautions.

I found the tape incredibly boring despite the fact that all the information was important. I learned there are sanders that can vibrate back and forth or orbitally at the flip of a switch.

This video is used in beginning woodshop courses and to accommodate the shop teacher, a copy of a ready–made quiz is included in the slipcase.

The Art of Wood Marquetry with Lora Hunt and Spider John, ©1991 (Conder Media Group, 9008 Mill Valley Circle, Suite 435, Fort Worth, TX 76120) $59.95 plus $4 shipping, 85 minutes.

This video is a spin–off of the collaboration of Lora Hunt and Spider Johnson, who give marquetry workshops.

Marquetry is the piecing together of thin materials (wood, shell, or metal) to produce decorated surfaces. Traditionally it was used to enliven the surfaces of furniture. The first known examples of marquetry date back to ancient Egypt and it flourished during the Renaissance. Lately, the technique of marquetry has been applied to framed compositions and is rightfully called art. The traditional artist mixes his own palette—the marquetarian composes with nature's supply of colors and grain.

Although I enjoyed seeing their work, I had anticipated a more impartial survey of marquetry technique. Instead, the tape shows their work exclusively and conveys a technique partially developed by them and based on what is called the "American patch–pad method."

The visual demonstration of the American patch–pad method left the process permanently in my memory. It was well-explained and easy to follow. My only objection to the method is glue–lines in the saw kerfs.

The tape begins with an introduction and rundown of materials needed to do marquetry their way. Hunt does a simple project to demonstrate the use of the fret saw on bird's eye wood. She makes up a pad of three or four sheets of different veneers, then cuts out a simple pattern of pieces which are pasted on top. She uses these pieces to produce three or four versions of the same picture. Next comes the real project, a full–fledged picture using the American patch–pad method. The process really comes across much better when described visually.

Hunt and Johnson use a Hegner scroll saw. The tape winds up with pictures of their marquetry followed by a bibliography, materials and equipment sources, and a list of marquetry magazines and organizations. This tape does a good job of demonstrating marquetry and I recommend it highly to anyone wanting to learn the American patch-pad method. PW

Alan Marks designs and builds furniture in Carmel Valley, California.

by Ken Sadler

A Cooperative Adventure

The Northwest timber industry is in trouble. Thousands of jobs are being lost and they are not coming back. They are gone forever. There are many reasons for this, and it is not my aim to discuss those reasons here—just the fact that the jobs are permanently lost. Many of the people involved are older folks without the skills to move to other industries. For them there is no place to go, no jobs to replace the ones they have lost.

Two men in Washington State have come up with an idea that is replacing those jobs so the people won't ever have to worry about losing them again. And that is what this story is all about.

Russ Mohney of Chehalis and Lane Watkins of Aberdeen have created The Pacific Wood Products Cooperative. There have always been business cooperatives, but this one is different—that is what makes it so interesting. Their idea was to form a cooperative made up of small businesses created by people with basic skills in woodworking, who could no longer find traditional jobs in the timber industry. I spent a day with Russ Mohney and here is how he explained their idea and how they've made it work.

How did your organization get started?

We conceived this project about six years ago and together did a great deal of refinement in order to develop a form that would be effective. In 1989 we approached the Lewis County Development Council with this project to try to replace some of the traditional jobs that were being lost in lumber and milling. The Economic Development Council took our idea as a priority project and funded a feasibility study to find out whether it would work. An advisory committee from the council determined that it would. The feasibility study was extensive, took several months, and in September of 1990 we filed with the state to incorporate the cooperative as a member corporation. That's when it began.

Where did the money come from to fund the new Co-op?

We got two major grants in order to demonstrate to the rest of the country that our idea could work. One grant was from the Northwest Area Foundation in St. Paul, Minnesota for $150,000 and one was from the State of Washington for $140,000. Those grants gave us two years to achieve self-sufficiency. Our projection for becoming self-sufficient is between December of this year and June of the next. We'll make it.

I've read that the basic purpose of the organization is to create jobs. How do you go about doing that?

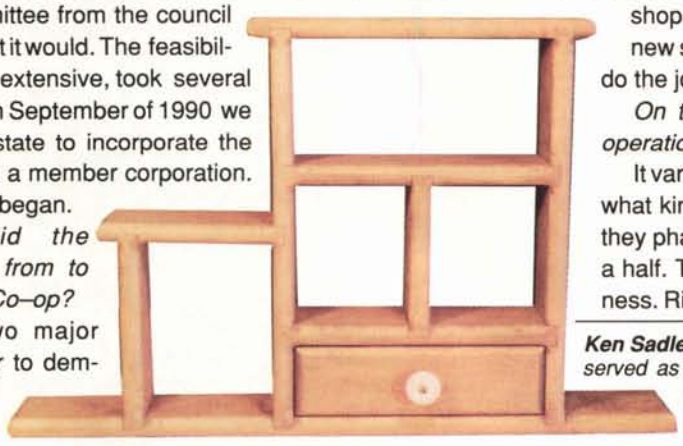
Well, we look for people that clearly have skills and access to equipment that can manufacture a selling product. However, we found from the very beginning that most of these people—while they may be skilled in making a product—lack several business skills that are required to build an independent business.

You said that you had 175 members. How many of them are companies with less than ten employees, and how many of them started as just a husband-and-wife or a one-person operation?

Most companies consist of one or two people. One has as many as 130 employees, but there are only 15 or 20 companies that have more than ten. Most of them are run from home, or home shops where either they've converted a garage or built a new shop building in order to get the space necessary to do the job.

On the average, how long has it taken these small operations to provide their owners with a reasonable living?

It varies enormously according to what they want to do—what kind of product they want to make. On the average, they phase into it in a little over a year—maybe a year and a half. They adjust from part-time work to their new business. Right now, many of them are in that process. Some of



***Ken Sadler** is a retired furnituremaker in Portland, Oregon. He also served as a counselor with the Service Corps of Retired Executives (SCORE), a volunteer organization that advises small businesses through the Small Business Association.*

our people are on a fixed income and they really need a part–time business in order to survive.

You said that you look for individuals who have expressed an interest in being self–employed. Do you interview them based on their talents and abilities and qualifications to run a business?

Oh yes, one of the most time–consuming things we do is the input interview. We call it a producer conference—a SWOT analysis. SWOT means strength, weakness, opportunity and threat. We do a pretty thorough analysis of the person so we know their skills, machinery and production—what they can do. Then, we try to match those capabilities with a suitable product or market.

Do you check to see if they have the necessary equipment?

No, we don't check them. They tell us what equipment they have, and then we have them make a product or perhaps several so that we know what they're capable of.

Do they come to you with ideas for products, or do you suggest a product for them?

We generally suggest the product. We don't deal with inventions or new products, because the Co–op is market–driven and we don't have the time or money to go out and create a demand for a new product. Perhaps we'd consider new ways of making a product which we knew had a market. Very often, we work with the members to refine the product's design and development, but usually we direct them toward a product with an existing demand.

If they come to you with product ideas that you know won't sell, do you tell them that, and suggest something else?

Yes, we can tell from their product what kind of skills and tools they have, and we can then go on to a product for which we know there's a market.

Where does the money come from for them to get started—buy necessary equipment, that sort of thing?

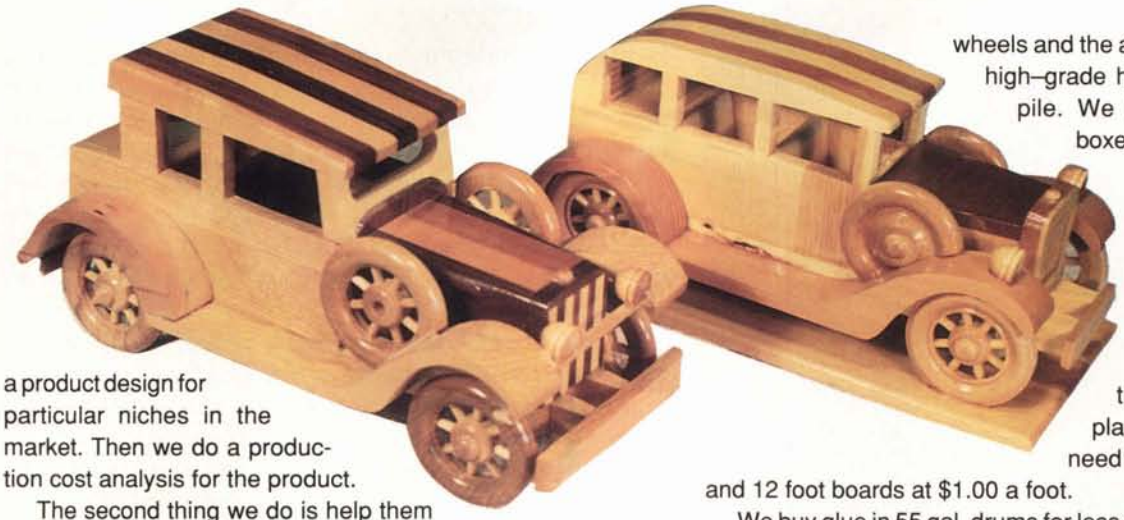
Most of them start on a shoestring. We don't fund their business—most of them move into it from other occupations. For example, one of our people was a sixty year–old, unemployed, lumber–process engineer working as a custodian in a school. Clearly, that was not what he wanted to do—he had skills that were much greater than that. Eventually, he worked out of the custodial job into producing woodworking. That transition has been repeated in a lot of cases.

If they have insufficient money of their own, do you loan them the extra to get started?

No. We suggest a product that they can make with whatever they have. They are independent businesses. We don't finance their operation, that isn't the way it works for us. We don't loan them money.

In addition to helping them get started, you said that you provide the members with services that are difficult or impossible for small businesses to acquire on their own.

Essentially there are five basic services that we provide. One is an analysis of the market which they generally have no access to, or skills in analyzing. Hand–in–hand with that is the development of products that the market accepts. We provide them with



a product design for particular niches in the market. Then we do a production cost analysis for the product.

The second thing we do is help them become a business through proper licensing procedures. We help them learn the basic things they have to do to be in business because, while they may be skilled at woodwork, they're not necessarily business people.

Third, and most importantly, is our collective purchasing of materials. For example, we buy pine for people who use a great amount of it (for making tole–painted items or small decorative pieces) from the mills' falldown—mill ends that have been graded, palletized and banded, and brought over here. While our competitors rely on automatic machines and have to pay $850 for a thousand #2 1x12 pine, we can get #2 in shorter pieces and pay around 15¢ a foot.

Here's a dart box. This was birdseye maple waste that was too small for any mill to use. We retail this box for $19. If we had to buy the wood in 8 ft. logs, it would cost from $8 to $12 a board foot. This costs us nothing; this is out of a burn pile, and yet we make 400 of these a month. We do that with a lot of products.

Here's a toy for kindergarten children—it's a basic truck. We have several models of it. The only thing we had to buy were the wheels and the axle pegs, the rest of it is high–grade hardwood out of a burn pile. We buy cedar for planter boxes—good cedar from over in Montana. We buy it in truck loads, 37,000 board feet at a time, and we get it delivered here for around 12–1/2¢ a foot in uniform, two–foot segments. If they're making 12" planter boxes, they don't need to go out and buy 8, 10, and 12 foot boards at $1.00 a foot.

We buy glue in 55 gal. drums for less than the price at a home center. We buy turnings, wheels, hardware, hinges, screws—all the supplies they need in quantities, as a larger manufacturer would. Our members are able to buy from the Co–op at the same price. We don't make a profit on it—after all, it's the member's material. To the small manufacturer that's very important, because if we have a member that uses 1000 feet of pine a month making their product, and if they're paying $850 for that at the local lumber yard and then they buy it here for $150, that $700 difference is profit—that is pure bottom–line money.

How deeply involved do you get in the operation of the smaller companies, particularly in the beginning?

Not very. We give them some guidelines, but we don't get terribly involved in their business. One of the services that we provide beyond logistics is marketing. We deal quite closely with them in order to insure that we have a product of sufficient quality to serve the market. But we don't infringe on the operation of their business. They come to us for advice and we're glad to give it to them, but we don't tell them how to run their business.

Do you show the smaller members how to do a cost analysis to help them keep their operating costs in line so that they know where they stand financially?

Actually, for the product we do the cost analysis for them.

From my experience, I know there are many small companies that don't know how to set up a cost system so that they have true costs.

We help them with that. We have a CPA that conducts workshops for the members to help them keep the kind of records they need. It isn't too difficult for small, beginning companies to know if they're making money, but as they get bigger, they have to become more sophisticated in their record keeping—that's why they can take advantage of our workshops. We have a workshop coming up this month on tax reporting.

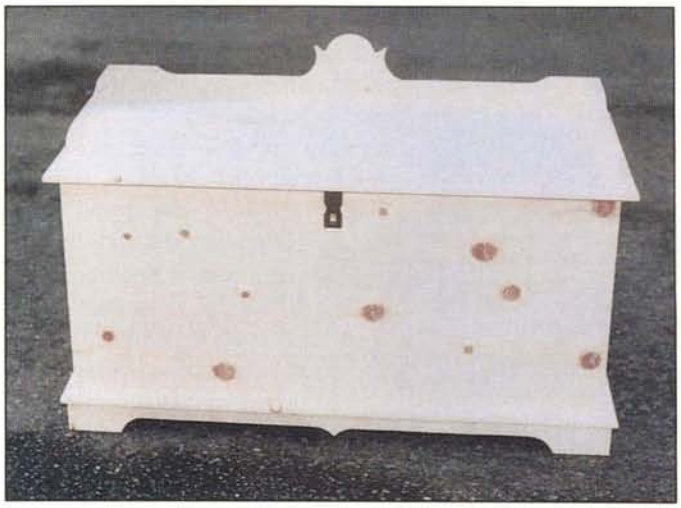
My experience was that new business owners didn't know the difference between salary and profit.

In our analysis with the individual, we clarify that their salary is part of the cost. We try to convert their product production into dollars—to show them how much they should take as profit and

how much is their salary. We go through the basics with them and most of them understand it pretty well. It's much different than operating a store or retail business because they are, in fact, small manufacturers and have fewer supplementary costs to consider. So it is greatly simplified from that perspective. Still, for some of them it is a problem and we offer advice when they come for it—help them out, and perhaps route them to somebody who can give them the background they need.

How does the Co–op get paid for the services it renders to the members?

We do it on a strictly commission basis. We are, to that extent, partners in business with them. We collect a commission based on our expenses. The commission rate varies depending on the product and how we sell it—which marketing strategy we use. The commission on a commercial manufactured export product will go down to about 4%. The highest rate would be on a single, mail–order retail item which we would collect 25% on. It's the sales category that determines what the percentage is. If we sell to a wholesaler, we charge 10% of wholesale, depending on



quantity. If we sell it to a buyer as a single–item commercial product—it's going to be down to 4%. If it's in our catalog, it would be the same as mail order. We negotiate the commission with the builder, but we have a fairly flexible standard as a basis.

The most important service you provide has to be marketing. How do you market your member's many diversified products?

We market the traditional ways—by direct sales and representatives to the retailers. We put out a wholesale price list for outdoor products to a number of nurseries. We're very traditional in that regard. We also go to trade shows and we do retail shows. We have our own franchised retail outlets—two are open now, another will open in May and we'll have six by the end of this year. The outlets sell only our products and complimentary products that we recruit from craftspeople. Then we do catalog sales.

We do institutional product sales, through a combination of catalog and direct approach to schools and institutions. Some products will go mail order through consumer magazines. So we have a number of strategies, it really depends on our assessment of the product and the possible markets.

We have commercial product sales that come to us through either our foreign trade offices or, in the case of export, from a buyer or broker who will come to us to have a product manufactured. For example, we do a series of knife blocks for a cutlery company in Germany to the tune of 15,000 units a month. A broker came to us and we worked with him to design the product to suit the overseas buyer. We do that with some furniture to Asia that initially came through the Washington trade office.

When you get orders like that, 15,000 units a month, the average mom–and–pop operation can't handle it, can it?

No, but a number of our members are not mom–and–pop businesses—they are commercial businesses. For example we are selling school products in a school catalog. 30% of the products cannot be made by a small mom–and–pop operation, but the other 70% can. The great advantage of the cooperative approach is its flexibility. If we suddenly get an order for a whole lot of pieces, we may bring in five or six different companies to each do a portion of it, in order to meet the order. I got a rush order

Co-op Advantages

The Pacific Wood Products Cooperative provides its members with five basic services:

1. Getting Started
Holds producer conference to analyze potential member's "strength, weakness, opportunity and threat." Helps them to obtain a business license.

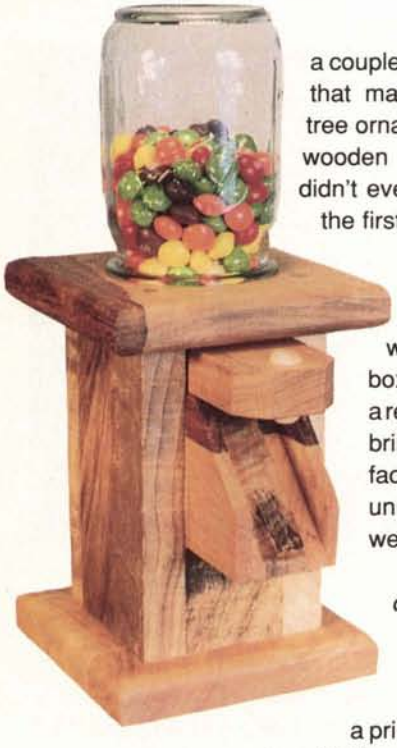
2. Market analysis
Assigns the new member a product or products based on market demands and member's existing production equipment.

3. Cost analysis
Determines cost of manufacturing new product. Teaches members accurate bookkeeping, and provides business management workshops.

4. Collective purchasing of materials
Co-op purchases supplies (wood, glue, wheels, hinges, etc.) in bulk at a discount and sells it to members at the same price.

5. Marketing
Sells the members' products through nurseries, catalogs, retail outlets, schools and trade shows. Handles all shipping.

The Business End



a couple of days ago from a company that makes hand–blown Christmas tree ornaments and they needed 300 wooden boxes in seven days—they didn't even have a design. We spent the first two or three hours with that buyer in their store looking at the product, determining how best to package it and what design we wanted in the box in order to get it for them at a reasonable price. This required bringing in more than one manufacturer in order to meet that 300 units in a week. This way we were able to do it.

When your people get an order that several Co–op companies can make, do you split it up?

Generally no, we have a primary producer for each product and if it's within that company's production capability, they get it all. If it isn't, then we'll assign another company with similar capabilities and sometimes that second company will pay a royalty if the design happens to be owned by the first one.

How do you handle the shipping?

The Co–op does the shipping. It all goes through here. We may package it and ship it, sometimes we arrange for the packaging to be done at the manufacturer and the buyer may pick it up there, but we still handle the transaction. In the case of large case goods for the schools, they would be packaged at the manufacturer, and the buyer would pick them up or we would arrange for shipping. Mail order items are always brought here. While the small manufacturer may be a lousy salesman, they're even worse record keepers, and we don't want to have a customer call us and say 'I ordered this six months ago, and I sent you the money and I still don't have it.' I don't want to have to call that manufacturer and ask, where is it? And he gets a stack of papers off the wall in the shop and says, 'Gee, I think I sent it.' We put that order in the computer, we know all about it. Shipping is the final service that the Co–op offers.

How many of the companies you helped start are still in business, and how many of the jobs that you helped to create are still there?

Far as I know, all of them.

Among the people who joined your Co–op you haven't had any failures?

No. In many regards, our biggest problem is getting enough product, getting enough production to open more retail outlets. Retail sales are very important to us because we have a lot of those folks who are on fixed incomes who don't want to work full time. They're happy with what they're doing. They just want to augment their income. A lot of our people are like that, and they are not going to make enough product for us to put in a catalog. We have a few who are exceptional craftspeople who produce really high–quality, high–value products, but they only want to make a few of them. For those people, our strategy is retail shows or retail stores. It's not something we can take to a department store because the person can't or won't make enough to satisfy that kind of store. So we put them in our retail stores. This is a limited production, high–value product.

Are you at a point now where your income covers your operating expenses?

It has; it's had to. One of our grants was delayed for several months, and more than half of our total operating cost came out of our earnings. This money has since been returned to reserves.

What were your gross sales in 1991?

In 1991, just $300 thousand but for 1992 we're projecting $1.25 million.

And you've done all of this from scratch?

Yes, we're the only manufacturing cooperative structured like this in the country.

How many people now work for the Co–op?

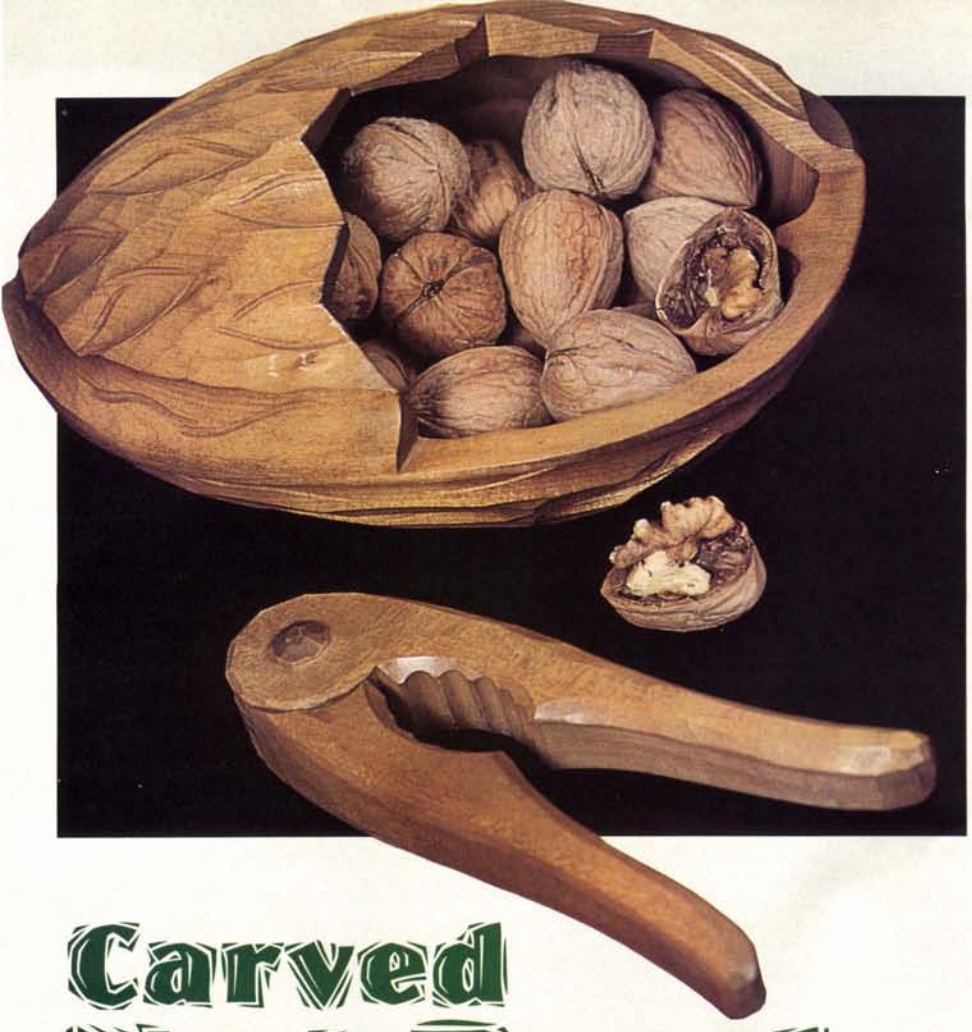
Three.

Just the three of you do all of this?

We have a lot of volunteer help, and we're about to add another marketing person, but as far as the employees of the Co–op go, there are just three. We work with a couple of sales representatives, which we'll have more of in the future. We're just starting to grow.

Well, that's how it's done. That's how to convert people who have been left behind by a changing industry into self–supporting, independent business people. It is also a way for established small woodworking operations to overcome the problems inherent in being small and alone. The pattern devised by the people of Pacific Wood Products Co–op is exportable. It can be used by others in other parts of the country. It may need some adapting to local situations, but the basic outline is there.

Editor's Note: If you live on the West Coast and are interested in joining the Co–op, or if you live in another part of the country and are thinking about forming a Co–op in your area, write to Russ Mohney, Pacific Wood Products Cooperative, Box 1422, Chehalis, WA 98532. PW



Carved Nut Bowl & Cracker

by Willard Bondhus

The walnut shell's beautiful shape makes a practical container. Carving this walnut bowl and nutcracker is very straightforward. Have some real walnuts on hand to examine while you work, and study the drawings and photographs closely to make sure you understand the step–by–step carving procedure. The base and cover are both basswood; the base is 2" stock and the top is 2¼". If these thicknesses are unavailable, glue up or use basswood as close as possible to these dimensions.

Start by transferring the pattern from the PullOut™ Plans to the base and cover on the basswood blocks. Position the patterns so the wood grain runs with the length of the bowl.

With the transferred drawing face up, secure the basswood block between a bench vise and bench dogs. From the inside rim, relieve the waste with a #9 or larger bent gouge to a depth not deeper than ⅜" at the bottom of the block. Repeat this process on the top piece so the two parts match.

Carve down from the top sides toward the center; then cut down the center (as shown in photo 2 on page 28). Make the side cuts across the grain. The center should be with the grain, leaving a nice clean groove. Sand any rough spots from the insides of the base and cover.

Cut the outside shape of the shell with a coping or band saw, following the outside rim line of your transferred drawing (photo 3).

Mark the center of the base (photo 4) to lay out the foot of the bowl. Secure the wood block with a *sculptural screw* or use a large vise to anchor it on the bench. While working the block, occasionally lift it and make sure you have the proper thickness. Use your fingers as a caliper—your touch is close enough. Round the pieces from the center down the sides; remember to leave the bottom foot on the base.

Remove the hold–down to finish the carving of the top. Wedge the piece between the bench vise and bench dogs (photo 4) and use a #9 gouge to carve the indentations that help give the bowl its nut–like appearance.

Look at your walnut for inspiration. With a small parting tool make the little lines that intersect the indentations and craze the entire bowl (photo 6).

Transfer the cover pattern from the PullOut™ Plans (photo 7) and cut away the opening on the band saw. Dry fit the base to the cover; then mark and trim away any excess. The fit is just right when it looks good. Turn the bottom piece upside–down, and finish shaping and detailing it.

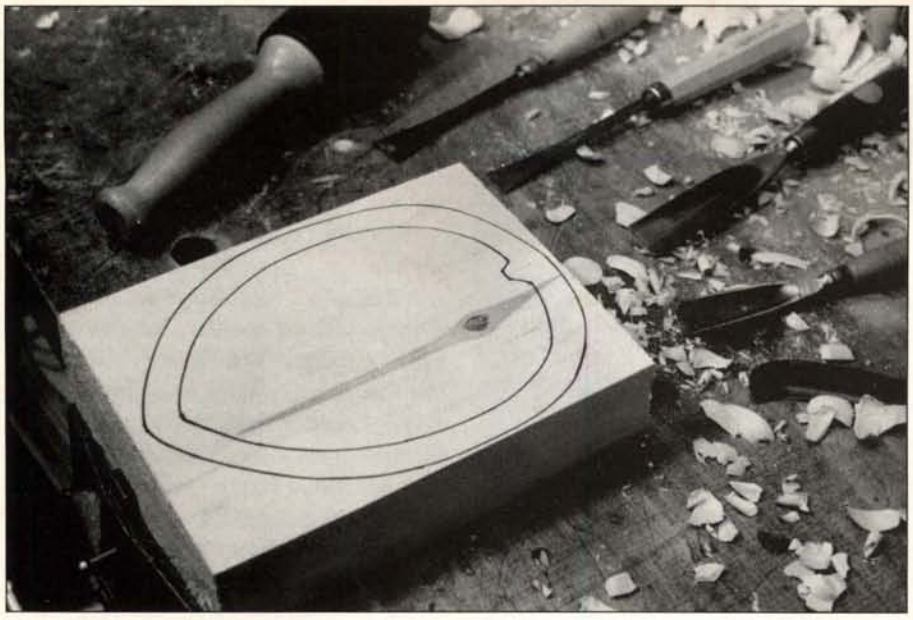
Finish with a light wash of walnut stain, but don't stain the edges where the base and cover are connected. Glue the pieces together. Be sure to stain the inside completely. With a whittling knife, shape the joint so that no line can be seen; then sand it smooth. Complete the finish with a coat of paste floor wax.

The nutcracker is for decorative purposes and is easy to make. You'll need to fit the handles together with a mortise and tenon joint, and drill a 5⁄16" diameter hole in the center to take a steel rod or nail.

First transfer the shape twice from the PullOut™ Plans to 1" X 4½" X 7" long basswood stock. Drill a 5⁄16" hole right on the pivot point in the center of the circle on each piece. Use a ¼" drill or a jigsaw to shape the teeth of the nutcracker (photo A, page 29).

Use a marking gauge to mark out the tenon on your stock. Clamp your stock on the drill press table and drill the tenon with a 1½" multi–spur or Forstner bit. Set the drill so it cuts to the depth of exactly one–

Willard Bondhus *is a master woodcarver in Bloomington, Minnesota.*



1 Lay out your tools before starting. Transfer the pattern so it follows the wood grain.

2 From the inside edge hollow out the base and cover. Shown here is the last cut which runs down the center with the grain.

3 Bandsaw around the outside edge of the base and cover.

4 Notice the markings on the center of this half. This will be the layout for the foot of the base. Carve from the center down.

5 Gouge the indentations that give the bowl its walnut–like look with a #9 gouge.

6 Use a parting tool to make little lines in the gouges.

7 Cut an opening in the top on the band saw. Carve and sand the edge of the opening to a pleasing shape.

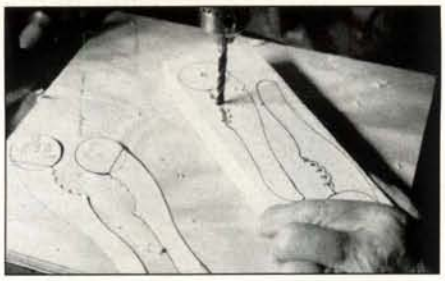
8 After staining the parts, glue them together, trim and sand the outside edge so the joint can't be seen.

third the thickness of the nutcracker. Turn your stock over, use the pivot hole as a guide, and drill to the same depth on this side (photo B). Do a trial cut on a piece of scrap and check it with a caliper. Cut out the handles with a band saw.

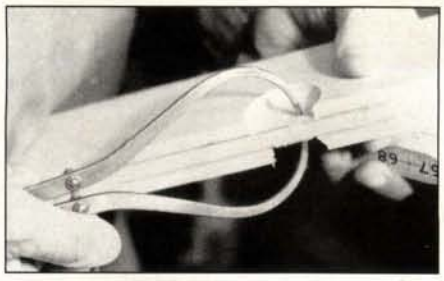
Using the same marking gauge, draw the lines for the mortise. Set the depth of cut on the band saw, clamp the mortised half of the nutcracker to a square block of wood so you can freehand saw the mortise at a uniform angle. The angle shown in the PullOut™ Plans is parallel to the saw blade (photo C) Make repetitive saw cuts to clear out the mortise. You can do this entirely on the band saw.

Use a small spoon–shaped gouge to complete the radius at the bottom of the mortise. Trial–fit the pieces for proper fit. Cut the head off a 5/16" diameter nail, insert the shaft into the pivot hole, and check for smooth operation. Whittle the handles round and sand (photo D). Whittle the two caps in a piece of scrap stock and cut them out. Stain all the pieces before you assemble the nutcracker. Then reinsert the nail, glue the caps over the pin, and finish with paste floor wax. PW

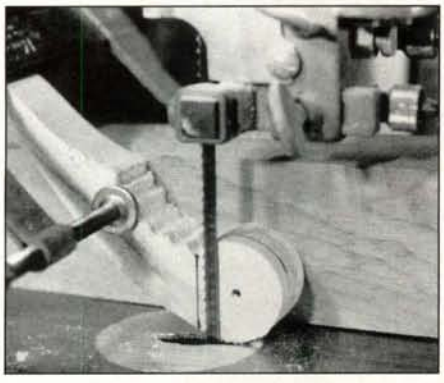
author



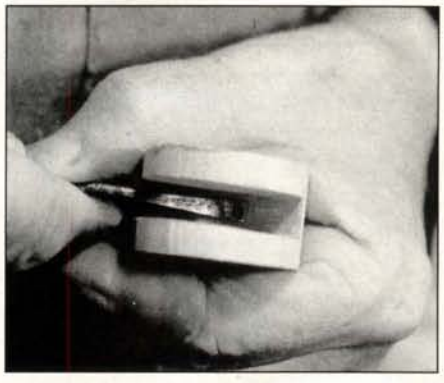
A *Drill a 5/16" hole in the center of both circles for the pivot hole placement. Then use a 1/4" drill to cut the teeth of the cracker.*



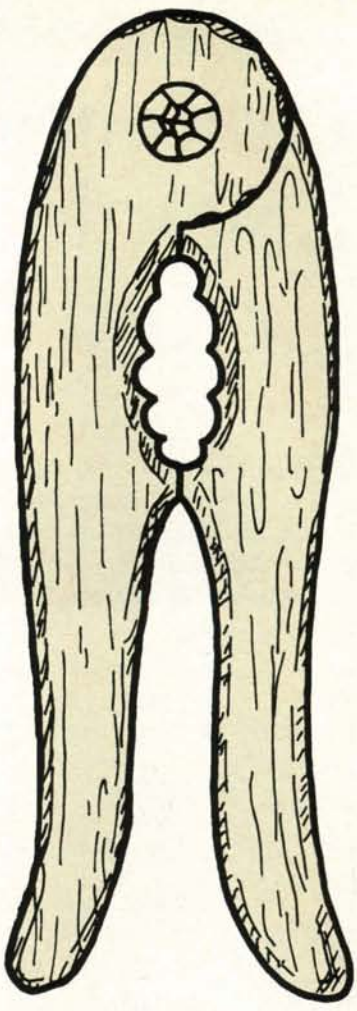
B *Great care must be taken so you have the tenon one–third the thickness of the nutcracker. Do a trial cut and check with a caliper.*

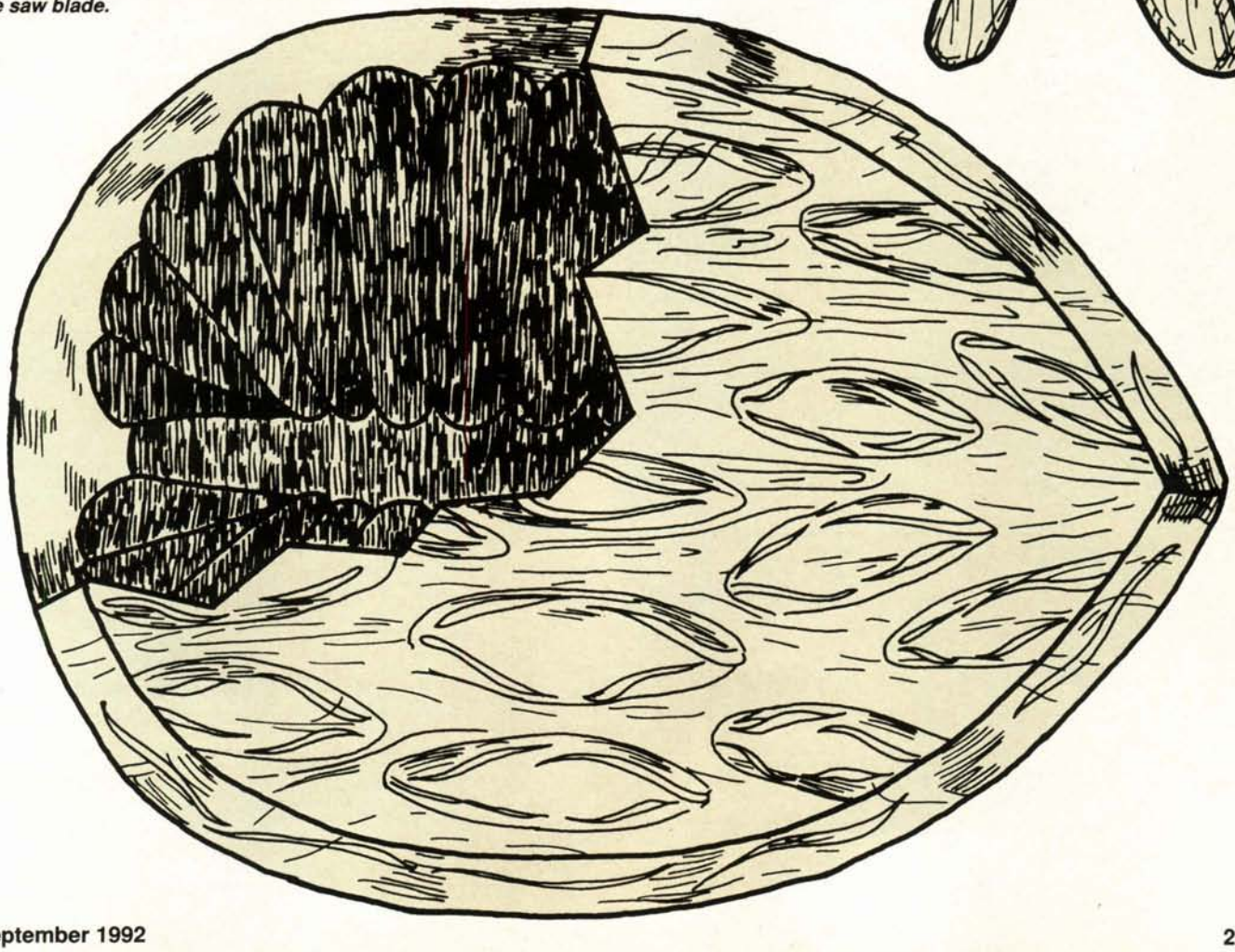


C *Clamp the handle to be mortised to a block of wood and freehand cut the mortise to a uniform angle. Use repetitive cuts to clear out the mortise. Notice the angle drawn on the handle is parallel to the saw blade.*



D *The bottom radius is made with a small spoon–shaped gouge.*





A Popular Woodworking Project

Building a Knock Down Couch

Photos by the author

by Hugh Foster

The idea for this couch came from a Thomas Moser furniture catalog, and plans from Bavaro and Mossman's *The Furniture of Gustav Stickley*. In some respects, the couch looks like a fancy garden bench—but it's really much more than that. I used biscuit joinery where possible to save time, and it gives the couch a clean look. The Moser and Stickley designs used like–sized slats that were larger than the ones I used. My motivation for the variety of sizes was to use up the collection of edge rippings left over from cutting the larger parts.

The couch is constructed out of cherry, and breaks down to four main components and a bundle of slats. It pays to make your jigs and fixtures carefully as you build this project—you may have to follow up with matching chairs and a love seat.

The couch is designed to fit 22" cushions, but 24" wide cushions would be easier to stretch out on. If you use cushions of other sizes, you will need to adjust the dimensions of the front and back rails so that they are ¼" longer than the width of the cushions.

Tom & Chris Larson

***Hugh Foster** is an English–teaching woodworker in Manitowoc, Wisconsin.*

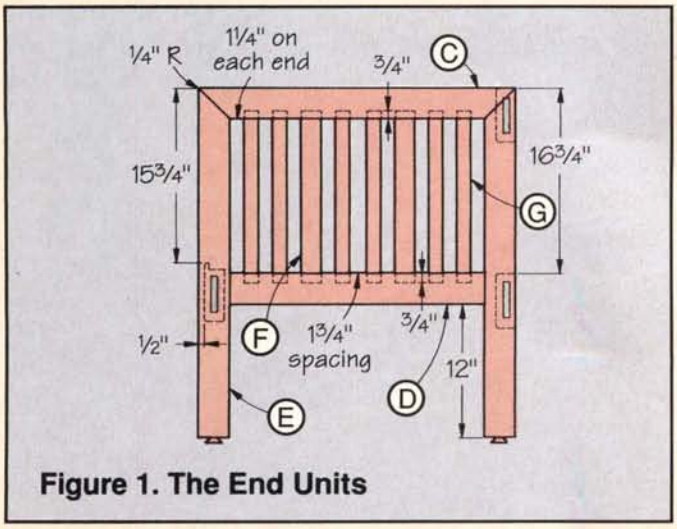
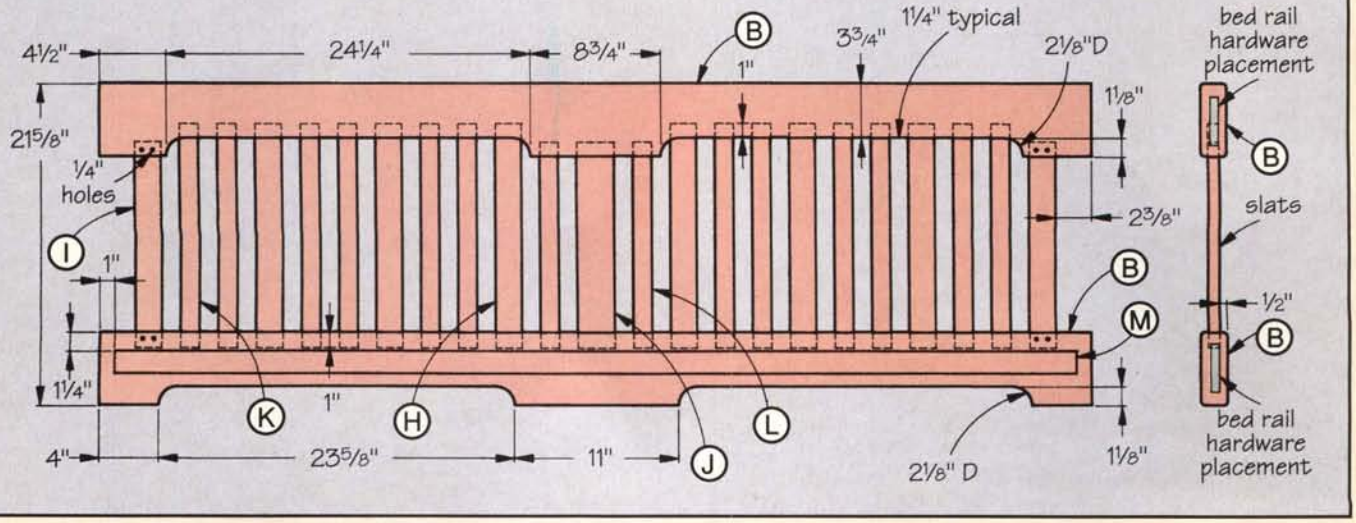
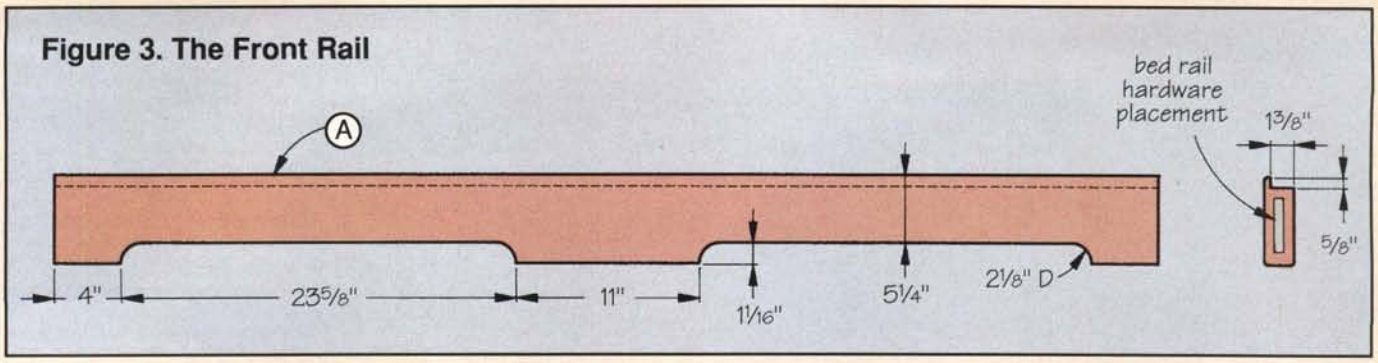


Figure 1. The End Units

Figure 2. The Back Unit





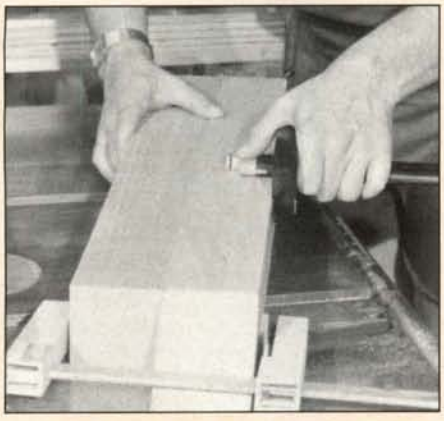
Start by cutting the front rail (A), back rails (B), top side rails (C), bottom side rails (D), and the legs (E) to the dimensions in the Cutting List. Plane them smooth, then use a ¼" roundover bit to round all four edges. Cutting the pieces over–length allows you to make any fine adjustments as you work through the project.

