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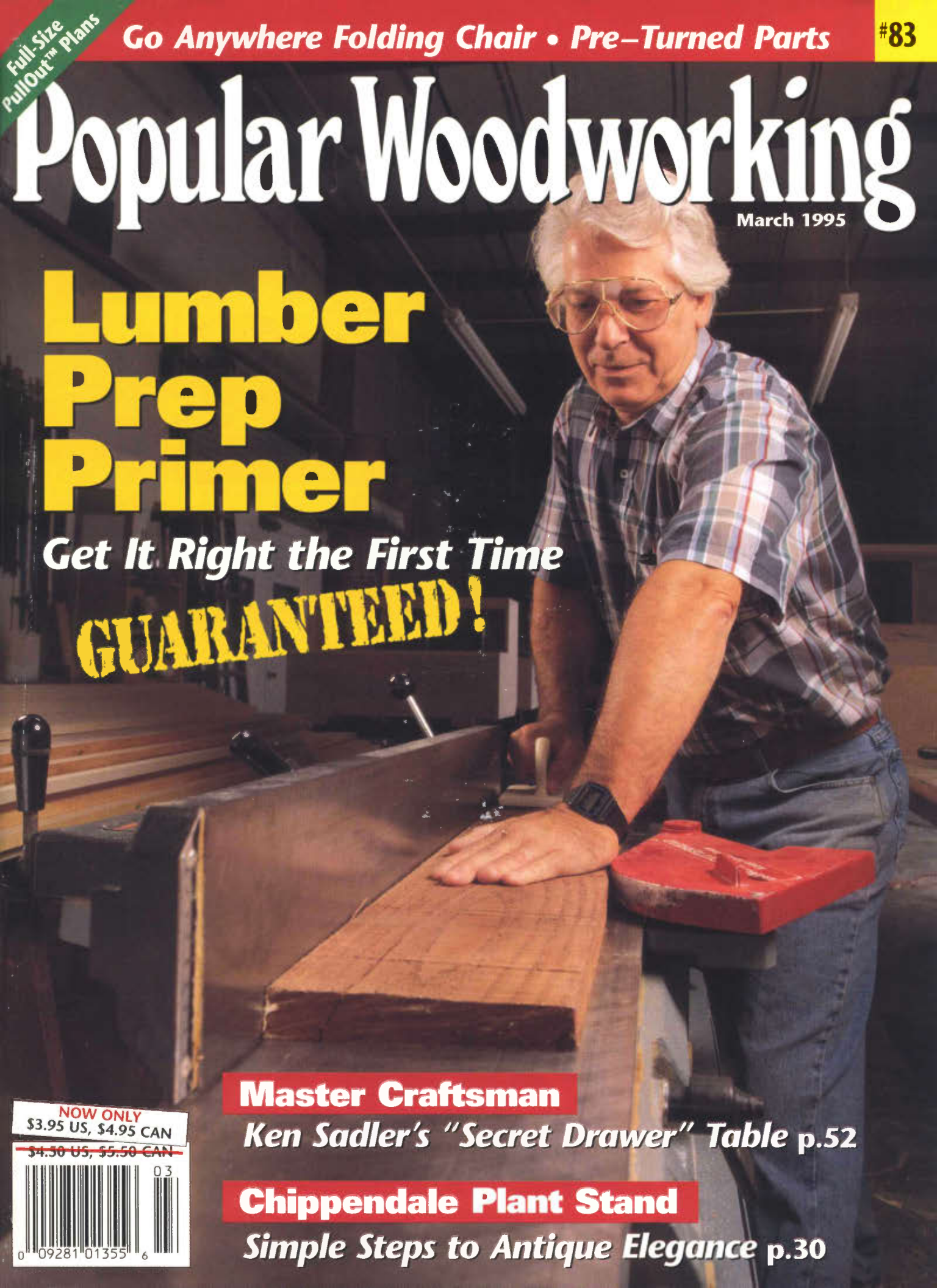

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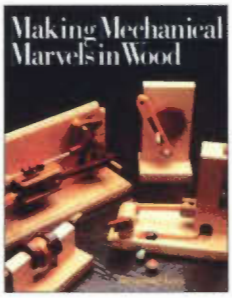

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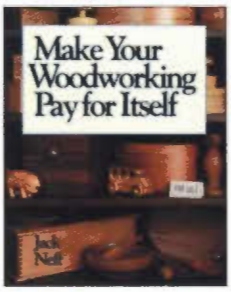

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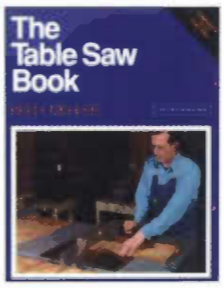

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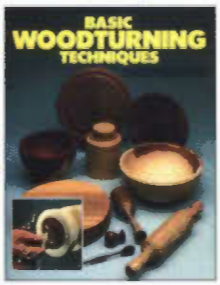

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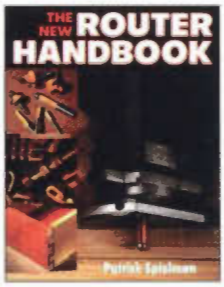

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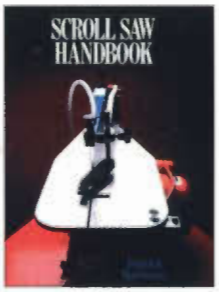

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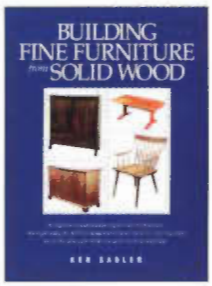

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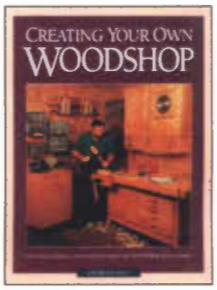

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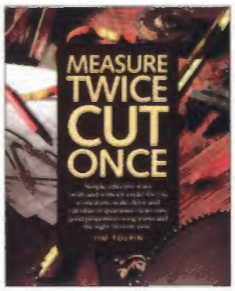

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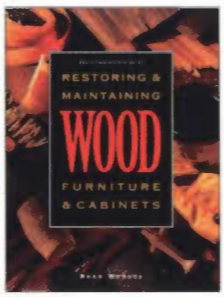

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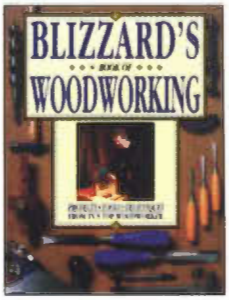

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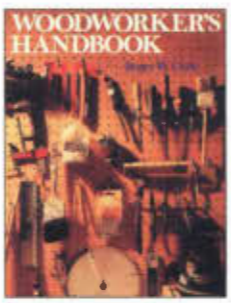

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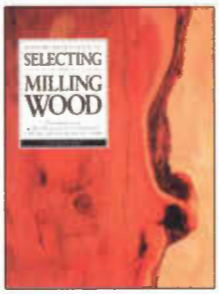

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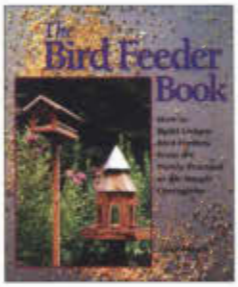

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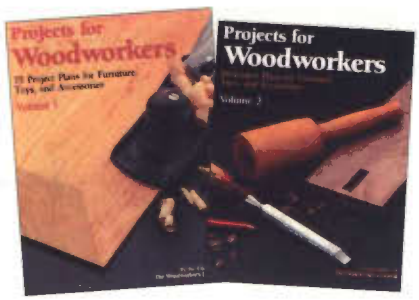

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LAPK

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Columns & Departments

Safety Note

Safety is your responsibility. Manufacturers place safety devices on their equipment for a reason.
In most photos you see in *Popular Woodworking*, these have been removed to provide clarity.
In some cases we'll use an awkward body position so you can better see what's being demonstrated.
Don't copy us. Think about each procedure you're going to perform beforehand. Think ahead. Safety First!

page 58

On the Cover

This issue's cover story concerns the importance of properly preparing stock and is discussed in detail on page 18. Klaus Thiel, who's pictured on the cover, graciously allowed us into his Blue Ash, Ohio shop for the cover photo. Thiel received his Journeyman's training and certification in cabinetmaking from the *Tischlerhandwerk Hamburg*, Germany in 1953. He has created high-end custom furniture and cabinetry ever since. His work reflects European influence and centers on contemporary design.

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Bill Warren, Buchmayr Associates
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Turnings

Woodworker or Cabinetmaker?

It's a safe bet that most readers of this magazine are woodworkers; a rather broad, catch-all term that can be defined simply as someone who works with wood. For me, "woodworker" is an inadequate term popularized in the late-1960's and 1970's when counterculture made all things informal and common the most preferable. At the time, those largely responsible for the resurgence in the popularity of woodworking were more likely free-thinking, alternative lifestyle individualists who became excellent cabinet makers and advanced to art of contemporary furniture making. As such, the more informal term "woodworker" suited and has since become commonplace.