The legs (E) are part of each end unit (see Figure 1). Cut the 45° miters on one end of each leg; then shorten each to 31½". Miter the top side rails on both ends at 28". Lay out the mortises by scribing a pair of lines ½" apart down the center of the top and side rail pieces. Mark the locations of the tenons; then cut ¾" deep mortises to accept the slats. Lay out the inside rails with 1¾" spacing between the 1¾" and 1¼" slats (F and G, Figure 1).

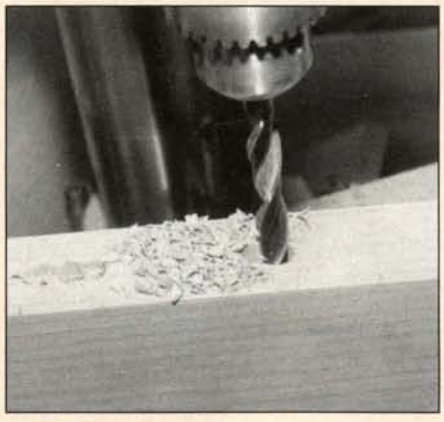
Use conventional biscuit joinery gluing techniques to join the legs to the top rail. Biscuit the mitered edges. Space five biscuits ⅜" apart across the joint.

Shape the back rails (B) according to Figure 2. Round over the edges of both rails before mortising, or the router bit guide bearing will ride into the mortises. Scribe the area to be removed; use a 2 ⅛" Forstner bit to cut the curves, and cut away the excess stock with the band saw or sabre saw. Lay out the waste area on front rail (A) and drill and saw away the excess. Plane or sand the inner edges flat.

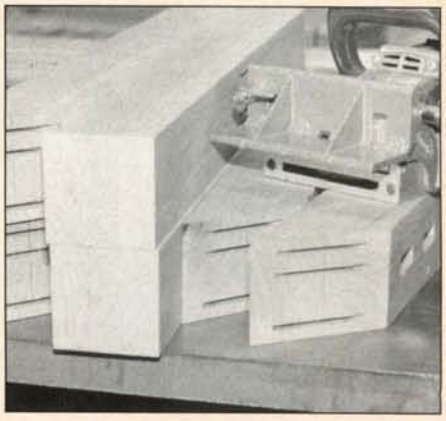
Refer to Figure 2 for the diagram of the back rails to locate mortises for the slats (H, I, J, K and L). Mark in 1⅛" from each end and space the slats 1¼" from each other; refer to the diagram for the location of the various width pieces.



Scribe the rails that need mortises for the bed rail hardware.

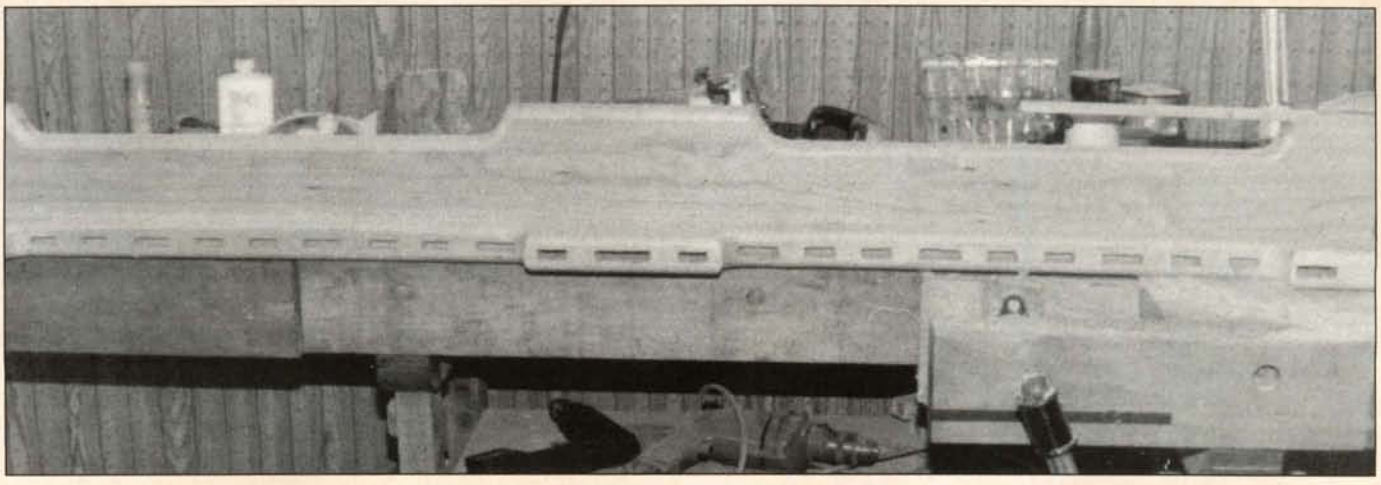


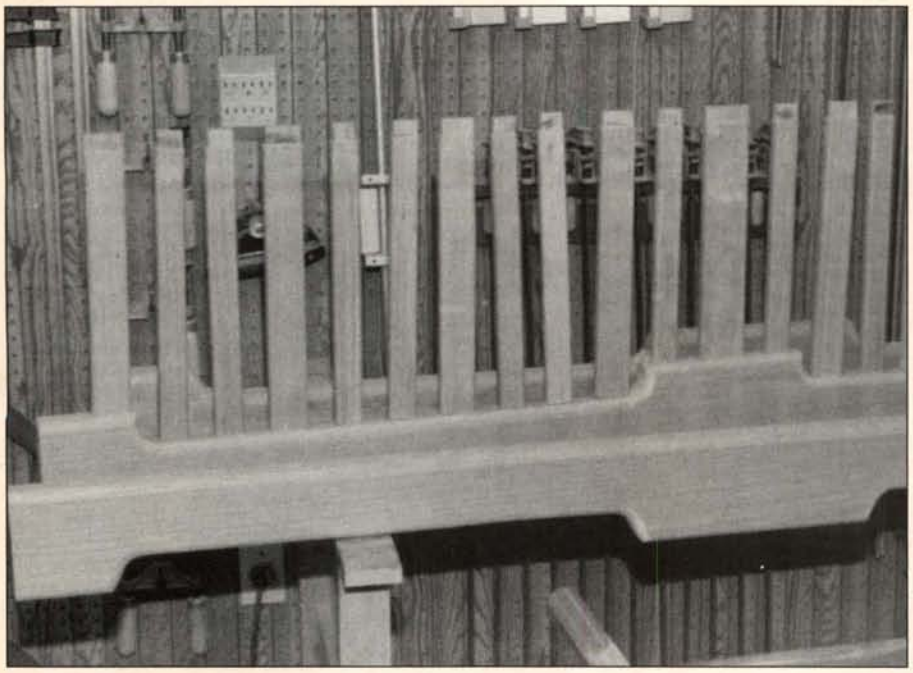
Drill the mortises ½" deep, then chisel the sides so that they are square.



Biscuit–join the legs to the top and bottom rails. Use five biscuits in each joint.

Round over the edges before mortising the back rails for the slats.

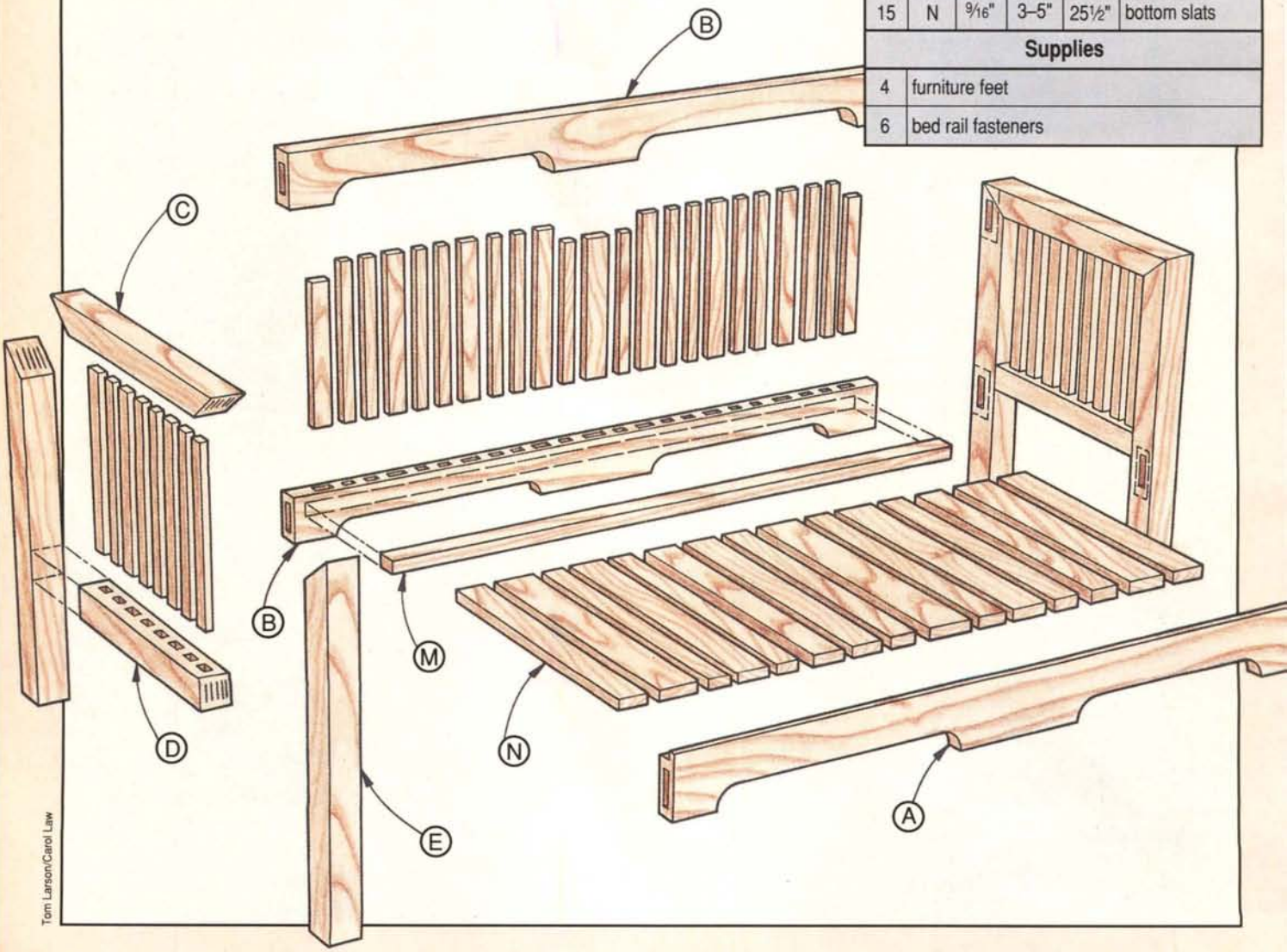




Slowly work the slats one at a time into the top rail after placing them in the bottom rail.

Knock Down Couch					
Cutting List					
		Finished Size			
Qty	**Part**	**T**	**W**	**L**	**Piece**
1	A	1¾"	5¼"	66¼"	front rail
2	B	1¾"	4⅞"	66¼"	back rails
2	C	2¾"	2¾"	28"	top side rails
2	D	2¾"	2¾"	22½"	bottom side rails
4	E	2¾"	2¾"	31½"	legs
4	F	¾"	1¾"	15½"	side slats
12	G	¾"	1¼"	15½"	side slats
6	H	¾"	1¾"	15"	back slats
2	I	¾"	1¾"	13¾"	back slats
1	J	¾"	2½"	13¾"	back slats
12	K	¾"	1¼"	15"	back slats
2	L	¾"	1¼"	13½"	back slats
1	M	1½"	1½"	64¼"	back ledger
15	N	9/16"	3–5"	25½"	bottom slats
Supplies					
4	furniture feet				
6	bed rail fasteners				

Figure 4. Assembly



Tom Larson/Carol Law

Cut the mortises 1" deep. Cut ½" tenons on all of the slats using the table saw with the "Tenoning Jig" in *Popular Woodworking* #62. When putting together these three subassemblies, the tricky part is adding the second rail after you've assembled all the slats in one frame. Patience is the key. Start at one end and work slowly and methodically.

Fit tenons in their mortises at one end; then fit the remainder by partially sliding them out of one side and into the other. Adjust the sides so the tenon's cheeks contact both sides of each rail, then firmly seat all the pieces together. Clamp the back assembly, mark where the end slats meet the rails, and drill two ¼" holes, ½" from either side of the outside slat. Then glue and add dowels. After the glue has set, saw the dowels off just above flush; then trim with a very sharp chisel and sand until perfectly flat.

Round over the edges; then glue and screw the back ledger (M) 1¼" below the edge as shown in Figure 2. Always short of material, I fabricated the ledger from the pieces cut out while shaping the long rails.

Cut a 1⅜" X ⅝" deep rabbet in the top edge of the front rail; this corresponds to the ledger on the lower back rail. The ledger is ⅝" lower than the corresponding rabbet on the front rail to make the couch more comfortable.

Cutting the mortises for the bed rail hardware is one of the more interesting challenges in this project. Bed rail hardware comes in different sizes, but ½" and ⅝" wide are the most common. My supplier delivered fasteners that were 9/16" wide and I didn't have the proper router bit. I made a template and used a guide bushing. A template spaces the mortises precisely (see Figures 2 and 3 for bed rail hardware placement). Mortise the hardware a hair below the surface in order to draw the joints tight after assembly. The bottom slats (N) can be replaced with a sheet of ¾" plywood to support the cushions. I used random width rails which made use of my scrap wood.

Sand all the pieces through 150–grit. The best way to apply the finish is with the four components disassembled. Apply a finish coat of Hydrocote© or similar polyurethane, let dry, then sand with 220–grit. Wipe up the sanding dust with a damp rag and apply a few more coats of clear varnish. Sand with a fine abrasive between each coat.

The beauty of this finish is that six coats can be applied in a single day. Hydrocote© on cherry is an absolutely clear finish—the light penetrates, allowing the cherry to turn from a light pinkish red to the dark, wine red I find so beautiful. Be sure to wear rubber gloves when you apply the material as there is no solvent to remove it from your skin.

Bed rail hardware is mortised into the ends of the back assembly and the sides of the side assembly.

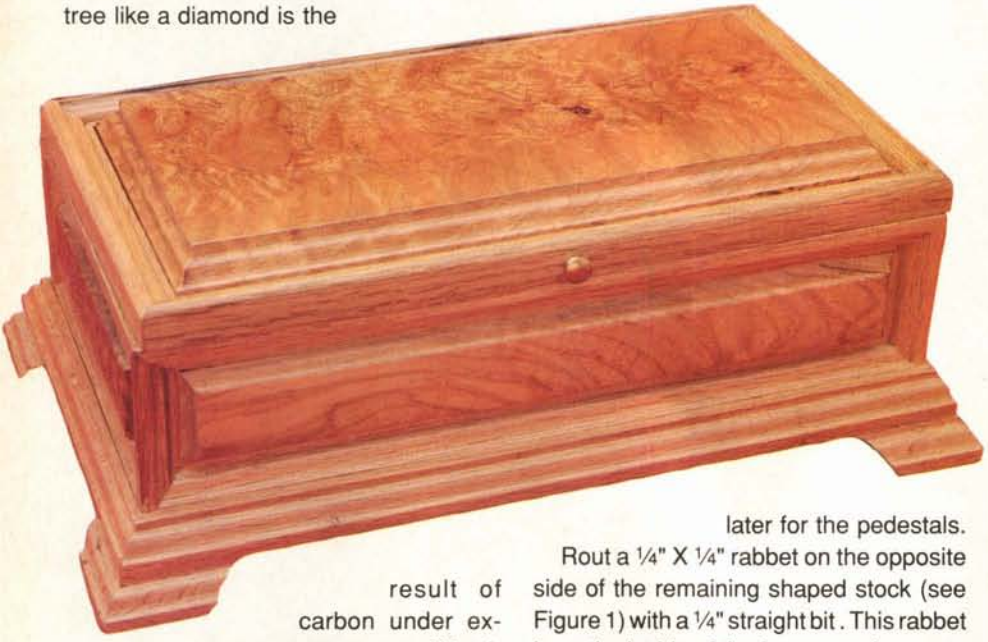
If you would like a lower profile couch, shorten the legs by an inch or two. Everyone who sits on this sofa notices how good their backs feel after just a few minutes of sitting. PW

The couch is easily disassembled and transported, yet it's also sturdy.

Burl Oak Jewelry Chest

by Garmon Coats

Burl is one of nature's most stunning and unpredictable woods. Its chaotic grain structure appears random and dense compared to normal growth wood. The compressed burl, often made from clusters of partially matured buds, is the gem of the tree like a diamond is the result of carbon under extreme pressure. Woodworkers typically remove hard knots of burl because they deflect nails and are difficult to work. But these same qualities make burl the perfect medium for freeform sculpture and panels. When framed by normal grained wood, a burl panel stands out like a masterpiece.



Construction

The jewelry chest is composed of five framed oak burl panels. The frames require 16 feet of ¾" X ¾" solid stock shaped on two sides. An additional 20" of the same stock is needed—shaped on one side only.

Use a ½" roman ogee router bit to shape one edge on all 18 feet (see Figure 1). The router bit should have a ¼" diameter X 3/16" wide bearing guide. Make your cut with the ogee bit ½" deep. After the stock has been routed, there will be a 7/16" wide flat surface along its length

Put away 20" of this ¾" stock to be used later for the pedestals.

Rout a ¼" X ¼" rabbet on the opposite side of the remaining shaped stock (see Figure 1) with a ¼" straight bit. This rabbet is on the inside of the frames and accepts the ¼" plywood backing.

The frame pieces each have opposing 45° ends. If you are using a miter saw, place the stock on its ½" surface with the ogee shape up to make the 45° cuts. If using a tilted arbor table saw, turn the stock so the ¾" surface is facing down. Cut six 14" lengths (A), six 7" lengths (B) and eight 3½" lengths (C) with opposing 45° angles at each end.

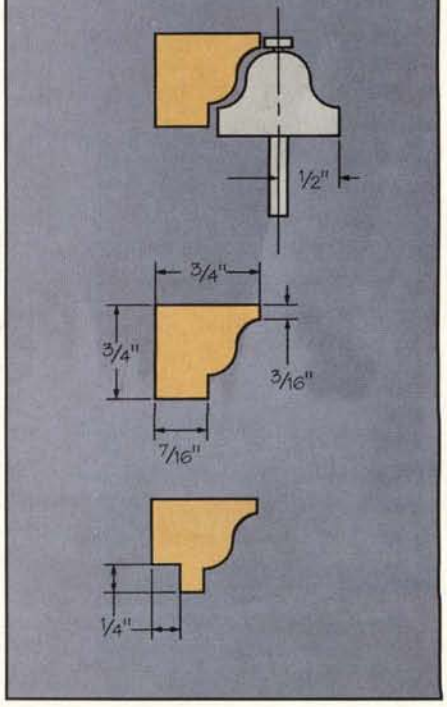
Assemble the frames with spring clamps. The front and back frames are each made from two 14" and two 3½" pieces, the side frames from 7" and 3½" pieces and the lid from 14" and 7" lengths.

The frame backings are cut from ¼" plywood. Cut two pieces of the same dimensions (as given in the Cutting List) for the sides (D) and two pieces of the same dimensions for the front and rear (E) frame backings. Glue the backings into the ¼" X ¼" rabbet on the inside edge of the front, back and side frames leaving a 1/16" gap between the top rail of each frame and the backing as shown in Figure 2. This gap is for concealing the edge of the velvet lining.

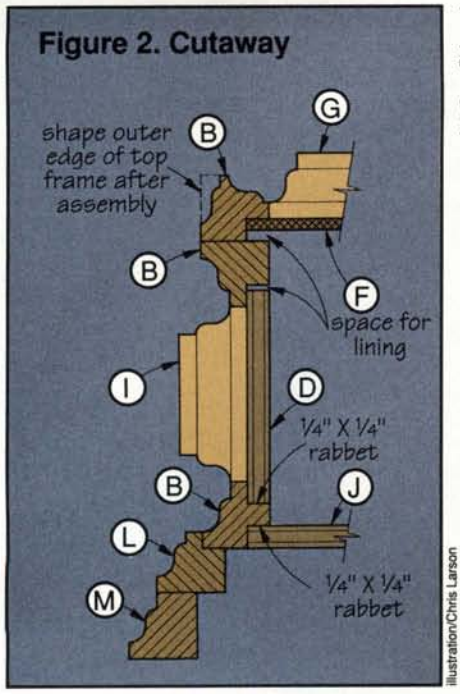
Cut the lid backing (F) to size from ⅛" hardboard (or ⅛" plywood) and glue it into the rabbet. The ⅛" backing will accommodate the thickness of the velvet lining without binding when closing the lid.

Cut the panels (G, H and I) to the dimensions given in the Cutting List from ¾" solid oak burl. Shape the face of the panels with the same ogee bit and setting used on the frames. Use the most interesting piece of burl for the top panel (G). Glue the burl panels into the frames and staple or nail through the plywood backing to secure the panels in place.

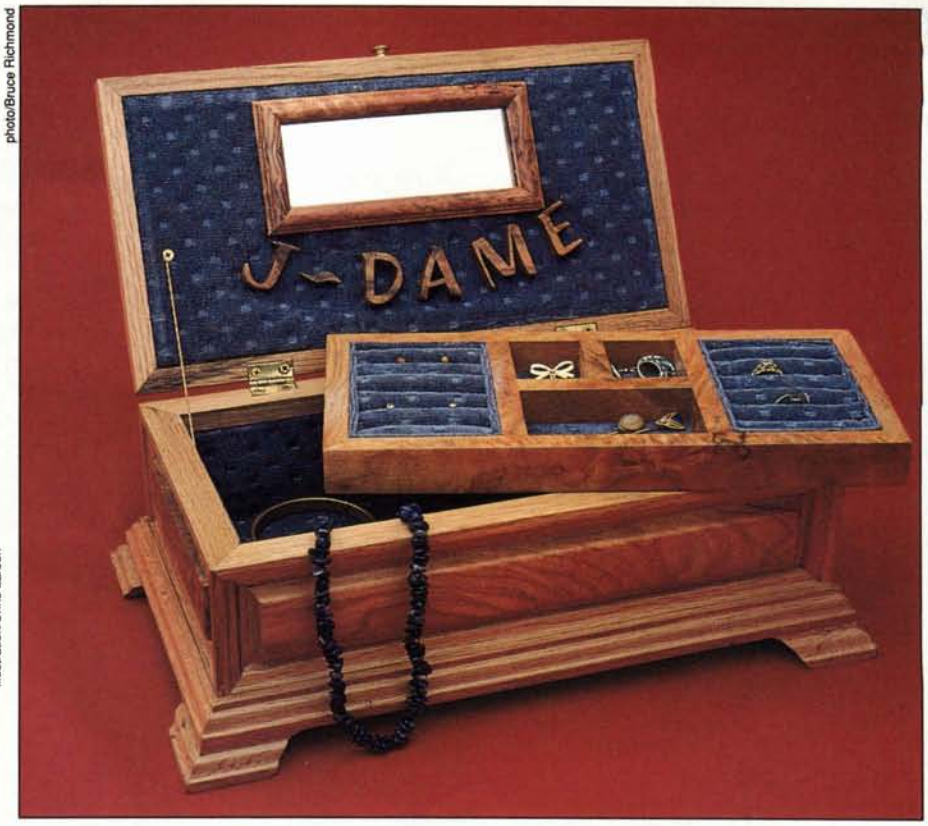
Figure 1. Frame Routing



Garman Coats has contributed many projects to Popular Woodworking.



illustration/Chris Larson



photo/Bruce Richmond

Box Assembly

Make a 1/4" X 1/4" rabbet on the inside bottom of the front, back, and side frames to accommodate the bottom piece as shown in *Figure 2*, making sure that the 1/16" gap for tucking in the lining is at the top of each frame. Stand the four frame and panel assemblies on edge, and miter their ends to 45° (don't shorten the length of the panels when making these cuts). Form a box with the front, back, and two side frames and glue and clamp the box together using a frame or web clamp. Check for square at the inside corners.

Cut the bottom (J) from 1/4" oak plywood the same dimensions as the hardboard lid backing. Glue the bottom into the rabbeted bottom of the box and secure it with a 1/2" finishing nail in each corner.

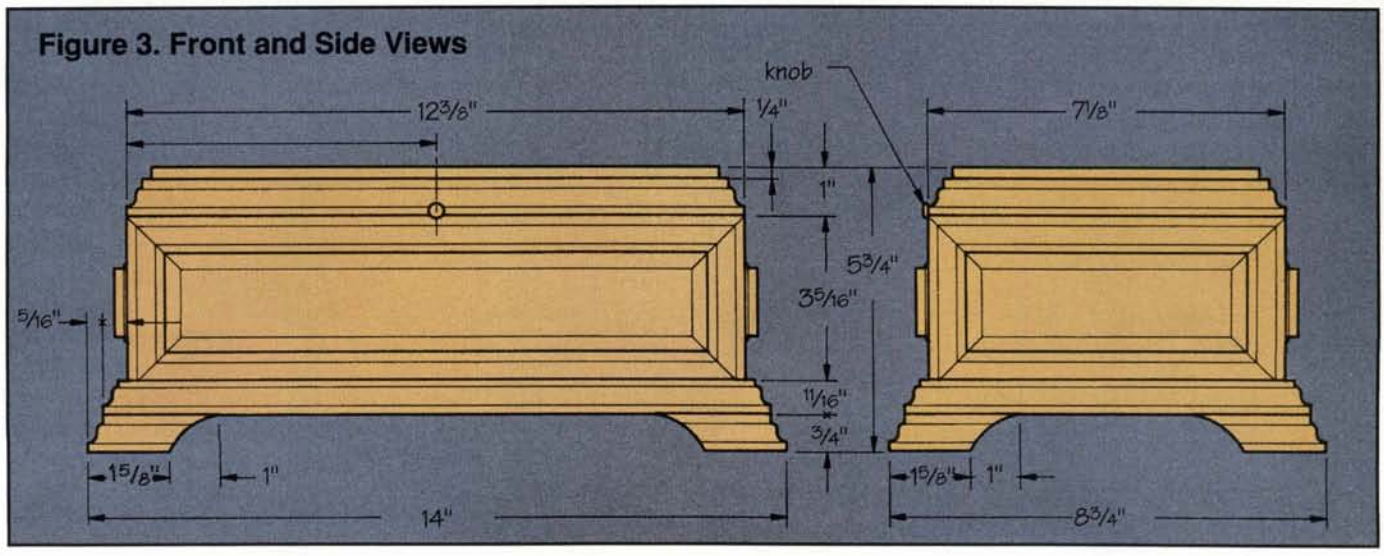
Level the top and bottom of the box and the bottom of the lid if necessary with a sanding board. This is a piece of plywood a couple feet square with sand paper glued to it. Sand in a diagonal motion first with 120–grit, then in a circular motion on 240–grit. Place the lid on top of the box, and check for a clean seam all around.

Shape the upper outside edge of the frame with a bull–nose router bit or the upper cut of your ogee bit. Don't cut this detail too deep, as you'll need enough surface on the outer side of the band for attaching the hardware. With a bull–nose bit, cut 1/4" deep and over. With the ogee bit set the bearing guide about midway up the frame band.

Base, Pedestal and Lid

Use the remaining rabbeted frame stock for the base. Cut the front and back (K) and side (L) pieces with opposing 45° miters on each end. When all four pieces are cut and fit properly, glue the base onto the box. After the glue has dried, sand the bottom of the base even on a sanding board.

Use the 20" of 3/4" X 3/4" frame stock



(without the rabbet) for the pedestals. The 7/16" edge will be the top when attached to the bottom of the base. Miter each end of the piece at 45° opposite angles. From the ends of this stock measure back 2⅝" and cut two pieces (M) off square. Glue the two 45° cuts together matching the ogee shapes for a corner pedestal. Repeat this process to make each of the four pedestals. After the glue has dried, round in the square ends of the pedestals with a band saw or a drill–mounted drum sander. When rounding the pedestal corners, leave the 2⅝" dimension at the top of the pedestal and leave about 1⅝" of flat surface at the bottom of each pedestal side.

Attach the pedestals under each corner of the base so the 7/16" top edge is flush with the vertical edge of the base. Glue and nail the pedestals with ½" finish nails through the rounded–in bottom.

Connect the lid to the box with two hinges. Chisel mortises in the box and lid to

Figure 4. Tray

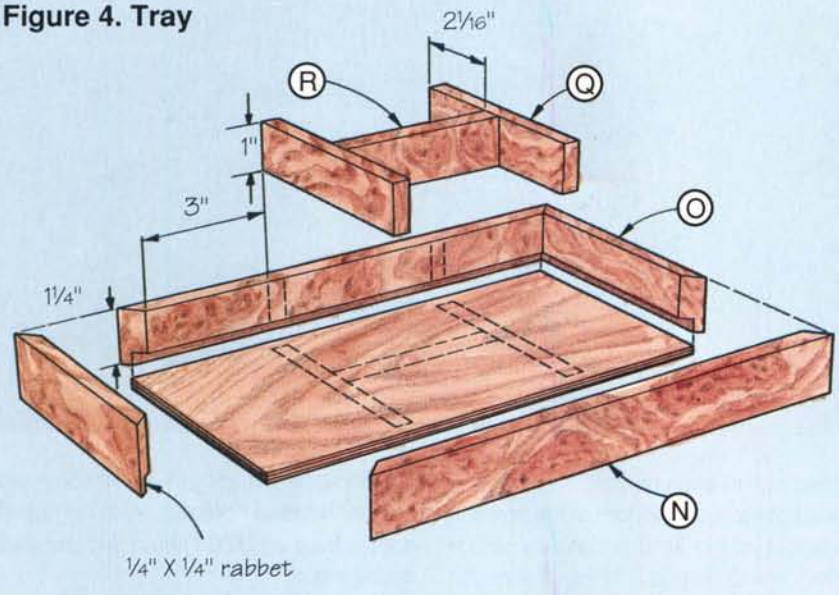
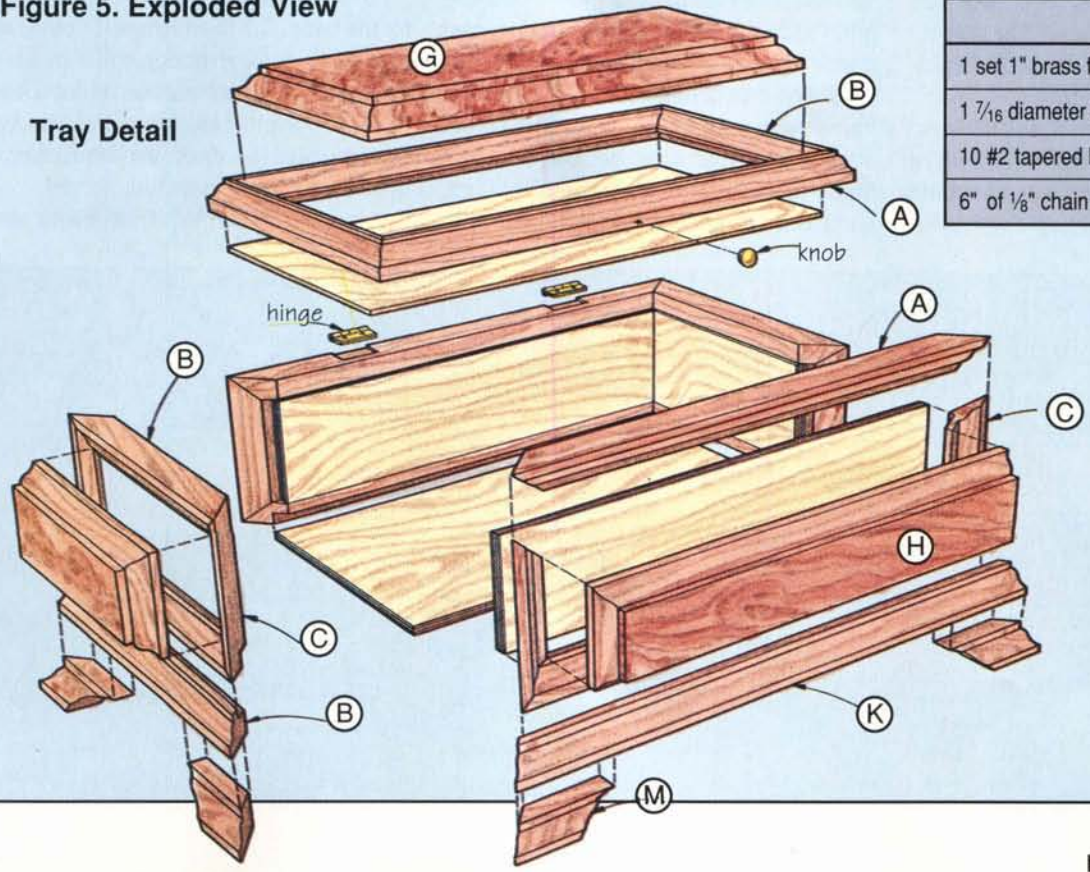


Figure 5. Exploded View

Tray Detail

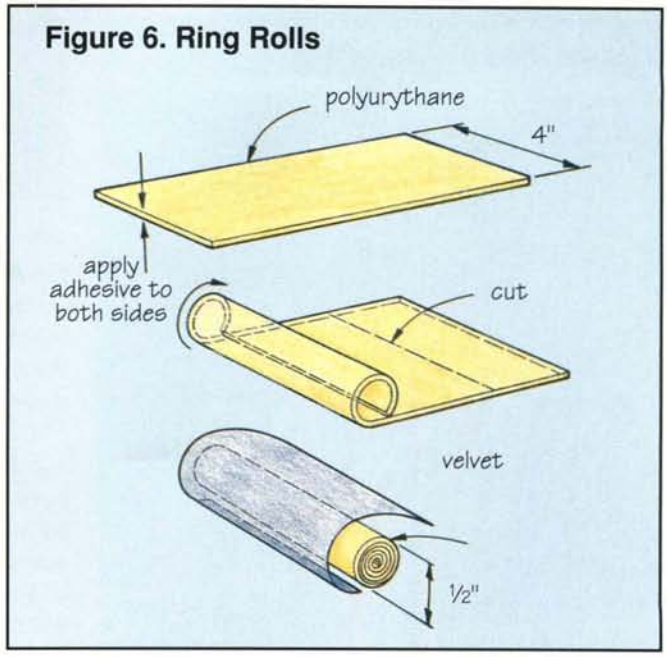


Tom Larson/Carol Law

Burl Oak Jewelry Chest					
Cutting List					
		Finished Size			
Qty	Part	T	W	L	Piece
6	A	¾"	¾"	14"	frame
6	B	¾"	¾"	7"	frame
8	C	¾"	¾"	3½"	frame
2	D	¼"	2 7/15"	6"	backing
2	E	¼"	2 7/16"	13"	backing
1	F	⅛"	6"	13"	lid backing
1	G	¾"	5½"	12½"	lid panel
2	H	¾"	2"	12½"	front, back panel
2	I	¾"	2"	5½"	side panels
1	J	¼"	6"	13"	bottom
2	K	¾"	¾"	15½"	base
2	L	¾"	¾"	8½"	base
8	M	¾"	¾"	2⅝"	pedestal
2	N	⅜"	1¼"	12¼"	tray frame
2	O	⅜"	1¼"	5¼"	tray frame
1	P	¼"	6"	13"	tray bottom
2	Q	⅜"	1"	4½"	tray divider
1	R	⅜"	1"	4¾"	tray divider
1	S	⅜"	1"	2 1/16"	tray divider

Supplies
1 set 1" brass flap hinges
1 7/16 diameter brass pull nob
10 #2 tapered head brass screws
6" of ⅛" chain brass or gold

Velvet Lining Cutting List				
		Finished Size		
Qty	Part	W	L	Piece
16	AA	5½"	12½"	bottom
8	BB	6"	13"	lid
2	CC	2 9/16"	12½"	front and back
2	DD	2 9/16"	2 3/16"	sides
4	EE	1½"	5⅜"	tray supports
8	FF	2 1/16"	2 3/16"	bottom
2	GG	2 1/16"	4¾"	bottom
1	HH	1½"	4½"	sides
1	II	1½"	3"	sides
1	JJ	1⅜"	3"	ring rolls



accept the hinges so only the hinge joint is exposed at the rear as shown in Figure 4. Drill pilot holes for the attaching screws. Remove the hinges for finishing.

Trinket Tray

The trinket tray requires five feet of ⅜" burl stock. Rip 39" of this stock to 1¼" wide for the tray frame and the remaining 21" to 1" wide for the tray dividers. Rabbet the 1¼" strip ¼" X ¼" along the length of one edge as shown in Figure 5. This will become the inside bottom of the tray. Cut the 1¼" strip to length for the sides (N) and ends (O) with opposing 45° angles on all ends to form a rectangular frame 12¼" X 5¼". Glue and clamp the tray together. Make the tray bottom (P) from ¼" oak plywood then glue and nail it in place.

Cut the tray dividers to size and sand them to a finish before installation. Glue and fit the two end dividers (Q) into the tray, each 3" from an end. Glue the cenrter divider (R) centered between the end dividers. Use the remaining piece (S) to divide one of the two middle sections. Turn over the tray and secure the dividers with ½" finish nails through the bottom.

Finishing

Sand all the woodwork through 320–grit. Spray on a heavy coat of sanding sealer, allow it to dry thoroughly then sand with 400–grit paper until a fine white powder builds up. Wipe clean with a tack cloth.

Use a satin gloss lacquer for the finish. The satin sheen preserves the appearance of the texture and looks natural. Cut the lacquer with 50 percent thinner. Use three coats, allowing each to dry before applying the next.

Velvet Lining

Use a velvet that has a course, cross–weaved backing so it doesn't allow the glue to bleed through and is strong enough to withstand repositioning when gluing. The color should compliment the wood.

Use contact cement to adhere the velvet to the wood. Brush–on adhesives allow more control; while spray–on adhesives are quicker and easier to work—although they require taping around lacquered areas. Lay out the velvet on a smooth, flat surface, with the back side up. Use a square and a sharp utility knife to square and cut off an edge of the lining.

Measure and cut the piece for the tray bottom (AA) from the squared edge. Check for fit before gluing—all four edges should just touch the sides. Coat the mating surfaces with contact cement. The bottom should be almost dry, and the cement on the velvet slightly wet when you bond the two. If both surfaces are tacky, it would be difficult to lift the piece to make adjustments for proper placement. Use a wide wood chisel to manipulate the velvet into the corners and edges, being careful to not cut the lining. Rake across the piece to smooth out any wrinkles.

Repeat these steps for the lid (BB), the front and back (CC) and sides (DD). When lining the sides, place the bottom edge first, pulling up into the corners with the chisel. After the cement has cured, tuck the edge of the lining into the gap around the inside of the box. Cut two pieces of scrap wood ½" X 1" X 5⅜" for tray supports. Wrap each piece with velvet (EE) on a ½" and a 1" surface. Glue the lined pieces of wood into each end of the box.

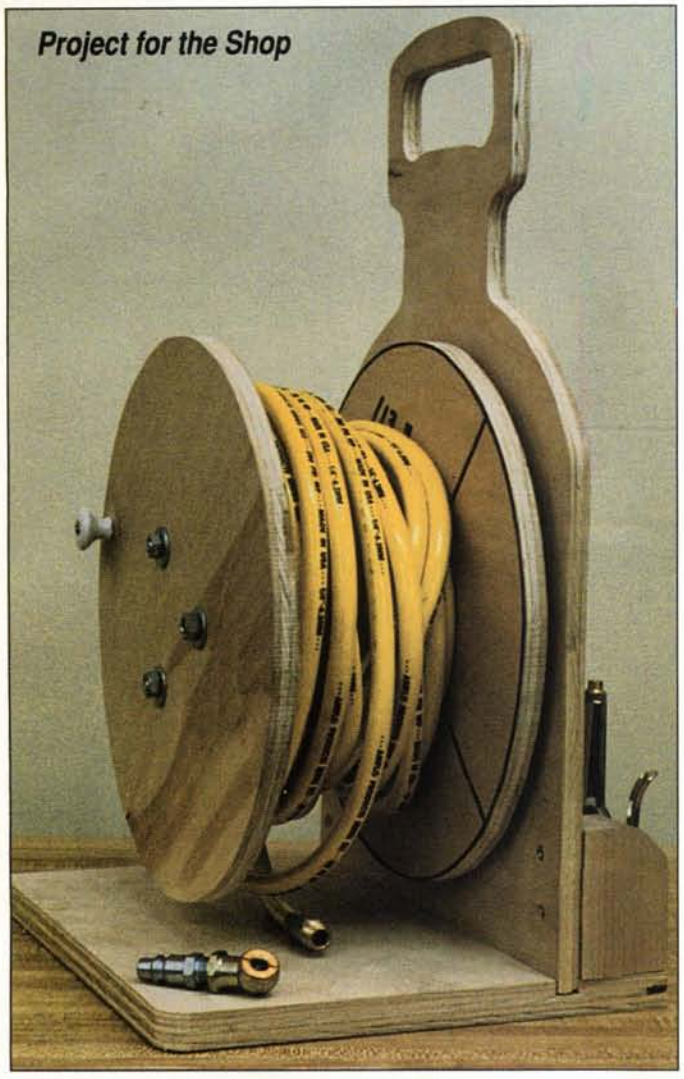
Remove excess contact cement on the velvet or laquered finish with a cloth moistened with lacquer thinner, gently stroking the glue until it comes off. The chemical base of the cement cuts the lacquer, so you'll have to apply another coat.

Line the tray with velvet on the bottoms (FF, GG) of the middle sections and the sides (HH, II) of the ring sections. The velvet on the sides is doubled over so the jagged edge is not visable. The top of the side strips should be about ⅛" below the top edge of the wood.

Next, make cushioned rolls for the ring holders (see Figure 6). Cut the ⅛" polyurethane foam into eight 7" strips (each strip will make two 3" ring rolls), coat both sides with rubber cement, then roll the foam into ½" diameter rolls. Cut strips of velvet (JJ) 3" wide, and cement to the foam rolls. Keep the velvet seams *over the foam* seams—this will be the bottom of the rolls. Cement the bottoms of the rolls and place them eight per side, in the ring sections.

Hardware and Waxing

Install the hinges. Drill a centered hole on the front of the lid frame to attach a 7/16" diameter brass knob. Use 6" of brass chain attached with #2 tapered head brass screws as a lid catch. Polish your chest with bee's wax to a jeweled finish. PW



Portable Hose Reel

by Alice and Robert Tupper

This portable hose reel holds 50 feet of ¼" ID air hose. Make the 4" hub from a steel can and fastened it between two plywood discs with three ¾" X 6" bolts. The bolts also keep the sides from spreading out. You can make this project in a day.

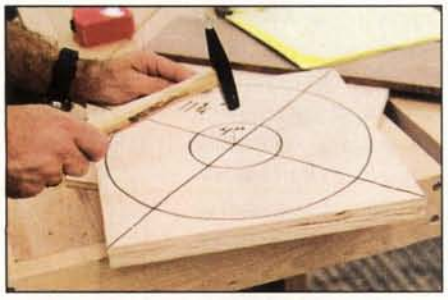
Choose a large steel can and empty the contents by cutting a circular opening 1" from the edge with a utility knife. We used a pumpkin can. Cut a 2" square opening in the side centered between the top and bottom. Roll back the metal edges to avoid damaging your hose.

For the disks (A), cut two 12" X 12" squares of ½" plywood and find the center. Use a compass to draw an 11¾" circle and the diameter of your steel can on both pieces. Line up the edges and attach the pieces together in the waste area. Cut off the waste on the band saw. Drill three ¾" holes equally spaced (120° apart) ½" in from the inside can circumference. Separate the parts; then drill a 1½" hole in the center of one piece with a Forstner bit.

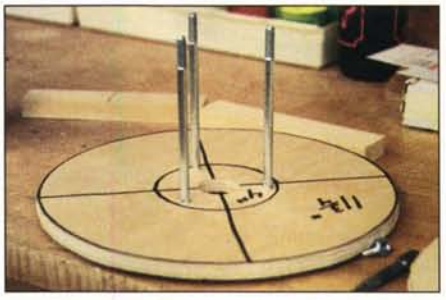
For the back (B) and base (C), cut a 12 ½" X 31" long strip of ¾" plywood; then cut the parts to the lengths given in the Cutting List. Cut a ¾" X ⅜" deep dado 2" in on the 12½" side of the base. Transfer the shape of the back from the PullOut™ Plans. Cut the waste away on the band saw and drill the 1½" center hole. Drill a ¾" hole in each corner of the handle; then use a coping saw or jigsaw to cut out the center.

Alice & Robert Tupper *are woodworkers from Lincoln County, South Dakota.*

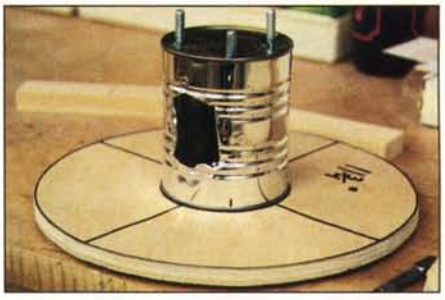
Fasten the two 12" X 12" plywood squares in the waste area.



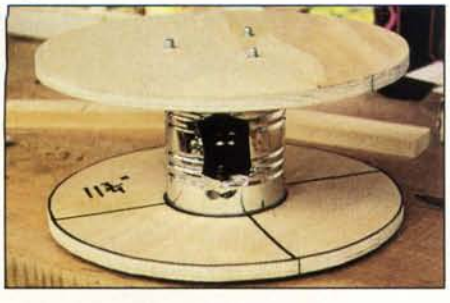
Run the bolts through the drilled disk with the marked can diameter facing in.



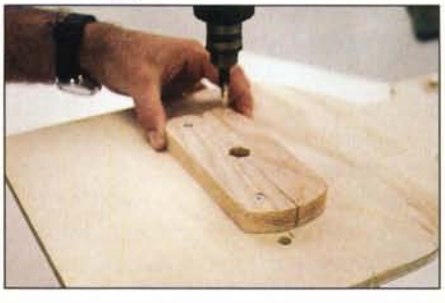
Drill the bolt holes in the can. Fit it over the bolts to match the outline.



Place the second disk on the can so the bolts fit through the holes, and secure the assembly with washers and nuts.



Center the notch over the 1½" hole on the back. Countersink a hole on the rounded end of the top and each end of the bottom.

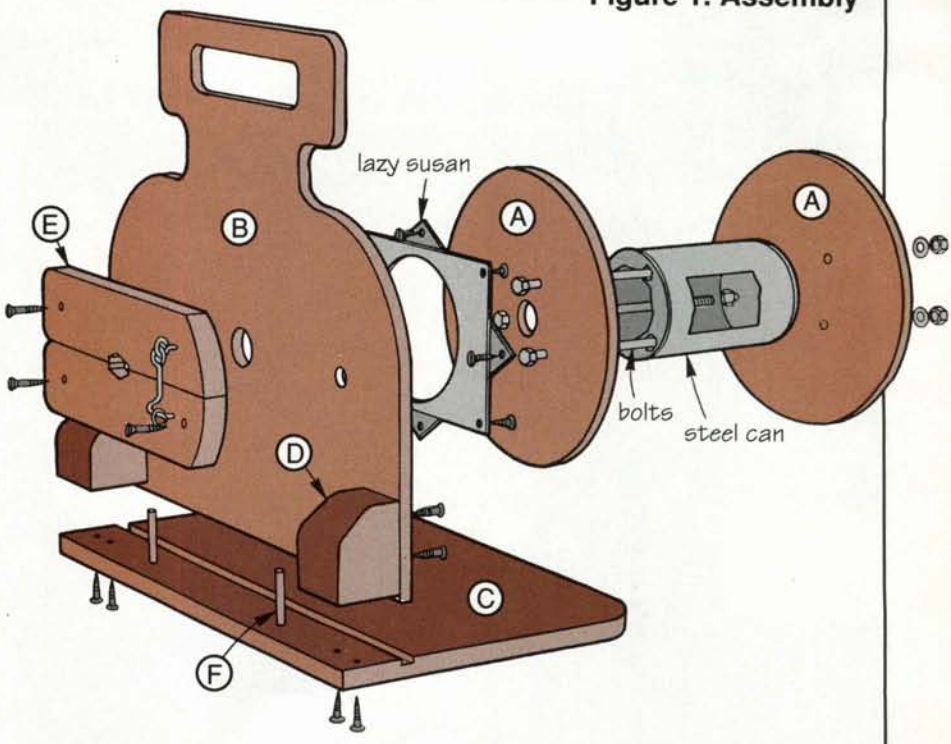


The screw blocks are attached from the underside of the base and the inside of the back.

Air Hose Reel					
Cutting List					
		Finished Size			
Qty	Part	T	W	L	Piece
2	A	½"	11¾"	diam.	disc
1	B	¾"	12½"	19½"	back
1	C	¾"	12½"	10½"	base
2	D	1½"	2"	3"	screw blocks
2	E	¾"	1½"	6¾"	couplings
2	F	¼"	diam.	2½"	tool supports

Supplies	
1	steel can
1	6" lazy susan
3	6" x ¾" bolts
6	¾" washers
3	¾" nuts
8	#6 x 1¼" screws
1	handle

Figure 1. Assembly



Use hardwood for the screw blocks (D) and the coupling clamps (E). Round a corner on each screw block. Now cut out the patterns for the coupling clamps which are in the PullOut™ Plans. When the clamps are put together, they form a hexagonal notch that holds the hex end of the supply hose quick coupling. When the coupling is held by the clamps, the reel rotates freely. The clamp also allows connection from another hose.

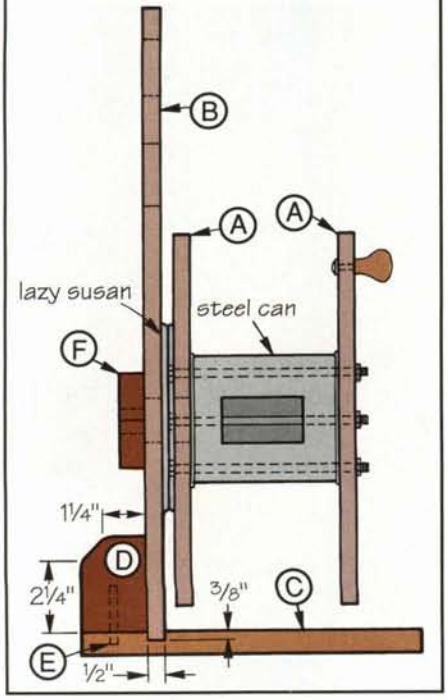
Place the bolts through the drilled center disc. Mark the placement of the bolts on the can, then drill holes for them. Fit the can over the bolts—the holes in the can now line up with the holes in the disk. Place the other disk on top of the assembly and secure it with washers and nuts.

Mark the placement of the lazy susan on the disk and back so the drilled centers align. The diagonal lines used to find the centers of the disk match the hole placement of the lazy susan.

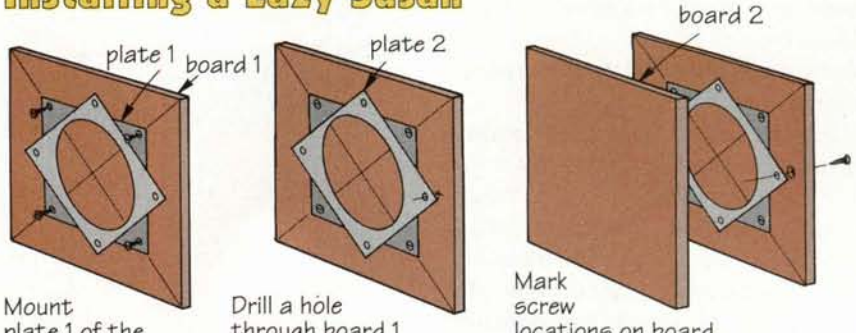
Place the clamps so the notches overlay the disk hole. Drill and countersink a screw on each end of the bottom clamp. With the top clamp flush with the bottom, drill and countersink a screw in the rounded end. The rounded end allows the clamp to rotate up. Place the hook and eye to keep the clamps tightly together.

Drill ¼" X ⅜" deep holes to hold the tool support dowels (F) on the base. Secure the dowels in any position you like with some glue. Glue and clamp the screw blocks to the base; then screw them together through the base. Glue the back into the dado and screw it to the screw blocks through the plywood. Because this project is for our shop, our only finish was a light sanding. PW

Figure 2. Side View



Installing a Lazy Susan



Mount plate 1 of the lazy susan to board 1.

Drill a hole through board 1 wide enough to fit the screw head through.

Mark screw locations on board 2, then screw it to plate 2 through the hole.

author

Rolling Shop Caddy

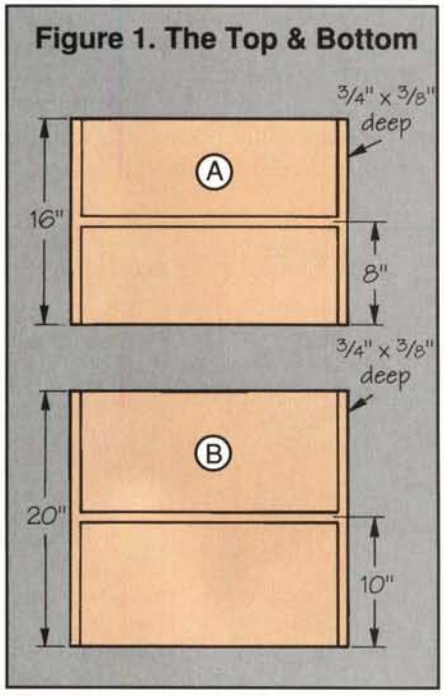
by Hugh F. Williamson

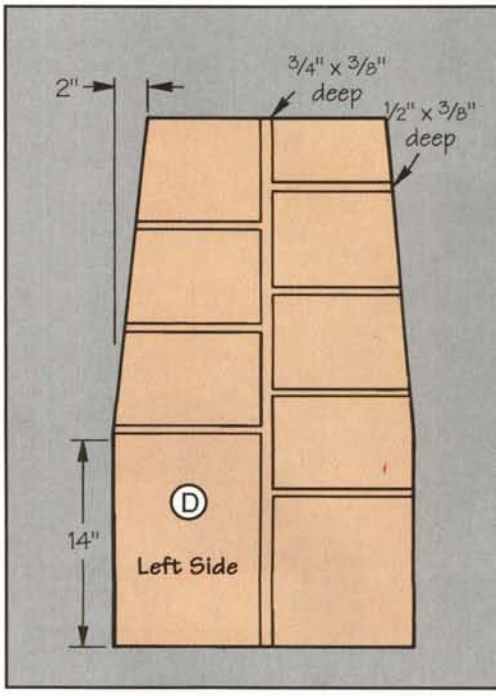
Every shop needs more storage space. Tools, fixtures, and small parts that are frequently misplaced need to be easily sorted, organized and stored. This shop caddy helps solve this problem, and also gives you a supporting hand to manage longer boards you're using. Before you build it, analyze your needs and take some measurements in your shop—you may want to change some of the dimensions to fit your setup.

The first measurement to consider is the overall height. With the casters locked, the caddy makes a great outfeed table for your power tools—but the height is critical. Be sure to take into account the dimensions of the casters and the outfeed rollers you choose. The second important mea-

***Hugh F. Williamson**, a retired physician, works wood from home shops in Tucson, Arizona and Dolores, Colorado.*

Figure 1. The Top & Bottom





surement to consider is the size of the small parts bins you've selected. The bins come in all sizes, colors and materials. Acquire your bins before you begin construction. You may even consider building them. The following instructions and dimensions are for my shop caddy, which is pictured here.

Cut the top (A), bottom (B), back (C) and two sides (D) from ¾" plywood using the dimensions given in the Cutting List. The shelves are all ½" plywood.

First, rout the ¾" X ⅜" deep dadoes and rabbets in the top and bottom as shown in Figure 1; then the vertical dado for the back in the two sides as shown in Figure 2. Next, on a large flat surface, lay out the two side panels with the back panel between them. Do not cut the tapers in the side pieces until you've cut all the dadoes. Carefully align the edges, and clamp the pieces in place. Use a large straightedge to span all three pieces, and clamp it in place as a router guide.

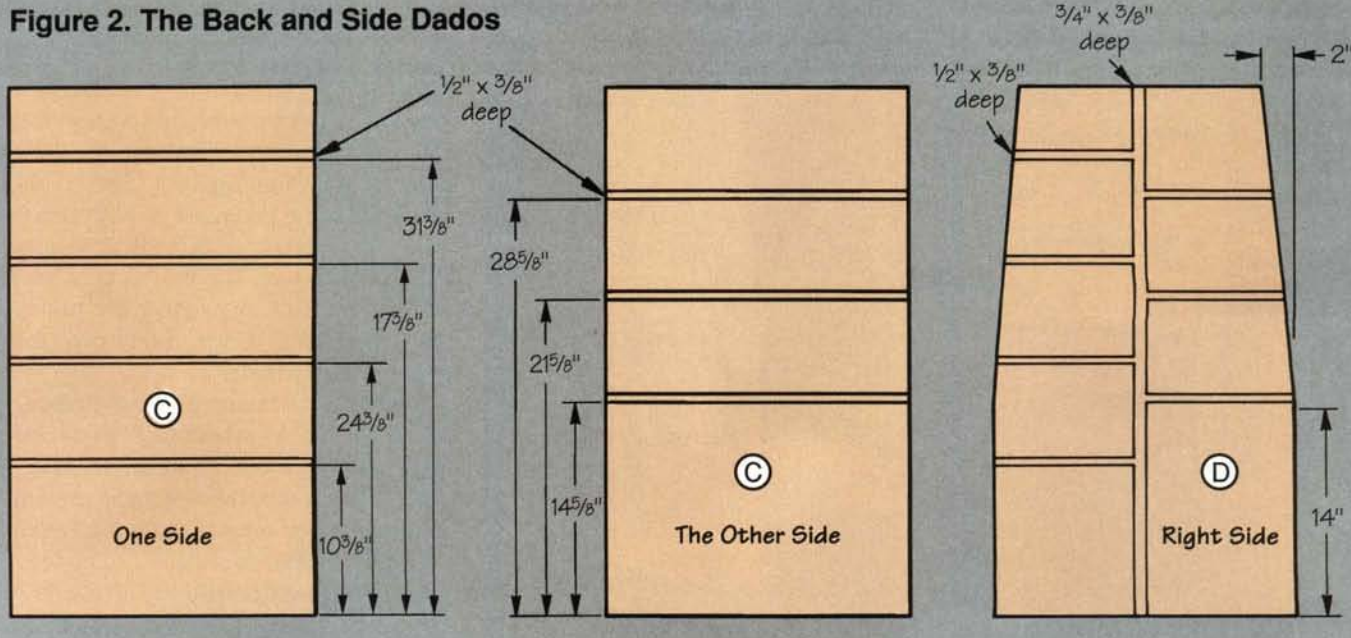
Cut the ½" X ⅜" deep dadoes for the shelves where indicated in Figure 2. The shelf dadoes are staggered to add strength to the carcase. Cut the dadoes on half of both side panels and the back to match; then turn the back panel over, realign it with the two side panels and clamp in place. Now, rout the other half of both side panels and the back panel to complete all of the shelf dadoes.

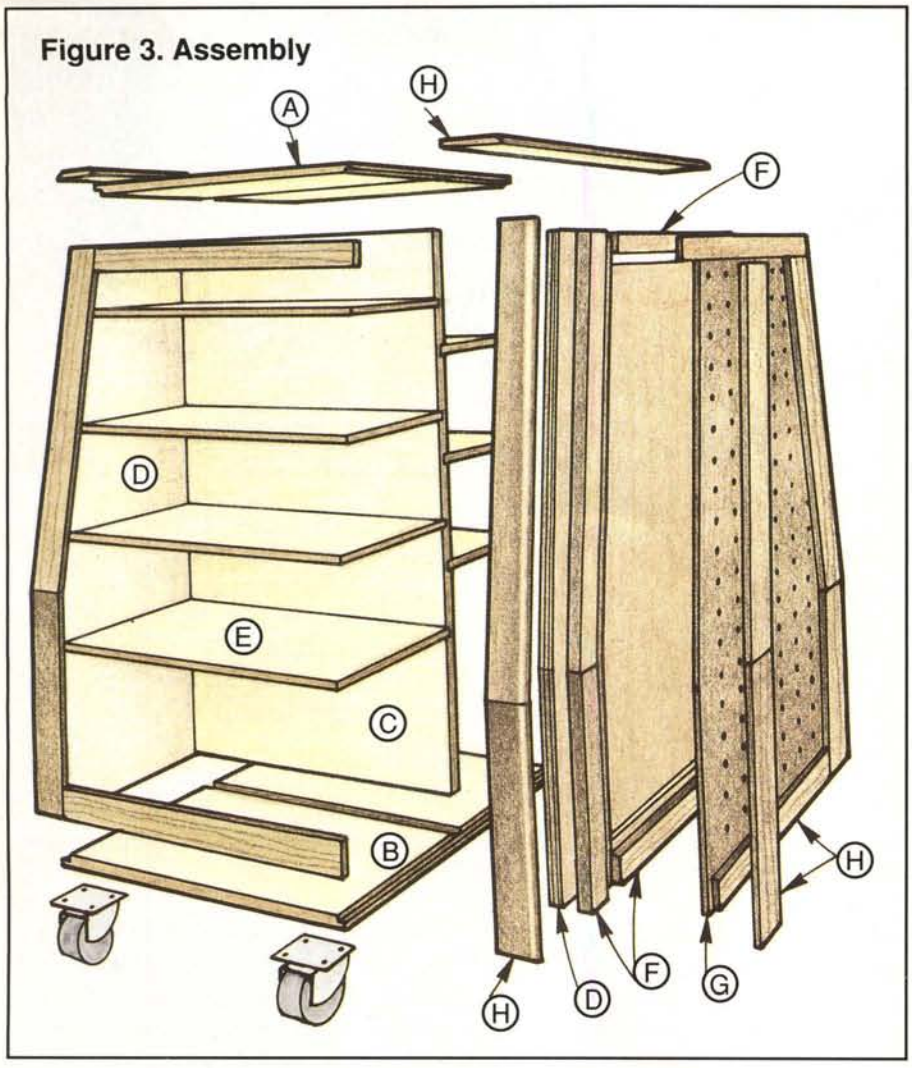
Stack and clamp the two sides together, measure up from the bottom, and place a mark at 14" on both edges. Along the top edges, come in 2" from each side and make another mark. Connect the two marks on each edge to establish the taper. Double check that the two marks on the top edge are 16" apart; then cut off the tapered pieces.

Make sure your router has a new carbide bit; it will cut through the plywood much easier than a dull bit and will make clean, accurate dadoes.

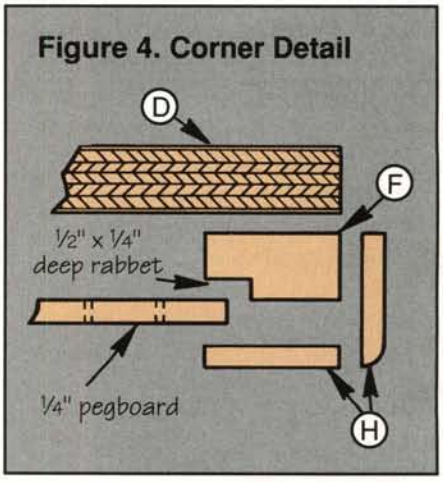
The width dimension given in the Cutting List is for the widest (bottom two) shelves. You'll need to measure from the middle of the back dado in the sides out to the tapered edge—along each shelf dado—to determine the correct width of the remaining five shelves. Round over the top

Figure 2. The Back and Side Dados





Rolling Shop Caddy					
Cutting List					
		Finished Size			
Qty	Part	T	W	L	Piece
1	A	¾"	16"	21¼"	top
1	B	¾"	20"	21¼"	bottom
1	C	¾"	20½"	36¼"	back
2	D	¾"	20"	36¼"	sides
7	E	½"	10"	20½"	shelves
	F	¾"	1½"	20'	moulding
2	G	¼"	18"	35"	pegboard
	H	¼"	1½"	38'	trim



You can use different colored bins to organize small parts, such as nails, screws, bolts and so on.

The pegboard sides are great for hanging tools, and the casters lock for safety when you use the caddy as an outfeed support.

and bottom front edge of each shelf. Assemble all the parts with glue and screws. Set the back in the bottom, add the sides, then the top and the shelves.

Moulding strips support the pegboard and hold it away from the sides so the hooks lock in place. Cut the moulding material to the dimensions given in the Cutting List, and cut a rabbet ½" X ¼" deep as shown in Figure 4. Secure the moulding to the perimeter of both sides. Trim the pegboard to fit and fasten it in place with screws. Rip the ¼" thick trim strips from a 2 X 6. After gluing and nailing the trim strips in place, round over the edges with your router.

For mobility, fasten 3" locking rubber swivel casters to the bottom. They can be obtained from Woodcraft Supply (800-225-1153). For a smooth work surface, cement a piece of plastic laminate to the top. Finish the wood as desired. Attach two outfeed rollers (Woodworker's Supply of NM, 800-645-9292) to the top and you're ready to roll. PW

Popular Woodworking No. 68

PullOut™ Plans

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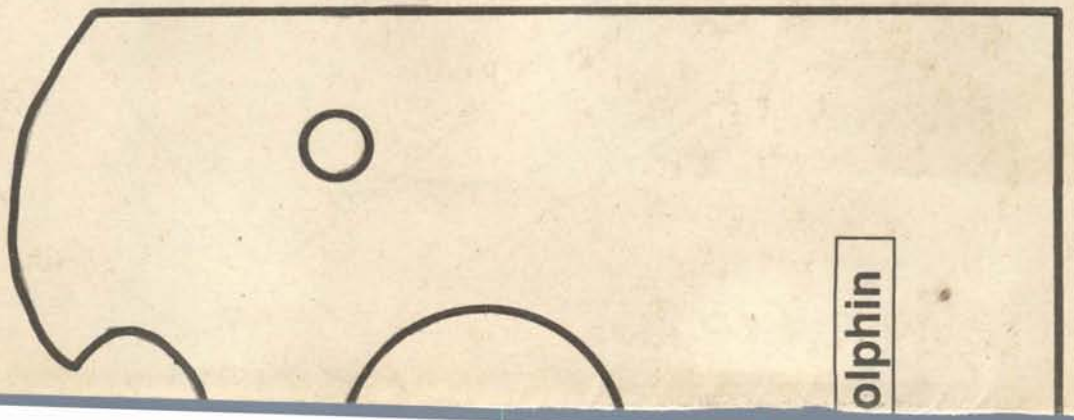
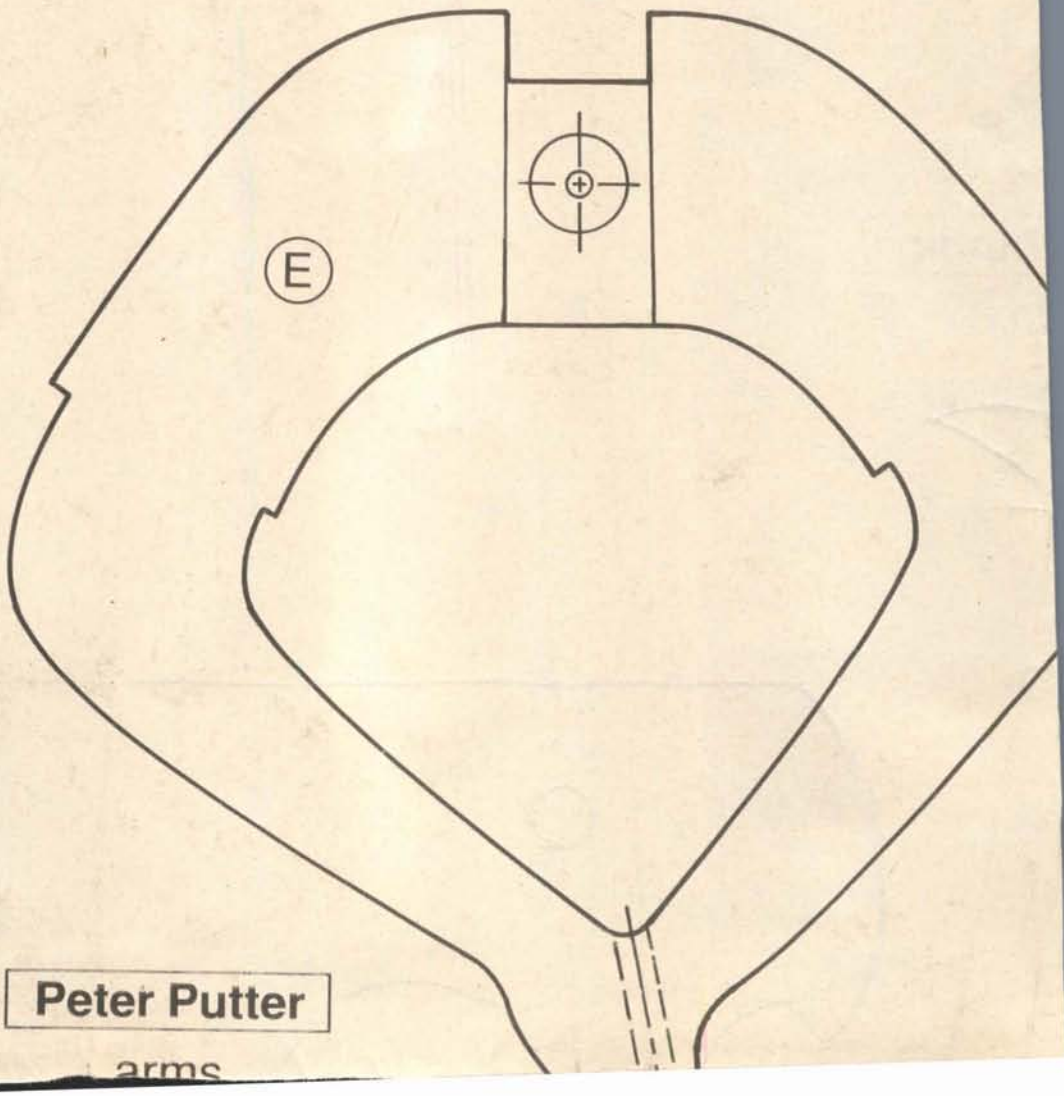
in



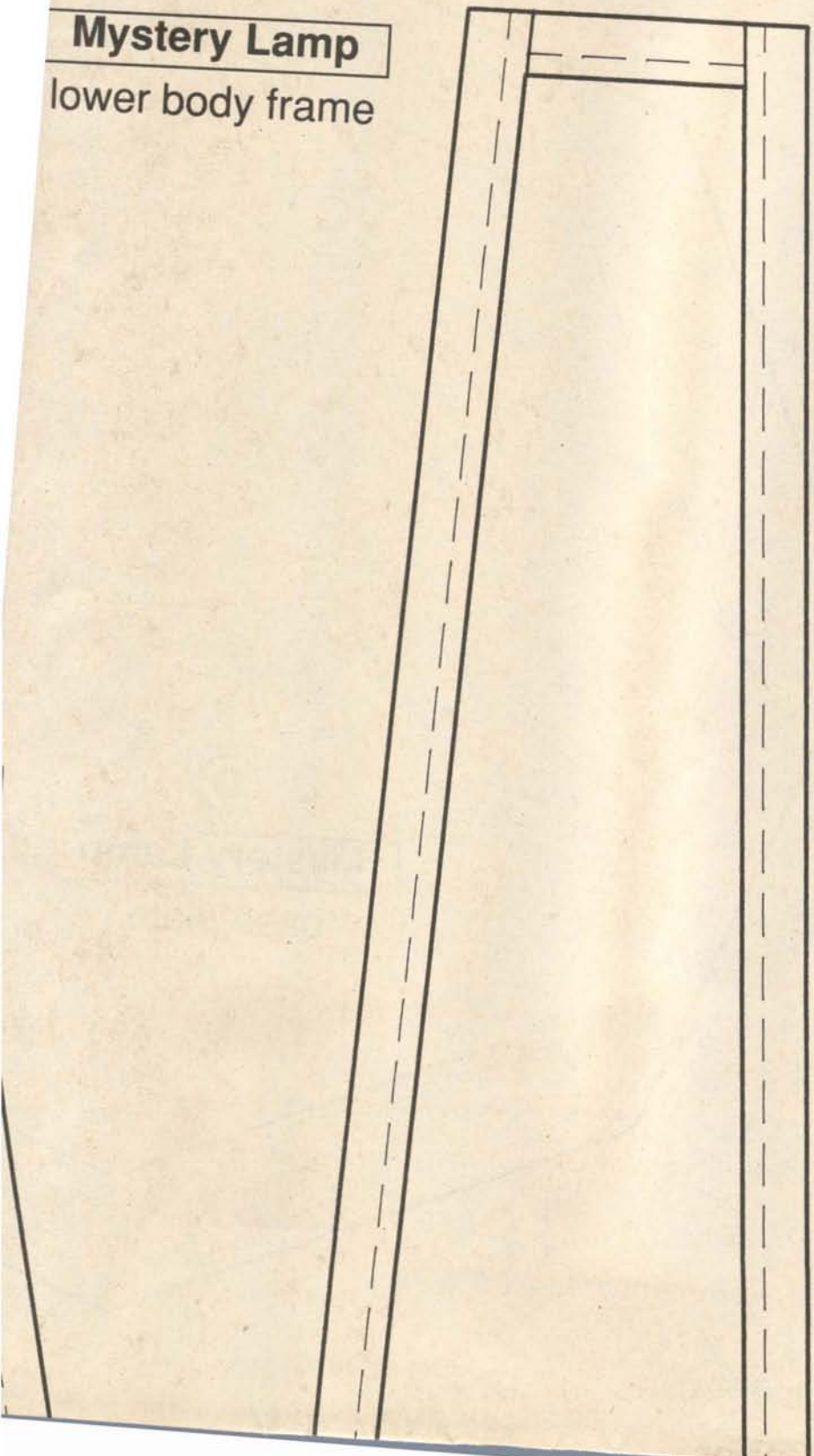


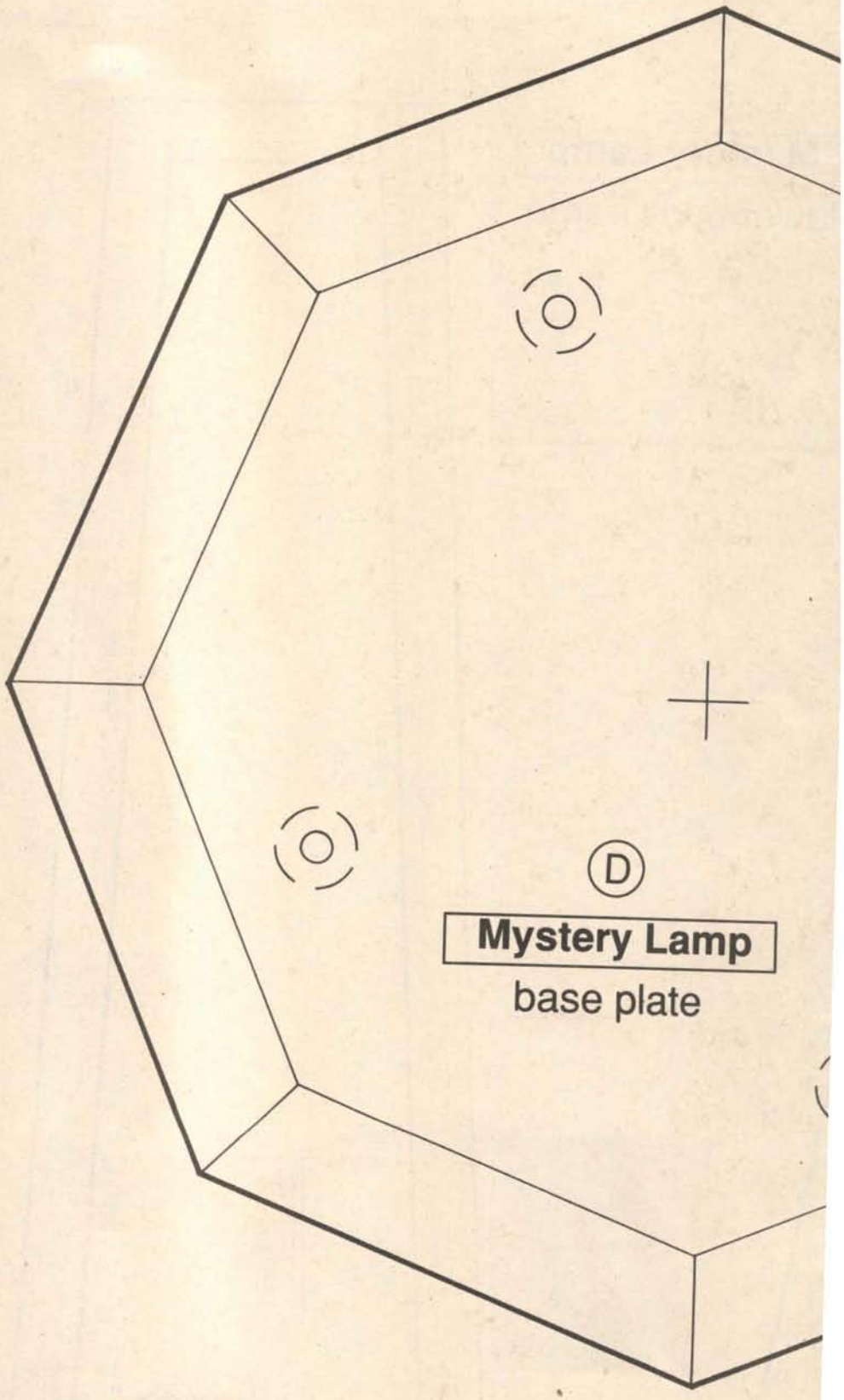
Peter Putter

arms

Mystery Lamp

lower body frame





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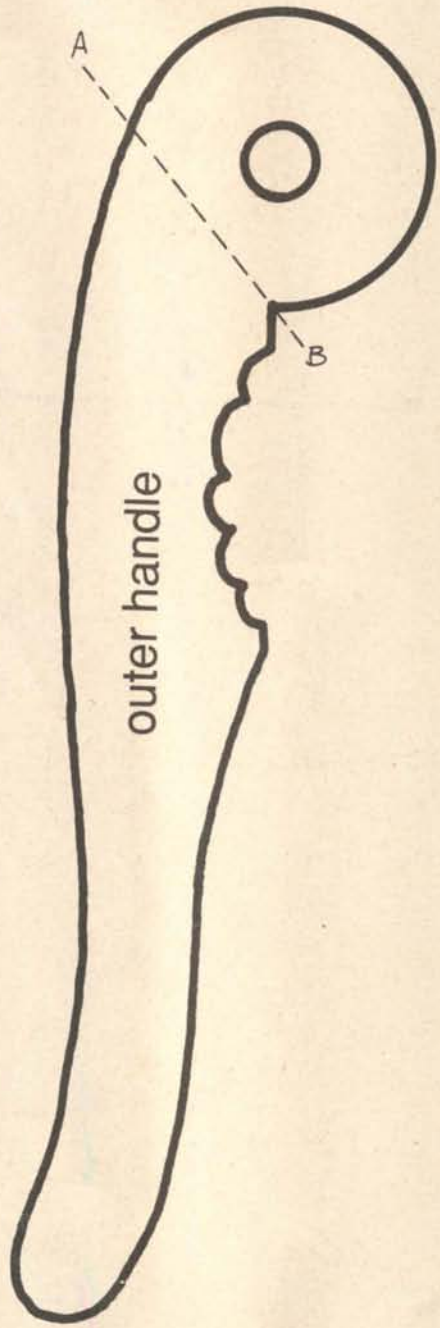
Mystery Lamp