I prefer the term "cabinetmaker" because, quite simply, it better defines what most of us are—or do. Furthermore, cabinetmaking has a truly rich tradition from which we all can draw great pride. Just what is the difference between a "cabinetmaker"and a "woodworker"? Checking the dictionary, a cabinetmaker is a "skilled" woodworker who "cuts, shapes and assembles high grade articles of furniture calling for fine finish (as decorative cabinets, desks, chairs, store fixtures or office equipment)." "Cabinetmaking," we learn, is the occupation or *art* of the cabinetmaker, " the dictionary states.

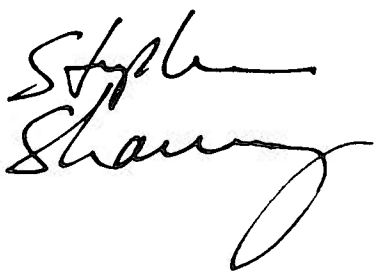
Not all woodworkers are cabinetmakers. I visited a palette making plant once and those fellows were working with wood, to be sure, and by definition that makes them woodworkers. But they sure aren't cabinetmakers! How about those *wood workers* who make pencils, or spend their days in a truss factory, shape kitchen knife handles, or make popsickle sticks! Yes, all are woodworkers.

Cabinetmakers, I think you'll agree, are working on a higher plane. Cabinetmakers are often creating in the process of their work. Cabinetmakers, to one degree or another, are involved in the design of their work. Even if you reproduce another's work from a detailed drawing, you are contributing to the design of the piece by your selection of wood specie and the care you give to the use of grain pattern. Also, a cabinetmaker is versed in the fabrication of joints, the engineering of furniture or cabinet structure, has a working knowledge of math and geometry, is often a machine repairman, is usually rather inventive in the process of working with wood, and should be knowledgable about finishing if not a finisher.

Cabinetmaking is an art, although today the general public would likely lump the craft in the same tool box with the other building trades; plumbers, carpenters, electricians, roofers, masons, etc. Cabinetmaking is not an art because modern practitioners say so. It has been considered an art form since it was first recognized as a distinct branch of architecture. If you've been to the library to look up something about fine fumiture and cabinetmaking, you found yourself in the fine arts section(Dewey Decimal classification in the 700's). If you want to look up something about plumbing or wiring or the other building trades, you'll find yourself in the applied science section (Dewey Decimal classification numbering in the 600's).

A cabinetmaker's work, as part of the decorative arts, can be found in many art museums. Fine examples of exquisite furniture grace the galleries of the same buildings as the works of Michelangelo, Whistler, Picasso and Warhol.

Whether hobbyist or professional, we should be proud of our cabinetmaking heritage. By recognizing our past we find inspiration to spur ourselves on to higher levels of skill and accomplishment in our work. Most certainly, it will lead to a greater appreciation of what we already enjoy so much, working with wood as *skilled* woodworkers. . . as Cabinetmakers.



Toy Chest Safety

In our last issue, we featured a project by Jacob Schulzinger for constructing a toy box. As we were preparing to go to press with this issue, we heard from a reader who is familiar with some of the safety guidelines for toy chests and other children's product safety issues.

Whether it's in our workshop or homes, safety should always be uppermost in our minds. As it relates to children, we should be especially mindful since youngsters don't see potential hazards.

You should also know that very strict regulations must be followed if you build a toy chest, or any consumer product, for sale as a commercial enterprise.

Essential safety considerations for toy boxes are protections against: possible entrapment and strangulation associated with sudden lid closing or dropping; hazards associated with possible crushing, pinching, and lacerations resulting from folding mechanisms, hinges and lid supports; and suffocation hazards due to lack of adequate ventilation should a child become entrapped in the chest.

If you would like additional details and regulation specifications, please write us at 1507 Dana Ave. Cincinnati, OH 45207.

Letters

We welcome your comments, pro or con, about articles we publish. We also want to see color pictures of what you're building. Send your letters and photos to: Letters, *Popular Woodworking,* 1507 Dana Ave., Cincinnati, OH 45207. Letters may be edited for publication.

Project Clock Finishing Touches

I am a hobbyist woodworker and in your January Issue (#76) you had an article on octagon clocks which got my attention. It looked like a good challenge so I built the clock and when I was done it didn't seem like the clock was finished, so I added a little more. I think it came out nice.

I am enclosing a photo so your reader's can see how the project turned out. I thank you for the idea.

I subscribe to *Popular Woodworking* and you have some good ideas and projects. Keep up the good work.

Gene Wright
Laguna Miguel, California

Another Pipe Maker Comments

Your article on Pipe Making (Issue #79) was very good, clear and concise for any craftsman who has all the tools mentioned in the article.

There are a number of different ways to craft a pipe. Drawing on my experience of making several hundred pipes, I would like to make a couple of recommendations

In cutting the bowls, using a number of custom ground spade bits will make things easier. I would suggest taking six spade bits to a machine shop to shape different U's, V's and any other shapes you prefer. A well balanced bit is important or vibration will ruin your Briar block.

To carve and fashion the bowl, an easy way to hold the bowl is by shaping several dowels to fit the ¾" or ⅞" tobacco hole. Some rubber cement coating the end of the dowel and allowed to dry will keep things from slipping.

Rubber stems for your mouthpiece can be shaped with heat. I've used my wife's deep fryer with a quart of sand.

If you have questions concerning pipe making, please feel free to write or call: Ray Ludwick, 4620 Hauala Rd., Kapa'a, HI 96746 or (808)822-3372.

Ray Ludwick
Kapa'a, Hawaii

Online Coverage Expanded

Please consider America Online if and when you expand your online coverage. As a Mac user, I find America Online to be much more user-friendly than CompuServe®.

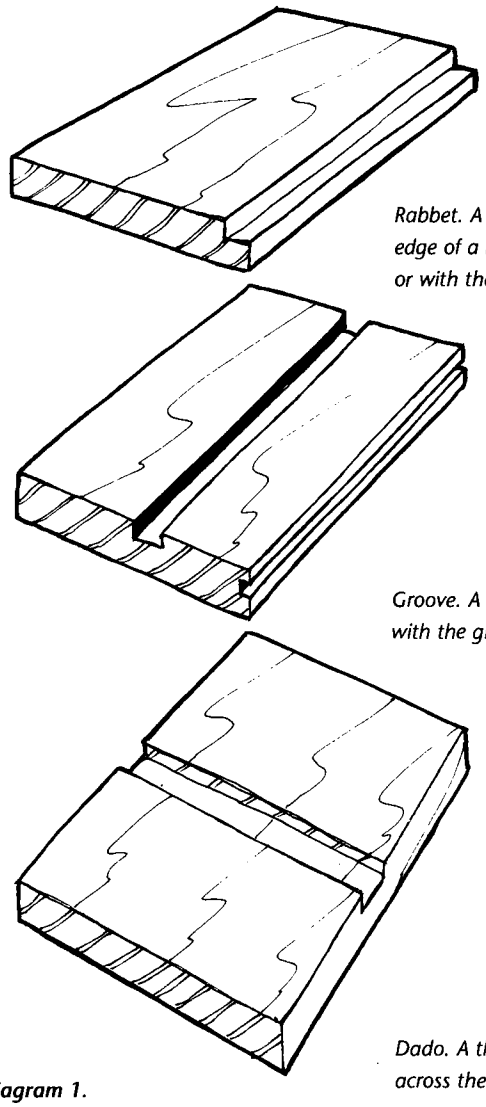
Thomas Hunter
Monroeville, PA

By the time you read this letter, the PW *editors are appearing regularly on America Online, as well as CompuServe. We are participating in many forum discussions on woodworking, as well as answering questions about the magazine. As of this writing we haven't officially signed on yet, so we can't provide specific information on where to find us. However, we will include more detailed information in our next issue. In the meantime, please look for us on America Online! And for those readers who prefer CompuServe, we will continue* PW*'s presence in the Crafts Forum. Hope to see you there!*

The Editors

Shooting Rabbets, Grooves and Dadoes by Hand

Cordless Routers: batteries not included ... or necessary.



Rabbet. A two-sided groove on the edge of a board, either cross-grain or with the grain.

Groove. A three-sided cut going with the grain.

Dado. A three-sided cut running across the grain.

Diagram 1.

A recent move made it necessary for me to streamline my shop. I was forced to reconsider all the extra tools and equipment I accumulated, despite the best intentions of only keeping things I would use—you can never be sure that one day you won't need that extra hollow auger or odd sized screw box. If you have any affinity at all for old tools, you've probably fallen prey to the irresistible impulse to bring home that extra wooden block plane with the wonderful patina that was such a bargain at the flea market. Now a smaller shop, plus the enormity of the actual move, demanded some serious culling.

My first thought was to abandon tools that could easily be replaced. This included all the modern electric power tools such as cordless screwdrivers, routers, orbital sanders and the like. But as much as I love old tools for their feel and history, there are many modern tools it would be foolish to be without.