base plate

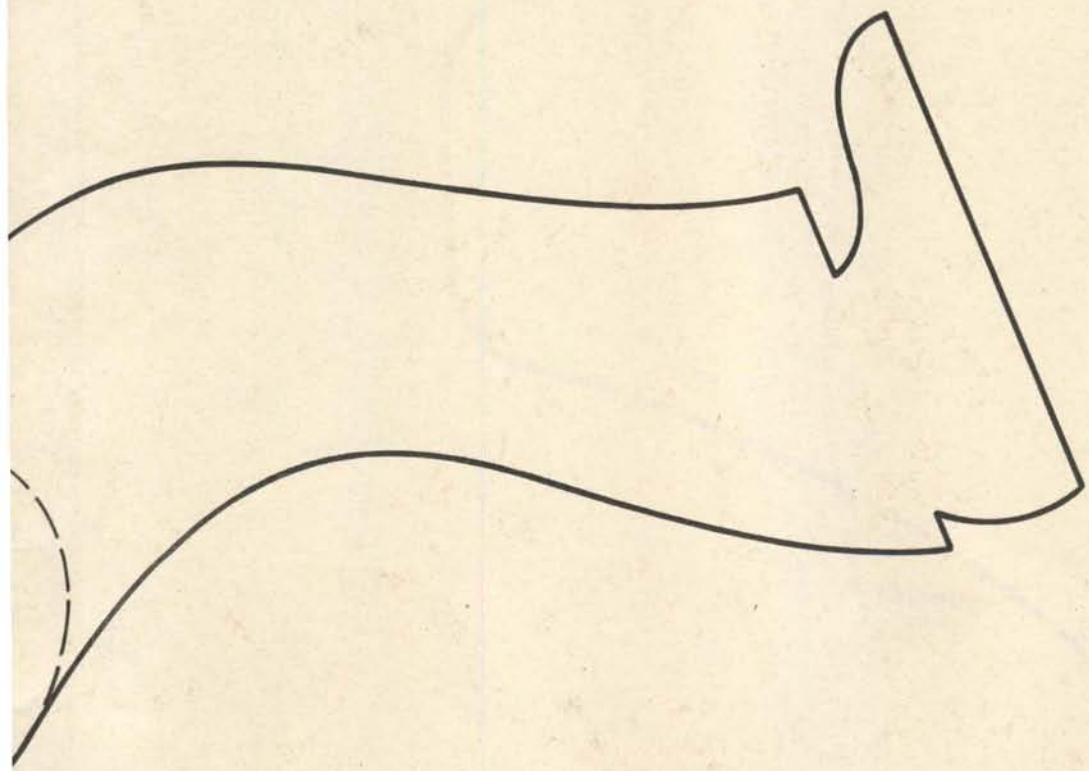
TA

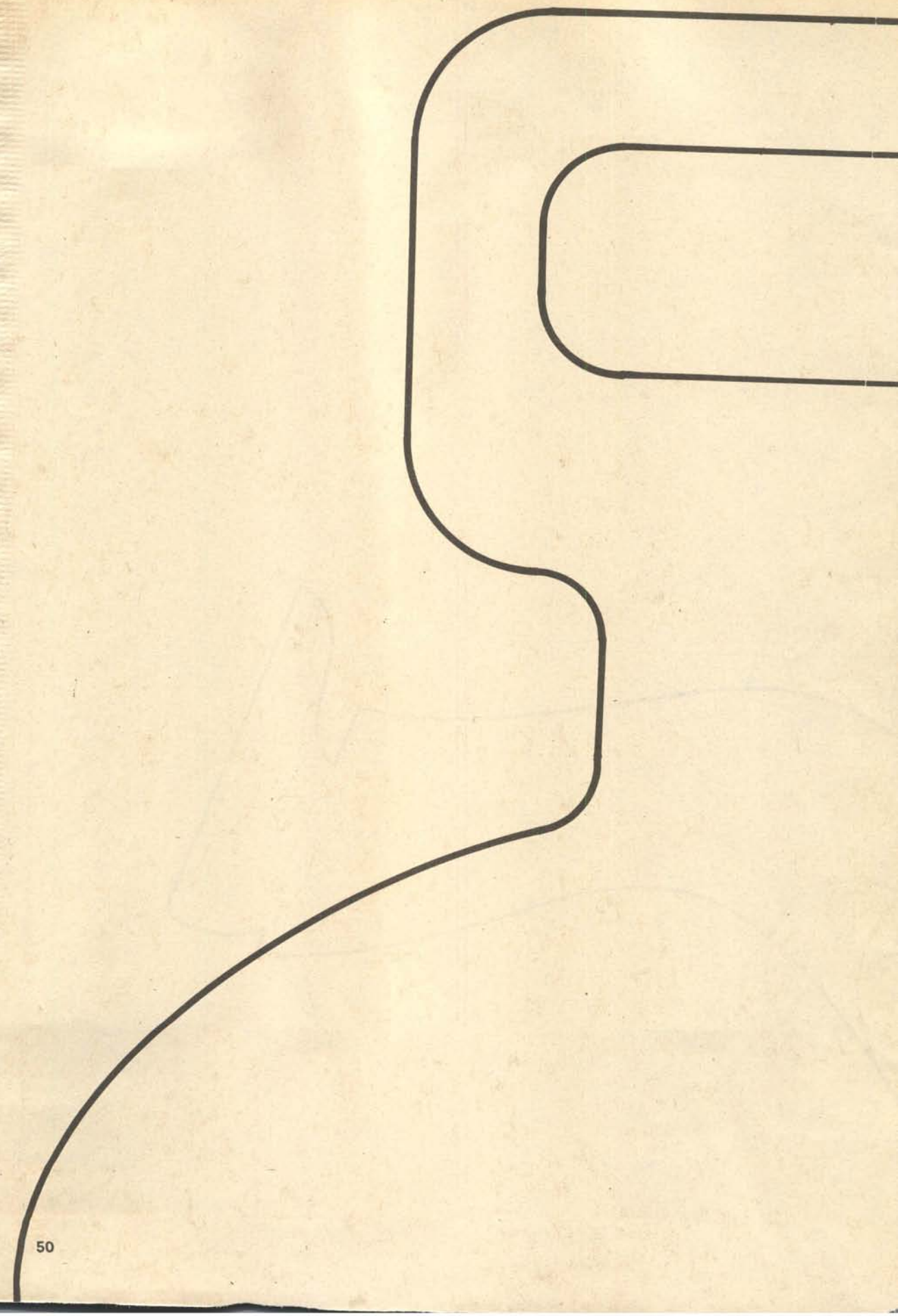
ll Top Desk

nbour sides



Carved Nut Bowl & Cracker



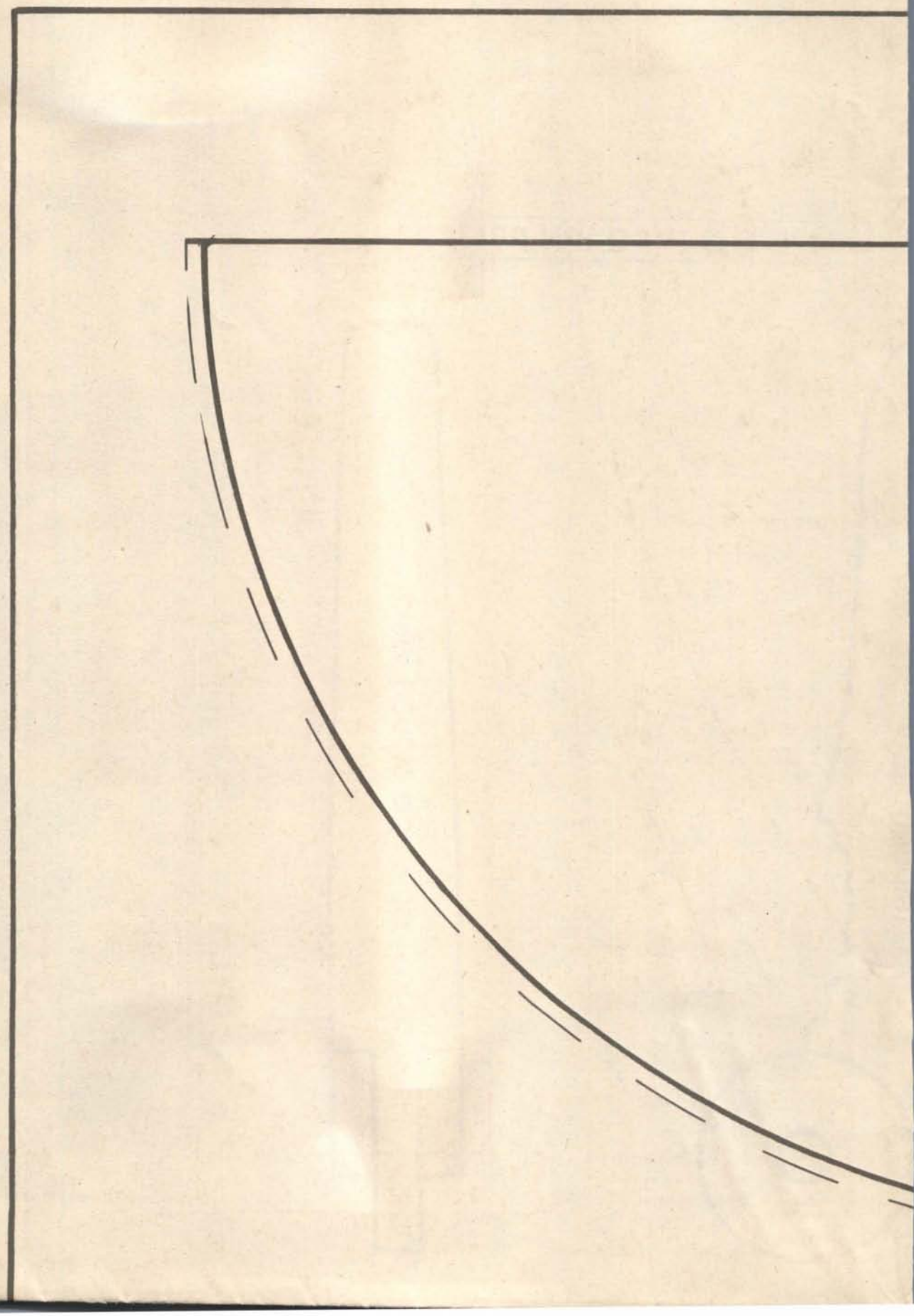


Portable Hos

back

Peter Putter
top
(underside)
A

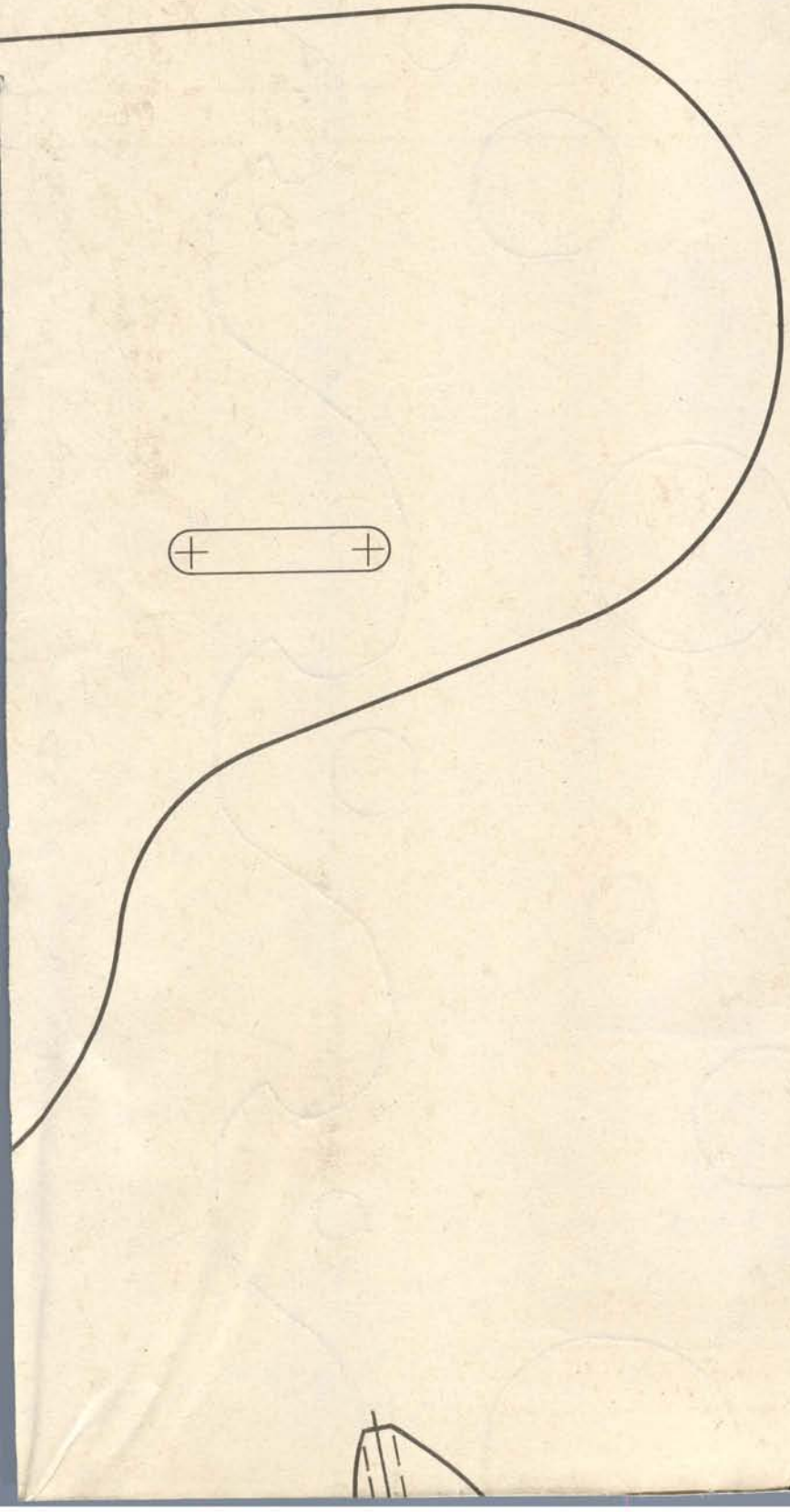
Carved Nut Bowl & Cracker



upper cap
Mystery Lamp
E

Mystery Lamp

compartment cover



Desktop D

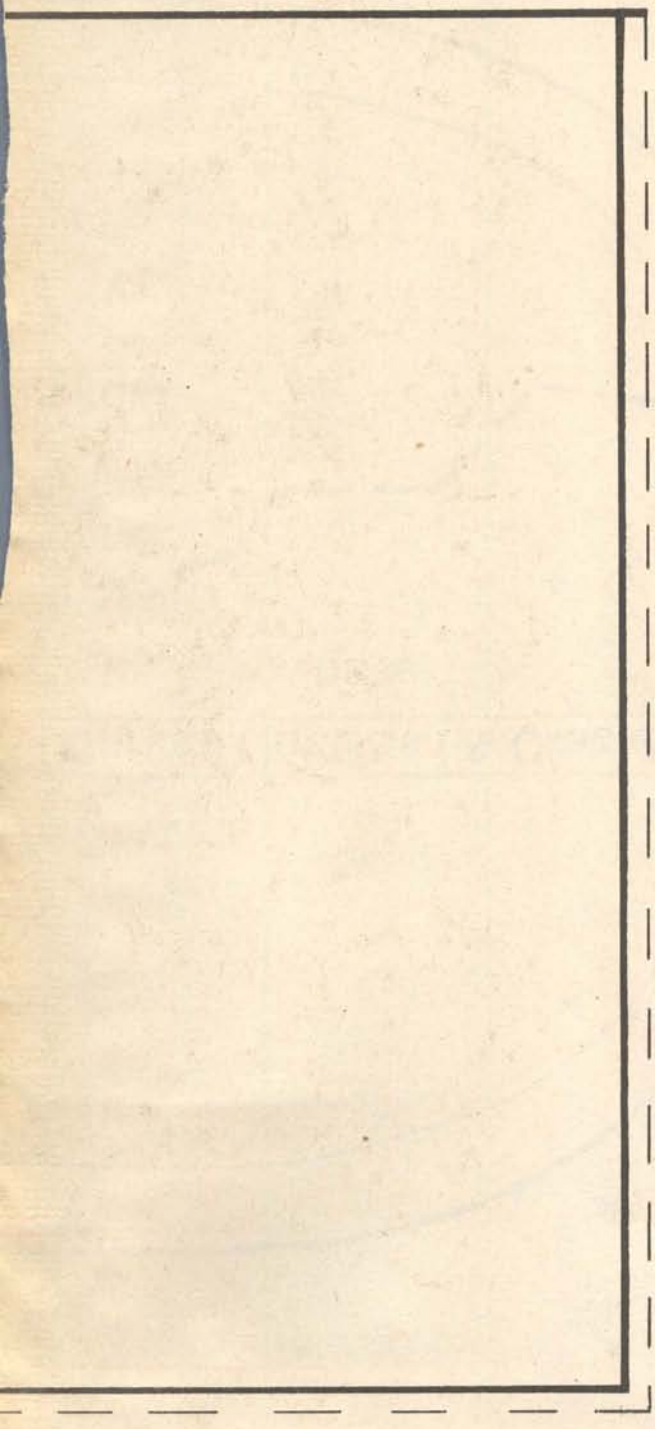
side

A

Carefully open staples to remove plans, then bend them closed again.

Peter's feet
1
1
5

Carved Nut Bowl & Cracker
base
racker



Roll Top Desk

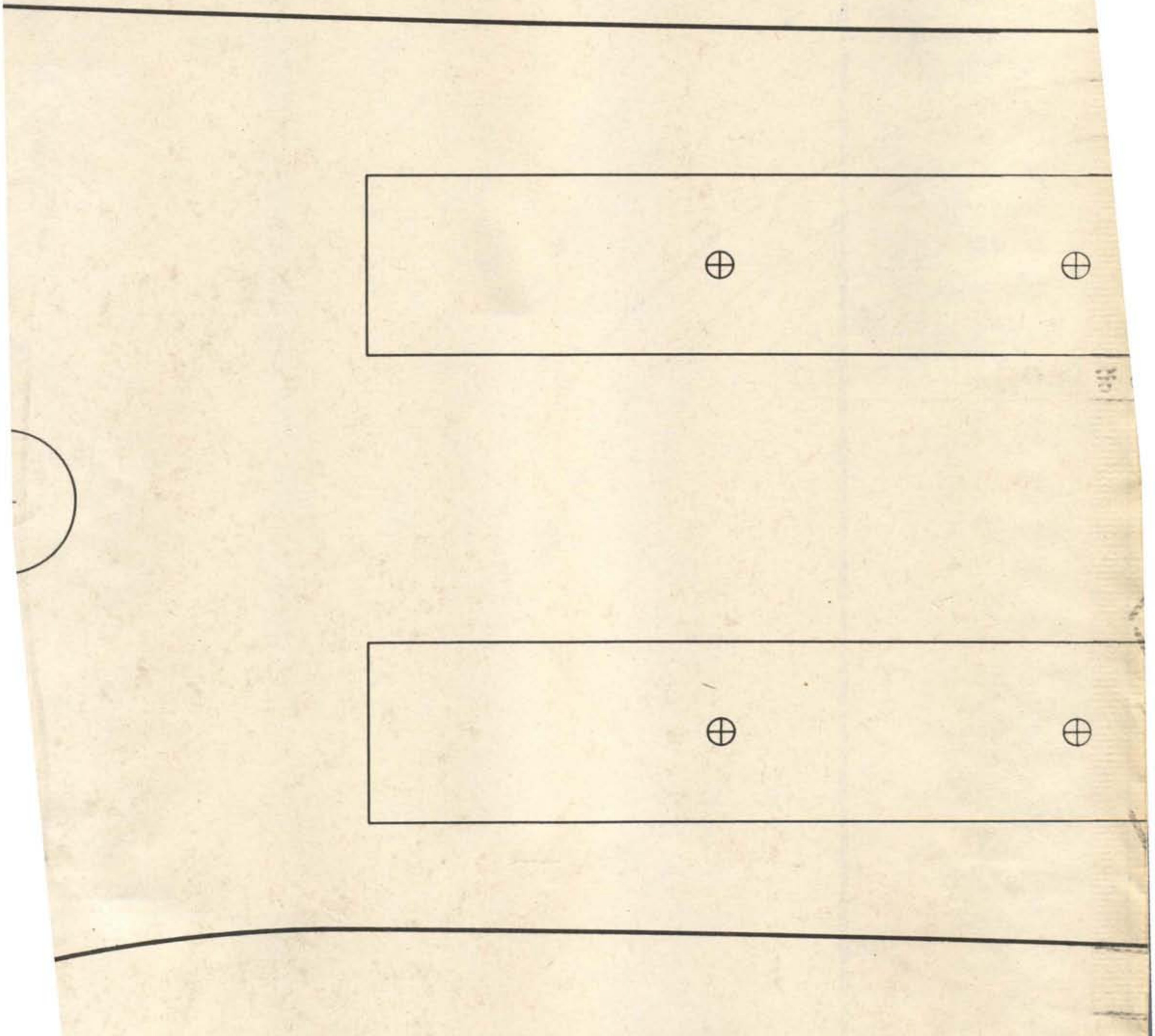
router template

solid line = 6" router base

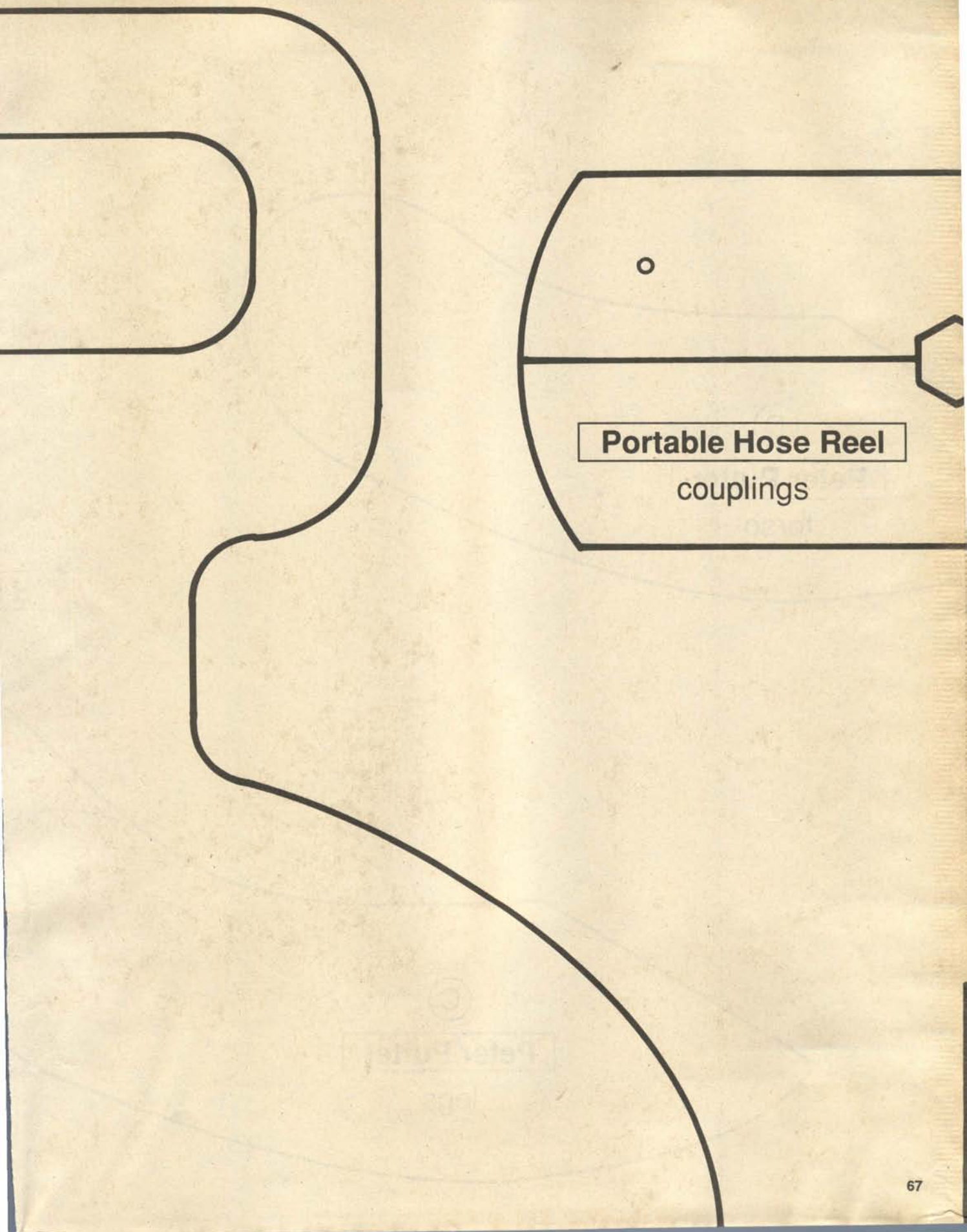
dashed line = 5¾" router base

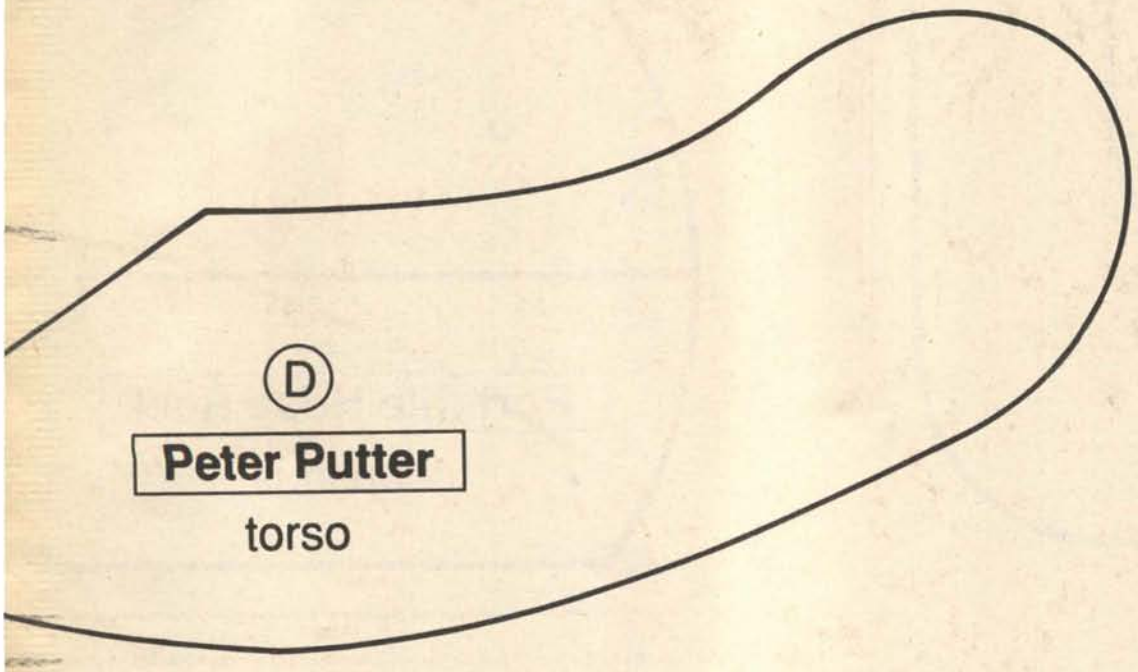
Carved Nut Bowl & C

cover



Reel


Portable Hose Reel
couplings



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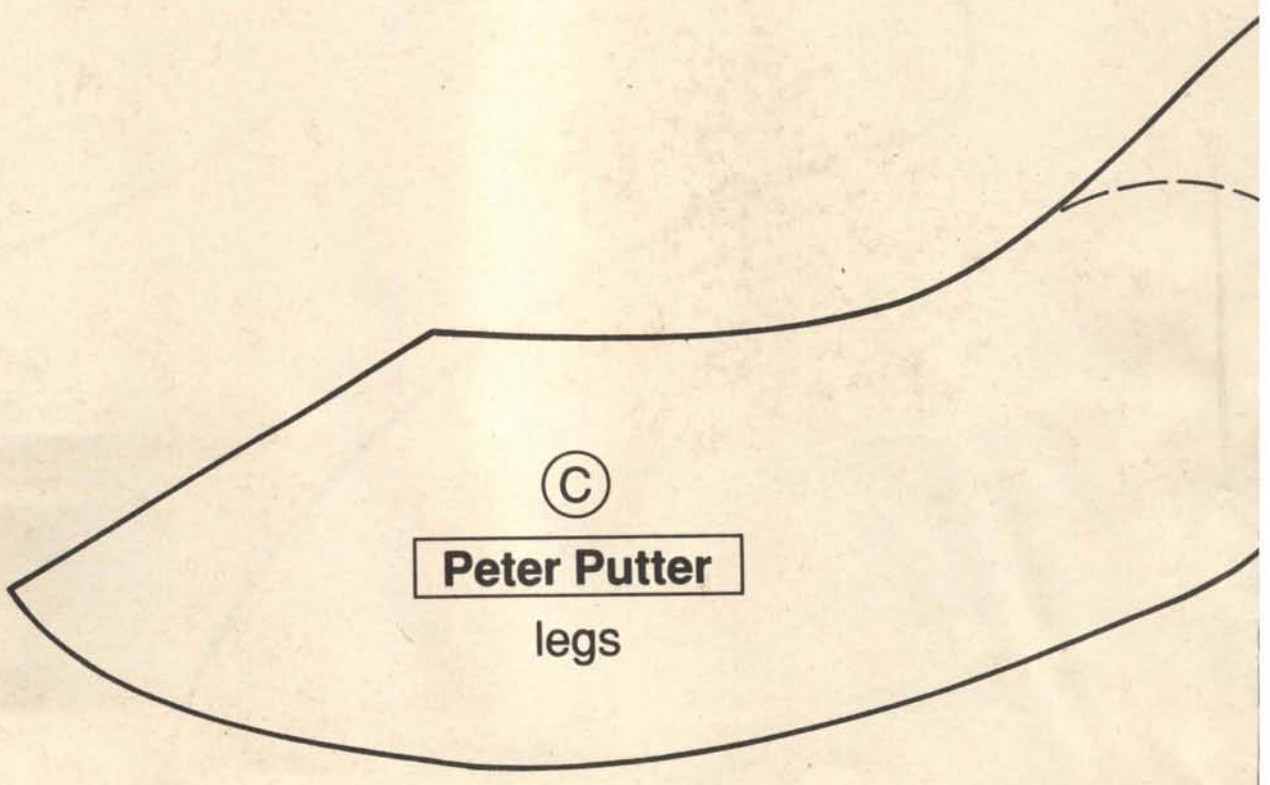
Peter Putter

torso



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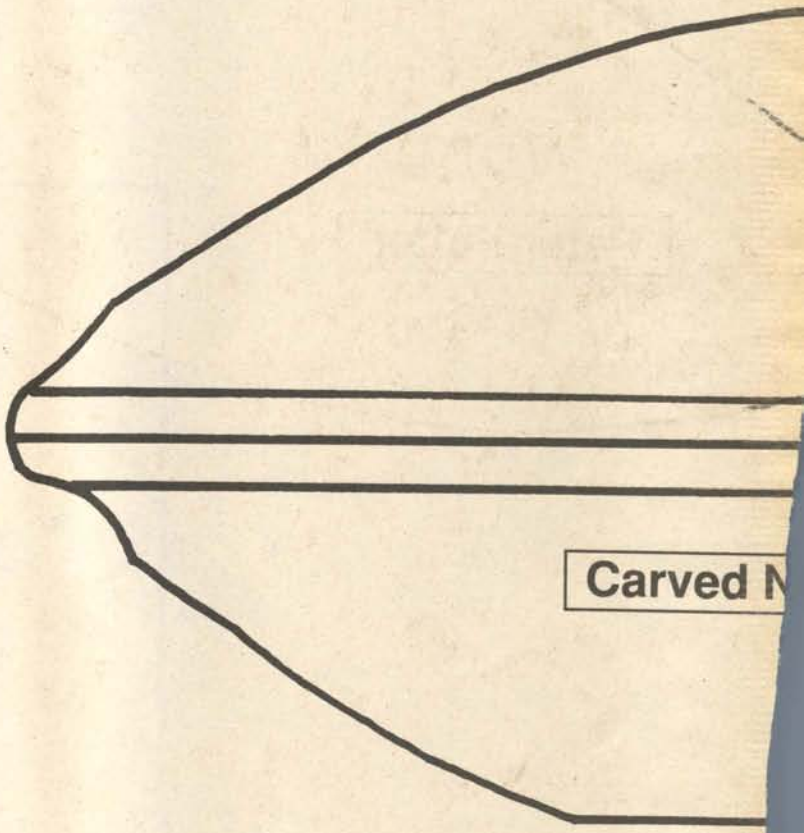
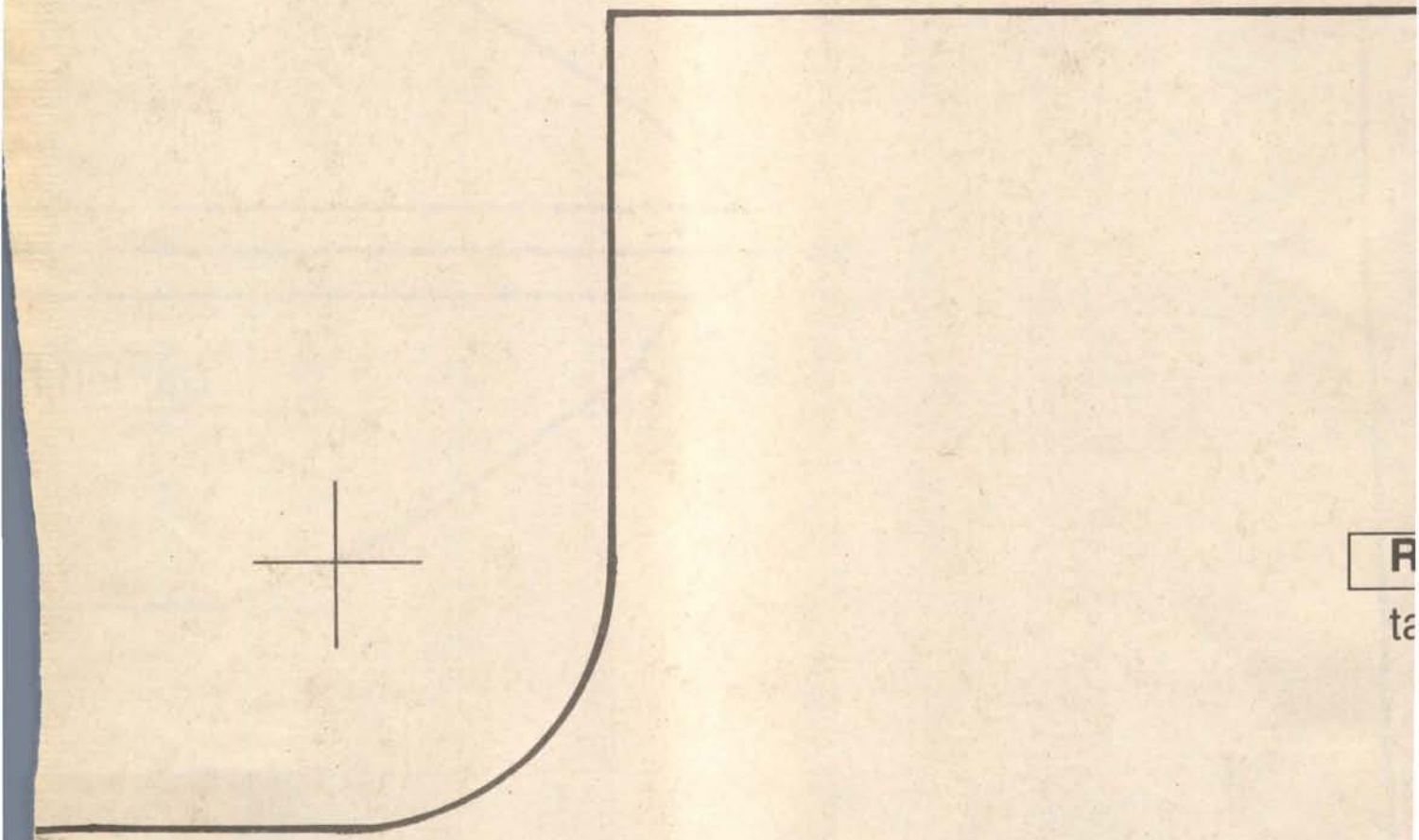
Peter Putter

legs


Carved N



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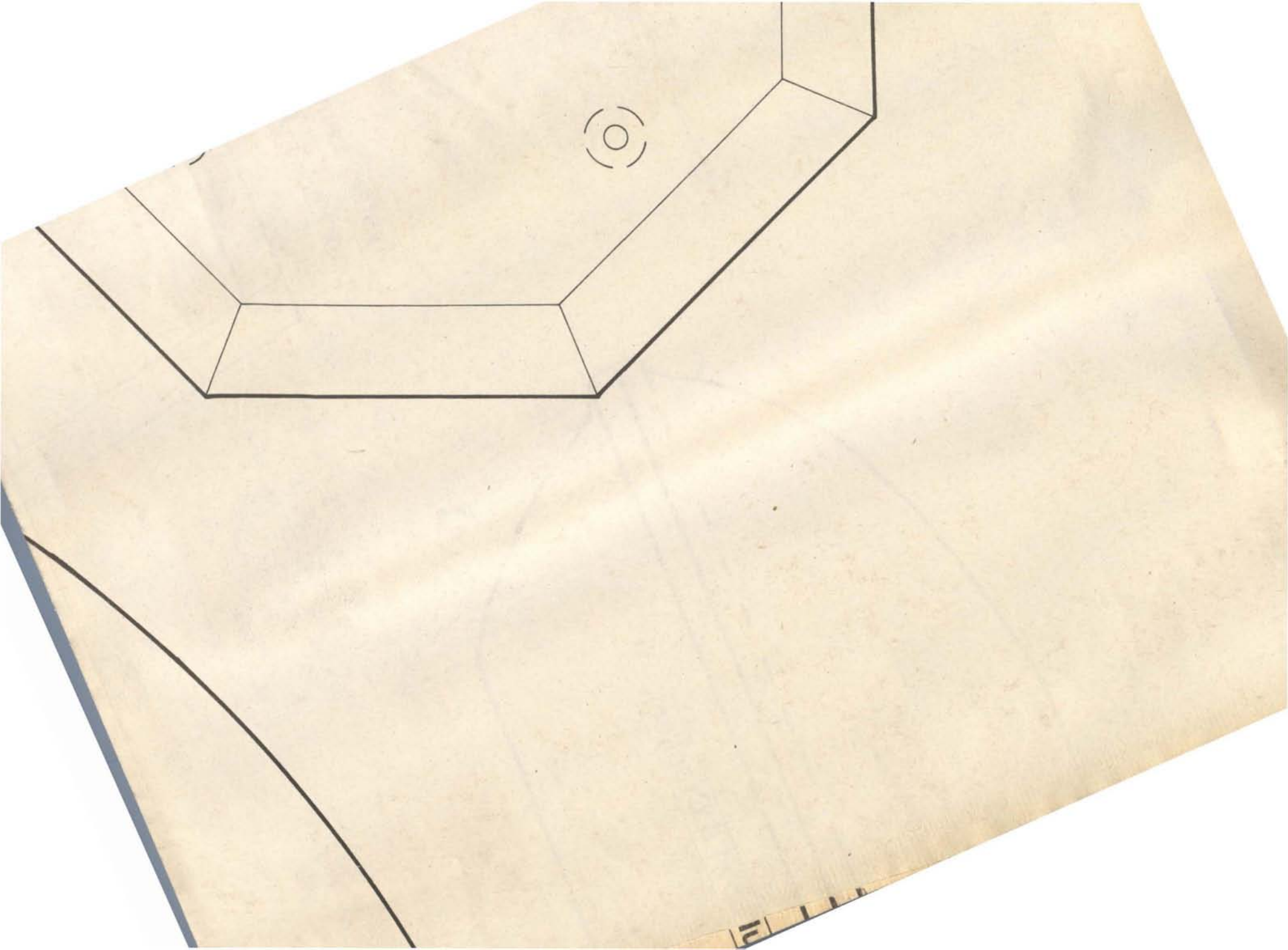
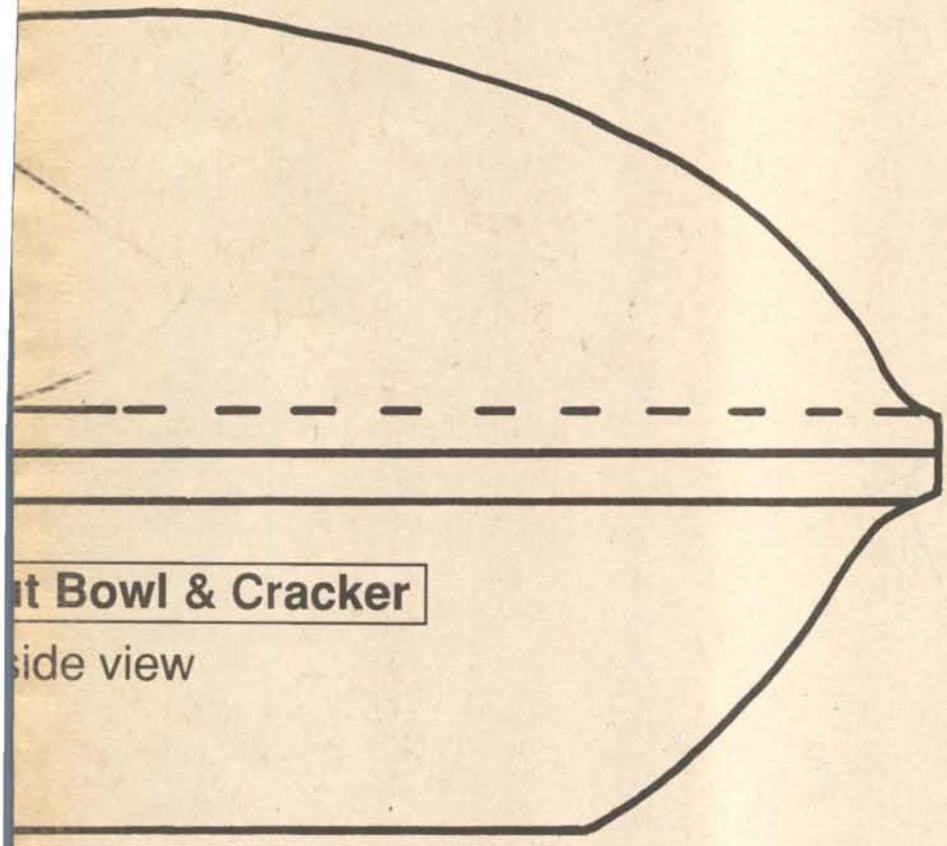


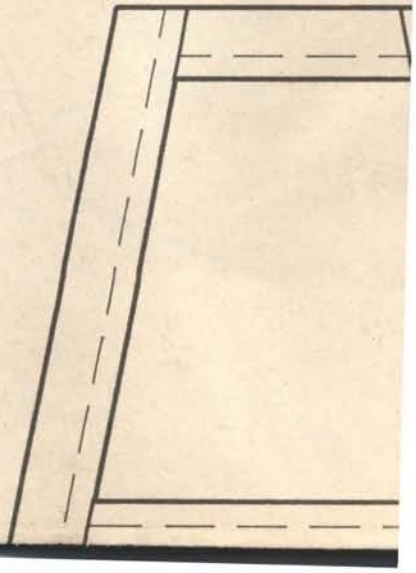


t Bowl & Cracker

ide view

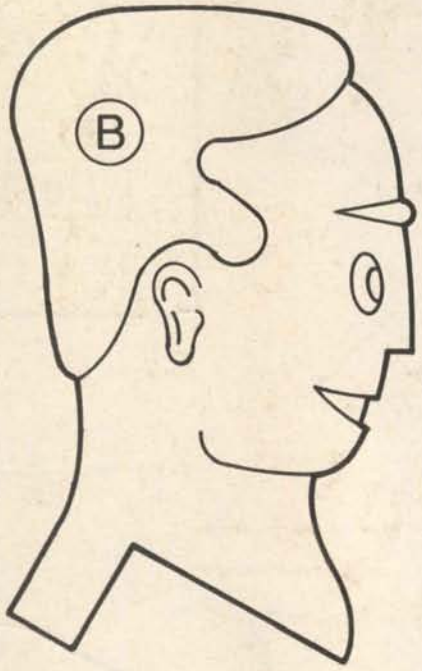
Mystery Lam

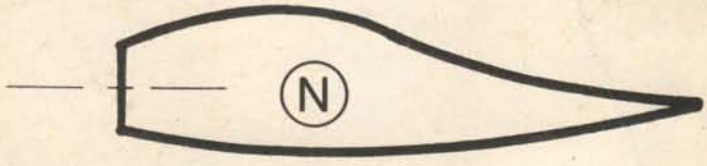
upper body fra



Peter Putter

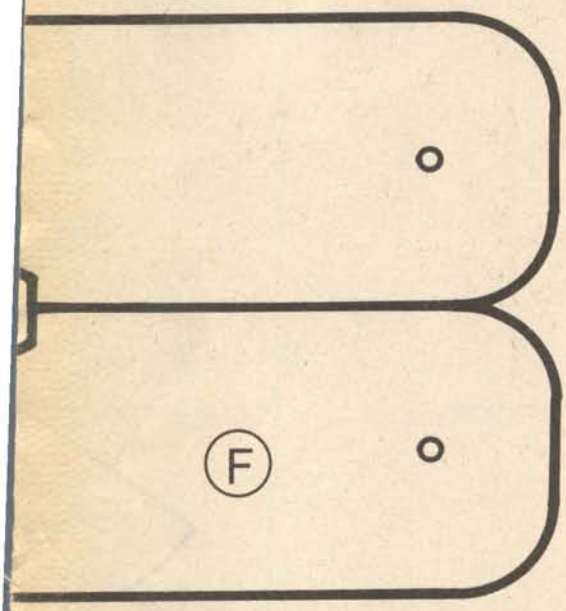
head





Peter Putter

lever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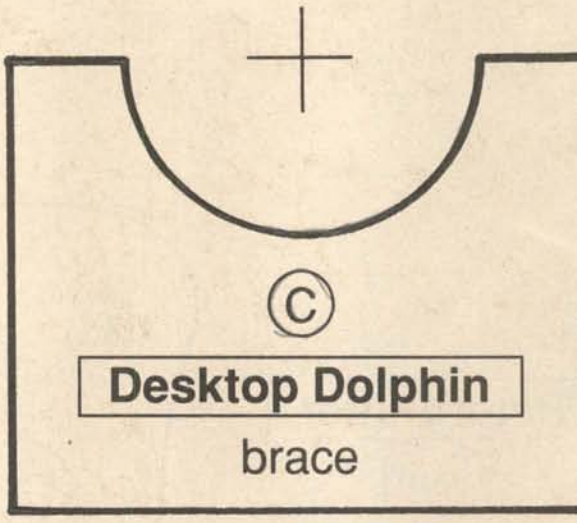
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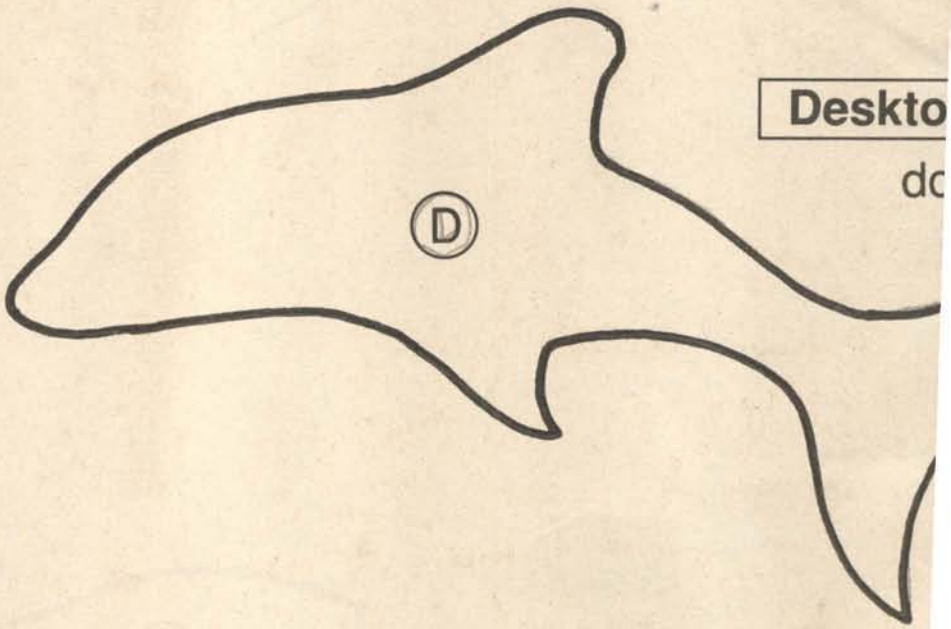
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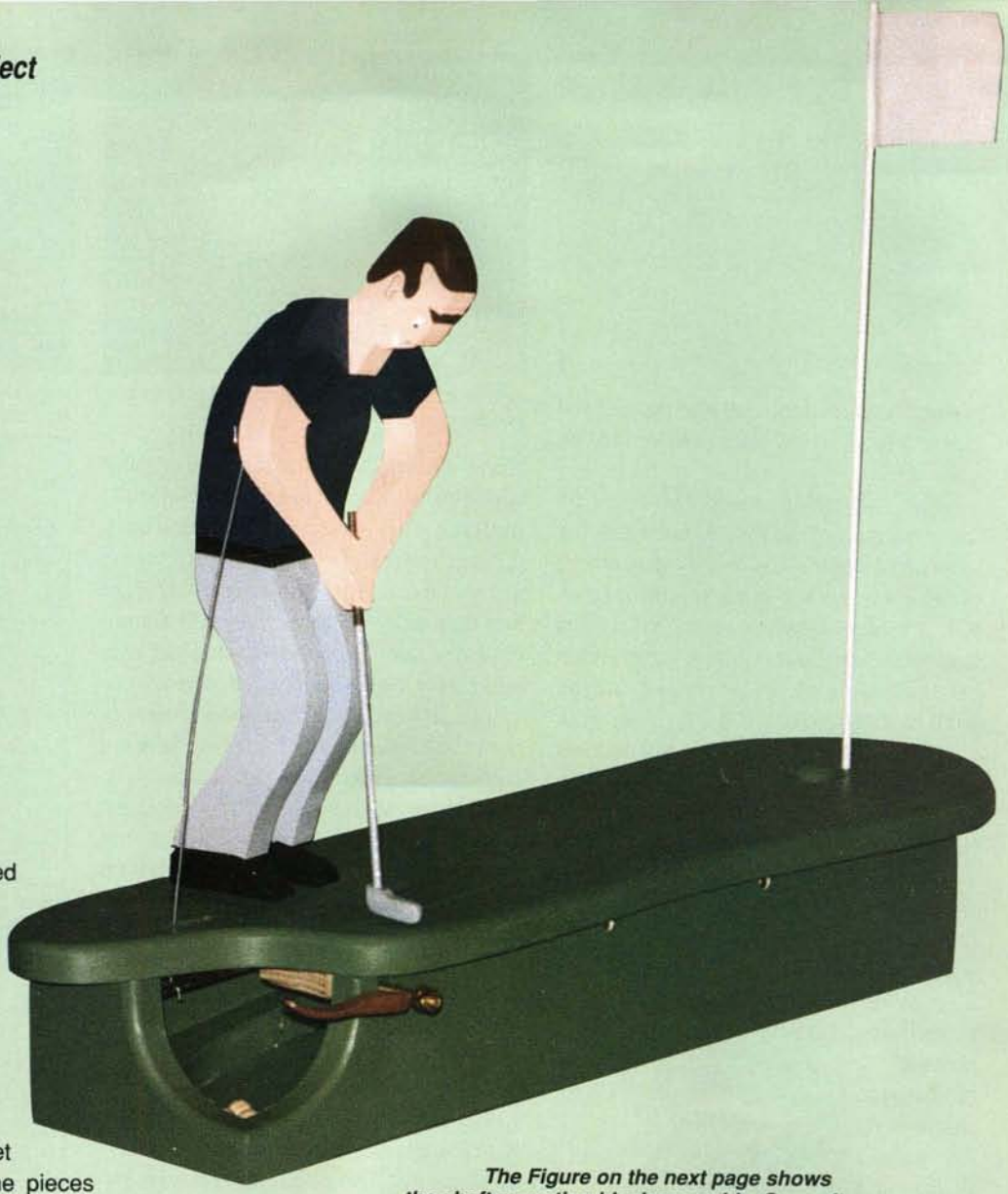
Peter Putter



The Figure on the next page shows the shaft mounting block assembly. Screw it to the underside of the top as marked on the PullOut™ Plans (in the center of the magazine).