One of the most useful of these is the electric router. This tool has become so popular in the last 75 years that it has literally changed many of the ways we make things. Old work methods and joinery techniques are obsolete and have been replaced with a whole new vocabulary that hand tools would find difficult to duplicate. A single router and a collection of router bits can do jobs that previously required a dozen or more hand tools.

Despite the fact that hand tools are quieter, cleaner and safer to use, it would be a dyed-in-the-wool purist indeed who would abandon the speed and accuracy of an electric router in favor of all the hand tools it has supplanted. Which led me to think about the router's original intent and its hand tool alternatives: namely, the making of rabbets and grooves. In many instances it's still quicker to reach for the specific hand tool and make the required cut than it is to choose an appropriate bit and set up the router, adjusting for depth and distance, and setting up fences or clamping on jigs and guides.

I kept the router, but I also feel various rabbet planes, dado planes, fillisters, ploughs and hand routers continue to play an active role in the modern shop. For those woodworkers who aren't fully conversant with planes and their functions, here's a review:

***Graham Blackburn**, a contributing editor to* Popular Woodworking, *is a woodworker and writer in Bearsville, N.Y.*

By Graham Blackburn

GROOVES IN WOODWORKING

A groove formed on the arris (the outside junction of two adjacent surfaces), or edge, of a board is known as a rabbet. A groove formed any distance in from the edge of a board is known as a dado if it runs across the grain, or a groove if it runs with the grain ***(diagram 1)***. The electric router can cut all these, whether they're straight or curved, through or stopped. There is a certain amount of set-up required, and the correct bits are needed, but almost everything is possible.

In most shops the tendency is to use several standard sizes for repeated jobs. such as ¾" dadoes, ¼" rabbets and most grooves formed for tongue-and-groove work.

This means that three or four hand tools, which are always ready for use, are all I need to form these extremely common joints. In my shop, the router ends up being used for unusual sizes or especially large jobs. The hand tool may be quicker when making a single 9" long rabbet, but it can't compete with a router if you have 90' to work.

THE RABBET PLANE

The most common, simplest and probably most useful of these hand tools is the rabbet plane ***(diagram 2)***. Wooden versions are still easily obtainable at flea markets and secondhand stores. The rabbet plane is commonly mistaken for a moulding plane since it shares the same basic shape. Its sole and cutting edge, however, are not shaped into a fancy profile, but are square to its sides. And, unlike all other wooden planes of this general shape and size, the opening through which the shavings exit is formed into a unique and gracefully truncated cone designed to throw the shavings off the bench.

It's possible to find rabbet planes (also referred to as rebate planes) in a large variety of widths ranging from as small as ¼" to as wide as 2". Occasionally you may run across shorter planes—the common size has a body or stock about 9" long—or especially long planes known as ship planes whose stocks may reach 24" in length.

Another class of tools, originally used for carriage and coachmaking, are made somewhat shorter than a standard carpenter's rabbet plane and are particularly distinguished by having curved soles, designed to make inside or outside circumferential rabbets. A peculiarity of these planes is that the body is commonly narrower than the sole to allow you to hold the plane in tight quarters.

All these planes may be found with cutting edges that are set square to the sides of the plane's body or skewed at an angle. The skewed variety, while requiring just a little more care when sharpening (so as not to alter the angle that the cutting edge forms with the mouth) are generally superior, since a shearing cut is invariably easier to make and usually results in a smoother finish.

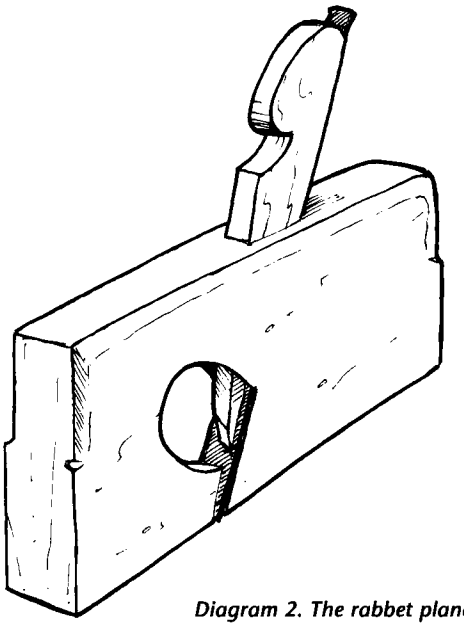
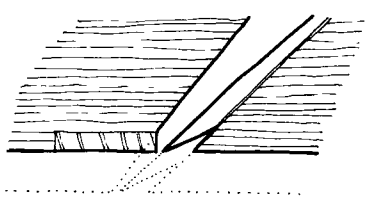


Diagram 2. The rabbet plane.

In using and fine tuning a wooden rabbet plane, there are a few items to pay attention to. Unlike almost all other moulding and special-purpose planes, wooden rabbet planes have no fence or depth stop. This means that to start the rabbet you must first mark the workpiece carefully for width and depth and begin the cut either by tilting the plane so that a small groove is taken close to the line with the corner of the plane, or by tacking or clamping a guide strip to the work. With experience it's possible to dispense with both these techniques and guide the plane simply by using the fingers of one hand as a fence.

The sole of the plane should be perfectly flat, true and square to the sides. If it's not, it may be made simply by 'jointing' the sole—clamping the plane upside down in the bench vise and planing it with a bench plane, or running it over the jointer. Do this repeatedly and you'll eventually widen the mouth so it'll be necessary to insert a small "mouth piece" ***(diagram 3)*** to close the distance between the front of the mouth and the cutting edge. The plane will work with quite a large mouth, but for the finest work, especially in difficult grain, the smallest mouth possible is preferable.

Diagram 3. Insert a small mouth piece to close the distance between the front of the mouth and the cutting edge.



High-end metal rabbet planes (made around the turn of the century by makers such as Mathieson and Norris) intended for use by cabinetmakers, piano makers and other trades requiring great accuracy, were made with mouths so small the gap between cutting edge and plane was barely visible to the naked eye.

Take care to set the iron just right. It should be perfectly square to the sides and also of exactly the same width, projecting or receding not the slightest on one side or the other. If it's not wide enough you'll end up producing a rabbet with a step-like side, and if it's too wide the sides will be continuously undercut. With time some wooden plane stocks may shrink leaving the iron wider than the stock. If this happens, carefully file the iron to the correct

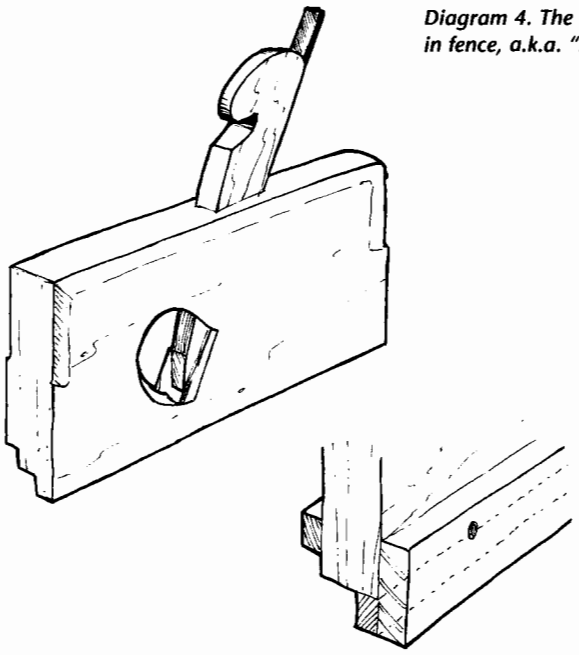


Diagram 4. The rabbet plane with a built-in fence, a.k.a. "standing fillister."

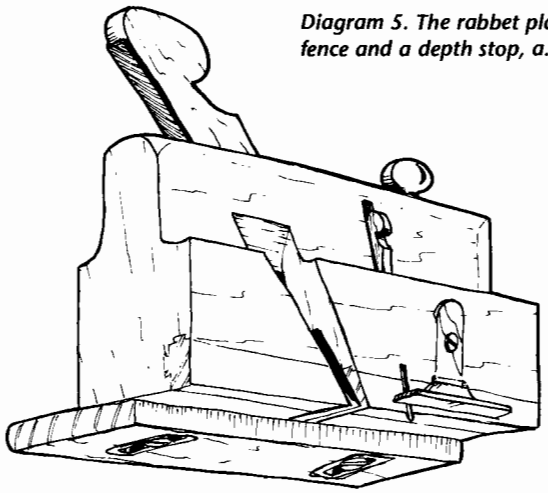


Diagram 5. The rabbet plane with both an adjustable fence and a depth stop, a.k.a. "moving fillister."

width.

Another common problem experienced by first time users is choking of the plane. This occurs if the iron is not held securely by the wedge and if the wedge itself is improperly fitted. Unless the iron seats perfectly flat against the bed (the part of the throat it rests against) it will chatter in use and allow shavings to slide up behind the iron.