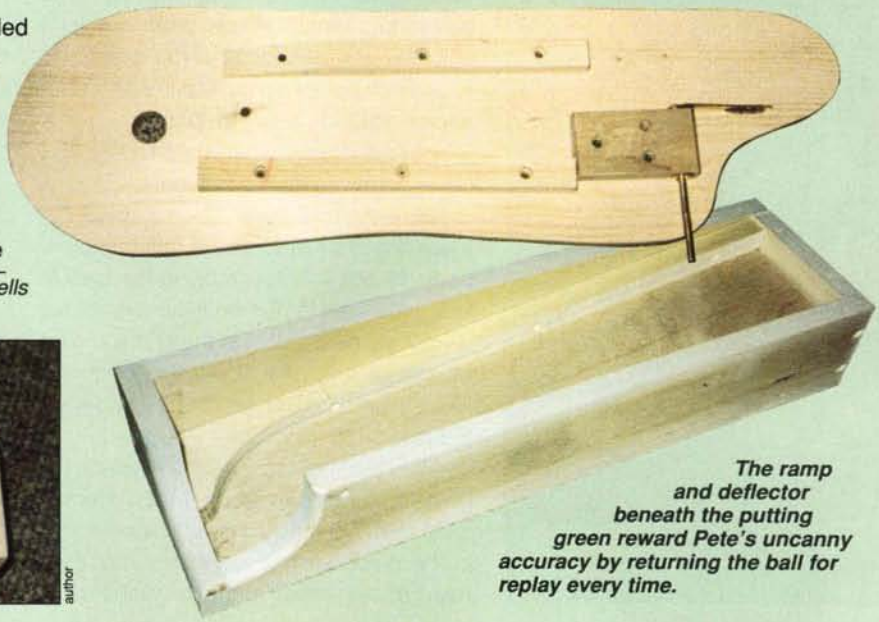
by Gabriel A. Zuckerman

Peter Putter is a lever–operated puppet who sinks a putt with uncanny certainty. The ball returns for replay via the ramp hidden beneath. It's the perfect table–top toy for rained–out golfers.

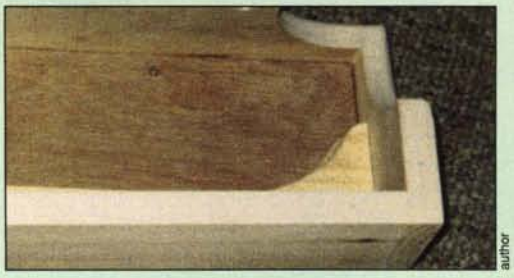
Transfer the patterns in the PullOut™ Plans for the top (A), body parts (B, C, D and E) and deflector (F) to ¾" stock. Cut them out and set them aside. You can make all the pieces except the shaft mounting block (G) from pine or fir, but the mounting block itself must be hardwood—oak and maple are fine.

Build the golf course first—it's a six–sided box. The top (A) is the putting green. The sloped bottom returns the ball after each putt. Mark the locations of the cup, flag hole and the slot in the top. Make the ¼" ¼X 1¼" slot for the connecting rod by drilling a ¼" hole at each end of the slot. Then saw out the

***Gabriel R. Zuckerman** designs, builds and sells whirligigs in East Northport, New York.*



The ramp and deflector beneath the putting green reward Pete's uncanny accuracy by returning the ball for replay every time.



author

material in between. Drill a 1" hole for the cup and a 3/16" X 1/2" deep hole for the flag pole.

Place the template upside–down on the underside of the top (A) and mark the location of Peter's feet and the placement of the cleats (I) and shaft mounting block (G). Drill two 3/16" holes for the #6 screws that hold Peter to the green. Attach each cleat with three #6 X 1 1/4" screws, and the shaft mounting block (G) with three #8 X 1 1/4" screws, to the underside of the top as shown in Figures 1 and 2, and marked on the PullOut™ Plans. Taper one of the cleats to clear the deflector (F). Remove the block and drill a 1/4" hole for the shaft, as shown in Figure 1. Round over the upper edges of the top and the edges of the cup with a 3/8" roundover bit in your router.

Assemble the box as shown in Figure 1 with screws. Cut the ramp support (J) diagonally

Screw in the arm connector and attach the pushrod.

along its length to make the two ramp supports, and attach them to the sides (K) with glue and small brads. Attach the back (L) and front (M) to the sides after cutting the semicircles from the ends of the front and right side. Install the plywood bottom (H) on the ramp supports with small screws, and screw the deflector (L) in place.

Figure 1 shows the mechanical components you need to make to give Peter his perfect putt. The brass shaft is a 7/32" X 6" rod with extruded threads on one end. It's made from a section of a brass float–rod from a toilet repair kit. Make the arm from a 1/4" X 3" strip of .064" thick brass, and solder it to the untreated end of the shaft. Make an offset bend in the arm so it lies directly under the slot in the top (A). Buy the brass float rod in the plumbing department of your hardware store and the brass strip at most hobby shops.

Make the lever handle by soldering a #6 X 1" FH. brass screw to the side of a 1/4"–20 brass nut. The small wooden lever (N) is pre–drilled and turned onto the end of the screw. Lock the handle in position on the threaded end of the shaft with a second brass nut. When the two nuts are tight against each other, the handle is secured in position on the shaft. For the arm connector, solder a brass strip .064" X 1/4" X 3/4" into the slot in the head of a #6 X 1/2" RH brass screw as shown in Figure 1.

Glue the two legs (C) and torso (D) piece together to form the golfer's lower body. Attach this assembly to the top (A) with two #6 X 1 1/2" FH wood screws. Make a 3/4" X 1/8" deep notch in the shoulders for the head; then drill a 3/16" hole through Peter's hands for the shaft of the putter, as indicated in the PullOut™ Plans.

With the shoulders held in place on the body, drill and counterbore the hole for the #8 X 1 1/4" RH wood screw and washer that is the pivot. Use one washer under the head of the screw and two washers between the arm and head assembly and the body. Do not overtighten the pivot screw—Peter must be capable of swinging freely without rubbing or binding. Glue the head to the puppet to conceal the pivot screw. Insert the connector behind Peter's right elbow. Install the wire connecting rod between the hole in the end of the shaft arm and the connector. You'll have to adjust the length of the connecting rod by trial and error to produce the best range of motion for Peter's putting stroke.

Make the shaft of the putter from a 3/16" X 8" dowel. Carve and drill a small scrap of wood for the putter head and attach it to the end of the shaft. Insert the club shaft into the hole in his hands and adjust the position of the grip so that the club head just clears the surface of the top as Peter

Adjust the handle to the best position; then tighten the lock–nut.

Peter Putter
Cutting List

Qty	Part	Finished Size T	W	L	Piece
1	A	3/4"	7 1/4"	25"	top
1	B	3/4"	3 1/2"	3 1/2"	head
2	C	3/4"	3 1/2"	12"	legs
1	D	3/4"	3 1/2"	8"	center torso
1	E	3/4"	6 1/4"	7"	arms
1	F	3/4"	2 3/4"	19 1/2"	deflector
1	G	3/4"	1 3/4"	3"	shaft block
1	H	1/4"	4 1/2"	19 1/2"	bottom
2	I	3/4"	1 1/4"	9 3/4"	cleats
1*	J	3/4"	2 1/4"	19 1/2"	ramp support
2	K	3/4"	3 1/2"	20 1/4"	sides
1	L	3/4"	3 1/2"	4 1/2"	back
1	M	3/4"	3 1/2"	6"	front
1	N	3/4"	3/4"	3"	lever

*cut diagonally in two

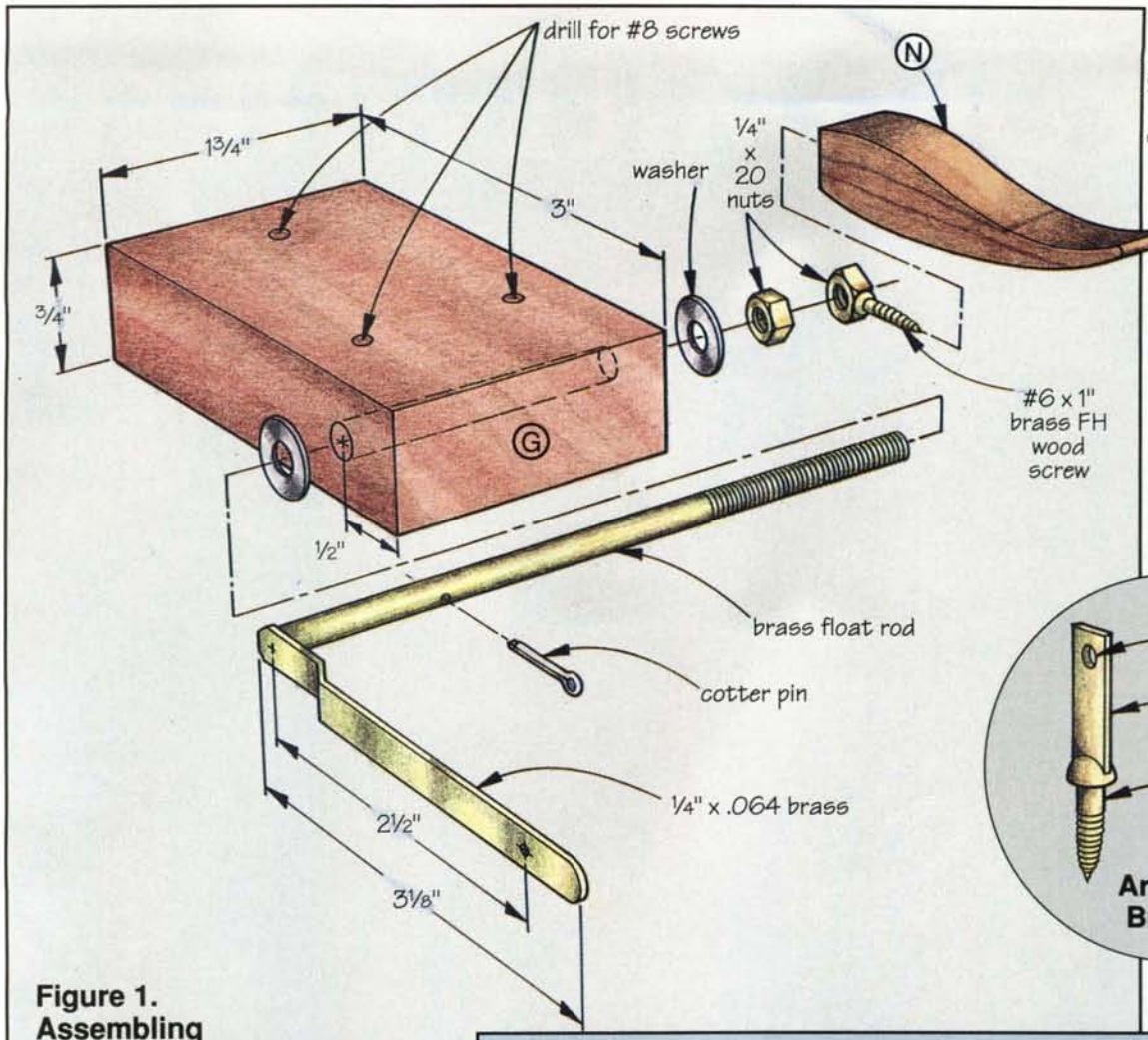


Figure 1. Assembling The Arm Rod Mechanism

swings. Use a small screw through the hands and into the shaft to secure the club.

The golf balls are ½" diameter wooden balls that are available from several mail order woodworker's supply stores and local hobby stores. Carve a shallow, round depression in the putting surface to hold the ball directly in front of the putter head. Then carve a shallow V–groove from the depression to the cup to make a path for the ball to follow to the cup.

Insert a 3⁄16" X 14" dowel into the hole behind the cup to serve as a flag pole—a small scrap of white felt can be added to the top end of the pole for the flag. Secure the top to the box with four screws through sides and into the cleats.

Partially disassemble Peter Putter to ease painting. Acrylic or latex enamel paints will dress up the scene smartly. Now enjoy a round of golf without the frustration of missing those short putts. PW

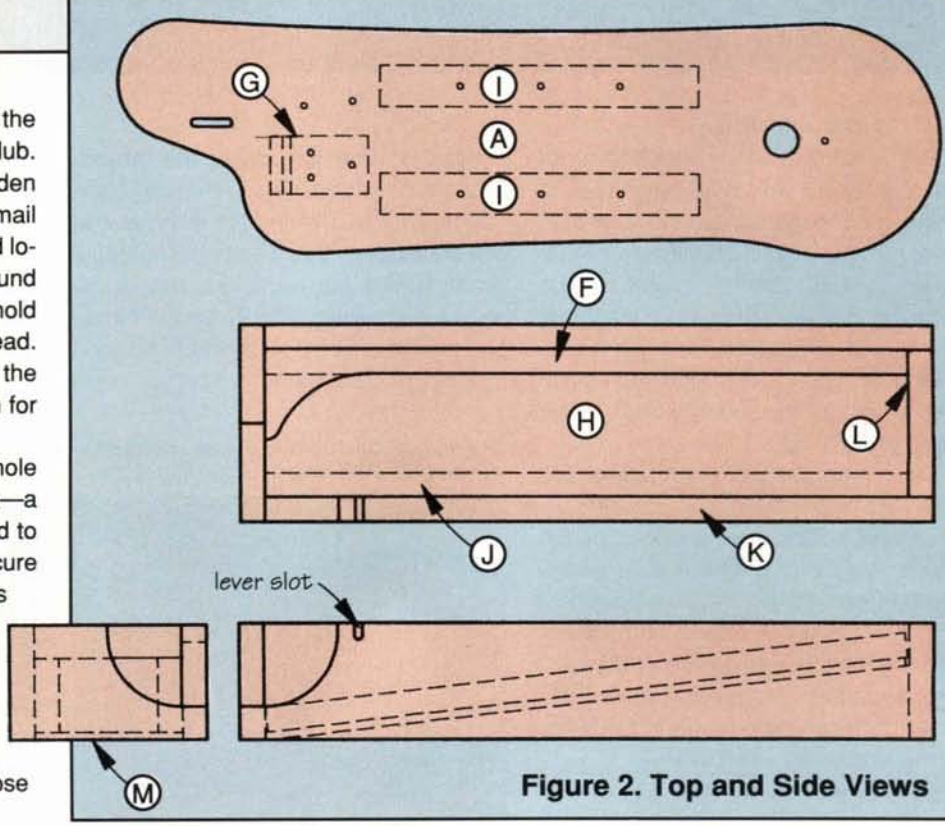


Figure 2. Top and Side Views

THE OLD MILL WHEEL

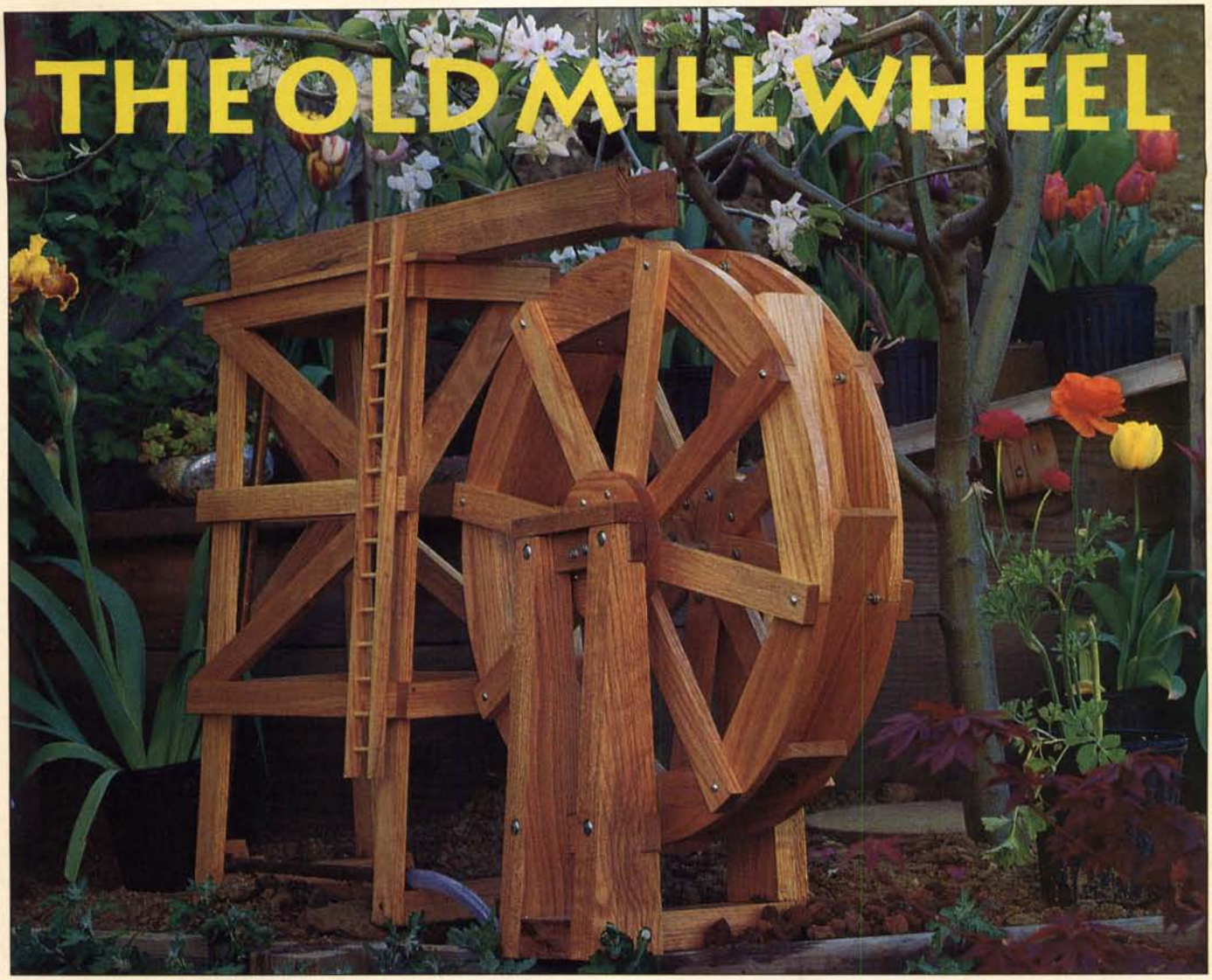


photo Bruce Richmond/garden Lou and Carol Bacher

by Howard French

The water wheel and its chute is an attractive project and is neither difficult to construct nor expensive to make. In fact, the oak material can sometimes be obtained for free. The mill wheel can be displayed indoors, using a child's plastic wading pool or outdoors beside a water-flower or fish pond. The unhurried motion of the wheel and the sound of falling water are very soothing.

This project can help to propagate water flowers or colorful fish. Circulation, filtration and aeration are provided by the submersible pump, its filter and the wheel. Create added interest by giving the wheel some work to do—either in an attached mill house of your own design, or adjacent to the structures. Adding small sheet metal lips will increase the capacity of the buckets and generate more power.

***Howard French** is the author of* Gifts from Grandpa's Workshop *(Tab Books, Blue Ridge Summit, PA).*

Oak is used throughout the project. There is no such thing as scrap oak. Certain heavier appliances are shipped with oak crate bases. Surplus car stakes, spacers and pallets can be picked up for disassembly and reclamation. This material can be sanded, planed or resawn to good advantage. Take care, of course, to remove any nails when using secondhand wood.

Standard lag screws, carriage bolts, flat washers and galvanized finishing nails constitute most of the hardware required. You will also need a short length of ½" diameter rod stock (axle) and a ½" pillow block (sleeve) bearing (see Supplies List).

The sixteen bucket side pieces need to be mitered and bandsawn accurately to result in a round finished wheel.

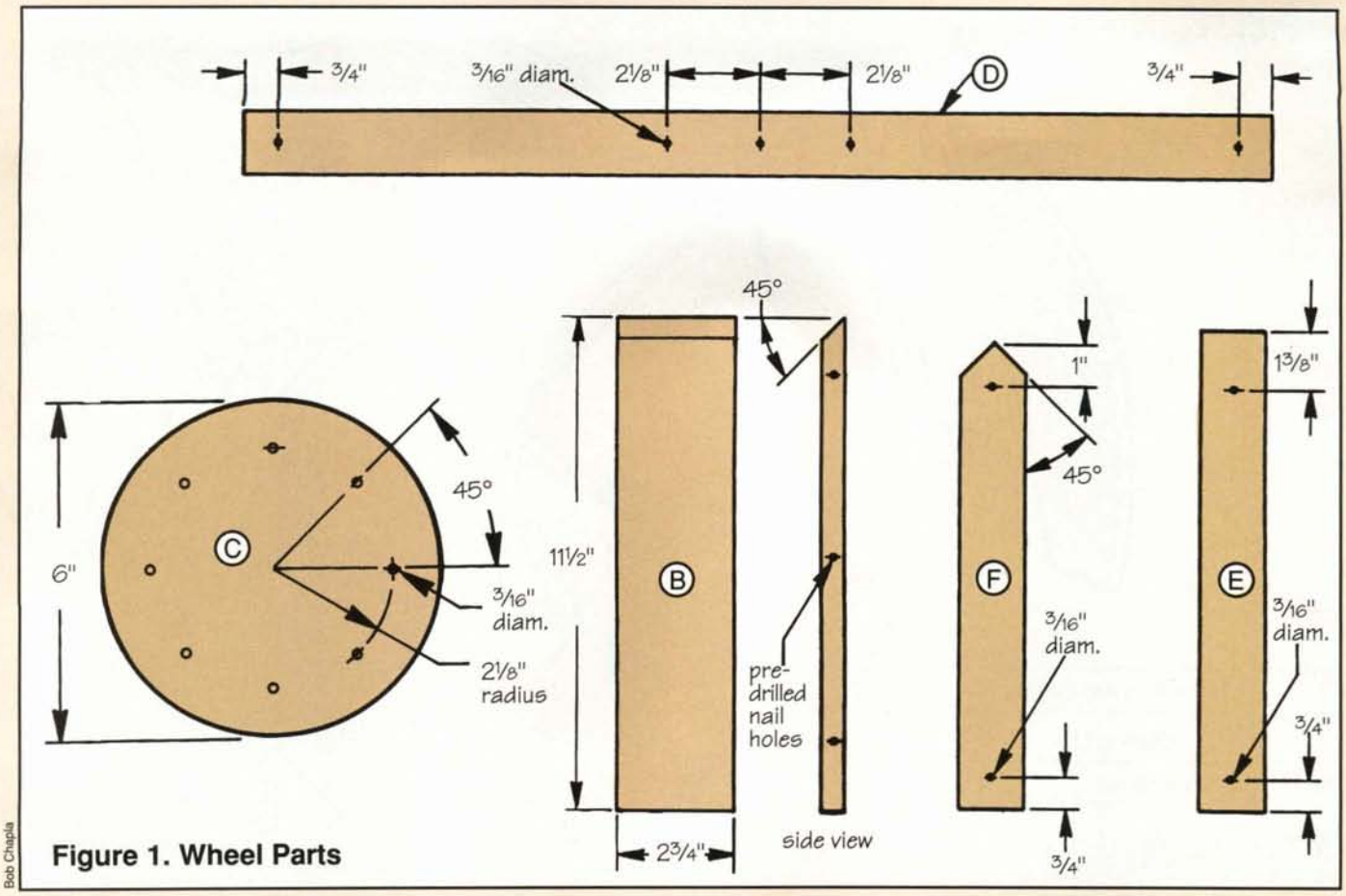


Figure 1. Wheel Parts

Bob Chapla

The plumbing system uses a good submersible pump with a ½" outlet and six feet of clear, thick-wall plastic tubing (or about four feet of copper tubing, a right angle fitting, and 3 feet of plastic tubing). The pump should be capable of lifting 2½ gallons of water per minute to a height of 30". Such pumps usually come with a coarse filter attached, however, further filtration should be provided if you intend to stock your millpond with fish. Excellent filters can be made easily and cheaply by using suitable plastic containers filled loosely with spun glass fiber.

Copy the bucket side (A) from the PullOut™ Plans and accurately cut out the sixteen pieces. The 22½° angles of the ends of these pieces must be accurately maintained. Cut out eight of the bottom pieces (B) and bevel one end of each piece to 45°, as shown in Figure 1. Cut out the two 6" diameter hubs (C) from ¾" material. Locate and drill eight 3/16" diameter holes 45° apart on a 2⅛" radius from the center pilot hole of each hub piece.

The spokes are comparatively easy to make. Cut out the two long spokes (D), four perpendicular spokes (E) and eight pointed spokes (F). Cut the 45° angles at one end of the pointed spokes as shown in Figure 1. Locate and drill 3/16" diameter holes through the centerlines of all of the spoke pieces to the dimensions indicated in Figure 1. When all of these pieces have been cut out, sand them smooth.

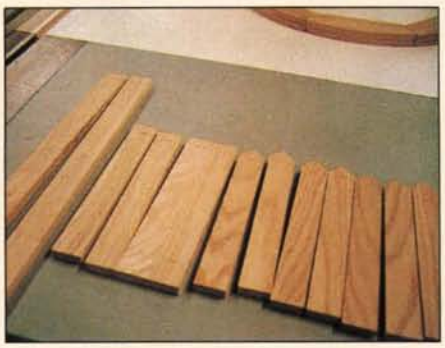
Wheel Hub Assembly

Align a long spoke (D) with a hub piece (C) so the center holes and the attaching holes line up, and the grain of the spoke is at a right angle to the grain of the hub. Secure spoke (D) in place with two 3/16" X 1½" carriage bolts, flat washers and hex nuts.

Align two perpendicular spokes (E) on

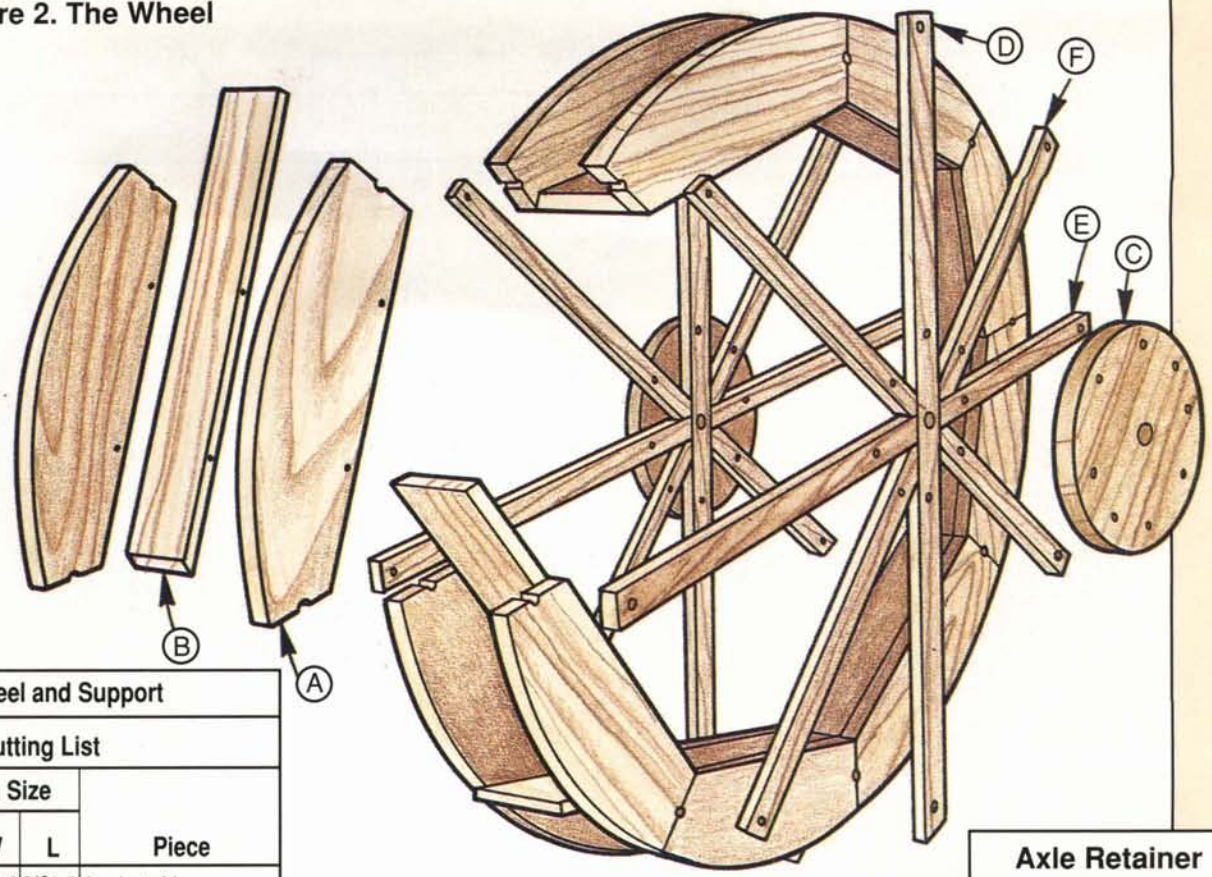
Drill eight 3/16" holes 45° apart 2⅛" from the center of each hub.

The water wheel spokes before assembly. They are ready for drilling.



For proper alignment use the drill press when drilling the bolt holes.

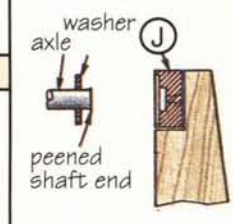
Figure 2. The Wheel

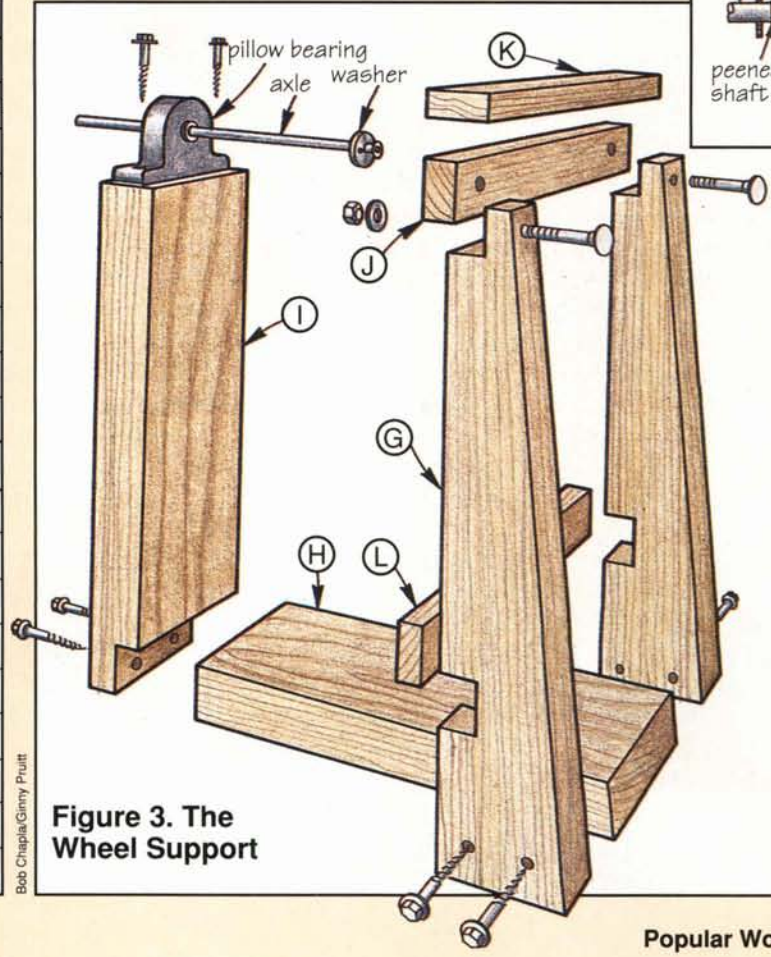


The Wheel and Support					
Cutting List					
		Rough Size			
Qty	**Part**	**T**	**W**	**L**	**Piece**
16	A	½"	2 13/16"	9 13/16"	bucket sides
8	B	½"	2¾"	11½"	bucket bottoms
2	C	¾"	6" diam.		hubs
2	D	½"	1½"	24"	long spokes
4	E	½"	1½"	11¼"	perpendicular spokes
8	F	½"	1½"	10 15/16"	pointed spokes
2	G	1½"	3½"	16⅞"	vertical supports
1	H	1½"	3½"	11¼"	base
1	I	1½"	3½"	15½"	bearing support
1	J	¾"	1½"	7"	axle retainer brace
1	K	¾"	1½"	7"	top brace
1	L	¾"	1½"	7"	lower brace

Supplies	
32	3/16" X 1½" carriage bolts, washers, hex nuts
2	¼" X 1½" carriage bolts, washers, hex nuts
2	¼" X 3" carriage bolts, washers, hex nuts
8	¼" X 3" lag screws, flat washers
1	½" diameter rod (axel), 9" minimum
1	½" ID brass or bronze flat washer
6	½" ID plated flat washer
2	#6 X 1" FH machine screws, washers, hex nuts
1	½" pillow block bearing

Axle Retainer

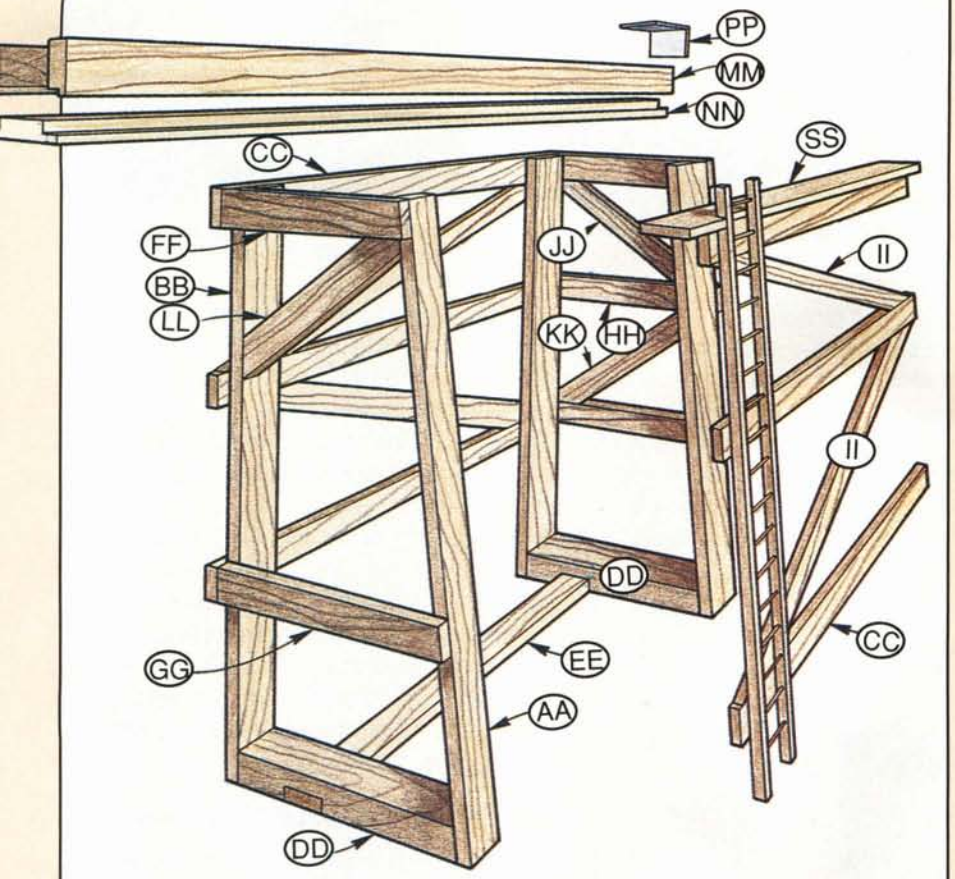




Bob Chapla/Ginny Pruitt

Figure 3. The Wheel Support

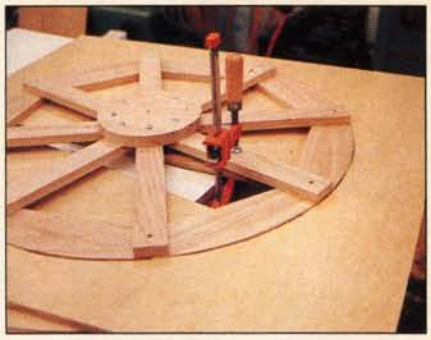
Figure 4.The Chute and Support Structure



The Chute and Support Structure					
Cutting List					
		Rough Size			
Qty	Part	T	W	L	Piece
2	AA	½"	1½"	28 11/16"	front supports
2	BB	½"	1½"	28½"	rear supports
6	CC	½"	1½"	17"	cross braces
2	DD	1½"	1½"	8½"	bases
1	EE	¾"	1½"	16"	long brace
2	FF	½"	1½"	6 13/16"	top side braces
2	GG	½"	1½"	9"	lower side braces
1	HH	½"	1½"	7 15/16"	mid side brace
4	II	½"	1½"	18"	diagonal braces
1	JJ	½"	1½"	11"	top diag. brace
1	KK	½"	1½"	11⅛"	lower diag. brace
1	LL	½"	1½"	11½"	mid diag.brace
2	MM	⅝"	2¼"	29"	chute sides
1	NN	⅝"	2½"	29"	chute bottom
1	OO	⅝"	1½"	2½"	retainer
1	PP	.032	3"	4⅞"	sheet metal cover
2	QQ	5/16"	⅝"	24"	ladder sides
15	RR	¼" diam.		2¼"	rungs
1	SS	5/16"	2"	19"	catwalk

Supplies	
3	#6 X 1" PH sheet metal screws
5	#6 X ½" PH sheet metal screws
6	#8 X 1½" RH brass wood screws
6'	½" ID / ¾"OD clear plastic tubing
1	submersible pump w/½" outlet

Use a piece of plywood with a 24" circle cut out as an assembly guide to keep the side pieces from shifting while you attach them to the hub.



each hub so that they're at right angles to the long spokes. Bolt them securely in place. Next, install four pointed spokes (F) to each hub so that they bisect the 90° angles formed by spokes (D) and (E) and bolt them in place. Align the two subassemblies with one another, and check for similarity in all spoke angles.

Final Assembly of the Wheel

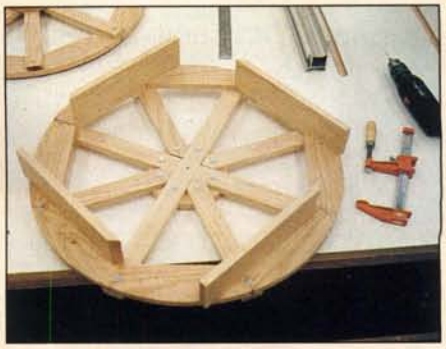
Fit the eight side pieces (A) together on a flat work surface so that they form a complete 24" diameter circle. To assure an accurate circumference cut a 24" circle from a piece of ½" scrap plywood to use as an assembly guide as in the photo above. Place a hub and spoke subassembly over the side pieces so that the drilled outer ends of the spokes are centered over their abutting ends. Once they're in alignment, clamp the subassembly to the side pieces. Using the 3/16" holes in the ends of the spokes as pilot holes, drill through the adjoining ends of the bucket side pieces so that half of each hole's circumference is in *each end* of the side pieces as shown in Figure 2. Reference the position of the side pieces and spokes with a piece of masking tape. Release the clamps, and clean away any extraneous dust and chips.

Apply a small amount of caulking compound to the abutting ends of all parts (A), and attach them to the spokes with 3/16" X 1½" carriage bolts, flat washers and nuts.

Build the other wheel half the same way. To assure roundness of the wheel, use a stationary belt sander jig as described in the Jig Journal on the following page. Align a bucket bottom piece (B) with the inside 7⅝"

Use caulking to seal the bucket bottoms to the sides.

Pilot drill the holes for the galvanized nails.



First install four alternating bottoms. Then fine tune and install the remaining four.

edge of a side piece (A) and clamp it in place.

Locate and drill the pilot holes for the galvanized finishing nails through the sides (A) and ½" into the edge of bottom piece (B). Separate the parts, apply a small amount of caulking compound to the mating surfaces, reassemble the pieces and nail them together.

Following the same procedure, install three more bottoms at 90° to each other as shown above. The remaining four interconnecting bottom pieces require careful fitting so their 45° beveled ends relate properly to the other pieces before drilling the remaining nail holes. Apply caulking compound to all of the 45° beveled surfaces and to the common edges of parts (A) and (B). Nail the bucket bottom securely in place.

Align the other wheel half with the exposed edges of the bottom pieces (B), just installed. Clamp in place, and drill the remaining holes for the finishing nails. Release the clamps and apply caulking compound to these mating surfaces and realign the components. Nail them in place and remove any extruded caulking from the exposed surfaces. Line bore a ½" diameter hole through the axle pilot holes in hubs (C).

The Wheel Support Tower

Make two vertical supports (G). Cut the two notches in each piece (G) to the dimensions shown in Figure 5. Cut one base (H), bearing support (I), and braces (J), (K) and (L).

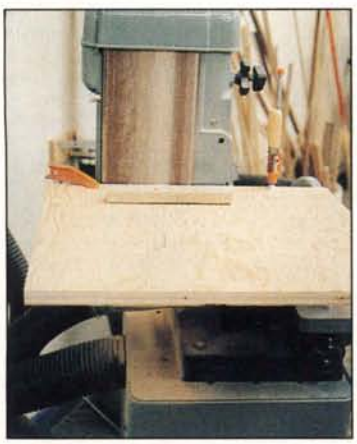
Lay out and drill two pilot holes for the ¼" X 3" lag screws in the top of the bearing support (I) to hold the pillow block. Use the same size lag screws to join the vertical supports (G) and the bearing support (I) to the base (H) (see Figure 3).

Place the braces (J and L) in position on the vertical supports (G) and drill and counterbore two ¼" holes in (J) to accommodate the flat washers and hex nuts. Predrill nail holes in the lower brace (L). Counterbore the upper ¼" holes in parts (G) to accommodate the heads of the carriage bolts to be installed later.

Bore a stepped hole in the center of part (J) as shown in Figure 3 Detail. The outer bore accommodates a thick ½" flat washer that acts as the guide bearing and axle retainer. The inner bore accommodates the peened end of the ½" axle rod. Drill and countersink two holes, 180° apart, through the washer for #6 x 1" flat head retaining screws, that are installed later.