Make sure the back of the iron does not rock on its bed; the bed sometimes needs a little scraping to be made clean and flat. Make sure when inserted, the wedge holds the iron securely; it too may require a little judicious planing to make it fit the throat and iron perfectly. In addition, notice that the bottom of the wedge is formed in such a way as to deflect the shavings up and out of the throat. If the bottom end of the wedge has become damaged and blunted this too can cause the shaving to become stuck and rapidly form a stubborn blockage that can only be cleared by removal of iron and wedge. Don't be tempted to use an awl, nail or other sharp object to clear the obstruction for this will only further damage the wedge and throat.

Most importantly, learn how to insert, set and remove the iron properly. This is not difficult and makes the tool much easier to use and maintain. The secret is to insert the iron and wedge by hand, roughly adjusting the cutting edge's protrusion, and then make all further adjustments by tapping the stock lightly on the toe (front end) or heel (back end). Despite its appearance, the wedge is not intended to be hammered out. You may use a mallet, (never use a hammer), to lightly tap it in, and to remove it hit the heel of the stock.

When the wedge and iron are securely held in the stock you'll discover that light taps on the toe will cause the iron to protrude more; light taps on the heel will cause the iron to retract. Hold the plane upside down as you make these adjustments and you'll be able to sight along the sole of the plane to judge exactly how much iron is showing. Too many taps on the heel will eventually cause the iron and wedge to fall out completely and you'll have to start again. Be aware of this possibility so you don't get taken by surprise as the iron clatters unexpectedly to the floor, possibly damaging its edge.

This may sound a little complicated, but in practice once the iron is sharpened and set properly further adjustments are only occasionally called for, and the tool remains ready for immediate use.

DADOES AND FILLISTERS

Over time, the humble rabbet plane evolved into slightly more complicated tools. The first development was a rabbet plane with a built-in fence, and the second was a rabbet plane equipped with both an adjustable fence and a depth stop. The former (known as a standing fillister ***diagram 4***) is actually more rare than the latter (known as a moving fillister ***diagram 5***), being useful only for one particular width and depth.

Better models were boxed (a strip of hard-wearing boxwood dovetailed into the working corner), fitted with brass adjustment screws, skew-bladed and provided a small spur to sever the fibers just ahead of the cutting edge, guaranteeing a crisp upper corner to the rab-

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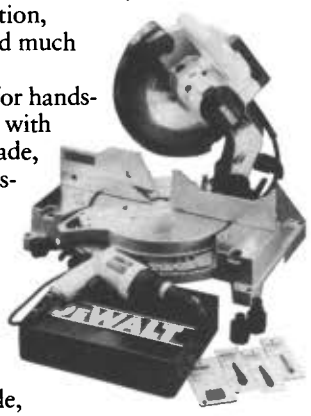

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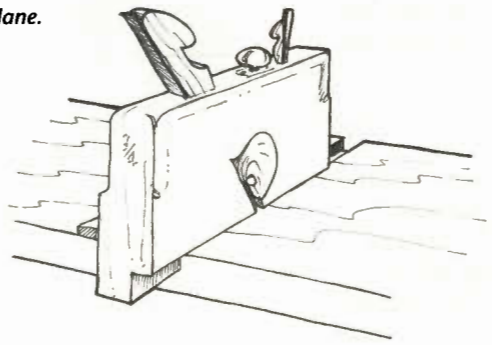
bet. The hardest part about using one of these tools is ensuring that the fence is adjusted perfectly parallel to the sole. This is made easier if the fence is secured with three screws instead of the more common two.

Dado planes ***(diagram 6)*** are designed to cut a groove across the grain. Their irons are always skewed and have a double spur to sever the fibers just ahead of the cut on both sides. They have no fence, making it necessary to provide some form of guide for the groove or dado, usually in the form of a narrow strip tacked or clamped to the workpiece. They do, however, invariably possess depth stops; simpler ones consisting merely of a block of wood mortised through the stock and held by friction or a wood screw. More sophisticated models are fitted with handsome integral brass thumbscrew operated shoes.

A dado plane can only be used to cut a dado of the size for which it's made. Therefore, a large set is required if you commonly make dadoes in varying sizes. Over the years I've collected as many as 15 planes, but in practice two or three sizes are all that I use. The cut is started—once a guide strip is in place—by drawing the plane backwards across the work. This allows the spurs to cut the edges of the dado so that when the plane is then pushed forward, the shaving taken has already been separated from the surface of the workpiece, leaving a perfectly crisp edge on both sides of the dado. For this to happen the spurs and cutting edge of the iron must both be perfectly aligned with the sole of the stock. The iron is adjusted just like the rabbet plane, and provided the cutting edges are kept sharp, the dado plane is very easy to use. Be aware that the spurs should only be sharpened on their inside edges—otherwise you'll be altering the overall width of the dado being scored and they will no longer cut a dado the same width as the iron itself. PW

Diagram 6. A dado plane.



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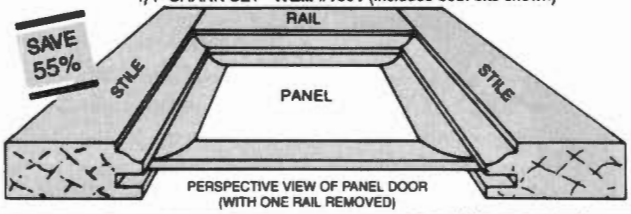

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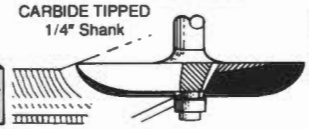

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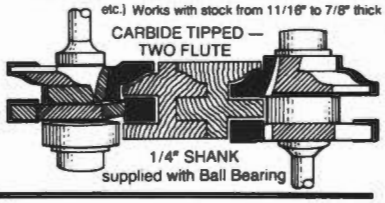

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#1309	45° CHAMFER - 3/8" Cutting Length	1/4"	$13.00
#1310	45° CHAMFER - 5/8" Cutting Length NEW !	1/4"	$15.00
#1311	45° CHAMFER - 5/8" Cutting Length	1/2"	$17.00
#1312	THUMBNAIL - 1- 3/16" Large Diameter	1/4"	$18.50
#1313	THUMBNAIL - 2-1/2" Large Diameter	1/2"	$35.00
#1314	ROUND OVER - 1/8" Radius	1/4"	$11.00
#1315	ROUND OVER - 3/16" Radius	1/4"	$11.00
#1316	ROUND OVER - 5/16" Radius	1/4"	$14.00
#1317	ROUND OVER - 1/4" Radius NEW !	1/2"	$12.00
#1318	ROUND OVER - 3/8" Radius	1/2"	$15.50
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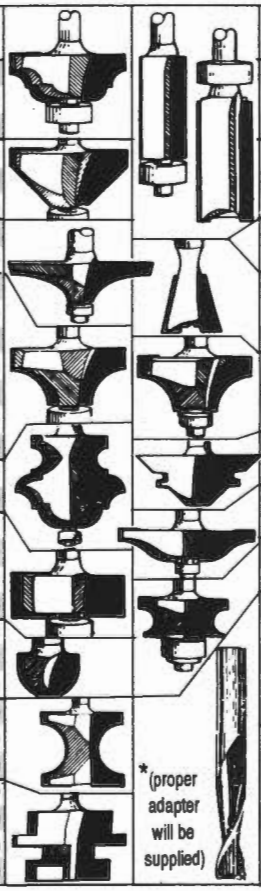

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#1338	FLUSH TRIM - 1/2" Diameter — 1" Cutting Length	1/4"	$ 8.00
#1339	FLUSH TRIM - 1/2" Diameter — 1-3/16" Cut. Length	1/2"	$ 8.00
#1340	PATTERN / FLUSH TRIM - 1/2" Diameter	1/4"	$15.00
#1341	PATTERN / FLUSH TRIM - 3/4" Diameter NEW !	1/4"	$17.00
#1342	PATTERN / FLUSH TRIM - 3/4" Diameter	1/2"	$19.00
#1343	KEYHOLE CUTTER - 3/8" (bit not	1/4"	$ 8.50
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#1346	DOVETAIL - 1/2" Diameter — 14° NEW !	1/4"	$ 6.00
#1347	DOVETAIL - 1/2" Diameter — 14°	1/2"	$ 6.50
#1348	BEADING - 1/4" Radius	1/4"	$13.00
#1349	BEADING - 3/8" Radius	1/4"	$15.50
#1350	BEADING - 1/2" Radius	1/4"	$17.00
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#1352	LOCKMITRE - 1-1/8" Cutting Length	1/2"	$45.00
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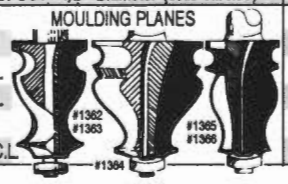

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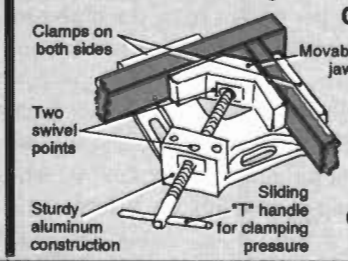

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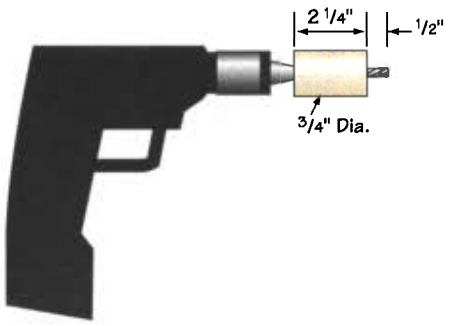
Hugh Foster
Manitowoc, Wis.