CIRCULAR SANDING JIG

Jig Journal



If you desire a perfectly round wheel this jig will enable you to get it in shape on the belt sander.

The jig is constructed by mounting an ⅛" bolt 11" from one edge of a piece of plywood. (Countersink this hole so that the jig will sit flat on the table.) This bolt acts as the axle over which fits the hub of one of the wheel sides. In order to keep the edge of the wheel from being pulled down when in contact with the belt sander, mount a piece of ¾" X 6" scrap 3" from the leading edge of the jig.

Clamp the jig to the belt sander table so that when the wheel is on the bolt/axle it barely touches the sanding belt. As you spin the wheel any irregularities in the circumference of the wheel will be smoothed. It may take a few repositionings of the jig to eliminate all bumps. PW

The Wheel Support Assembly

Align the upper brace (J) with the two vertical supports (G) and secure them together with two ¼" X 1½" carriage bolts, flat washers and hex nuts. Glue and nail the lower brace (L) and top brace (K) in place as shown in Figure 3.

Align this subassembly with the beveled end of the base (I) and install the lag screws, two on either side, with flat washers. Finish the completed wheel assembly and supporting base with a waterproof sealer such as polyurethane or spar varnish.

Cut a 9" length of ½" diameter rod for the axle, unless you want to extend the axle beyond the main bearing to use for a power take-off. Peen one end of the axle shaft uniformly and smoothly to radially displace about 1/16" of its material.

Slip the drilled, countersunk retainer washer over the shaft and against the peened end. Install the washer in its recess in the upper brace (J) with two #6 x 1" flathead wood screws. Install as many ½" I.D. flat washers against the retainer washer as needed for proper spacing.

Lay the support subassembly on a flat work surface so the sloping edges of the vertical supports (G) are down. Slip the wheel assembly over the axle shaft until it rests against the ½" spacer washers. These washers also serve to retain lubricant.

Slide the main bearing and its support piece (I) onto the free end of the shaft, along with additional ½" flat spacer washers as necessary (between the hub and bearing). Align the lower end of part (I) with the end of base (H) and install the two ¼" X 3" lag screws with flat washers.

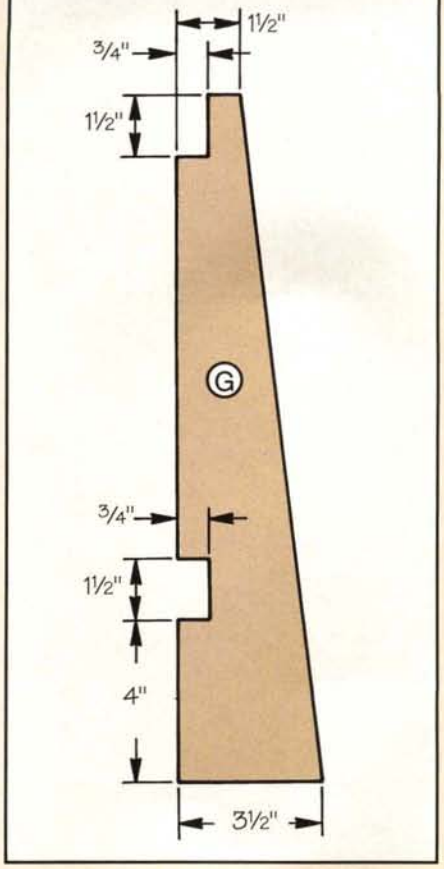
Finally, stand the completed assembly upright and give the wheel a spin. Correct any imbalance by securing an appropriate size weight (hex nuts) in one of the buckets, with self-tapping sheet metal screws. The wheel is now ready to go to work for you, but first you have to get the water to it.

The Chute and Support Structure Components

Cut the two front support pieces (AA) and bevel their ends to 7° so they are parallel. The two rear supports (BB) have square ends (see Figur e 4). Cut the cross braces (CC) to the dimensions given in the Cutting List.

Cut the two base pieces (DD) and bevel one end of each to 7°. Cut out the 1½" X ¾" deep dado in each of these pieces to accommodate the long brace (EE). Cut out the two top braces (FF) and bevel one end to 7°. In similar fashion, cut out the lower (GG) and middle (HH) side braces.

Figure 5. Vertical Support



Cut four diagonal braces (II) with parallel cuts in both ends of each piece at 30°. Cut the other diagonal brace pieces (JJ), (KK) and (LL) in a similar fashion. Since their lengths and terminal angles vary, they are best fitted and installed during final assembly.

Rabbet two chute side pieces (MM) ⅜" X ¼" deep along one edge as shown in Figure 4. Rabbet the bottom (NN) along both edges at ⅜" X ⅜" deep.

Locate and drill a ¾" hole on the centerline of the bottom, 1⅛" from one end. Cut out the tubing retainer (OO); observing the direction of the grain as shown in the Figure 6 Detail. Drill a ¾" hole through the retainer corresponding to the hole just drilled in the bottom. Counterbore the mating circumferences of both holes with a ⅞" bit 1/16" deep. Drill three holes 120° apart to accommodate the attachment screws which draw the components (NN) and (OO) together. The V cross–section formed by the countersinks will accommodate an O ring or caulking compound to seal the tubing.

The Chute Subassembly

First, build the side frames of the chute; then join them with the cross (CC) and diagonal braces (II). Each side frame is constructed identically, except there are two additional braces on the right side frame as shown in Figure 6.

Attach the front vertical support (AA) and the rear vertical support (BB) to the base (DD) with galvanized nails. Pilot drill the nail holes using a nail for the bit. Use #8 X 1½" R.H. brass wood screws for a nice accent in attaching the vertical supports to the base.

Install side braces (GG, HH and II) with galvanized nails, mid–brace (II) is only on the right side frame. These braces are spaced at 9" intervals from the bottom of the base. Install the six cross braces (CC) with galvanized nails, and join the two side frames as shown in Figure 6. Note that these pieces overlap the vertical supports so their ends are flush with the side braces. Glue and nail the long brace (EE) into the dadoes in the bases (DD).

Attach diagonal braces (II) between the cross braces as shown in the figure. Fit and install diagonal side braces (JJ and KK) on the right side. The mitered ends of these braces are butted against the side braces. Check for fit, and install the diagonal side brace (LL) on the left side elevation. The mitered ends of this piece are butted against the vertical supports. The resulting clearance on the left side permits the water wheel to operate in close proximity to the chute structure without sacrificing strength.

Assemble the chute side pieces (MM) with the bottom (NN) and predrill the nail holes. Separate the pieces and apply caulking to the rabbeted edges. Reassemble, and nail them together securely. Fit the sheet metal closure (PP) over the aft end of the chute, and apply caulking compound to the mating surfaces. Drill the closure while in place, and secure it with pan head sheet metal screws.

Align two ladder pieces (QQ), on top of each other, with their ⅝" surfaces together. Lay out the locations for the rungs (RR), at 1½" intervals, starting 1¼" from the top. Clamp the ladder parts together and at-

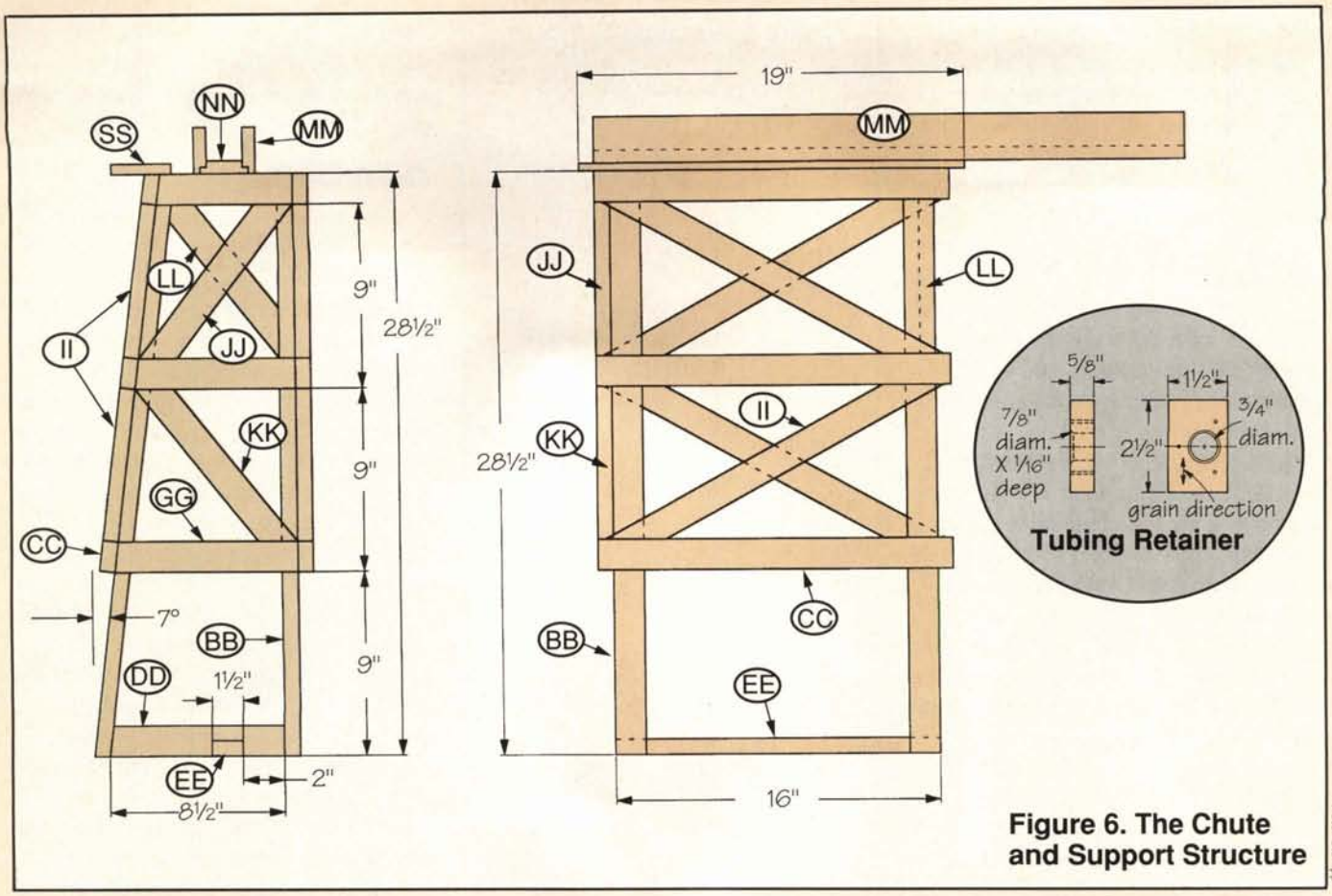


Figure 6. The Chute and Support Structure

Peter Stumpp

tach a piece of scrap to the drill press as a fence, so the center of a ¼" bit is indexed over the centerline. Stack–drill the holes for the rungs (PP).

Cut fifteen pieces of ¼" diameter dowel rod stock, 2¼" long. Slip one end of each rung into place in one of the ladder sides (QQ) flush with the outer surface. Use a small wire brad as a drill bit, and drill pilot holes through one 5/16" edge of part (QQ) and into the ends of rungs (RR). Brad each rung in place. Align the rungs with the holes in the remaining side (QQ). Pilot drill and brad the remaining rungs.

Final Assembly

Cut one end of the ¾" O.D. clear plastic tubing at 45°. Slip the tubing through the hole in the retainer (OO), through an O ring (if used), and into the hole in the chute bottom (NN). Apply a gasket compound to the mating surfaces, and screw them together. This tubing can either be used *exclusively*—run directly to the pump, or you might want to use copper tubing and fittings for *durability and appearance*.

Locate the chute assembly on top of the top braces (FF) so the end with the tubing is flush with the end of the chute support. Drill pilot holes through the centerline of the chute bottom (NN) into the centerline of the braces, and secure it in place with brass screws.

Install the ladder so it is aligned with the front vertical support piece (AA). Install the catwalk (SS) along the top front edge, fitting its notch around the ladder, and finish nail it in place.

With the bases of both the chute structure and the wheel structure level, and in the same plane, position the delivery end of the chute above the center of the wheel. There should be at least ⅛" clearance between the chute bottom (RR) and the ends of the wheel buckets. Rotate the wheel, and check for adequate clearance.

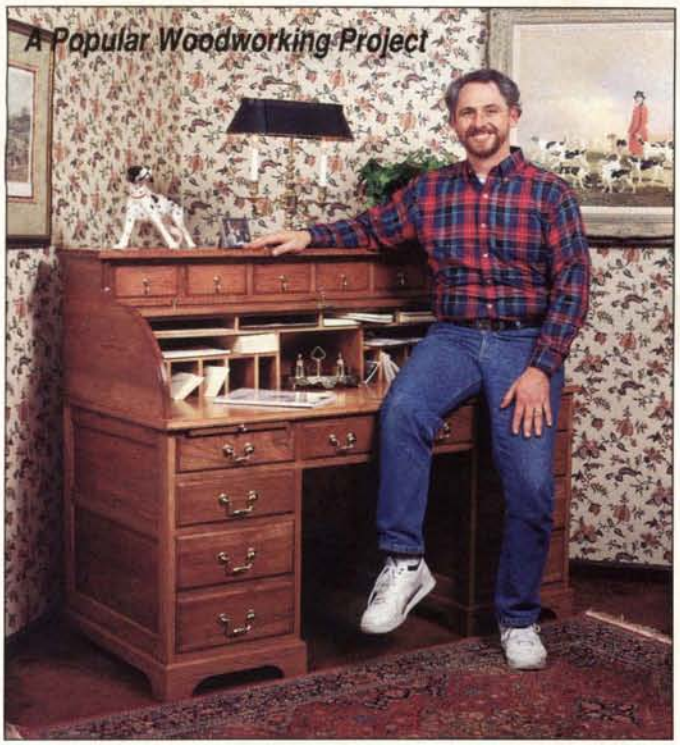
Operational Check

Place both of these assemblies in position in a child's plastic wading pool (or the like) and fill the pool with a few inches of water. Next put the submersible pump unit in the water beneath the wheel. Attach the free end of the plastic tubing to the pump's outlet, avoiding any sharp bends in the tubing, and tie it at appropriate intervals to the structure for support. Florist's tie wires or electrical tie wraps work well. Do not restrict the water flow within the tubing by reducing its diameter, or by introducing any elbows or other restrictive fitting into the supply line.

Now, plug in your pump, and fine tune the relative locations of your structures with one another to give the maximum energy of the water to the wheel.

For optimum operation, the bottom of the wheel's circumference should be above the maximum water level of the pond. In outdoor installations a simple spillway arrangement can be used to divert excess rainfall or sprinkler flow. The pump will never starve if it is recessed into a suitable cavity just below the nominal pond bottom. Such a cavity can also act as a filter when surrounded with galvanized hardware cloth, two layers of spun glass, and a second hardware cloth retainer. Such a filter is easily changed, and is easy and inexpensive to make and to maintain.

A mill house, or at least a facade of such structure, can be built as a backdrop to the water wheel and the rotation of the wheel can be harnessed to accomplish some secondary motion. A light in the mill house or beneath the millpond will add interest and call attention to the installations. PW



Bruce Richmond

Building A Classic Roll Top Desk

Part 2 The Tambour Top

by Robert C. Cook

Last issue we built the desk itself—now we make the pigeonholes and tambour top (see page 85 for ordering *Popular Woodworking* #67, "Building A Classic Roll Top Desk—Part I").

More Panels

What did you expect? Locate the biscuits away from grooves and joints, especially in panel P5 (photo below right). Cut the stiles (TC and TD) and the rails (TE and TF) to the dimensions in the Cutting List. Rout the appropriate edges and ends with your stile and rail bit to make the frame for the back assembly (Figure 1, next page). Plane P6 to a thickness of ½", alternating sides so the biscuits remain in the middle.

Refer to the Cutting List and cut the end (TG) and center (TH) panels. Use the dado cutter in the table saw to cut a 7/16" X ¼" deep rabbet around the perimeter of one side of each panel. Sand and stain the panels.

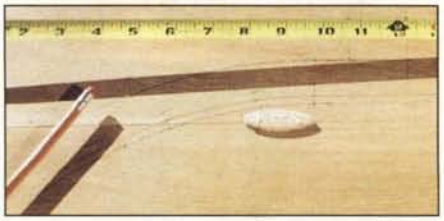
Assemble the back on the particle board set–up you used to make the frame and panel assemblies. Dry–assemble and check the fit. Slip the pieces apart and apply glue—don't get any on the panels. Lightly clamp everything and check for square. Make sure the overall length of the assembled panel is exactly 54⅜".

Now cut the strips (TS) for the tambour. You'll need about 27" of combined width if your saw blade is ⅛". Select wood carefully; people will try out the rolling tambour. Number each strip as it comes off the saw and cut extras to cover cracks and splits (I rejected four out of thirty). The Board Buddies™ (Cascade Tools, 800-235-0272) on my fence held the work firmly on the table and tightly to the fence. Its wheels rotate only in the infeed direction to help prevent kickback.

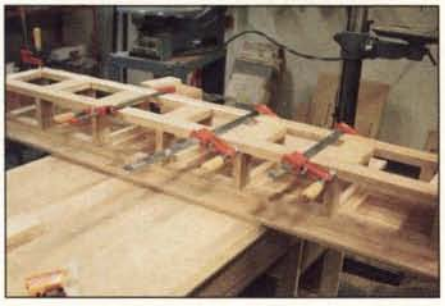
Cut the lead strip (TL) to the dimensions given in the Cutting List, and rabbet the underside ends ⅜" wide X 5/16" deep (Figure 2, page 73). I used a dado blade on the radial arm saw and a piece of scrap to set the correct depth of cut. Finetune the thickness of the tongue in the tambour channel. Set the blade in your table saw to 45° and adjust the fence to camfer the top 5/16" above the tongue. Next, locate and cut the mortise to accept the locking mechanism, and cut the hole to accept the key (photo to the right). Set–up with an ⅛" round–over bit and ease the front edges of all the strips.

Set up the table saw and cut with precision—the tambour strips must be identical.

Don't sink a biscuit in the path of the router.



Mark the pieces with indexing lines to help in the final alignment.



Rob Cook is Associate Editor and shop manager here at Popular Woodworking.

Building The Top Drawer Frame

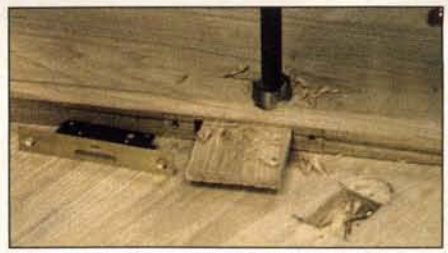
Select a 60" board that changes color dramatically along its length, or one that with a striking grain, and cut and trim the six top drawer faces (TDA).

Set up your router and trim the front and side edges of the tambour top (P7) using the same procedure you did for the desktop. Lay the tambour top face down, and glue and nail one of the rails (TFA) 13/16" from the back edge and 1 13/16" from each side edge (see Figure 1). Clamp a narrow piece of scrap—edge down and flush with the back edge of the top—to act as a guide.

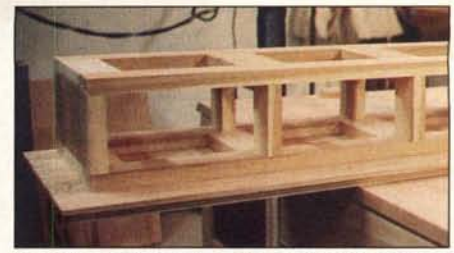
Dry–assemble the complete frame. Position five of the drawer slides (TFB) against the the back rail, set another rail against the exposed ends, and roughly space the drawer slides. Set the two end plates (TFF) in position, and stand all the stiles (TFE) on end. Use the drawer guides (TFD) as front–to–rear spacers and a drawer face for lateral spacing between the stiles. Put the two remaining rails (TFA) on top of the stiles and end plates. Place the end slides (TFC) between the stiles—resting on top of the end plates. Clamp them; then space and clamp the remaining drawer slides (TFB).

Position a drawer face between each of the stiles at the front and the back for proper spacing. *Note—for the remainder of this section, "up" is in relation to the world, not the workpiece, which is upside–down now.* Without letting anything move, extract the upper drawer slides (TFB), remove the clamps, and lift off the top face rails. Apply glue to the end plates and each stile. Reassemble, clamp and check for square. Check the spacing again with the drawer faces. Nail the end slides (TFC) to the end plates (TFF) and nail the rails (TFA) to the stiles (TFE). To do this, measure and mark the center of the stiles on the top of the rails, and down the center of the drawer slides (TFB). Put a little glue on the ends of the drawer slides, slip them between the two rails, and clamp.

When the glue is dry, remove the frame and install the drawer guides (TFD) as shown below. Mark the centers of the

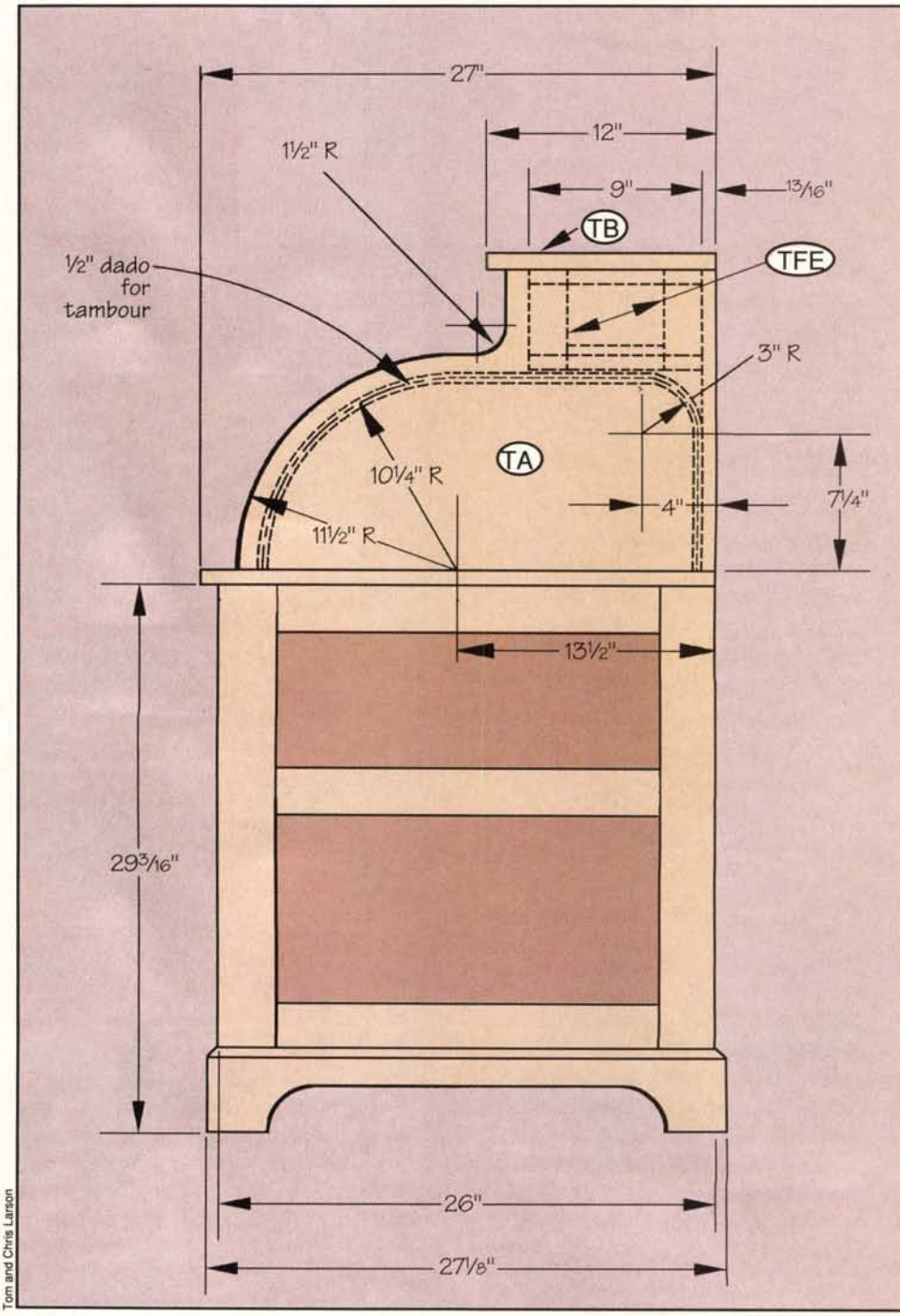


Place a backing strip in the mortise to prevent tear–out.



Re–check the alignment of all parts before proceeding to the next step.

Pigeon Holes					
		Finished Size			
Qty	Part	T	W	L	Piece
1	PA	¼"	9½"	54⅜"	ply. back
1	PB	½"	8½"	54⅜"	top rail
1	PC	½"	8½"	9¼"	outside stile
2	PD	½"	8½"	47"	middle rail
7	PE	½"	8½"	2"	mini–stiles
1	PF	½"	8½"	7¼"	center stiles
2	PG	½"	8½"	17⅜"	lower rail
1	PH	½"	8½"	4¼"	multi–stiles



Tom and Chris Larson

Panel List					
		Rough Size			
Qty	Part	T	W	L	Piece
1	P5	13/16"	16½"	46"	tambour sides
1	P6	13/16"	12"	52"	(2) 12", (1) 25"
1	P7	13/16"	12"	60"	tambour top
6	DP4	⅛"	5 11/16"	6 13/16"	dust panels †

† Measure rabbetted areas before cutting

Supplies		
Qty	Part	Source
1	31963 tambour lock	Woodworkers Supply of New Mexico 800-645-9292
6	35519 pendant pulls	
2	35469 brass knobs	
1	24" x 60" uncoated cotton canvas	

Roll Top Desk Cutting List					
Top and Tambour					
		Finished Size			
Qty	Part	T	W	L	Piece
2	TA	13/16"	16½"	16½"	tambour sides
1	TB	13/16"	12"	58"	tambour top
2	TC	13/16"	11 11/16"	16"	end stiles
2	TD	13/16"	2½"	16"	center stiles
4	TE	13/16"	2½"	11¾"	outer rails
2	TF	13/16"	2½"	24¾"	center rails
2	TG	½"	11¾"	11¾"	end panels
1	TH	½"	24¾"	11¾"	center panel
1	TL	13/16"	2"	54⅞"	lead strip
24	TS	½"	½"	54⅞"	strips

Roll Top Desk Cutting List					
Drawer Frame and Drawers					
		Finished Size			
Qty	Part	T	W	L	Piece
4	TFA	13/16"	2"	54⅜"	drawer rails
10	TFB	½"	2¾"	5"	drawer slides
4	TFC	13/16"	1¾"	5"	end slides
5	TFD	½"	13/16"	5"	drawer guides
10	TFE	13/16"	2"	3 13/16"	stiles
2	TFF	13/16"	9"	3 13/16"	end plates
6	TDA	13/16"	2½"	11¾"	drawer face
12	TDAS	7/16"	3¾"	8½"	sides
6	TDAB	7/16"	3 3/16"	7⅝"	back
6	TDAP	⅛"	7⅝"	8⅛"	ply. bottom

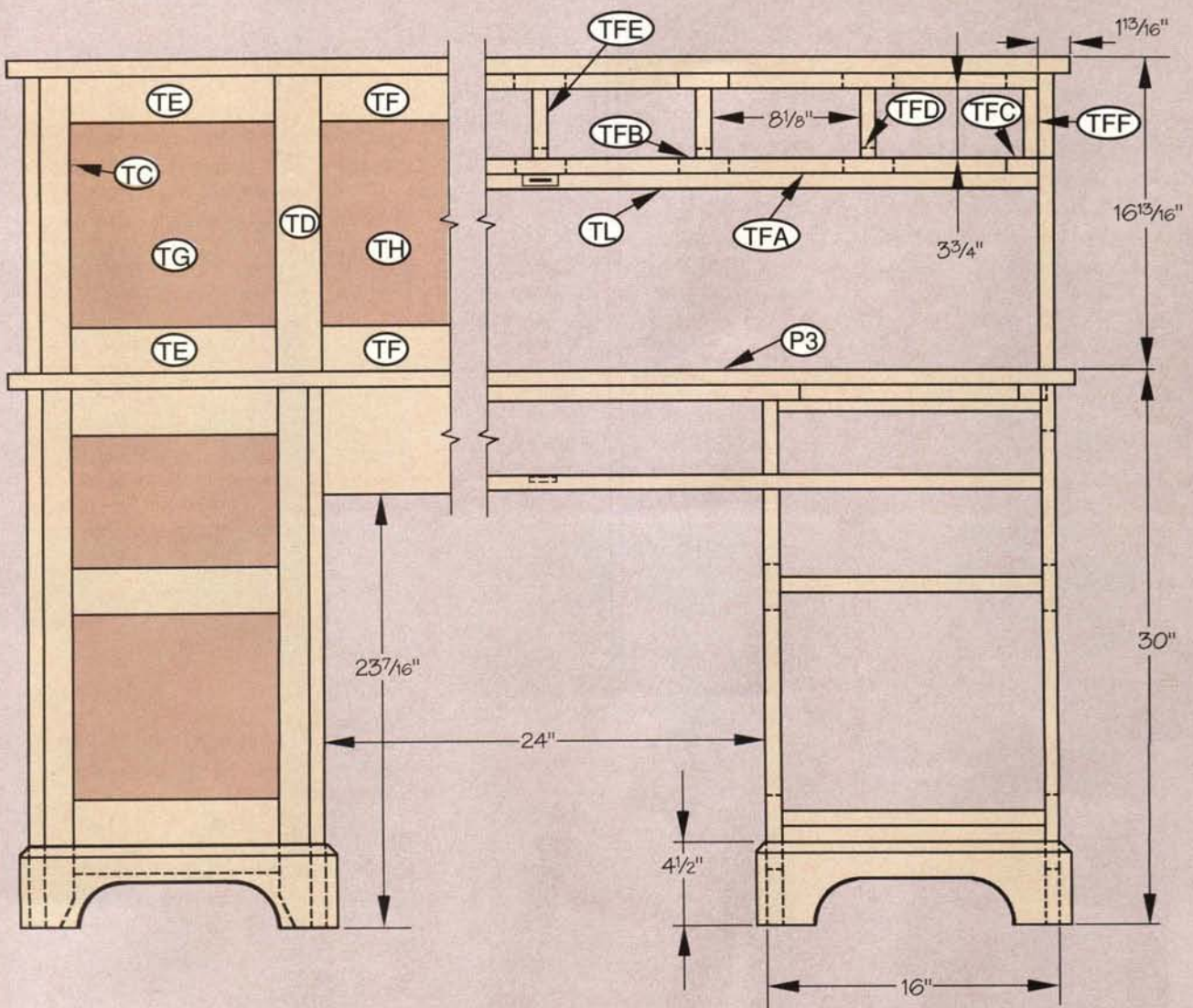


Figure 1. Front, Back and Side

remaining drawer slides, and locate them approximately. Set the end slides (TFC) between the rails and clamp in place. With the drawer slides in their approximate locations, set the assembled portion of the frame back in place. Adjust the loose drawer slides so they're centered on the stiles. Place clamps on the rails to hold the drawer slides in place between them; then remove the larger frame. Locate, drill and counterbore for the #10 X 1¼" screws (photo below). Apply glue to the end plates and stiles on the frame, and place it on top of the screwed–in end slides and rails; clamp. After the glue has dried remove the screws—you'll need a 90° off–set driver (like the one I used from AEG, telephone 800-243-0870) to get into this and other tight places. Flip the frame over and nail the rails to the stiles and end plates. The only piece to be glued to the tambour top is the rear drawer rail. Put a little glue on all the parts that contact that back rail; then screw the frame back into position.

Put a ⅜" rabbeting bit in your router, and cut the bottom of the frame 3/16" deep to accept the six dust panels (DP4). Since these panels aren't held in by gravity, staple them in place (photos at the bottom of the page). Use a nail set to bottom the staples if they don't drive all the way in.

Handle the drawer frame carefully as you screw—but not glue—these pieces together.

Rout the rabbets first, then cut the dust panels to size.

Assembling The Tambour Top

Make templates for the sides and for routing the tambour channel from the full–size patterns in the PullOut™ Plans section. But first, measure the diameter of the base of your router; it's probably either 5 ¾" or 6". The tambour channel template is sized for either one, so check before you cut. Use a spray adhesive or contact cement to affix the pattern to a scrap piece of hardboard, cut it out, and sand the edges smooth.

Transfer the pattern for the tambour sides (TA) onto Panel P5; then cut them out with either your saber saw or band saw. Transfer the index mark (the center mark for the two arcs in the side view of Figure 1) to each side. Note that there's a left and right side. Line up the index marks, and clamp the template to one of the sides. Recheck all the dimensions from Figure 1 just to keep me happy; then clamp the work to your bench. Clamp a run–out block on the left edge where the router exits the work to prevent tear–out. Install a ½" straight bit in your router and set the depth to 7/16". Slowly and carefully, rout the channel for the tambour. You can do it in one pass with a good carbide bit; otherwise, make two shallow passes. Remove the template, transfer the index mark to the other side and follow the same procedure.

On the front edge of my tambour sides (TA) I used the stile and rail ogee to rout the outside edge, and a ⅛" roundover bit on the inside edge. Sand the entire side pieces when you're finished routing; get the tambour groove very smooth.

One ½" staple in each side is adequate. The panels may be glued in place if you wish.

Apply glue along the the top edge of the back panel and on the edge of the frame–and–panel assembly of the upper rear rail (TFA). Align the back assembly to the frame, and nail through the rails into the drawer frame; don't nail through the top. Measure accurately, and nail through the four back panel stiles (TC and TD) into the lower rear drawer rail (photo below).

Attach the tambour sides to the tambour top, the drawer frame, and the back frame. There are several important points to consider here: one is the direction the grain runs in the side piece in relation to its points of attachment; the other is the look you want to achieve in the sides. I chose to have the grain in the sides run horizontal so its direction matched that of the panel pieces in the desk sides. The resulting conflicts are: the attachment to the desktop, tambour top and the outside stiles (TC) of the back assembly. To resolve this, I attached the tambour sides to the desk with screws from underneath, through elongated holes in the desktop. The tambour top is not connected directly to the sides at

If the sides have vertical grain, glue them to the top and end plates.

Install the staples flush so they don't scratch the tambour .

all, but the sides are glued and nailed to the end slides (TFC). You may prevent these conflicts by orienting the grain vertically. If this is your choice, make panel P5 28" X 33".

Glue and nail the sides to the outside stiles of the back assembly (TC), to the ends of the front rails and the edges of the end slides. Turn this assembly over, and set it on a flat surface (like the desktop) to ensure that the bottom of the tambour sides are in the same plane. Place a 54⅜" spacer between them at the front opening, and clamp the tambour sides to the drawer frame and back assembly.

When the glue has dried, remove the clamps and slide the whole top assembly forward so that the tambour channels are exposed over the front edge of the desktop. Get all the tambour strips and the lead strip (TL). If you numbered the lead strip

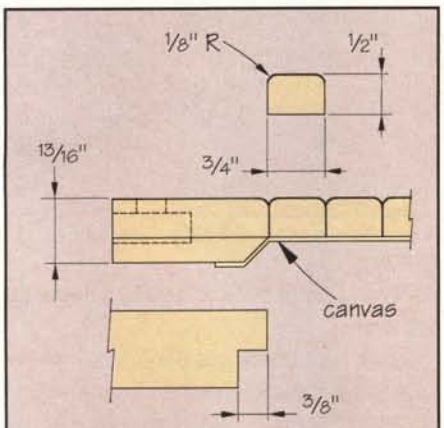


Figure 2. The Lead Strip and the Tambour

Check the wedges—they may loosen up.

#25, then start with TS #1. Slide it into the groove and up and back. When the lead strip is in place, slide the top back into its approximate finished position then stand back—it's that time again. If you really want a thrill, put all the drawer faces in place and then stand back!

Gluing The Tambour

Build a frame to compress the tambour strips while you glue on the canvas (see Figure 3). Rout a ⅜" X ½" deep rabbet in a piece of 1 X 2 X 48" scrap, then cut this piece in half. Attach a 58" backstop to your bench; then screw one of the rabbeted edge strips perpendicular to it. I used the shop wall as a backstop, and installed the edge strip at 90° to the wall. Lay one of the tambour strips under the rabbet in the edge strip and up against the backstop. Lay another tambour strip perpendicular at the other end of the edge strip and place the other edge strip against the backstop with the rabbet over the the two tambour strips. Make sure this "box" is square, and screw the second edge strip down.

Sand the edges of all the tambour strips—this is the last time you'll be able to get at them easily. Slide all the strips and

Spread the glue smoothly; don't try to force it into the grain or between the slats.

Now apply pressure to wet out the canvas.

the lead strip into the frame, and screw in the anchor strip parallel to, and about 3" from, the lead strip. Cut four 3" X 4" blocks in half diagonally to make the jam wedges. Strike them from opposite directions to tighten. When all the strips are jammed in tightly, use your mallet and a short piece of scrap to make sure they are all laying flat (photo above). Sand; then remove the dust. Draw a line on the strips 1" from each edge; then cut your canvas to fit.

Spread a thin coat of alphatic glue over about half of the tambour, lay the cloth in place, and roll it smooth (see the photos above). When you're satisfied, peel the cloth back ½" to expose the glue next to the dry half. Apply glue to the other half, spread evenly and roll out the cloth. As the glue dries, the canvas will shrink a small

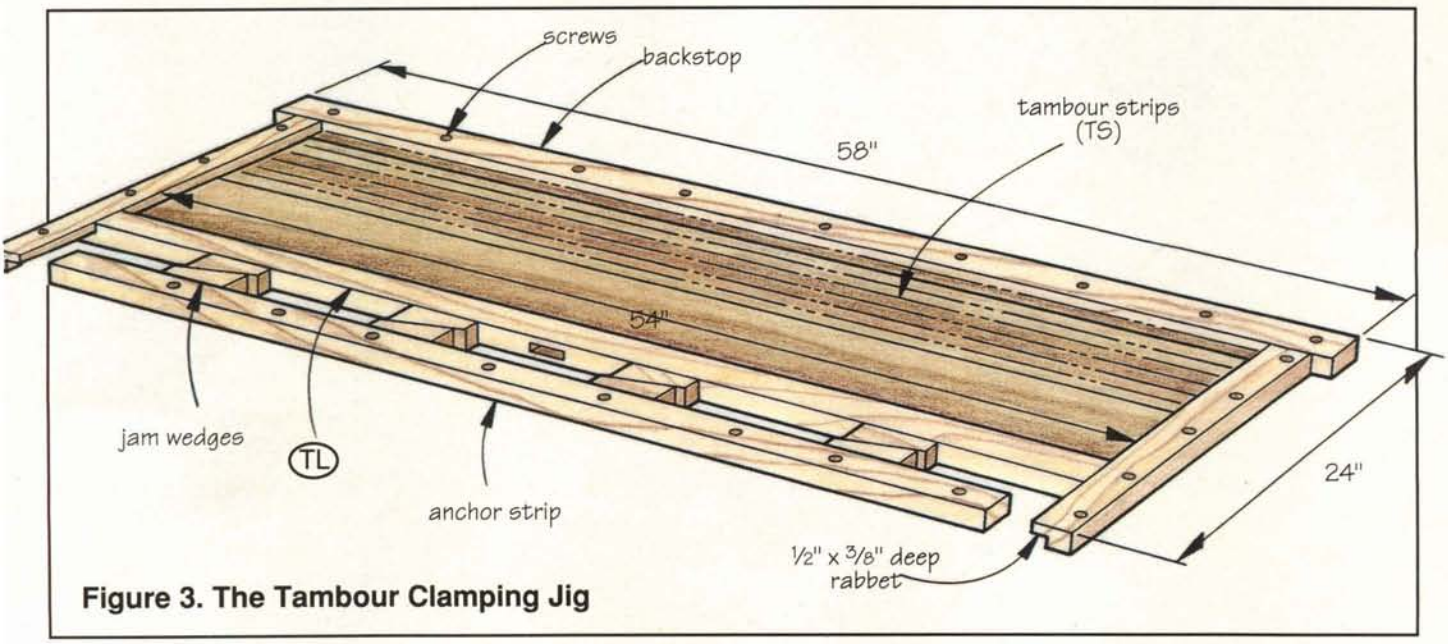


Figure 3. The Tambour Clamping Jig

amount. If it tries to lift up where it rises onto the lead strip, keep it pressed down by sliding a hard block back and forth along the joint. Keep the cloth down as the glue dries (photo right). Let it dry overnight before removing the tambour from the frame. When dry, lightly sand any rough edges around the perimeter of the canvas.

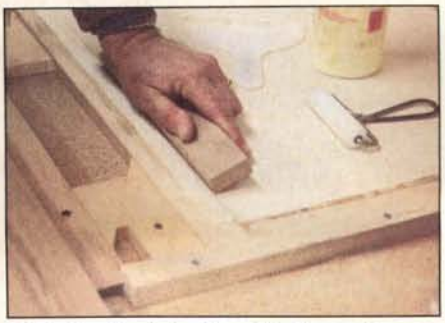
Turn the whole top assembly upside–down, test–fit the tambour, and sand where needed. Ease the tight radius in the tambour sides with a chisel and sandpaper if needed. If your tambour slides easily now, when you apply finish and wax the groove, the roll–up will be problem free.

Installing The Tambour Lock

While the tambour is still in the groove, align the whole mess squarely on the desktop—backs flush and the sides 1" from the edges. Clamp the tambour top to the desktop to prevent any movement. Then pull the tambour down to the closed position and let the lock in the lead strip rest on the desktop. Use a pencil to lightly outline where the latch makes contact.

This operation is a little difficult on the drill press—to insure that the bit is vertical, watch the depth of cut and drill slowly.

Increase the depth a little at a time. Check the trap–door for proper clearence.



Slide the block back and forth; as the glue sets up, the canvas will stay put.

Examine the trap door mechanism that comes with the lock—the hinge pin will be away from the front edge of the desktop when it's installed. After you've determined its exact position, slide the tambour up and out of the way, and lay out the outline on the desk top. Use a Forstner bit with the same diameter as the ends of the face–plate and drill down the thickness of the plate. Use a chisel to remove the waste where the trap door will drop down into the top (photos below left). Leave the lip for the face–plate to screw down to and be careful not to go all the way through the top.

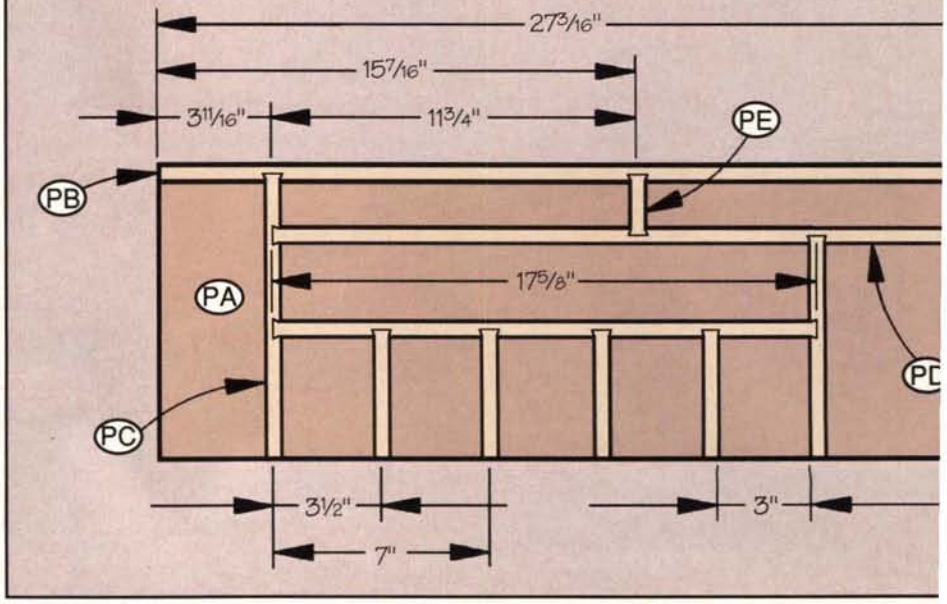
With the tambour top still secured to desktop, pull the top toward the front of the desk, lift the front edge up and rotate it onto its back. Drill, counterbore and elongate four holes on each end of the top to accept the #10 X 1½" screws you'll drive into the tambour sides. Do the same for five screws along the back edge, and remember to lubricate them before you screw them in (photos above right). Put the top down, slide in all the drawers, pull the tambour down and stand back. It's getting better all the time.

A little block under a diagonally secured clamp will keep it from damaging the edge.

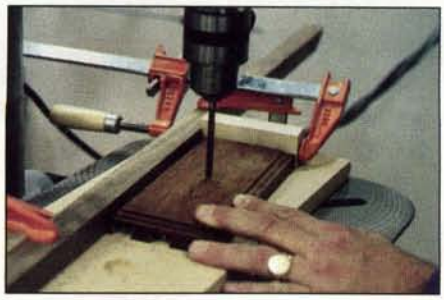
A little lubrication will prevent a lot of aggravation.

Now, take the whole thing apart. Make a finishing support like the one in the first photo on the next page. The radius of the circle is 9", and is 12" up from the bottom edge. The spreader bar is about 45" long.

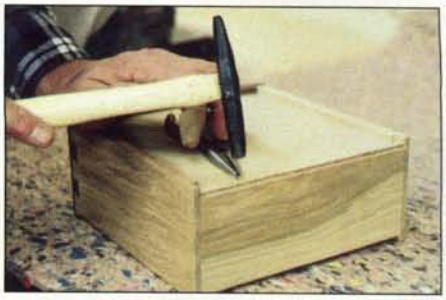
Figure 5. The Pigeonholes



This fixture makes the job of applying stain and varnish to the tambour a lot easier.



Set the stop–block and fence carefully; off–center holes will stand out like a sore thumb.

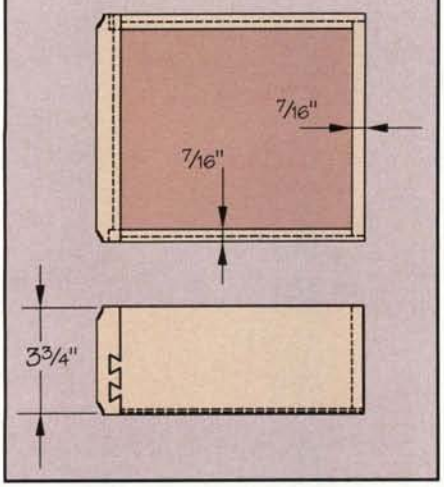


The bandage is from a splinter, not a missed blow!

Making The Drawers

This goes a lot easier than the last time. First, set up a fence and stop–block at the drill press to drill the holes in the center of each drawer front (photo above center). Check the Cutting List to make the six sets of sides (TDAS), backs (TDAB) and bottoms (TDAP). Refer to Figure 4 and assemble the drawers in the same fashion as you did in Part I. Use the width of a drawer back to establish the location of the groove in the sides and the drawer faces for the bottoms. Clamp them up squarely; and when they're dry, nail the bottom. These drawers don't require sliding hardware.

Figure 4.
The Tambour Drawers

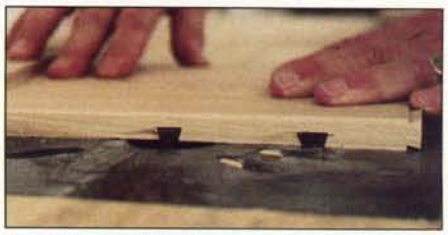


Making The Pigeonholes

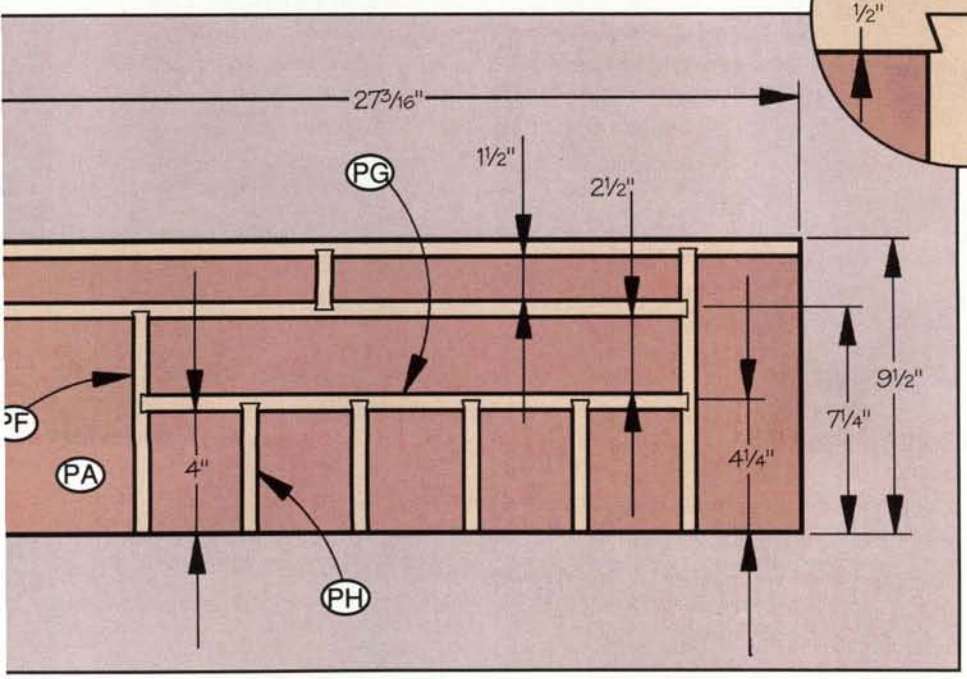
Here is where you can really personalize your design—extra drawers, slots or secret compartments especially sized for your needs. I kept it simple, except for the elegant sliding dovetail joinery. After all those drawers, what the heck!

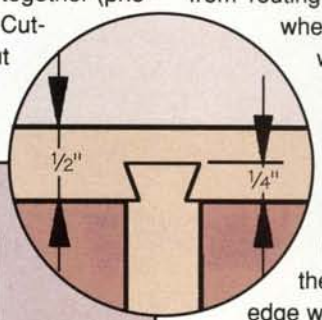
Set up the dovetail bit in your router table, and adjust the height using some scrap exactly the same thickness as the pigeonhole stock (½"), so the tails and pins slide easily but firmly together (photos above right). Use the Cutting List and Figure 5 to cut out and rout all the parts. Initially, cut the stock a little over width, so if there's a little tear out from routing the joints, you'll remove it when you rip all the pieces to width. Sand, stain and varnish all the pieces before you put them together.

Repetitive testing for correct bit depth and accurate fence positioning are the keys to success when making sliding dovetails.



You'll have a little tear–out, so rip all the pigeonhole stock ¼" over width to begin.



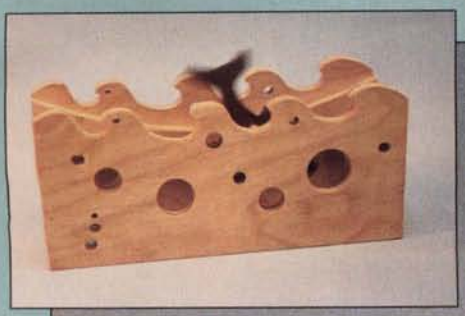


Assemble all the dovetailed pieces with the back edge against the workbench. Brush a little glue in the pins, but just on the front edge where the tail slides in. It'll be enough to hold the pieces firmly together, and not leave a glue stain (which is really a place where there's no stain) on the front.

Stain and varnish the plywood back (PA); then nail it in place with ½" brads. Finishing was discussed in some detail at the end of Part I.

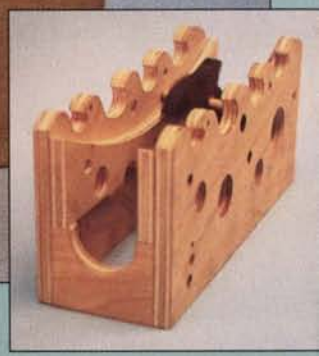
Let me know how your desk turned out. Did you discover any methods or short–cuts you'd like us to pass on to your fellow readers? Did you have any difficulties?

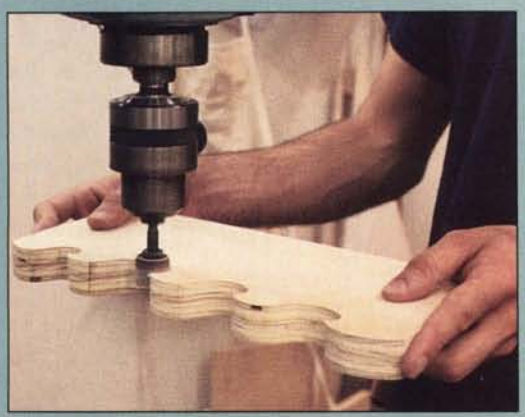
This has turned out to be a wonderful but enormous project. Remember, if you do a little every day on that masterwork, it'll get done. PW



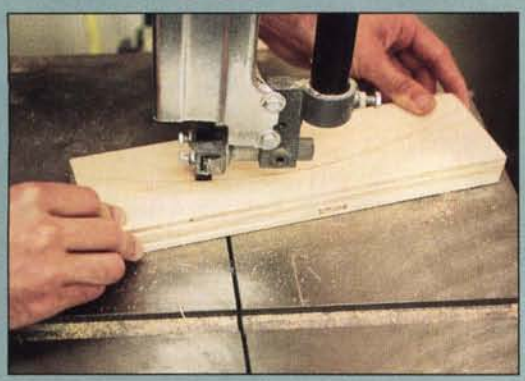
A Popular Woodworking Project

DESKTOP DOLPHIN





Smooth the edges of the sides with a drum sander mounted in your drill press.



Cut the ramps in one motion on the band saw. It is important that this cut be clean for a smooth swimming dolphin.

by Benjamin Green

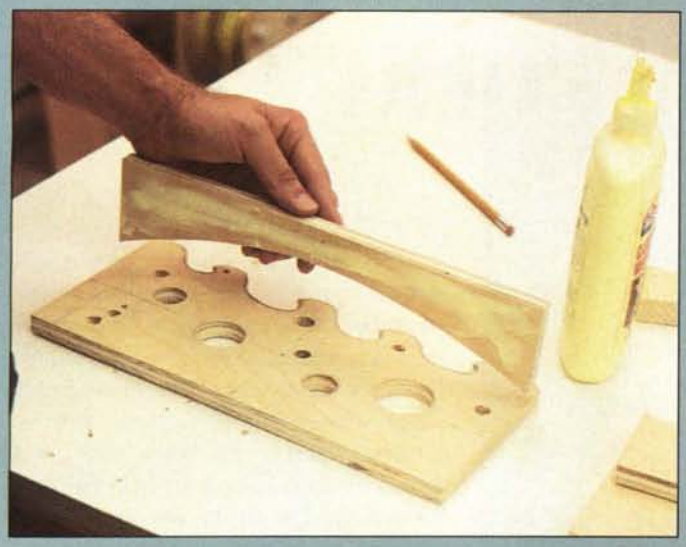
It's not *quite* the perfect perpetual motion machine, but it will happily entertain landlubbers as well as salty dogs. The desktop dolphin doesn't take long to build and requires a minimum of materials—in fact you probably have the perfect piece of scrap for the dolphin already set aside.

Cut out the sides (A), ramps (B), and braces (C) to the sizes given in the Cutting List. I used ½" birch plywood for these pieces. Transfer the side pattern from the PullOut™ Plans to one of the side pieces and tape both sides together so that both profiles can be cut at the same time. Cut the wave shape on the sides with a scroll saw if you have one; if not a band saw or a coping saw will work.

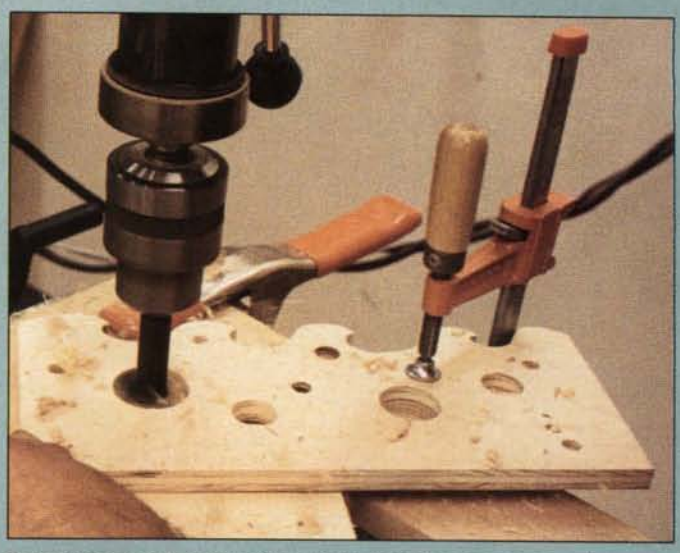
While the sides are still taped together, drill out the bubbles as located on the PullOut™ Plans. Make sure that there is either solid wood behind the area being drilled, or use tape on the backside to avoid tearout when drilling. The size and location of the holes are not set in stone. If you don't have a bit for one of the hole sizes, then be creative with the tools you have. Forstner bits work well for the large diameter holes.

Transfer the ramp pattern from the PullOut™ Plans to one of

Benjamin Green *is Assistant Editor of* Popular Woodworking.

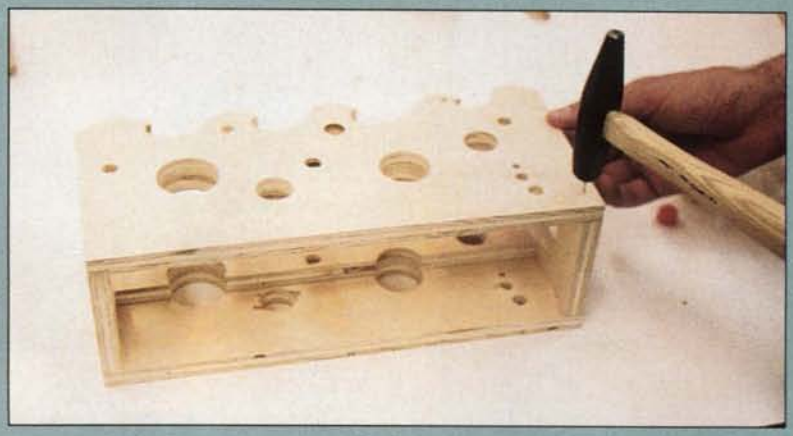


When assembled, the sides should retain the same relation to each other as when cut.



Rebore the holes in the sides after attaching the ramp using a scrap piece of ½" stock to support the side when drilling.

Desktop Dolphin					
Cutting List					
		Rough Size			
Qty	Part	T	W	L	Piece
2	A	½"	5½"	12"	sides
2	B	½"	2½"	12"	ramps
2	C	½"	2⅜"	3"	braces
1	D	½"	3½"	6"	dolphin
1	E	⅜" diam.		3"	axle



Glue and brad nail the sides to the braces.

Cut the dolphin from a piece of ½" stock. Use a good looking piece of hardwood if you're going to use a natural finish.

the ramp pieces. Tape the two ramp pieces together and cut the curve on the band saw in one smooth motion. It is important to make this cut without dips to insure that the dolphin swims smoothly.

Attach the ramp pieces to the sides with glue and a couple of small wire brads. The ramps are positioned 2⅜" from the bottom of the sides. They should be attached so that they retain the same relation to each other as when they were cut when the toy is assembled. This will account for any irregularities in the curved cut. The ramp pieces will block some of the previously drilled holes. Rebore these holes with the original bit, using a scrap piece of ½" stock to keep the side level when drilling.

Transfer the curve pattern from the PullOut™ Plans to the braces. These can be cut either with a 2" diameter bit or a saw. Attach the braces to the sides with glue and brads below the ramps on the inside of the sides. Transfer the dolphin pattern to your stock (I used walnut) and cut it out. Drill the ⅜" axle hole as located on the pattern. Center and glue the axle to the dolphin.

Sand and finish the completed toy. I used Watco Danish Oil, but you might want to paint the waves and/or the dolphin. The toy takes a bit of fine tuning for a smooth roll. If the dolphin slips more than it rolls, try adding strips of sandpaper to the ramps. PW

photos by author

MYSTERY LAMP

by J. T. Osterman

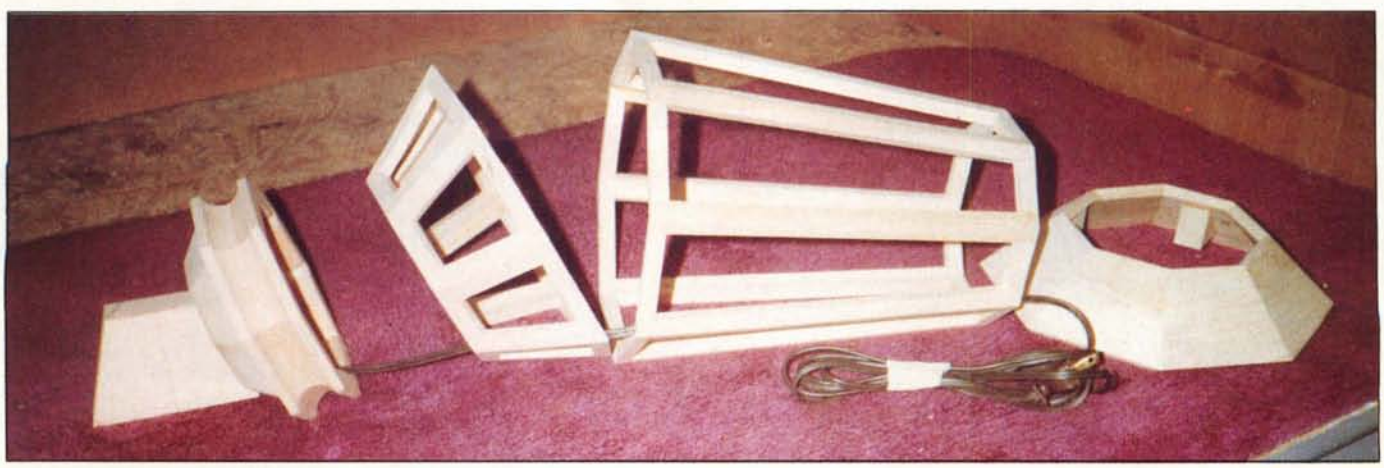
This lamp uses classic proportions as a springboard for several interesting design ideas. I built it so that a small art object or figurine can be displayed in the open body. There are two elements of mystery in this design—the electrical wiring is run through a hidden dado in the frame stiles, and there's a hidden compartment in the base of the lamp. The design will also accommodate panel inserts of wood or transparent acrylic sheeting.

Because of the number of octagonal elements in this project, there is a fair amount of hand fitting involved. Take your time to make each frame and ring as accurately as possible.

Lower and Upper Body

The body of the lamp consists of an upper and lower section, each composed of eight frames. Parts (A) and (B) in the Cutting List don't represent individual pieces. Instead they refer to a length of material from which you will cut the rails and stiles to make frames (A) and (B). Rough cut the eight strips for the lower body frames (A) to 25" each, and the strips for the upper body frames (B) to 14". Prepare the stock for these frames on your table saw. Cut a 1/16" X 1/8" rabbet on each strip (see Figure 1) before cutting them to size for frame assembly. These rabbets provide a recess to accept panels (see the PullOut™ Plans for a full–size panel tem-

J. T. Osterman *works wood in Hickory, North Carolina.*



Clamp a stop to the sliding table when cutting the long rails.

Clamp a stop to the fence when cutting the short rails to length.

Christopher Larson

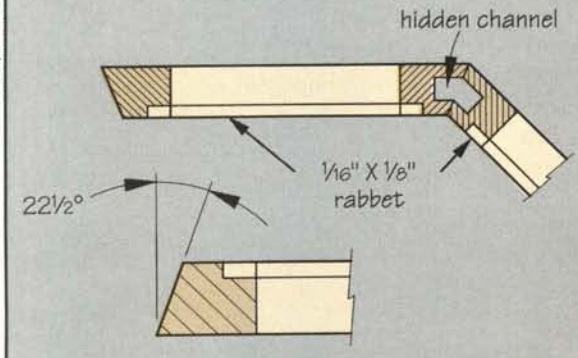
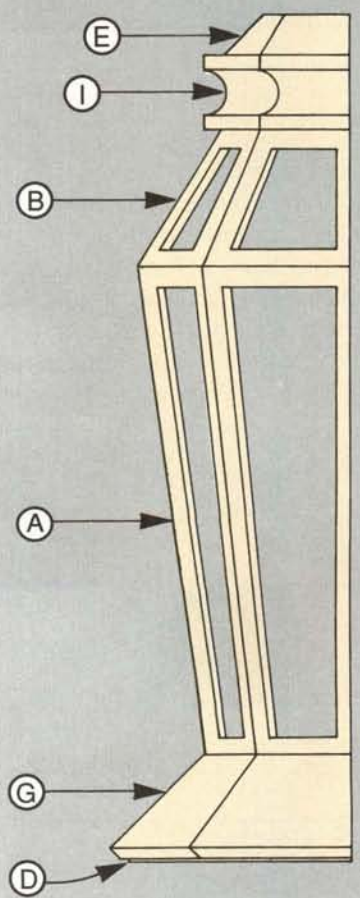


Figure 1. Frame Rabbets and Hidden Dado

Peter Stumpp

Figure 2. Lamp



Mystery Lamp					
Cutting List					
		Rough Size			
Qty	Part	T	W	L	Piece
8	A	9/32"	3/8"	25"	lower body rails and stiles
8	B	9/32"	3/8"	14"	upper body rails and stiles
8	C	9/32"	2½"	2¾"	base panels
1	D	¾"	8"	8"	base plate
1	E	¾"	4¾"	4¾"	upper cap
8	F	5/16"	2¼"	1¾"	interior base ring segments
4	G	¾"	1"	1⅛"	base blocks
8	H	5/16"	2"	2½"	compartment covers
1	I	11/16" cove		36"	collar

plate).

Refer to the Frame Assembly Pattern in the PullOut™ Plans for the finished lengths and angles of the frame members. Set up your panel–cutter on the table saw so that there is minimum blade exposure for the cut. Clamp a stop block to the fence to cut the short rails to length, and a stop to the sliding table for the long rails (see photos above). The end cuts on the upper frame stiles should be parallel and as close to 79¼° as possible. Cut the lower frame rails and stiles at 87° in the same orientation as the upper frames. Dry assemble the frames and check them against the full–size template in the PullOut™ Plans.

Frame Subassembly

Seal all the end grain cuts with a thin, even coat of aliphatic resin glue to fill the pores in the wood for a stronger glue joint. Allow about 15 minutes to dry before gluing up the frames. I suggest you make a positioning jig to ensure symmetry during the assembly of the trapezoidal frames. Take care in applying glue; don't over–clamp. Let the glued frames dry overnight.

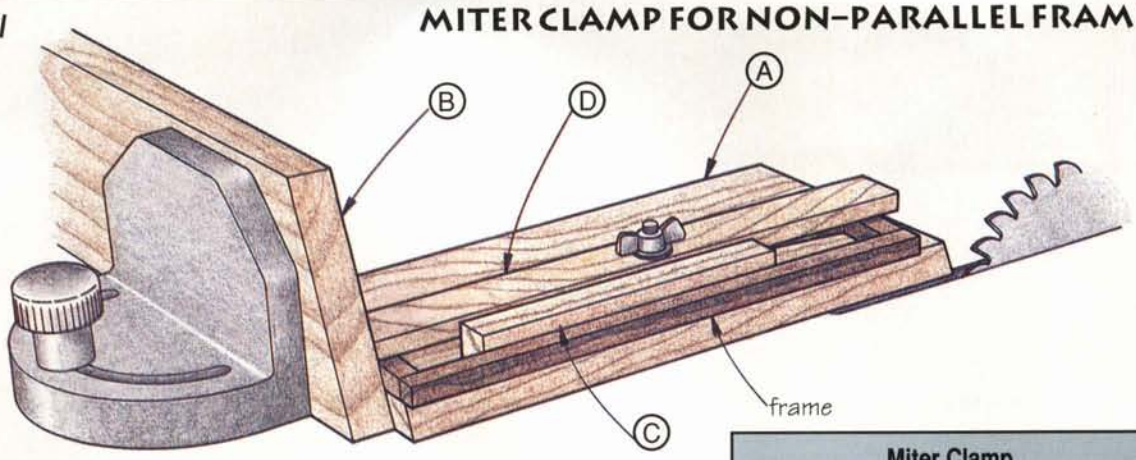
Miter the outside edges of the frame stiles to 22½°. Use the table saw jig described on page 40 to make these cuts. Left– and right–hand versions are required for each of the frames. Use the panel–cutter and a stop to miter the bottom edge of the upper frames to 60° and the top edge of the lower frames to 82°.

Make the hidden channel for the power cord by cutting ⅛" X ¼" dadoes on the right side of one lower and one upper frame and on the left side of another (adjoining) upper and lower frame set (see Figure 1). One way to make these cuts is to attach a high plywood fence to your table saw fence, and set it so the stile is centered over the blade. It's best to use a thin kerf (⅛") carbide blade here and make one pass. Finish sand all surfaces except the outside edges.

Upper and Lower Body Subassembly

Dry assemble the upper frames to check for fit, then glue

MITER CLAMP FOR NON-PARALLEL FRAMES



Use this jig in conjunction with your miter gauge (set to 90°) for accurate miters on a non–parallel frame. You'll need to construct two jigs—one a mirror image of the other—to cut opposing stiles. One approach is to position a frame whose stiles you want to miter on a base board, then snug blocks into the corners of the frame and nail them to the base. Or follow these instructions:

Miter a long edge of the base (A) to 67½°. Attach a back stop (B) so it's square to the mitered edge of (A). Attach side stop (C) perpendicular to piece (B) so that it'll hold the outer edge of a ⅜" rail flush with the top of the mitered edge of (A). Drill a ¼" hole 6" from the end of piece (A), centered ⅜" from the edge of piece (C). Countersink so the head of a bolt is recessed into the bottom of (A). Drill a ¼" hole centered on the width of clamp block (D) and 5¼" from one end. Assemble the clamp as shown above with a washer between the wing nut and piece (D) and use it to clamp to the jig for cutting opperations. Omit the screw clamp when using the jig for the smaller upper body frames. PW

Miter Clamp

Cutting List

Qty	Part	Rough Size T	Rough Size W	Rough Size L	Piece
1	A	½"	5"	12"	base
1	B	¾"	¾"	5"	back stop
1	C	¾"	¾"	5"	side stop
1	D	½"	1"	10"	clamp block

Supplies

- ¼" X 1 ¾ carriage bolt
- ¼" ID washer
- ¼" wing nut

Tom Larson and Ginny Pruitt

and clamp the upper octagon together. Be sure to match up the dadoes that form the wire channel.

Dry–assemble; then glue and clamp the lower body frames. After the glue has dried overnight, dry fit the upper and lower body assemblies together. Sand the mating faces until they fit cleanly. Line up both assemblies, pull a standard 18 gauge 2 conductor lamp wire through the hidden channel, and glue and clamp together the body sections. Dress the slight upper body overhang by sanding to correct any minor variations.

Base Subassembly

Cut the base panels (C) to the dimensions shown in Figure 3. The grain of these pieces should run horizontally. Miter the end of these pieces as close to 15¾° as possible—or cut to 16° and adjust with a little hand–sanding during assembly. The fit of the base panels' upper edges to the lamp body is critical. Glue the panels together in pairs; then glue the pairs into a ring.

Use the templates provided in the PullOut™ Plans to cut the base plate (D) and the octagon cap (E). Bevel all the edges of

Figure 3. Base Panels

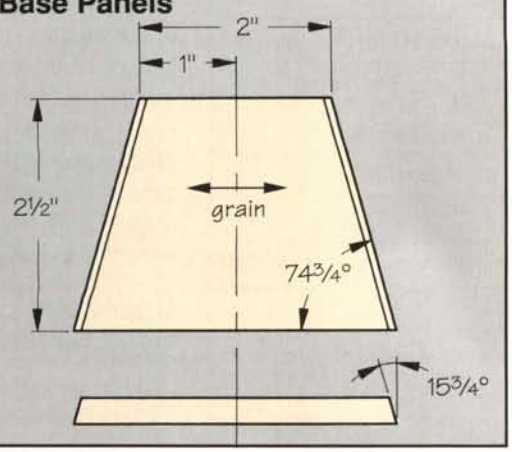
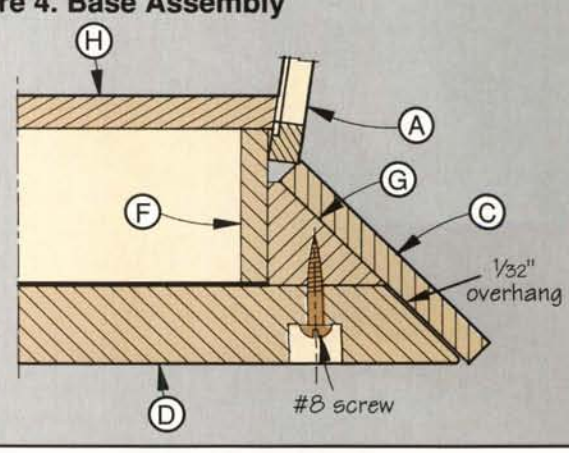


Figure 4. Base Assembly



Illustrations by Christopher Larson

Figure 5. Sub–Cap

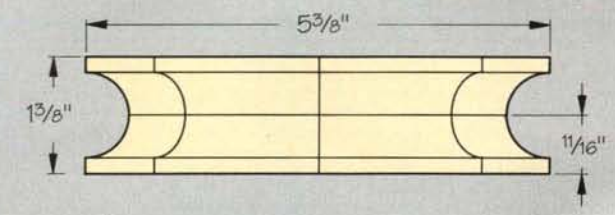
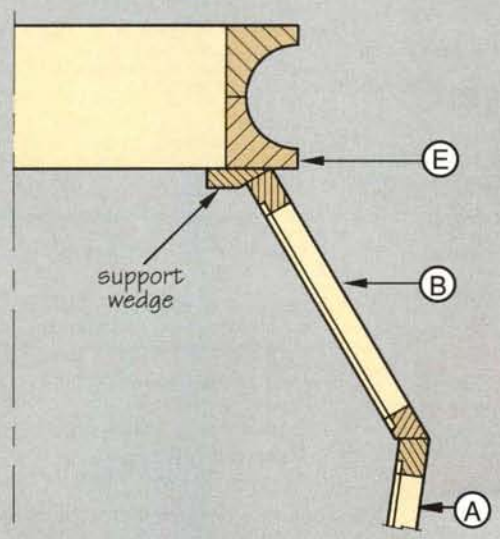


Figure 6. Top Assembly



these pieces on all sides to 45° using a stop on your panel cutter. Set aside the octagon cap until you've completed the base assembly.

Cut the interior base ring segments (F) to size mitering their ends to 67½°. Hand sand the inner edge of the bottom of the lamp body frame so that its surface is vertical and mates cleanly with the edge of the interior base ring as shown in Figure 4. Once you've achieved a proper fit, glue together this inner support ring.

The four triangular base blocks (G) transfer the weight of the lamp to the base plate. Size these blocks to extend 1/32" beyond the base plate (see Figure 4) so the base panel ring assembly is not stressed laterally by resting on the base plate. Glue and screw the base blocks to the base plate, using the inner support ring as a positioning guide. Countersink these screws from the bottom of the base plate. Next, attach the base panel ring assembly to the base blocks, making sure it's level. Its upper edge will extend slightly above the base blocks, but must not extend past their inner surfaces into the compartment area.

Glue a felt bottom to the top surface of the base plate (which is the bottom of the hidden compartment). Now glue the inner support ring to the inside of the base blocks—it rests on top of the felt pad.

Compartment Cover

Achieve a parquet effect by using contrasting shades of wood for the hidden compartment cover. Cut the eight triangles (H) according to the PullOut™ Plan Pattern, and bevel the base of each triangle to 8° so that when the cover is assembled it will fit snugly in the ring segments. Build this octagon in two halves and, for an accurate fit, joint each long edge before gluing them together.

Dry fit the lamp body to the base, paying close attention to the fit; then glue the body to the interior base ring—this butt joint holds up the lamp.

Cap Subassembly

Glue together two 18" pieces of 11/16" cove moulding so they form a concave profile, as shown in Figure 5. Make the collar from eight sections (I) of the glued–up moulding, each cut to a length of 2 1/16". Miter the short sides of each piece to 22½°; then assemble the collar octagon with glue. Drill a 3/8" hole in the center of the cap (F) to receive a standard lamp rod; then glue the collar to the cap. Size and fit four support wedges, as shown in Figure 6. These wedges serve as a glueing surface between the lamp body and the cap assembly. Glue the cap assembly to the body of the lamp.

Lamp Hardware

Most towns have a lamp specialty house for electrical and decorative hardware. Pick a fixture that's to your liking. I lucked out when my wife accidentally dropped a heavy brass shade nut on a thin glass lamp body. I don't suggest this method for everyone!

Coordinate your finish with your body panel treatment. Be creative and have fun—that's no mystery. PW

This photo suggests a possible panel treatment—using vellum to diffuse the light. Note the notch in the cap flange for the wire.

photo by author

Calendar

Events of Interest to Woodworkers

If your group is having an event you would like other woodworkers to hear about, please send us all pertinent information at least three months before the opening date. We will publish it for you in *Calendar* free of charge.

California

Woodworking Show: (9/25-27), San Mateo Expo Center, San Mateo, CA
Contact: Roth Exposition Group, 19th South B St., Ste. 11, San Mateo, CA 94401. Tel. 415-340-9767

Carvers Show: (9/19-20), 15th Annual Show of California Carvers Guild, Coast Union High School, Santa Rosa Rd., Cambria, CA
Contact: Hans Koch, 1615 Newhall, Cambria, CA 93428. Tel. 805-927-1750

Colorado

Furniture Workshops: Sculptural Woodcarving (8/10-21), Advanced Furniture Making (8/10-28). Anderson Ranch Arts Center, P.O. Box 5598, Snowmass Village, CO 81615. Tel. 303-923-3181

Connecticut

Boat Building Workshops: Adirondack Guideboat (8/17-22), Ultralight Boat (8/24-28), Brookfield Craft Center, Inc., P.O. Box 122 Brookfield, CT 06804. Tel. 203-775-4526

Hawaii

Woodworking Festival: (8/21-23), Neal Blaisdell Convention Center, Honolulu, HI
Contact: Roth Exposition Group, 19th South B St., Ste. 11, San Mateo, CA 94401. Tel. 415-340-9767

Illinois

Craft Show and Flea Market: (10/3), Knights of Columbus Hall, East Gillespie, IL 62033
Contact: Joyce Norris, Illinois Valley Economic Development Corporation, 501 Mounds St., Jerseyville, IL 62052. Tel. 618-498-9521

Hardware Show: (8/16-19), 47th Annual National Hardware Show, McCormick Place Complex, 23rd St. and Lakeshore Dr., Chicago, IL 60616
Contact: Pat Dolson Association Expositions and Services. Tel. 203-325-5099

Building Products Exposition: (8/14-17), The National Building Exposition and Conference, Hyatt Chicago Exposition Center, 151 East Wacker Dr., Chicago, IL
Contact: Pat Dolson, Association Expositions and Services. Tel. 203-325-5099

Woodworking Show: (9/18-20), Chicagoland Woodworking Show, Odeum, North Hall, 1033 N. Villa Ave., Villa Park, IL 60181. Tel. 800-826-8257

Massachusetts

Arts and Crafts Show: (9/26-27), The Centrum, Worchester, MA
Contact: American County Crafts and Folk Art Shows, Box 326, Masonville, NY 13804. Tel. 607-265-3230

Woodcarving Lecture: (10/4), With Dr. Howard K. Suzuki at New England Wood Carvers Inc., American Legion Hall, Great Road, Rt. 4, Norton, MA 02766-3107. Tel. 508-649-6279

Minnesota

Woodcarving Workshops: Relief Carving, Songbirds, Birds of Prey, Fish, Small Animals, Chip Carving, Marquetry and Caricature (8/4-15), Villa Maria Woodcarver's Workshop, Old Frontenac, MN
Contact: Villa Maria Woodcarver's Workshop, Box 37051, Minneapolis, MN 55431. Tel. 612-827-6590

Woodworking Show: (10/2-4), Twin Cities Woodworking Show, Minnesota State Fairgrounds, Empire Commons Building, Snelling and Como Avenues, St. Paul, MN 55108. Tel. 800-826-8257

Missouri

Wood Show: (9/12-13), Wonders of Wood, St. Peters Cultural Art Center, 3960 Mexico Road, St. Peters, MO
Contact: Danny Cook, St. Peters Woodworkers Guild, 2851 Park Valley Dr., St. Peters, MO 63376

Nebraska

Miniature Show: (9/12-13), Miniature Show and Sale to benefit the future Midwest Miniature Museum in Omaha, Ramada Hotel Central, 7007 Grover St., Omaha, NE
Contact: Edna H. Perkins, 806 Hogan Dr., Papillion, NE 68046. Tel. 402-339-5071

New Jersey

Arts and Crafts Show: (9/19-20), Anderson Park, Upper Montclair, NJ
Contact: Rose Squared Productions, Inc., 12 Galaxy Court, Belle Mead, NJ 08502. Tel. 908-874-5247

New York

Woodworking Festival: (9/11-13), Erie County Fairgrounds, Buffalo, NY
Contact: Roth Exposition Group, 19th South B St., Ste. 11, San Mateo, CA 94401. Tel. 415-340-9767

Craft Exhibition: (8/13-11/8), Contemporary Studio Exhibition, American Craft Museum, 40 West 53rd St., New York, NY 10019. Tel. 212-956-3535

Woodworking World Show: (10/2-4), The 5th Annual New York Show, Rockland Community College, 145 College Rd., Suffern, NY 10901
Contact: Woodworking World Show information line: 800-521-7623

North Carolina

Wood Workshops: Side table (8/17-28), Chair from a tree (8/31-9/4), Penland School, Penland, NC 28765. Tel. 704-765-2359

Workshops: Ladderback Chairmaking (8/17-22), Japanese Woodworking (8/31-9/4), Crafts and Chalet Tour of Switzerland (9/29-10/8), Country Workshops, 90 Mill Creek Rd., Marshall, NC 28753. Tel. 704-656-2280

Woodworking World Show: (9/25-27), 8th Annual Carolina Show, Omni Durham Hotel, Durham, NC
Contact: Woodworking World Show information line: 800-521-7623

Folk School Workshops: Woodcarving: In the Round (8/16-22), Caricature (8/23-29), Relief (8/30-9/4), (9/6-11) & (10/4-10), Hound Dog (9/11-13), Song Bird (9/20-26) Indian or Mountain Man (9/27-10/2). Woodturning: Basic (9/27-10/2). Woodworking: Rustic Chair (8/16-22), Windsor Chair (8/23-29), (8/30-9/4), (10/18-24), Shaker Box (10/30-11/1). John C. Campbell Folk School, Rt., Box 14-A, Brasstown, NC 28902. Tel. 800-562-2440

Ohio

Woodworking Festival: (9/25-27), Ohio State Fairgrounds, Columbus, OH
Contact: Roth Exposition Group, 19th South B St., Ste. 11, San Mateo, CA 94401. Tel. 415-340-9767

Woodworking Show: (9/11-13), Greater Columbus Woodworking Show, Ohio Expo Center, Lausche Building, 600 E. 17th Ave., Columbus, OH 43211. Tel. 800-826-8257

Pennsylvania

Pennsylvania Crafts Festival: (9/12-13), Grange Fairgrounds, Wrightstown, Bucks County, PA
Contacts: United Craft Enterprises, Box 326, Masonville, NY 13804. Tel. 607-265-3230

Tennessee

Woodturning Workshop: (8/10-14), Arrowmont School of Arts and Crafts, 556 Parkway, Gatlinburg, TN 37738-0567. Tel. 615-430-4101

Wood Seminar: (9/25-26), 4th annual wood products seminar, Norris, TN
Contact: Bill Parrish, TVA Forestry Building, Norris, TN 37828. Tel. 615-632-1656

Texas

Trade Show: Los Amigos del Mesquite Annual Convention, Competition and Trade Show (9/24-27), Wyndham Hotel, Austin, TX
Contact: Herb Nordmeyer, Los Amigos del Mesquite, P.O. Box 68, Knippa, TX 78870

Virginia

Crafts Festival: (9/11-13), Sugarloaf's 12th Annual Virginia Crafts Festival, Prince William County Fairgrounds, Manassas, VA
Contact: Deann Verdier, Sugarloaf Mountain Works, Inc., 200 Orchard Ridge Dr., Ste. 215, Gaithersburg, MD 20878. Tel. 301-990-1400

Vermont

Woodcarving Classes: Beginning Figure Carving (8/10-14), Intermediate Figure Carving (8/17-21), Fletcher Farm School for the Arts and Crafts, RR 1, Box 1041, Ludlow, VT 05149. Tel. 802-228-8770

Washington

Woodworking Festival: (10/2-4), Seattle Trade Center, Seattle, WA
Contact: Roth Exposition Group, 19th South B St., Ste. 11, San Mateo, CA 94401. Tel. 415-340-9767

Washington D.C.

Woodworking Show: (9/25-27), Washington D.C. Woodworking Show, D. C. Armory, Main Hall, 2001 E. Capital St., Washington D.C. 20003. Tel. 800-826-8257

West Virginia

Craft Workshops: Basic Cabinetry (8/3-7), Twig Furniture & Weaving (8/17-21), Crafts Center, Cedar Lakes Conference Center, Ripley, WV 25271. Tel. 304-372-7005

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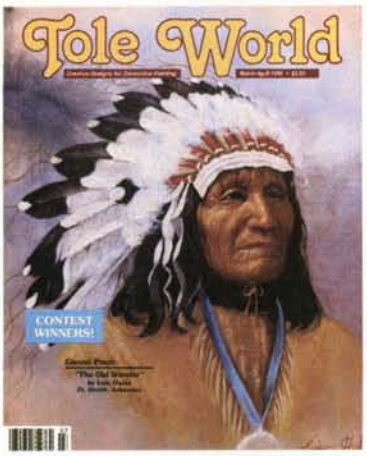

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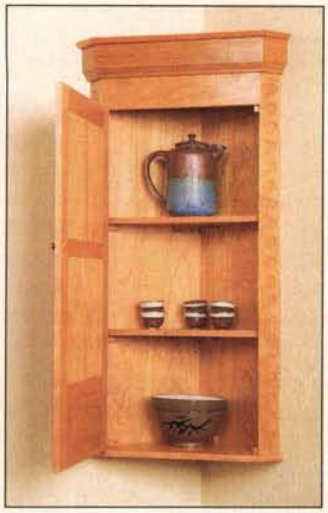

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The Finishing Forum

by Tom Wisshack and Dick Fitch

The Finishing Forum is an ongoing discussion about the art of wood finishing. If you have a question or a problem to solve, we'd like to help. If you have a tip or secret to share, or you recently tried a new product, write to: The Finishing Forum c/o *P.W.*, 1320 Galaxy Way, Concord, CA 94520. Letters may be edited for publication.

A Sticky Glue Problem

What's the best adhesive to use when one of the surfaces is painted, and the other is clean, freshly–sanded wood? I know you shouldn't use glue on a painted surface, but in this situation I have no other choice.

Frederick Apfel, Jr.
Clinton, NJ

Your problem is not an unusual one. It's true that adhesives used in furniture construction are not appropriate for nonporous, painted surfaces. Neither animal protein glue nor the popular aliphatic, polyvinyl acetate glue will adhere properly to a painted surface.

The two materials I've used for this are epoxy and resorcinol. Either one does an excellent job. Both are two part adhesives and must be measured carefully and thoroughly mixed for the best results. Both components of epoxy—resin and hardener—are liquid and may be a little easier to measure and handle. Resorcinol is comprised of one–part liquid and one–part powder, and may be a little harder to work with. In either case, just follow the manufacturers directions.