No More Shelf Pin Hole Mistakes

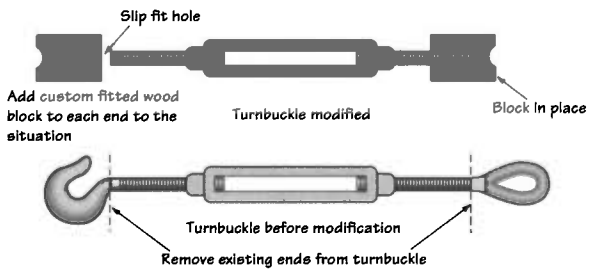
For years now I have been using tape on my drill bits for judging the depth of holds. Putting this idea to use, I still had to be careful not to drill too deep, such as drilling through the side panel when drilling for adjustable shelves. To avoid this problem I made a stop by cutting a piece of dowel, or any small block of the desired thickness, the proper length and drill a hole through it the same size as the bit. By putting the bit in the chuck, and the dowel on the bit, you are ready to drill holes the same depth each time.

Tim Muzic
Fountain Valley, Calif.

Pliers Give Glue Squeeze-Out a Place To Go

If you're making your own dowels, you may have run into the problem of glue keeping the dowel from seating all the way into the pocket. If you make indentations with a pair of pliers on the ends of the dowels the grooves formed will allow the glue to escape from the pocket and the dowel will seat all the way.

Art Gustafson
Cobleskill, N.Y.



Spreader Bar From A Turnbuckle

Quite often woodworkers find need for a spreading action, rather than closing pressure. Over the years I have seen many suggestions for making spreading tools, usually by modifying bar clamps or by use of threaded rods. The following turnbuckle method surpasses them all and is more economical and less cumbersome.

Turnbuckles come in a wide range of sizes and are available at hardware stores. I have made spreader bars from turnbuckle in three sizes, but the 8" frame size is most useful for furniture disassembly. By removing the hook and eye from the turnbuckle and placing a block "pad" on the ends you'll have a very useful new tool.

Devore O. Burch
Fort Worth, Texas

Fool Proof Glue Cap

Using an empty barrel shaped plastic mustard squeeze container as a glue bottle makes gluing neat and easy. The container has a nozzle with an adequate sized hole, and the twist cap is air-tight keeping the glue fresh and the opening free of obstruction. It also has the added benefit of never losing the cap!

Robert F. Wilson
Jacksonville, Vt.

Darned Clogged Spray Cap!

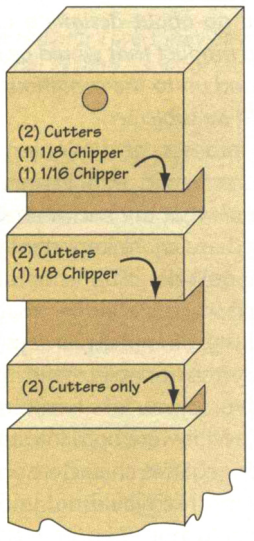
It's frustrating when the tip of a spray paint can clogs. Even after tuming the can upside down and spraying to remove the excess, I always remove the tip and place it on a can of WD-40. Spray a shot and return the tip to the original paint can. Clean as a whistle!

John Edwards
Slidell, La.

Dado Set Gauge

A stack type dado blade can be time consuming to set up each time a particular width dado is needed. To solve this, I keep a strip of hardwood hanging near my saw. Each time I set up my dado blades for a different width, I make a shallow dado cut on this strip. I then record the number of chippers and any shims used for each dado. The strip provides a handy future reference.

Daniel Cassidy
Medway, Maine



Scroll Saw Pattern Trick

I have been working with a scroll saw for about ten years and during that time I have tried all kinds of tricks to glue patterns to the wood I am cutting. This problem was solved when I tried the new "Post It" glue sticks for 3M. I have found that this product holds the pattern to the wood as well as any of the other methods and the excess paper just peels off. It leaves practically no residue and is far less messy to apply.

Steve H. Heller
Springfield, La.

Saved From Paint Mess

If you've ever tried to close a half full can of paint then you've probably splashed paint around when you seal the lid.

To keep that extra paint from building up in the lip of the can I punch three to five small nail holes in the bottom of the lid groove of the can. This way the pressure from the lid being sealed doesn't push the paint out. It also allows the can to seal properly.

Norm Streit
Lancaster, N.Y.

Keep Your Splitter Guard Accurate

Adjusting the splitter-guard assembly on my table saw used to be frustrating because it would slip out of alignment as the bolt nut was tightened. Splitter alignment is especially important on my saw since I use thin-kerf blades and there is little margin for error. I took a square piece roughly 2½" x 2½" about 20" long and ripped it down the middle stopping half-way along its length. Without removing the piece, stop the saw and clamp the piece to your rip fence. I slid in the splitter and as I tightened the nut the clamped piece of wood held the splitter in perfect alignment with the blade. I wrote the rip fence setting (about 1¼") on the wood so I can use it to reset the splitter any time it gets out of whack.

Incidentally, making this device also served to convince me to use the splitter-guard despite its occasional awkwardness. As I ripped the apparently straight-grained basswood I watched the kerf close up nearly completely behind the blade. I instantly became a believer in the value of the much grumbled about safety device.

Sam Finnell
Princeton, N.J.

Covering Cast-Iron Radiators

A former university professor finds a satisfying career in the world of custom woodworking.

In these days of centralized heat or electric baseboard heating, why would anyone think they could make a living designing and building covers for cast iron radiators? Aren't they an endangered species? Not to Paul Pezalla. Because for him, necessity was the mother of invention.

In many of Chicago's affluent neighborhoods, such as Oak Park and River Forest, 80% of the homes have steam or hot water heat—and that means cast iron radiators. About 10 years ago these ugly objects, often stuck in arbitrary places in a room, were left bare or at best covered by equally ugly metal enclosures. Paul decided it didn't have to be that way and that correcting it could provide him with a good business.

This Idea came to him not out of the blue, but after much scholarly thought about how to fill a need—a new way to make a living. For seven years, Paul had been an assistant professor in the Dept. of Biological Sciences at the University of Illinois, Chicago. He taught physiology, endocrinology and neurobiology, and did research on pain perception and opiate drugs (such as morphine). However, after failing to get tenure he suddenly found himself, as he says, "on the street and forced to find something else to do. In the process I came to an agreement with virtually every potential employer in North America: They didn't want me and I didn't want them. The last job in which I really got along well was as a truck driver/furniture mover for an agent of North American Van Lines. They gave me the keys and told me where to get the load of furniture and where to deliver it. The freedom and concern only with the results suited me. Considering this, the logical move was to become self employed."

After hearing this, I decided to ask a few more questions:

How did you start your business? Did you begin doing it part-time or did you just jump right in on a full-time basis?

I left the University of Illinois in 1985 and started doing remodeling, repair and restoration work on the old houses in Oak Park. I did almost everything, from ceramic tile to roofing. I eventually discovered that I didn't have the temperament for that sort of work. I don't like working on site and dealing with walls that are not square and repairs that someone else had botched. At about this time, without having a purpose in mind, I began shopping for used woodworking tools and machinery. This led to an increased emphasis on wood-related work and to some amateur furniture building to acquire skills.

So you decided to build a product, what did you have in mind?

Radiator enclosures were the first product I considered.

Where did you get the idea of making radiator covers?

In the course of my repair work, I noticed that virtually all the fine old houses I worked on were flawed in that they had naked radiators. When the radiator is 11' long and stretched across the front of the living room, it can amount to a significant eyesore. The factor that tipped me into the business was a comment by a friend on the fine wood enclosures that were in his childhood home. This inspired me to build a prototype for the radiator in my dining room. It looked good, covered an ugly radiator and provided additional seating when extra kids showed up for lunch. I took a few photographs of it and mailed prints to some of my previous clients. One of them ordered five enclosures and the business was born.

Once you decided to make them, how did you go about designing and developing a product that would be attractive and stand up to the conditions to which it would be subjected?

The process of designing radiator enclosures began with a careful consideration of what the enclosure should do and, perhaps more importantly, what it should not do. The structures were intended to replace the visage of an often dusty, often rusty, always unattractive cast-iron monolith with that of an attractive piece of furniture which looked as if it were born into that room.

As for negative characteristics, I needed a piece that would not impede heat flow, would not warp or crack, would not fail at the joints and would not look dated in a decade or two. The functional aspects had to precede the aesthetic considerations because sitting atop a 180°F radiator is arguably the worst possible place for a piece of furniture.