You should be aware of three important properties of these products. The bond to a painted surface is only as strong as the strength of the paint's bond to its substrate. These adhesives, once cured, are irreversible; the bond is permanent and cannot be steamed or soaked to take the piece apart. Both materials have a pot life—after which it can no longer be used. The pot life varies from brand to brand, but it is wise to mix only enough to do the job with a little to spare.

There are a number of brands available for each type of adhesive. Your local hardware, paint, or marine supply store should have one or both of these and can advise you as to which brand to choose for your project. The brands I keep on hand are Durcisseur Epoxy Glue, produced by Industrial Formulators of Canada, Ltd. and DAP Weldwood Resorcinol Glue, produced by Beecham Home Improvement Products, Inc., Dayton, Ohio 45401. You will be able to find these products or their equivalents at many local outlets.

If your project is small, there are epoxy glues available in small tubes, some of which will set in minutes. These are more than adequate for many projects.

Dick Fitch

Faux Finish

I'm a weekend refinisher who recently had the great pleasure of refinishing an antique dresser made sometime around 1850. I was contacted after a friend had attempted to refinish the dresser, and accidently removed the elaborate false graining design from the top drawer front.

I was able to reproduce the drawer front by using a trial–and–error method based on a small amount of information I found on false graining techniques. I am trying to locate more information on this process, as well as the best type of paints to use as I plan on doing some false graining on a sideboard that I'm building.

Mike Day
Alexandria, KY

Tom Wisshack *makes and restores fine furniture in Galesburg, Illinois.*
Dick Fitch *is the resident alchemist at The Bartley Collection, Ltd.*

Our Readers Respond

Easy Ebony

I was very interested in your explanation of how to produce a black, ebonized finish without using paint (*PW*–May 92). It reminded me of my experiences in Kenya and Tanzania, where I saw woodcarvings being made. Some of the wood was actually ebony, but much of it was a fairly soft, light brown wood. The carvings were of animals and Masai warriors and other crafts which are found in import stores where African items are sold.

For the African craftsman, the application of a very bright and shiny ebony finish on their products was simple and inexpensive. They used black, liquid shoe polish followed by a coat of paste wax. Thai people also use this same, lower cost method, as evidenced by a trip I made to Thailand in 1989. Perhaps your readers would like to experiment with this idea before buying what sounds like an expensive alternative.

Roger A. Carlson
Winona, MN

Proper Photo Protection

I'd like to respond to a question posed by Aaron Armstrong in the May issue of *Popular Woodworking* regarding the protection of his photo work.

There are a number of products on the market designed to protect the surface of a photo. Some are brushed on while others are applied by spraying. They can be purchased in various sized spray cans at most photography stores in finishes from glossy to matte. The sprayed finishes dry in four to eight minutes under most conditions.

The labs that serve professional photographers can apply a clear, glossy, permanent film to the surface of a print. This helps prevent fingerprint damage and is easy to clean. If you want a deeper build up over your picture, you can apply a coat of epoxy resin.

Charles Pulsipher, Glendale, AZ

From the photo you enclosed, the dresser is a style known as American Eastlake, and actually dates closer to the end of the 19th Century—about 1885. The style is named for Charles Eastlake, an English designer who was associated with the Arts and Crafts Movement. Your rough date of 1850 was close, but in the furniture industry a lot of changes can take place in 35 years.

It was originally part of a bedroom set that would have included a dresser, bed, washstand and perhaps a rocker. Furniture of this type was mass–produced, although factories still employed a certain amount of handwork. The drawer fronts, one of which you had the pleasure of restoring, were painted to resemble burl or swirl walnut, which was a fairly common practice at the time.

For information on the technique of false–graining, I suggest you pick up a copy of Early American Life *magazine and make an inquiry as to which back issues contain information on this subject. Other, more comprehensive literature exists, but you'll have to research it on your own at the library. Many woodworking tool catalogs have a section devoted to books—Garrett Wade and Woodcraft Supply would be good places to start.*

I've used various techniques in the past to do false graining—but this is proably the most straightforward. Consider the amount of contrast you want between the ground and glaze. For the ground, I suggest a shade that's roughly equivalent to yellow ochre. You can mix artists oilcolors, with turpentine, a little boiled linseed oil and a few drops of Japan drier (this may darken your color) for a traditional ground coat. Although it's slightly unorthodox for faux finishes, I prefer using latex to oil paint because it dries faster and is more reliable with no difference in appearance. Your local paint dealer can mix up a quart of the desired shade.

Seal the raw wood with a wash coat of thinned shellac to prevent the latex from raising the grain. Apply a couple of coats of the ground, let it dry overnight, then seal the surface thoroughly with shellac. This isolates the ground so you can safely experiment with the glaze without it sticking permanently to the ground. The shellac should be rubbed down with fine steel wool when dry.

You're now ready to mix the glaze coat. By intermixing artist oils, you'll be able to come up with a contrasting tone—preferably brownish–black with a hint of red. With a little experimentation, you'll be able to make the mixture semi–transparent by adding small amounts of both linseed oil and turpentine. Flow a coat onto your horizontal surface and work it with either a brush, graining comb, corn–cob, sponge, wor whatever applicator gives you the desired effect.

Let the surface dry for several days, then apply the top coat. Apply another wash coat of shellac. It won't dissolve the glaze coat because its solvent is alcohol, not turpentine. For an antique effect, spice the white shellac with a bit of orange shellac to give the surface a warm, amber tone. Use the orange shellac sparingly and thin it adequately. When your surface is dry, lightly sand it with a piece worn, 600–grit paper and apply a coat or two of your favorite varnish.

When the varnish is dry, rub down the surface with a pad of #0000 steel wool, saturated in mineral oil. For a higher gloss, use a soft cloth and rottenstone with oil. Remove all traces of the oil and abrasive. The more time you spend on the final finish the better—you want the illusion of looking into the actual wood grain through a patina. To further the affect of a patina, try applying a coat of a tinted paste wax—available in several shades from Liberon Finishing Supplies, P.O. Box 86, Mendocino, CA 95460. Before buffing it off, try dusting the surface with soot from an old furnace or chimney—traces of the wax and soot will remain to further the effects of age.

What I've described is only one of many approaches to false graining—be open to experimentation, and use whatever tools and techniques give you the results you're after.

Tom Wisshack

Band Saws

Selecting a band saw today can be a chore because the market offers many machines spanning a wide price range. Start by considering the main uses you have for a band saw—your choices should decrease dramatically. Do you focus on tight, intricate cuts with complex curves in thin stock, or do you look to the bandsaw to produce affordable veneers for marquetry work? Perhaps you want a machine that handles both applications with the same courage. Let your needs guide you in choosing the right tool.

First consider a machine's cutting depth capacity—the distance between the table and the bottom of the upper guide when it is fully raised. This measurement will let you know exactly how thick a piece you can cut on a particular machine. If you're going for deep turning blocks, your needs will be different than if you just do scroll work on 8/4 stock.

Second, review throat capacity—the distance between the rear frame and the blade. Sheet goods or wide cuts require a saw with a wider throat so this might become an important factor in your purchase decision.

Finally, you need to ascertain blade size compatibility with your intended applications. For really tight scroll work, an 1/8" blade might be your best choice on shallow lumber, but if you're resawing, a 3" blade provides needed support on deep cuts. A good rule of thumb is to use the widest blade acceptable for the application. That way, you'll get support without sacrificing intricacy.

***Sanford Wilk**, a builder and organic architect in Boston, Massachusetts, heads a team of craftsmen who evaluate tools under actual working conditions.*

AMT Model 4113

This Taiwanese machine is one of many generic units offered on the market. Some crudity in parts assembly and machining was evident while we were putting it together. Not everything fit together just so—a little coaxing was required. It was a bit more primitive than other machines in our test.

Areas in need of improvement include trunnions graduated by means of a decal instead of a stamped metal plate, and a blade guide mechanism that sits a bit askew on the underbelly of the table. These and a couple of other items needed to be tweaked into accuracy and correctness.

On the inside of the machine, you'll find

News and Notes

Need to sand hard–to–reach areas? Mitchell's flexible cords and tapes can slip into those narrow slots, grooves and holes in metal, plastic or wood. Mitchell's abrasive cords are available in 0.012" to 0.150" diameters and the tapes come in 1/16" to 1/4" widths. Both are supplied on handy tape-like spools. (E.C. Mitchell Co., Inc. 88-90 Boston Street, Middleton, MA 01949. Tel.508-774-1191)

Skil Corporation has introduced a 6 amp, 12,000 RPM professional plate joiner kit that uses wooden plates (biscuits) for more accurate and durable wood joining. The plate joiner features a double ball bearing blade support, plus 3–position depth stop, depth–of–cut indicator and highlighted scales and center line for cutting accuracy from the 12–tooth carbide blade. (Skil Corporation, 4300 West Peterson Ave., Chicago, IL 60646. Tel.312-286-7330)

Also new from Skil, the Model 3400 10" table saw, featuring a self-aligning, quick-set rip fence, a 13 amp motor with improved controls, miter gauge and a larger table. Plus this table saw has dust collection capability and wrench storage. (Skil Corporation, 4300 West Peterson Ave., Chicago, IL 60646. 312-286-7330)

Porter-Cable presents a new 3"X 21" variable speed belt sander. The 850 to 1300 SFPM variable speed feature is perfect for sanding woods at slower speeds, allowing the user to control the stock removal rate—ideal for blending surfaces or inlay applications. The sander's center of gravity is positioned directly over the platen, providing efficient sanding with less tool tipping for a smoother finish. (Porter-Cable Corporation, 4825 Highway 45 North, P.O. Box 2468, Jackson, TN 38302-2468)

aluminum wheels which exhibit more vibration than cast–iron. The overall weight of cast–iron wheels absorbs more machinery vibrations, and we recommend that you don't use aluminum for these particular parts.

This machine is relatively simple to use. The saw incorporates friction–type guides that can be adjusted by means of a knob requiring no special tools to operate. Another plus here that might be even more useful for beginners is a built–in scale for blade tension settings. It's not a cure–all and it can be thrown off if your blade is stretched or a bit long, but it's a starting point for those who are not familiar with band saws.

The AMT has plenty of power for its class and is smooth and quiet. Despite its machining shortcomings, it does reasonably well and features a cast–iron table with a full–sized ¾" miter gauge slot. (American Machine & Tool, Fourth and Spring Streets, Royersford, PA 19468. Tel. 215-948-3800)

AMT 4113

Delta Model 28-283

The Taiwanese imports tested here borrow their engineering from the overall design of this unit. It features a cast–iron C–frame, but like its Taiwanese offspring, the wheels are aluminum and suffer the same vibration problem as the AMT unit.

If our whole evaluation was based on ease of set–up, Delta would ace the testing. The machine features the finest blade guide system that comes standard, and the micro–adjust knobs take the hassle out of alignment. Unfortunately, our test unit wasn't quite as smooth as the General in terms of overall performance. Still, we have to say that the machining of trunnions and other aligning parts is superb.

The enclosed base protects the motor from sawdust, and the unit has a collection chute up front. The switch is located on the riser block for easy access, and the miter gauge slot is full–sized (¾"). (Delta Intl. Machinery Corp., 246 Alpha Dr., Pittsburgh, PA 15238. Tel. 800-438-2486)

Delta 28-283

General Model 490

The folks from the Great White North have consistently produced machines that score well in our testing and this one's no exception. It uses more cast–iron in its construction than many of the other machines combined. Its wheels are cast–iron, as is the table and one entire half of the machine itself. No wonder it's so smooth running and vibration free—it's built like a '49 Cadillac.

The unit's blade guide system is almost as good as the Delta's but lacks a micro–adjust knob for the lower guides. On the other hand, you get more capacity with this machine, since it's a 15" model, versus the typical 14" saw. The blade capacity is also greater since the General will take 1" blades while the Delta is limited to ¾"—meaning additional accuracy for the Canadians with respect to resawing.

Though the rip fence and miter gauge are optional here, they both came through with our test unit and we were very happy to see them. Both are better than 99% of those found on cabinet–grade table saws. If you purchase this machine, we recommend an additional investment in these two accessories. They'll last a lifetime.

One recommendation we can make to the manufacturer is to add dust–collection capability—now absent from an otherwise

General 490

brilliant machine. (General Manufacturing Co., 835 Cherrier St., Drummondville, Quebec, CANADA J2B. Tel. 819-472-1161)

Hitachi Model CB75F

This machine has almost three horses worth of raw power. Tim Allen (on ABC's *Home Improvement*) would be so inspired by this machine that he might actually omit his traditional request for "more power." Believe us, it's got more than plenty. We tested the unit's resaw capabilities with a 10" X 3" piece of hundred–year–old chestnut heartwood. The Hitachi resawed it as fast as we could push it through with just one finger for drive. The 3" blade that comes standard with this saw is stellite–tipped and is perfect for veneer resawing (and cutting cars in half).

The saw can handle blade sizes from the 3" resaw type all the way down to ¼" scroll version, but you need to purchase and install additional blade guides at certain intervals. Some other noteworthy features include a full–sized 4" dust chute, cast–iron wheels with brass brushes to keep them clean, and even a hand–brake for convenience and safety.

The rip fence and the guide post both run on rack–and–pinion gearing for superb accuracy and adjustability. You'll also find the most elaborate blade tensioning/tracking mechanism we've ever seen. The hand wheel is oversized for easy adjustment, and the tracking knob is beefy with a spring to assist it. The tensioning scale is easy to read and well graduated so that expert and novice alike can benefit.

On the down side, we missed having a miter gauge slot, and we didn't think that a masterpiece like this needs to be so noisy. Still, if you're looking for the best you can get, this could be the one. (Hitachi, 4487 E. Park Dr., Norcross, GA 30093. Tel. 404-925-1774)

Makita Model 2114C

Ryobi has dropped their bandsaw line, but the folks at Makita persist. This is an electronic, three–speed saw with a few nifty features. First off, the three speeds are generated through the motor, not by jumping belts on pulleys. The adjustable speeds are nice when it comes to cutting different material types, so if you're looking for a multi–lingual saw that doesn't require you to remove guards and play with pulleys, then this is a valid choice.

It's a 14" machine, but its features are typical of the next class up. It's 1" blade capacity, like that of the General's—as well as a 7⅛" maximum cutting height under guides—gently reminds us of Japanese efficiency. A few other niceties include scrapers on the wheels to keep them clean, and a dust–chute for user convenience and safety.

On the flip side, like Hitachi, the Makita sorely lacks a standard miter gauge slot, and it rivals the other Japanese entry in the loudness category. We don't want to knock this unit too much, though, since it's unusually flexible, and runs smoothly with consistent power. (Makita, 14930 Northam, La Mirada, CA 90638. Tel. 714-522-8088)

Numark Model 20-334

This import looks a lot like a Delta band saw. It features the same cast–iron C–frame, but like most copies it shows a flaw or two. The Taiwanese should have taken more time replicating the Delta blade guide system, since that seems to be the weakest point here.

Aside from the guide system, several other features are almost identical to the Delta saw. These include a nice blade tracking/tensioning system and a 14" cast–iron table with a full–sized miter gauge slot. Other overall specs are typical to Delta—horsepower, blade capacity and blade speed exactly duplicate the mother machine. A lot of what we said about AMT goes here, too. The aluminum wheels and lack of dust collection chute stand out as drawbacks, but this machine also runs

Hitachi CB75F

with smooth power, and that makes it a viable option. We wouldn't be surprised if this unit came off the same assembly line in Taiwan as the other Taiwanese imports we tested. (Numark, 13306 W. 99th St., Lenexa, KS 66215. Tel. 800-899-8663)

Powermatic Model Artisan 043

This machine features a unique welded–steel box beam construction frame instead of cast–iron. This substitution seems to be a sturdy alternative, and the overall design even looks a little cleaner. However, the instructions don't tell you how long the replacement blades should be. The saw can accept blades from ⅛" to ¾" (standard for the 14" variety), but we had to research the fact that the unit accepts a 95" to 98" blade. A simple decal installed behind the cover would do a world of good.

The blade guides are all ball bearing (both upper and lower) and easily adjusted with an Allen wrench. Perhaps what impressed us most was the quality control methods practiced here. Though this is a Taiwanese unit, Powermatic apparently has gone to great lengths to ensure that their reputation is upheld. It shows in the quality of parts and systems ranging from castings to tracking controls.

This machine has brass brush wheel cleaners and the under guide capacity is a full 7½" versus the typical 6" to 6¼" found on other saws in this class. The square cast–iron table is nicely sized at 15" with a full–sized T–slot so that your miter gauge is accurate even when extended.

The power switch location is conveniently located on the riser. When you consider the other competitors and weigh this unit against them, you end up about the middle of the road. The power is sufficient for the capacity, and cutting accuracy is equivalent to, or better than its Taiwanese counterparts. (Powermatic, McMinnville, TN 37110. Tel. 615-473-5551)

Numark 20-334

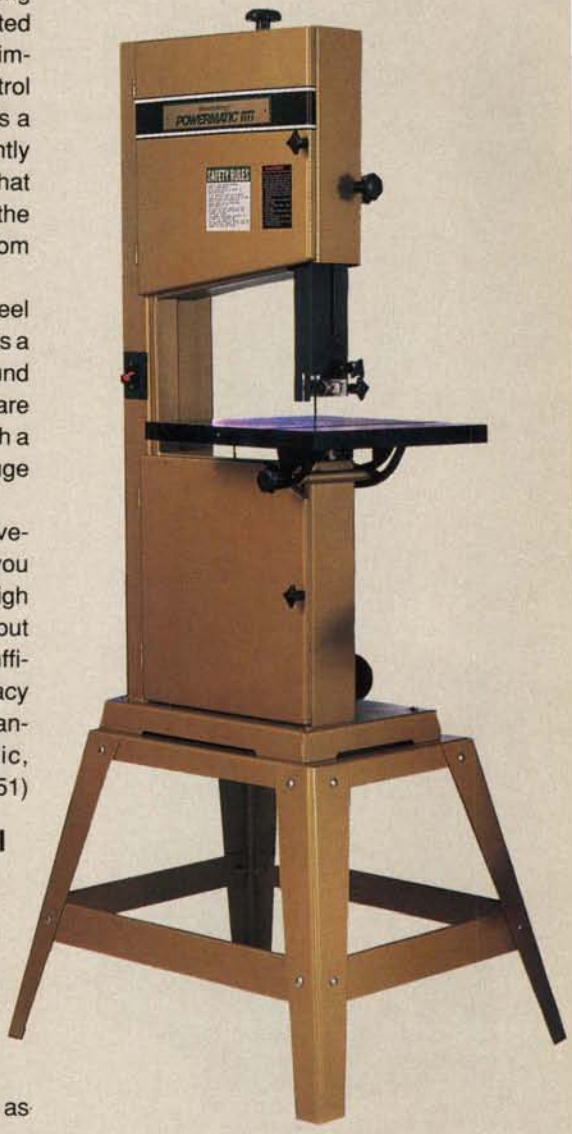
Power Tool Specialists Model 8155A

Once again, we appear to be in Delta knock–off mode. This is a cast–iron C–frame that runs a little smoother than the average import. The unit still suffers the handicap of aluminum wheels, so it doesn't run quite as smoothly as it could.

Most of the specs for this saw are identical to the Delta unit including blade speed, horsepower and blade capacity. The saw also offers a ¾" miter gauge slot common to most Taiwanese imports. The unit does leave the Delta arena when it comes to set–up, however, and you can expect a more complicated and time–consuming alignment process with respect to guide block adjustment. You won't find any thumbscrews or micro–adjust dials—you'll need an Allen wrench and a steady hand to attain proper results.

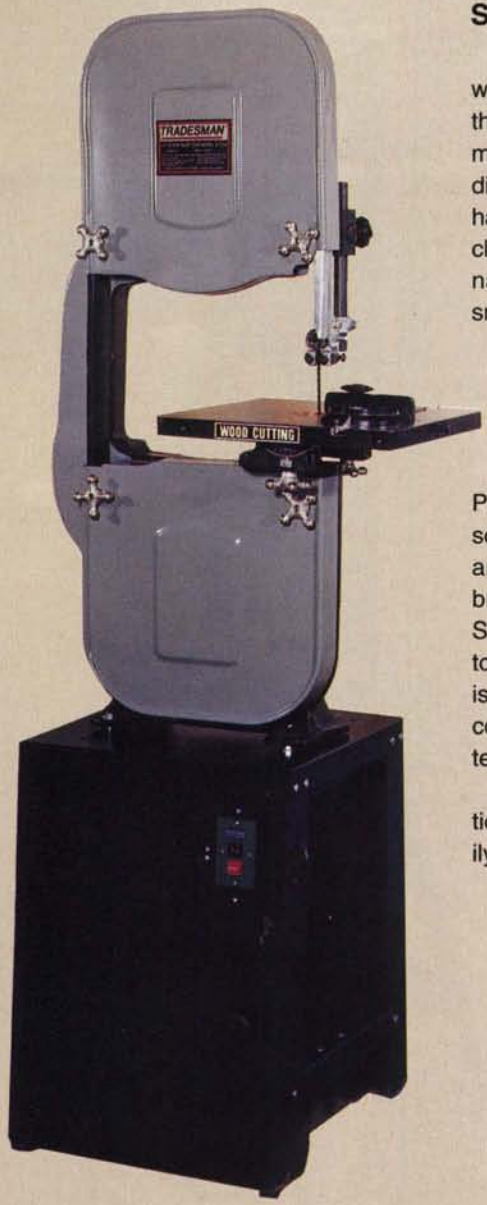
As far as power goes, this saw runs about equal with the other units in its class, and it makes about the same amount of noise. Once you take the time to set up the finicky guide blocks and make other adjustments, you'll find that this unit runs very well. (Power Tool Specialists, 3 Craftsman Rd., E. Windsor, CT 06088. Tel. 800-243-5114)

Powermatic Artisan 043



Reliant Model EE166

The folks at Trend–Lines bring this unit into the country. It's basically the big brother to the other Taiwanese machines we tested. It's extremely similar in design and construction, but on a larger scale, and in a few spots takes quality a step further. The power switch is located on the riser at an easy–access location. Another feature that puts this tool above the typical import is the 3–speed capacity it shares with Makita. It requires jumping belts and guard removal, but depending on your applica-



PTS 8155

tion, the task may be worth the hassle.

Like some of the other larger machines, it does accept a 1" blade which adds to stability in resawing. The switching control is also a bit better quality and should provide a longer life than the average import switch. Vibration is the major complaint. Though the machine itself runs *rather smoothly* and quietly, the vibration transmitted to the blade guard and the wheel guard are downright irritating. Given the proper amount of fine–tuning, these problems could be eliminated.

One thing we expected from this saw was a dust–collection port, which it lacks. It does come with a rip fence, however. (Trend–Lines, 375 Beachum St., Chelsea, MA 02150. Tel. 800-767-9999)

SCMI Model S45

This is a 17¼" throat capacity machine with a whopping 10" of clearance under the guides. The unit incorporates an almost 20" square work surface which makes difficult cuts on large patterns easier to handle. The electrical controls are first class, and the cast–iron wheels are dynamically balanced so the unit runs smoothly—even under a cutting load.

The machine's extra–heavy weight actually helps; the overall mass of the bottom half of the tool seems to buffer the user from vibration. The frame is welded box construction similar to the Powermatic model, but on a much larger scale. Dust collection is built–in, as are wheel cleaning brushes. The brushes are kind of low–tech for SCMI—they're paint brushes cut down to fit into the frame. Still, what's important is whether or not they do the job, and we could find no problem with this unusual technique.

The upper blade guides are worth mentioning since they adjust easily and speedily. Anyone can do it in seconds. The lower guides are a little more difficult due to the limited access caused by the table getting in the way just a bit.

SCMI S45

Raw power versus capacity is excellent on this machine. We performed our old–chestnut resawing test, and though it's not the wood slicer that the Hitachi is, this machine still handles the job well. One last noteworthy item here is that this is a 230 volt machine, so you might need to figure additional wiring into your net cost. (SCMI Corp., 5933-A Peachtree Industrial Blvd., Norcross, GA 30092. Tel. 404-448-1120)

Reliant EE166

Sears Models 24851 & 24395

These saws are made exclusively for Sears. The 24851 is the smaller unit and has some pretty unique features. First of all, it's a 12" saw with a nifty tilting head design. Rather than offering a tilting *table*

Band Saws										
Maker	Model	Capacity	Max Cut Height	Blade Capacity	Table Size	HP	Blade Speed	Weight	Rating	List Price
AMT	4113	14"	6"	1/8" – 3/4"	14" X 14"	.75	3000	163	7.5	$376
Delta	28-283	14"	6 3/8"	1/8" – 3/4"	14" X 14"	.75	3000	224	9	$910
General	490	15"	6 3/4"	1/8" – 1"	15" X 15"	1	3000	295	9	$1050
Hitachi	CB75F	14"	11 13/16"	1/4" – 3"	20 5/8" X 19 1/8"	2.8	1200	309	9.5	$2694
Makita	2114C	14"	7 1/8"	1/4" – 1"	14" X 14"	1.8	466/700/933	136	8.5	$1560
Numark	20-334	14"	6"	1/8" – 3/4"	14" X 14"	.75	3000	195	8	$540
Powermatic	043	14"	5 1/2"	1/8" – 3/4"	15" X 15"	.75	3000	154	8.5	$815
PTS	8155A	14"	6"	1/8" – 3/4"	13 3/4" X 13 3/4"	.75	3000	172	8	$509
Reliant	EE166	16"	10 1/2"	1/8" – 1"	16" X 16"	1.5	1000/1600/2800	231	8.5	$499
SCMI	S45	17"	10"	1/4" – 1"	19 1/2" X 19 1/2"	1.8	3000	330	9	$1495
Sears	24851	12"	6"	1/8" – 1/2"	23" X 26 1/2"	1.125	1500/3000	149	8.5	$449
Sears	24395	18"	11 3/4"	3/16" – 1"	18" X 19"	2	270/700/1480/3800	249	9	$1499

like the other test units, the whole head mechanism tilts on this baby. This offers an advantage when cutting large pieces since you don't have to work against gravity on an angled workpiece. The Sears unit always keeps the stock on a horizontal plane which makes better sense.

The work surface also gets points because of its ominous size—intricate cuts are easier to handle. The digital readout tells you the degree of bevel or the angle of the head. It also advises you of blade speed since the tool is a two–speed machine, and it will also give you a reading on blade tension. This digital readout is more than just a gadget; it reduced set up time significantly.

This isn't the easiest machine to assemble, however, and you might end up feeling like a contortionist trying to twist arms, hands and fingers in unnatural ways.

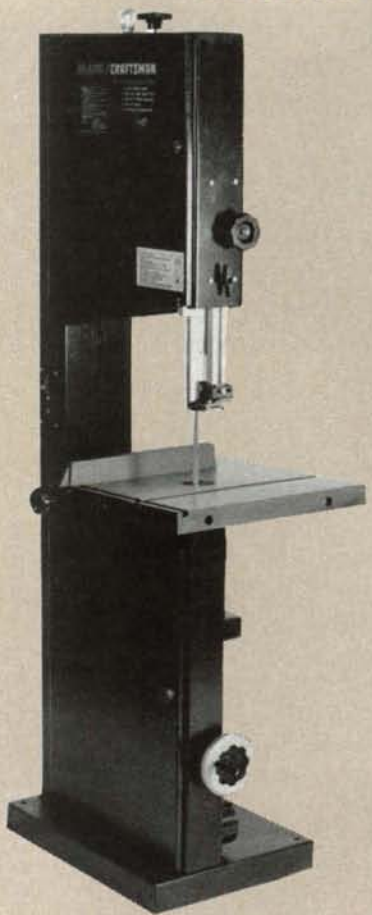
Additional features include a built–in work light that illuminates the entire table, as well as a dust collection chute and a full–sized miter gauge slot. Power–wise, this unit offers plenty of muscle.

At the other end of the Sears spectrum is the model 24395. This is a big 18" unit with incredible power. The blade range spans 3/16" to 1", and with its four speed options, you can cut metal as well as wood. To change speeds, you have to jump pulleys with the belts, but that's not a problem here, thanks to clear access to the pulleys and a nice belt–tensioning crank. The table is heavy duty cast iron and is large enough to handle big jobs. The miter gauge slot is a full–sized T–slot for extra stability, and the unit includes a 4" dust collection chute. Like the Hitachi, the upper guide post is rack–and–pinion for smooth and steady adjustment. The upper guides are like the ones we liked in the SCMI model since they adjust easily and offer better blade control. Also like the SCMI, the lower guides are a bit difficult to reach. Once adjusted properly, however, they hold their tracking positioning quite well. You can get almost 12" of resawing room under the guides.

No matter what we did, we couldn't slow this machine down. It would be nice to have a blade tension scale for helping beginners, especially since the manual just gives a few rules of thumb. Still, this machine offers some heavy competition for the high–end. We look forward to seeing more Sears products dedicated to the serious woodworker.(Sears stores throughout the United States) PW

Sears 24851

Sears 24395



Eastern Spruce

by Ken Textor

This versatile softwood has been asked to provide everything from the base for an old–time chewing gum to sounding boards for grand pianos. Eastern spruces make up the backbone of the home–building industry east of the Mississippi. Though similar to their western cousins in some ways, they warrant a separate discussion because of their differing uses and mechanical properties. We'll look at Western spruces in a future issue of Popular Woodworking.

General Description

When you buy eastern spruce at the lumber yard, you could be getting any one of three distinct species—red, white, or black. Eastern spruces grow rapidly throughout the Northeast, and the Lake states, as well as in the Appalachian Mountains. They grow best in cool, rocky, upland soils, but you'll also find them near streams, rivers and even bogs. Their ability to regenerate quickly accounts for their widespread popularity throughout the years.

There is little variation in wood among the three species. It dries quickly, shrinking a lot initially but stabilizing dimensionally after a thorough drying. Compared to hardwoods, it is very light in weight, but only moderately light when compared to other softwoods. It is fairly strong, resilient and can be tough to break, but can also be very soft and easy to mar.

The three eastern spruces appear similar, though red spruce may have a more reddish cast in the growth rings. Otherwise, the color for both heartwood and sapwood is light cream, with dark brown knots that are often tight and very occasionally loose. Old growth spruce has tight growth rings, which accounts for its toughness. But *most of* the quickly grown spruce available today has wide growth rings and is not as tough.

Spruce is not rot resistant and should not be left exposed to the elements for more than a year or so. It is easily bent, particularly when green, and it contains sap pockets that can bleed a sticky gum when exposed in heated or sunny areas.

Next to pulp wood, Eastern spruce is most commonly used for house construction. Where readily available, all interior framing members—joists, studs, headers and the like—are made of spruce. It's also used to ship crates, paddles, oars, and industrial design patterns, and for sounding boards in musical instruments. Spruce has also been the backbone of the traditional Christmas tree industry, particularly red spruce. Black and white spruce's strong, stringy roots also serve a more esoteric function. Birch bark canoes are traditionally sewn together using these roots after they have been cleaned and split in half.

__Ken Textor__ works wood and writes about it in Arrowsic, Maine.

Working Properties

Of all the woods I use, spruce is the easiest to work with. Planing is usually free of problems, even around knots. Moreover, because the wood is so soft, in each pass through the planer you can usually take twice what you take off in planing a hardwood. Big useful shavings (for mulch or animal bedding) come off in the planer and make the shop smell like a Christmas tree. Few people have an allergic reaction to this wood.

Sanding requires more care than planing. The wood's softness allows a belt sander to dig hollow dips into the surface very easily. But planing is usually so effective that you can often go directly to a vibrating sander and avoid the problem of dips.

Cutting spruce is easy, provided it's well–dried. Green spruce is stringy when cut, leaving a ragged edge when ripping and cross–cutting. Turning spruce is not advisable. Its big grain, softness and widely–spaced growth rings make it very difficult to obtain a smooth, finished surface on the lathe.

Fastening spruce is a snap. A pilot hole is not necessary when nailing or using small wire screws (#8 or smaller). With larger screws, use a pilot hole one size smaller than the screw size to be sure the screw's teeth have plenty of material to bite into. When nailing, be aware that kiln–dried spruce is prone to splitting, particularly when nailing end grain. Also, since spruce is a softwood, use a nail set for surfaces that will show later on. Even a light hammer blow

on the wood can leave a nailing depression. Gluing spruce presents no significant problems. All the resin–based liquid glues work well. Epoxies, of course, need a porous surface for proper adhesion. Clamp carefully. Even if you use clamping pads, the pads themselves can leave a depression if you overtighten. Be sure extra glue doesn't dry in place, removing it may take off some wood in the process.

Finishing

Spruce is best finished with a stain. Paints, particularly latex, seem to have a hard time adhering to spruce. I suspect this may be due to the wood's tendency to absorb moisture during the damp seasons of the year. Also, paints don't cover the ever–present knots very well. You'll have to apply a pigmented shellac to the knots first so they don't bleed through the paint.

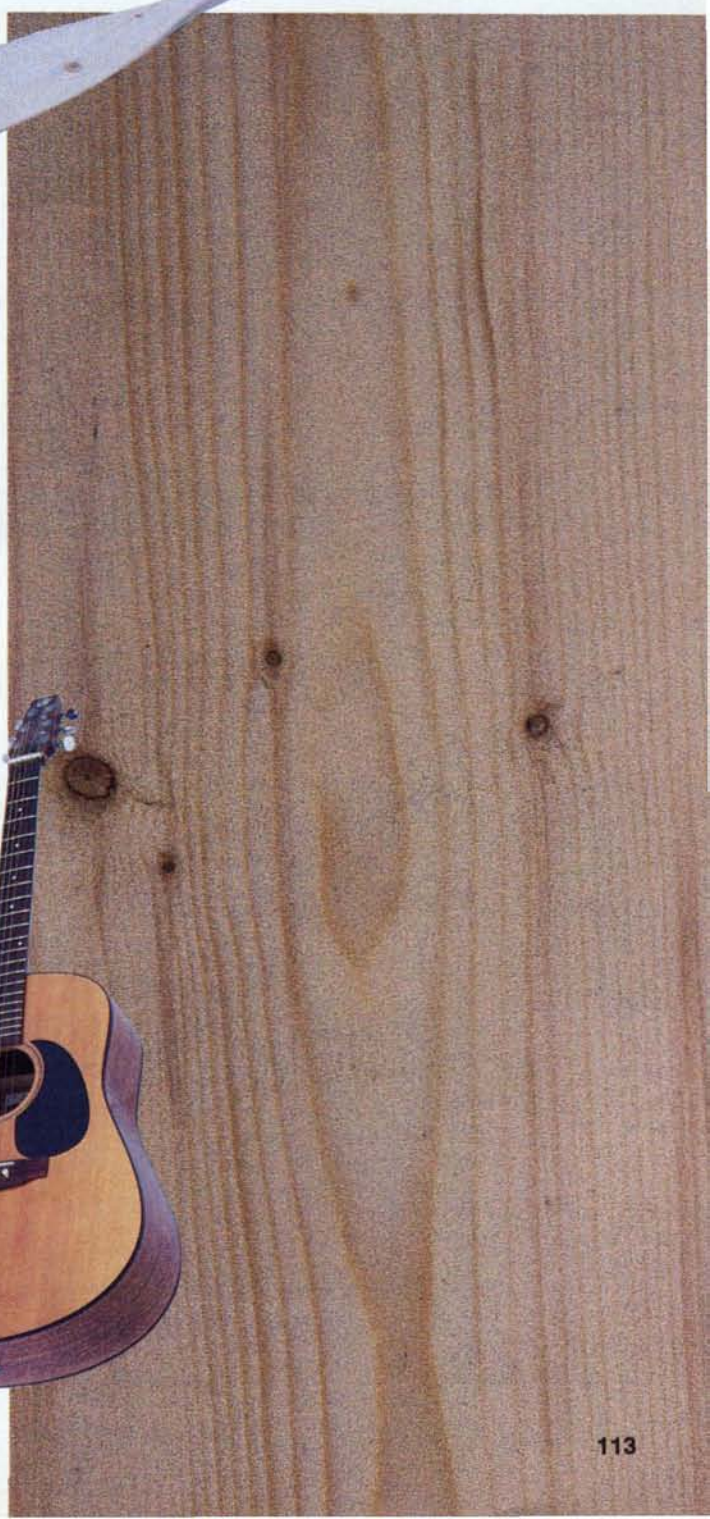
Varnishes and clear polyurethanes have the same adhesion problem as paints. Moreover, a clear finish yellows as the wood ages. That's because unfurnished spruce surfaces will turn a light brownish–yellow color over the years, eventually becoming gray if exposed to direct sunlight. And if the soft surface of spruce is dented, the underlying wood will stain gray by following the pattern of breaks in the clear finish, creating a varicose vein effect.

Availability

Woodworkers will find an abundant supply of spruce lumber where eastern spruces grow readily—in the Northeast, Lake states, and in the Appalachians. Large dimensional stock (up to 12x12) is always on hand, as well as standard two–by planks and one–by boards. I've never found a supplier of spruce plywood or spruce veneers.

Spruce is relatively cheap. If you're not too concerned about how clear the wood is, the price ranges from 40 cents to about a dollar per board foot. Dimensional lumber runs about 20 to 30% more. In most cases, though, you'll usually get construction grade lumber, which will have some knots in it. But they're generally tight, no bigger than a quarter and spaced so they won't impair the plank's strength.

Woodworkers will pay premium prices for knot–free wood with tightly spaced growth rings. This type of spruce is still used for sounding boards in musical instruments, and the price can run up to three or four dollars a board foot. Even if you use standard lumber store spruce, don't underestimate its sound–conducting properties. When I was building my house, I got a good deal on some 2x6 tongue–and–groove spruce flooring. The deal was even better, I thought, because if I used it for the second–story floor, it could double as the first floor's exposed–beam ceiling. Unfortunately, we discovered that even a whisper upstairs could be heard clearly downstairs. Particle board, padding and a heavy pile rug made only a small difference. Though I have played the piano—with its spruce sounding board for years—it was this woodworking experience that taught me what a truly remarkable wood spruce is. PW



by Paul Gerhards

Between the Fence & the Piano

Last summer I took some time off to rebuild a large section of my backyard fence. It was a bothersome chore that could not be put off any longer. And after severing two underground wires with my post–hole digger, my enthusiasm for the job was about nil.

But once I spliced the wires, set the posts in concrete, and cut the tops level, I was ready to nail on the 2x6 cedar cap rail. The first rail was to tie into the existing fence and run to the corner of the lot. I mitered one end, set it atop the posts and sighted the length to make sure it lined up with the existing fence. Satisfied, I nailed it down.

I repeated the process for the adjacent rail. A quarter–inch gap in the inside of the miter was pretty obvious. My options were to fix it or leave it. I based my decision on these criteria:

- The offending joint is behind some bushes (from my point of view).
- The miter is tight on the outside (from the neighbor's point of view).
- The fence is more than five feet high and uphill from the neighbors (who will never see the joint anyway).
- "I ain't buildin' no piano" (a justification I've relied on more than once).

Yeah, I know, I might have made the effort to make it right, but I didn't. I chose to use my time to get the fence up rather than to fuss with something relatively insignificant.

Long ago, I learned that the mark of a good woodworker is not preventing mistakes, it's knowing how to correct them when they occur. I'm not talking about unskilled amateur work that consumes entire cans of filler, I'm talking about router tear–out, an assembly that's not quite square, or a mistake in measurement that isn't detected until it's too late.

"If you're dad's a woodworker, I guarantee it'll drive him out of his mind."

Production workers can sell their seconds at a discount. But what of us who depend on income from single items? Anyone who's built large, expensive pieces knows that rock–in–the–stomach feeling when he makes a mistake that will take many hours and material to do over. Sometimes it's impractical and even impossible to do a job over, particularly when it means the difference between profit and loss. Minimizing the effect of the error is often the best one can do.

Many errors go unnoticed to all but the maker. The piece, to quote Mary Poppins, is "practically perfect in every way." Yet there is that flaw to forever gnaw at the ego of the maker, especially if he or she has an ounce of integrity. I've heard that some traditional quilters in Appalachia purposely incorporate a flaw into their work so as not to outdo the work of God. I have trouble enough with things I do accidentally, let alone on purpose.

When is less–than–perfect good enough?

When woodworking is one's sole hobby, you can spend time on achieving perfection—if that is your goal. When woodworking is a means of generating income, then somewhere one must cross that threshold, find that "happy medium" between perfect and passable. It's an individual's judgment—where that threshold is and when to cross it. At some point you say, *The drawer fits well enough*, or *The surface is smooth enough. I can't afford to spend more time here. I ain't buildin' no piano.*

Anyone who's worked wood for any length of time knows that one's skills constantly improve. Along with a change in skill level comes a change in perception. What could not be improved last year might be considered inferior work this year. Good enough gets better.

The danger of producing inferior work is that consumers become inured to it and will pay high prices for low-quality products. This is a problem for craftsmen who care about their work. I'm not saying we should all be perfectionists and purists—I'm certainly neither—I'm saying that the mere act of striving for perfection can improve our work's quality.

As for the situation that prompted these reflections on quality? I needed a fence, and a fence is what I got. It's solid, sturdy, and pretty good–looking too. But it ain't no piano. PW

SCRAP SOLUTIONS will return next issue—we hope! We received too few entries for this month's challenge. If you did enter, don't worry, we'll put you in the running next time. If you didn't, then get out to your scrap pile and build us something. See the May and July issues for rules. (We'll accept solutions to either.)

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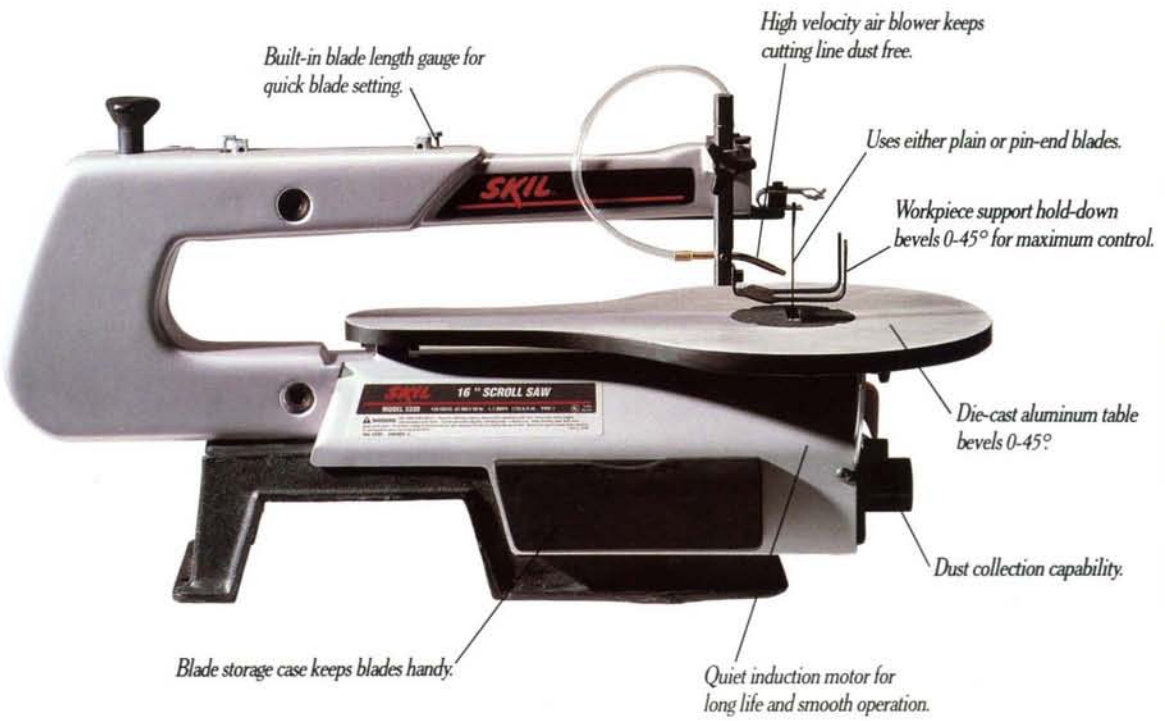

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