I read extensively before I began designing and learned as much as I could about the behavior of wood and the basic rules of furniture construction. Factors such as balanced construction and finishing, control of moisture content and orientation of growth rings are always important in furniture construction, but assume an even greater significance in radiator enclosures.

Before building an enclosure, I made samples of materials, joints and finishes to test. I placed them on my own radiators and subjected them to innumerable cycles of hot and cold. Once I was sure

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If you have any questions on the subject discussed in this article you may direct them to ***Ken Sadler****, 75 N.W. 90th Ave., Portland, OR 97229. If you are a Compuserve user, the address is: Ken Sadler 76334,735. Mr. Sadler would also be happy to offer suggestions on other business related problems.*

Custom radiator covers may be niche woodworking, but to Paul Pezalla it's his bread and butter.

that the details were adequate, I assembled them in what I hoped would be an aesthetically pleasing fashion. On the first enclosures I built, I used perforated steel grills, the same material used by the manufactures of all-steel enclosures. This sort of grillwork is available in a multitude of patterns and does an admirable job of concealing the radiators while permitting air flow. It provides an attractive look, appropriate to many but not all settings.

Occasionally, I encounter a potential client who either is not completely satisfied with my existing designs or wants something completely different to fit with the character of the room. These are the people who inspire new designs. The major push has always been for more elegant, more finely detailed, and consequently, more expensive designs.

What made you think that you could make a living doing this?

I didn't really think about making a living, but there was always the knowledge that I had a wife and three daughters who expected food and clothing. Over the past 15 years, our family income has probably fluctuated at least five-fold.

Does your wife work with you in the business in any way?

No, she has her own career.

Where do you get your materials?

Despite the apparent inefficiency, I have four main suppliers of wood. I use one for milled slats, one for quarter-sawn red oak, one for bulk purchases of lumber and one when I want to dig through the pile and hand select each piece.

Do you have to spend much time searching for the right wood?

No. Chicago is a big place and there's a good variety of suppliers. For the most part, people want enclosures that go with the house's woodwork. This generally means red oak, birch or mahogany.

What percentage of the cost of your products is in the materials?

I shoot for about 20–25%.

How much did you invest in equipment at the start?

Very little. I stumbled across a man who was selling a load of machinery that had been sitting in a barn in Wisconsin for a decade, or so. I got a Craftsman table saw and drill press and a Delta jointer for a couple hundred dollars. I put a good Biesemeyer fence on the saw and had a functioning shop. I subsequently found a garage full of hand tools and machinery pulled from a shop that had thrived building taverns at the end of Prohibition. I took home a horizontal boring machine and a substantial collection of hand tools from this sale.

How much do you have invested now?

I still only have a few thousand dollars invested. I sold the Craftsman table saw and bought a 40-year-old Unisaw with some of the proceeds. I built a 24" abrasive planer, subsequently sold that and bought a used commercial machine. The only new machine I have is a Delta planer—a modest expense.

Were you able to make a living right from the start or did you have to rely on savings to carry you for a while?

It was a meager living supplemented by my wife's earnings, but acceptable.

Where and how big was your first shop?

I worked for about eight years in my 500-square-foot basement with seven-foot ceilings. It was an easy commute but I seemed to spend more time shuffling materials and half-assembled pieces around than I did on actual work.

Have you had to enlarge it since you began?

About 18 months ago, I bought a building that has a 1,500-square-foot shop with 12-foot ceilings. It also has two apartments and a second storefront/office. The rents from these help cover the note. With the financial help of the Village of Oak Park and the design help of a great architect, Mark Adelman, I remodeled the front of the building to present a better face to the world pass-

Concentrating on older Chicago neighborhoods, Pezalla seems to have tapped a healthy market for his radiator covers. This design incorporates metal grillwork.

ing by and to provide display area.

Do you have anyone working for you now?

I have one person, Joe Uchison, who does most of the finishing for me and comes in to work in the shop 1–2 days a week.

Did you have trouble finding people you felt were good enough to produce your pieces?

Joe has standards that are almost unreasonably high. I pay him a somewhat burdensome rate for the finishing work but neither I nor any client has ever found the slightest fault with his work.

Did you have to train him?

He's self-taught in finishing. On shop work, it's not so much training as it is discussion of the best way to do things. Since I have built far more pieces than he has, I am more efficient and quicker, but not necessarily better.

What do you make besides radiator covers?

About 75% of my business is radiator enclosures, the rest is one-of-a-kind furniture (about 20%, with the barest trace of repair work filling in the gaps). I have built office desks, dining room tables, entertainment centers, coffee tables, beds and dressers. I do not actively seek these commissions but do appreciate getting one every few months.

Which is most profitable?

The radiator enclosures. I know exactly what I am doing at every step and because I have devoted considerable effort to specialized jigs, clamps, fixtures and procedures.

Explain the philosophy behind your furniture designs. Are they copies of traditional styles or have you developed your own style?

Most of the furniture I've built has been of my own design, although a few pieces have been heavily influenced by the client and a long dead designer. I don't consider myself as having a philosophy of design, though I do have a process. I like to fix the function of the piece firmly in my mind, to the point of pondering it from every viewpoint for several days. Once I have a clear idea of what the piece is to accomplish, I wait for an inspiration of what it should look like. In this stage, I look at other furniture, at buildings, at paintings, at sculpture, at every possible source of ideas. With luck, I come up with something that appears novel, is functional, is buildable and will appeal to the client.

Do you expect to increase the amount of furniture you produce?

No. I expect to continue to expand the range of styles of radiator enclosures and to increase my efficiency at building them. I do have an inordinate fondness for radiator enclosures and would like to get them in every house with radiators.

Are you considering any other products? If so, what will they be?

I have new designs for enclosures but no totally new products under development. I am trying to increase retail sales of grillwork, both wood and heavy brass. This can provide a little income without excessive physical labor.

How do you market your products?

I started with direct mail to people for whom I had worked previously. The furniture business just trickles in. I don't make any real effort to get it. Much of it comes from people who started out looking at radiator enclosures, the rest are referrals from apparently satisfied customers. I have been mentioned in the *Chicago Tribune*, suburban newspapers and a magazine or two. People seem to hang on to these articles forever and a good percentage of my sales comes from them. Shows are also important.

What shows do you enter, and where?

Not juried or art type shows. I have had a booth at a few remodeling/renovation shows. Their popularity and consequent value seem to have declined considerably over the past few years, but I have had good success with the Hyde Park Show. This is held in the University of Chicago neighborhood, an area of great old houses and devoted owners.

How do the shows operate, who attends and do they place orders at the show?

The shows occur on Saturday and Sunday and consist of displays of products and services presumed to be of interest to home owners. Exhibits range from handmade glass door knobs to replacement vinyl windows, and from architects to exterminators.

Attendees are generally people from the immediate area, usually those who have recently purchased an old house and are seeking sources. Because of the nature of my products, I don't take orders at the shows but rather get my literature into the hands of interested parties and wait for them to call. Radiator enclosures are usually not a high priority item, certainly behind roof repairs, paint and kitchen renovation. Fortunately, many people manage to hang on to my phone number for years and the orders do trickle in.

What is the cost of participating in a show?

The cost is about $250, but the orga-

nizers will usually negotiate with small businesses with top quality products that will enhance the image of the show.

Do you do any advertising? If so, how much, what kind, and where?

In the past, I did some advertising in suburban newspapers. More recently I have run ads in a special edition, (Home Design), of the Sunday *Chicago Tribune Magazine*. These are quite expensive, but reach a huge audience.

Do you sell through galleries or stores?

No, but I did have an enclosure on display and in use in an architectural hardware store for a number of years. And an enclosure is part of a wall paneling and molding display at a hardwood lumber store. I also try to make myself known and have a stack of brochures at appropriate places.

How did you set prices in the beginning and how do you do it now?

I have a fairly heavy reliance on my computer. I have spreadsheets set up that ask for the dimensions of the radiator and return the exact size of each piece along with its cost. This gives me a very accurate idea of my materials cost. I then use a multiplier to determine the price. I haven't been very good at tracking the time it takes to build an enclosure or to accomplish the particular tasks involved. Watching a clock and keeping track of how I spend my time makes my occupation seem too much like a real job. Consequently, I started by just guessing at what an appropriate multiplier might be and making adjustments until the income seemed about right at the end of the month. I've used the data from my spreadsheets to establish a price list so that I can quickly produce an exact quotation for any size enclosure in most any design.

What are your present gross annual sales, and what growth percentage do you foresee in the next two or three years?

Sales are roughly $100,000, and I'm not enough of businessman to really answer this, but I would hope about 20% per year.

In your own mind, have you put any limit on how big you want to get?

I like change and new challenges and have no objection to continuous growth. At some point in the growth process, I may have to revert to woodworking as a hobby but that would be acceptable.

Do you personally deliver and install the radiator covers?

Yes. I handle all contact with the clients, from the first phone call or greeting them in my shop to delivery and installation. I deliver it myself unless it is out of state. Then I call a delivery service.

What is a typical day for you?

I have a cup of coffee at home as soon as I get up. Then I fill a Thermos and head to the shop. I get into the harder work immediately, gradually going to easier tasks as the day proceeds. I generally go home, (it's only about 4 blocks away), to grab a sandwich or some leftovers for lunch. I work until about 5:00 or 6:00 p.m., depending on if it's my turn or my wife's turn to cook. After dinner, I generally do the sedentary work: bookkeeping, design work and correspondence. If I have relatively quiet chores to do at the shop, I go back for a few hours to take care of them. Most deliveries and visits to potential clients occur on weekends since the vast majority of my sales are to families where both partners work.

What is the most important thing in your life?

Barbecued ribs and, if I can pick two things, rock and roll.

And that's the story of how there has come to be some classy cover-ups in Oak Park and River Forest, Ill. PW

Preparing Stock

Making your lumber flat, straight and precisely thick eliminates numerous hassles throughout a project.

By Hugh Foster

Preparing stock is a part of every project that experienced woodworkers take for granted.

Woodworking authors haven't really addressed stock preparation in quite a long time, and, as the pendulum in education swings, it's become the untaught issue in woodworking.

Contrast today's non-teaching of stock preparation with my junior high school woodworking "career" in the late 1950s. We were given a rough-cut pine board and rudimentary instructions in the use of the hand saw and hand plane. We would be eligible to start making projects as soon as we created a 6" X 6" X ¾" piece that was perfectly square and accurately sized in all dimensions. Many of us spent 13–14 weeks planing and cutting that board and others like it. Not too proudly, I recall shedding the board's approximate weight in tears as I repeatedly failed this hand-tool task. It's a wonder my classmates and I ever became interested in woodworking.

As much as I hated preparing stock in the '50s, it's now one of my favorite parts of a project. Today, making square stock is easily achieved with power equipment, so there's little reason not to begin each project with all the advantages square stock offers.

When I buy rough lumber, and that seems to be the only way to get fine wood without paying excessively high prices, I always delight in surfacing it to see what beauty nature has left below that cobbie surface for me and the end-user of the project to enjoy. The wood for these photos revealed stunning birdseye maple, pecan with beautiful tiger stripes, great waves of grain and some "wormy" sections that will help the finished project look far more handsome than store-bought furniture. All these "defects" (or beauty marks, as I prefer to call them), are surely a major contributor to the notion that custom-made furniture looks "more real" than does its mass-produced, commercial counterpart.

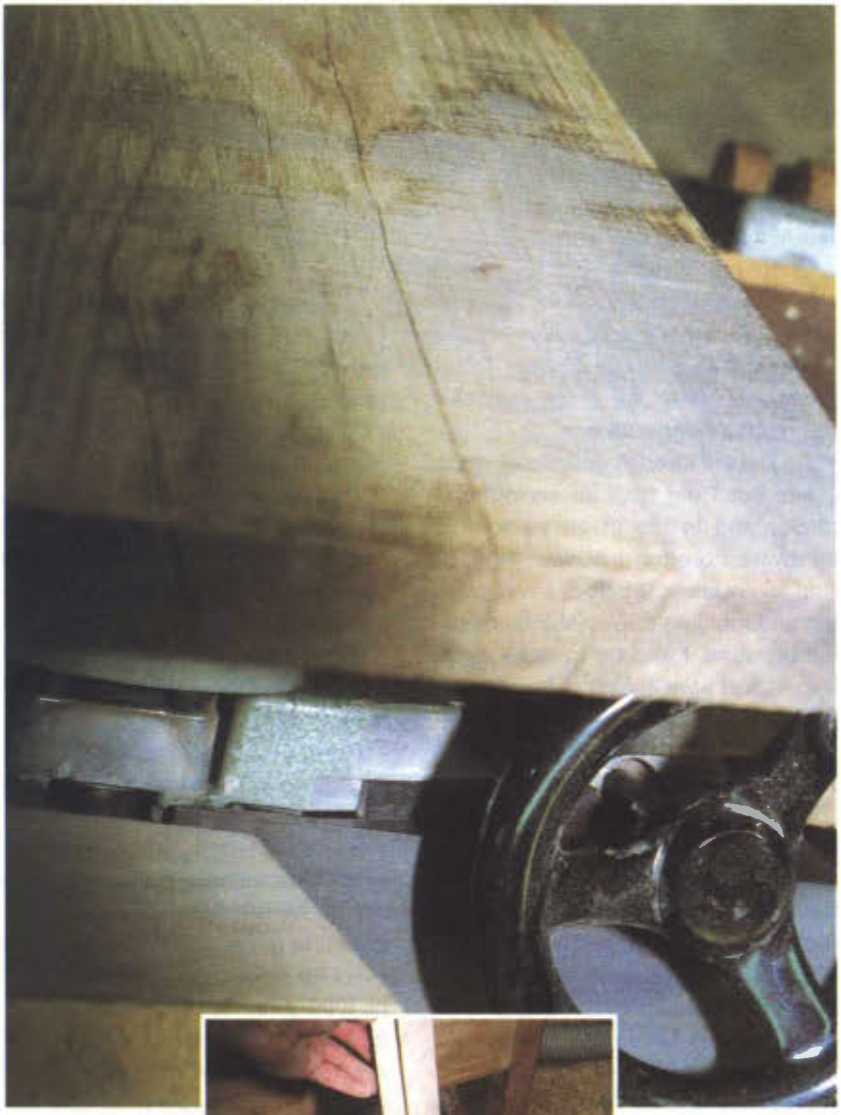


Photo 1. *Inspect boards for end checks as shown above. Usually, these ends should be cut off before jointing begins.*

Photo 2. *Check stock for flatness along its length. What you find determines how to proceed with this board. As is, it would be a candidate for cross-cutting to shorter, usable length.*

Hugh Foster *is a noted woodworking writer and a contributing editor to* Popular Woodworking, *from Manitowoc, Wis.*

Klaus Thiel face joints a walnut board.

Working with properly prepared stock is largely a matter of self-respect. With this in mind, let me mention a couple of important safety issues: Wear hearing protection and use dust collection and respiratory protection as you do all the steps described here, beginning with jointing the stock.

Working with uniformly thicknessed stock is also a matter of convenience. I know professional woodworkers who skim-thickness even commercial stock so it's all the same thickness when they begin a project rather than "fudge" fit everything later. Now that small planers have become relatively inexpensive, there's little point in not having one. All stock should be at least skimmed for thickness before using, saving lots of cussing as you glue-up panels and assemble parts later.

"Working with properly prepared stock is largely a matter of self respect."

Here's how you properly prepare stock:

1) Select your material. Serious woodworkers keep often used stock on hand. When I go to my wood merchant, I hand select the planks I want to buy. I always select 100 board feet or so, giving me both a price and delivery advantage. Most of the time I work from the same materials, so having some excess on hand is never really a problem. Further, as prices keep escalating, having even a couple hundred board feet of cherry on hand is like having money in the bank.

I stack my selections on wood racks in my shop and as I get ready to build a project, I can be even more choosy than I was in the lumber yard. I like to fancy that I build each project with the best materials, even if that isn't necessarily true.

2) Cut the pieces to rough length. I use a saber saw rather than a circular saw for this operation, regarding the saber saw as both quieter and less dangerous. This safety gain is a small price to pay for the difference in speed. Many woodworkers, however, use a radial arm or circular saw for this step. Remember that the rough ends of boards are likely to be "checked" beyond use **(photo 1)**. Further, note how the straight edge illustrates **(photo 2)** the twist and waves in this board. Only by cutting it to appropriate lengths before beginning to joint and plane can you get maximum use from this board.

3) Joint one edge clean **(photo 3)**.

4) Examine the ends and joint the cupped side first. If the stock is cupped badly, it may be necessary to rip the piece into two narrower pieces making the cupping less pronounced. The first pass or two may take material only from the edges of the board **(photo 4)**. It's not necessary to joint all the way to a clean face **(photo 5)**; indeed, it's desirable to take at least the last pass off the jointed face with a planer. Milling marks, or "chatter," from the planer are finer than those left by the jointer knives.

It's only necessary to face joint until the board is flat enough across its width and straight enough along its length so the

Photo 3. *After cross-cutting to rough length, remember to edge joint the stock before face jointing it.*

Safety Tips for Jointing Stock

- Always use the guard. No excuses.
- Jointing stock with knots or other defects are prone to cause accidents.
- Keep your fingers away from the revolving cutter head.
- Always joint with the grain.
- Don't attempt to surface pieces shorter than 12".
- The maximum dept of cut should be ⅛".
- Always use a push block when surface jointing or jointing a thin piece of stock.
- Always stand to the left of the machine and behind the cutter head.
- Make sure stock is always held firmly against the fence.
- Check the machine to make certain all parts are securely tightened.
- Wear safety glasses.
- Don't wear loose clothing. Roll up long sleeves and keep shirt tails tucked in.

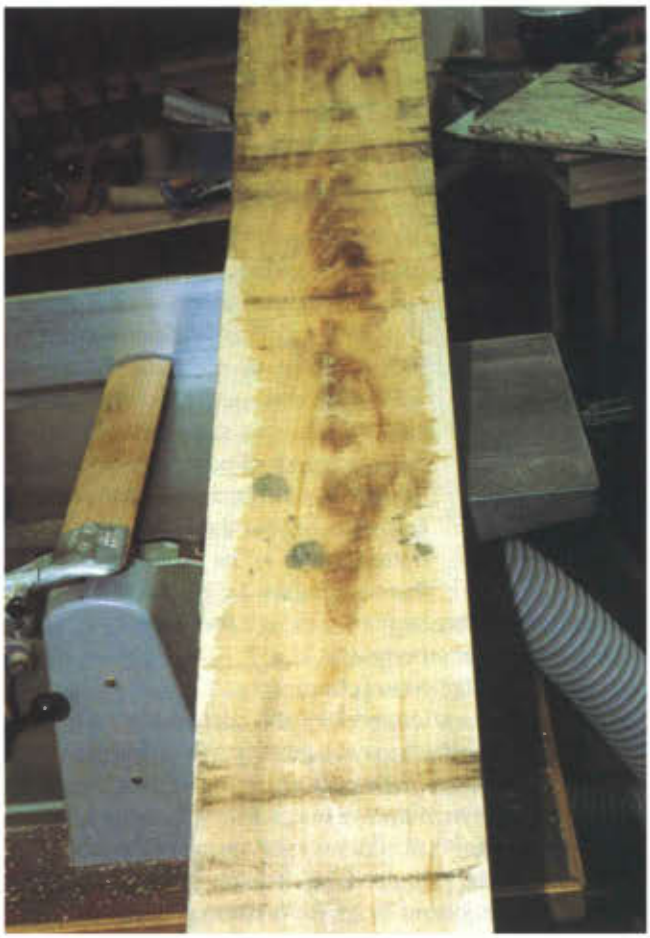


Photo 4. *With the cup side down, the first pass on the jointer may only take off material from edges as shown above.*

Photo 5. *Subsequent passes on the jointer have flattened one face, leaving some rough surface that will clean up during planing.*

***Photo 6.** Since the board was jointed with the cup side down, the first passes through the planer will skim the "crown" on the opposite face.*

***Photo 7.** Continued planing takes more material off the higher or thicker areas of the board. Continue planing this face until the board is smooth.*

planer's pressure rollers will not flex the board. If it's not flat on one face before planing, it never will be.

5) Measure and rip to just over your desired width (which may be ⅛" smaller than the narrowest part of the board). There's no point in planing material you won't be using. The rippings you make now will work better in your fireplace than will the dust you'll generate by planing this excessive material.

6) Check the material's thickness in the center of the board as well as on the edges. The piece is nearly 1⅜" at the rule, but only about 1 1/16" at the edge. Would that all 1" lumber were so generously cut!

Moving to the planer, try to take approximately equal amounts off both faces of the board. The same amount doesn't necessarily mean the same number of passes, for your jointer passes are likely to be heavier than your planer passes.

***Photo 8.** With one face planed nearly smooth, it's time to flip the board and plane the jointed face.*

7) If necessary, wax your planer table surfaces before you begin to prevent the loss of a setting later on if you have to open the planer to wax it.

8) Run all the pieces at the thickest setting to start. You don't lose much time doing this, and you prevent surprises and damaged machinery

9) Thickness your stock. The first pass through the planer will illustrate the thick and thin spots. By the fourth pass we can no longer remove 1/16" at a time in this very hard pecan, so I start taking only half as much per pass. **Photo 8** shows us a clean surface at 13/16". Now we can advance to the other face.

10) I plane, then alternate sides, all the way down to finished thickness, which, in the case of this sample, is a "fat" ¾". A fat ¾" is not 13/16"; it may not even be 25/32". It's enough that I can sand to my heart's content, and still have ¾".

11) Joint one edge square to the now perfectly parallel faces. You may have to start this jointing process at mid-board somewhere to get an ever-so-slightly-concave rather than ever-so-slightly-convex straight edge. This process can take several passes.

12) The material is now ready for serious cross cut and rip operations.

13) The capacity of my old planer is about 6¼", so I rip all pieces that will be glued into panels to about 6". This allows me to plane the second edge absolutely parallel to the first. If you have wider boards and want to use the full width, rip the rough edge with the new jointed edge against the fence. After ripping, joint the edge to make sure it's straight and square.

14) Cross cut and glue edges together. I like a couple of biscuits to force alignment. But in a longer panel, I'd also use clamps like the Plano Glue Press to help ensure the flattest possible panel. The flatter a panel you glue-up, the less fooling around needed to get it right.

15) Some woodworking authors advise that you wipe off excess glue with a damp rag. Don't! This invariably leaves a mess that's invisible until finishing the project. Others say to let it harden completely. Cleaning up that glue is too much work! My policy is to clean the squeeze-out glue when it's about the texture of stiff cottage cheese. I use a chisel with the beveled edge down to prevent digging into the wood. What little glue doesn't come up easily now will clean up later with a cabinet scraper.

This is what preparing stock is about. Even the most twisted materials can be tamed with this process. PW

A Very Versatile Flap-Top Table

This 18th century influenced table is a welcome challenge and addition to any woodworker's portfolio.

By Craig Cairo

This flap-top, multi-purpose table is loosely based on English designs of the mid-18th century. One of its main attractions is its versatility. Placed against a wall it becomes a decorative lamp or entrance table. With the top closed, use it as a handsome sofa table. Swing the gate legs open, flip open the top, and it transforms into a serving table or even a writing desk. The center drawer can store flatware or stationery. The two small candle slides at each end add a decorative touch.

Although this project uses pine, selected hardwoods would give it a more traditional look. Cherry, walnut or mahogany would be good choices. In fact, mahogany was the material of choice in fine furniture of English origin built in the mid-1700s.

Regardless of the specie selected, choose your lumber carefully. It should be straight-grained and free of warps, cups, knots and checks.

Craig Cairo has a small shop and makes custom furniture. He's also interested in redesigning period pieces.

The finished table with the candle slide open.

In this front perspective, we see a double thickness top. The leaf, resting on the table top, hinges at rear.

This view of the table, with the top held vertically, shows the table placed against a wall.

If desired, you may edge dowel or use biscuits on the table top pieces when joining them. Here, edge boring holes are being drilled.

Dry fitting the boards for the table top.

Turning a leg on the lathe. Remember: Don't turn the piece where the aprons and stretchers join the legs.

Start the table tops first. Use boards no wider than 4" and cut all the pieces slightly longer than needed, allowing trim to square up later. Joint the edges straight and square, then edge glue the top pieces together. While not necessary, you can edge dowel or use biscuits on the pieces. This adds no strength to the top, but aids in both surface and end alignment while clamping. If you edge dowel, dry fit the pieces. Then glue and clamp, following the recommended drying time for the glue.

Select stock for the legs, either building up from two pieces of ¾" pine or starting with 1½" stock. Cut pieces longer than finished length to allow for trimming the marks left from the lathe centers. Now, mark the layout lines on all six legs—this will help avoid measuring errors. The legs are easy to turn, but remember not to turn where the aprons and stretchers join the legs. Don't use a duplicator when turning since any slight differences will add authenticity. Examine the turned legs and clean up rough spots or slight differences by sanding or turning.

Mark the legs for the apron and stretcher dowels. Remember, the rear legs have no bottom stretcher. The gate legs are marked on only one face for the apron and stretcher dowels. Double check all marks, making sure you have marked the correct faces. Begin with the legs, drilling ¼" diameter holes ⅝" deep using a brad point bit in a drill press (a self centering doweling jig would also work). Center the holes in the face of the leg.

Next, cut and shape the aprons. Because the front apron has a drawer, it can be made in four pieces, as shown in the drawing ***(see dimensions drawing)***, or marked out on one piece and cut out with a jig or scroll saw. This method leaves the grain uninterrupted. The side aprons must allow for the candle slides. Mark the side aprons for the ¾" x 5⅞" candle slide opening ***(see Pull-Out Plans for candle slide details)***. Cut these very carefully using a fine tooth saw. Use a candle slide to check the fit. Any slight adjustment should be made with a sharp paring chisel. The fit should be a good slip fit with no binding or play. However, keep in mind that these pieces will have a finish put on them, which will make the fit even tighter.

Screw the candle slide stop in place. Place it in the opening, and attach the hinge. Screw on the copper or brass cover plate, and attach the pull using a 3/16" x 1½" dowel screw. When you're satisfied with the fit, it's time to disassemble the pieces, since it's much easier to finish them separate.

Carefully measure the purchased table top fasteners' dimensions, and cut a corresponding groove for them in the table aprons. Use a scrap ¾" thick piece as a gauge to check the fit. Make any necessary adjustments with a paring chisel or fine sandpaper. Cut a ⅛" wide groove ¼" down and ¼" deep on the inside top edge of the table base aprons for fastening the top with clips later.

Using a band saw, cut six decorative curved apron blocks. Sand the edges smooth, then glue and clamp in place at the junction of the apron and leg.

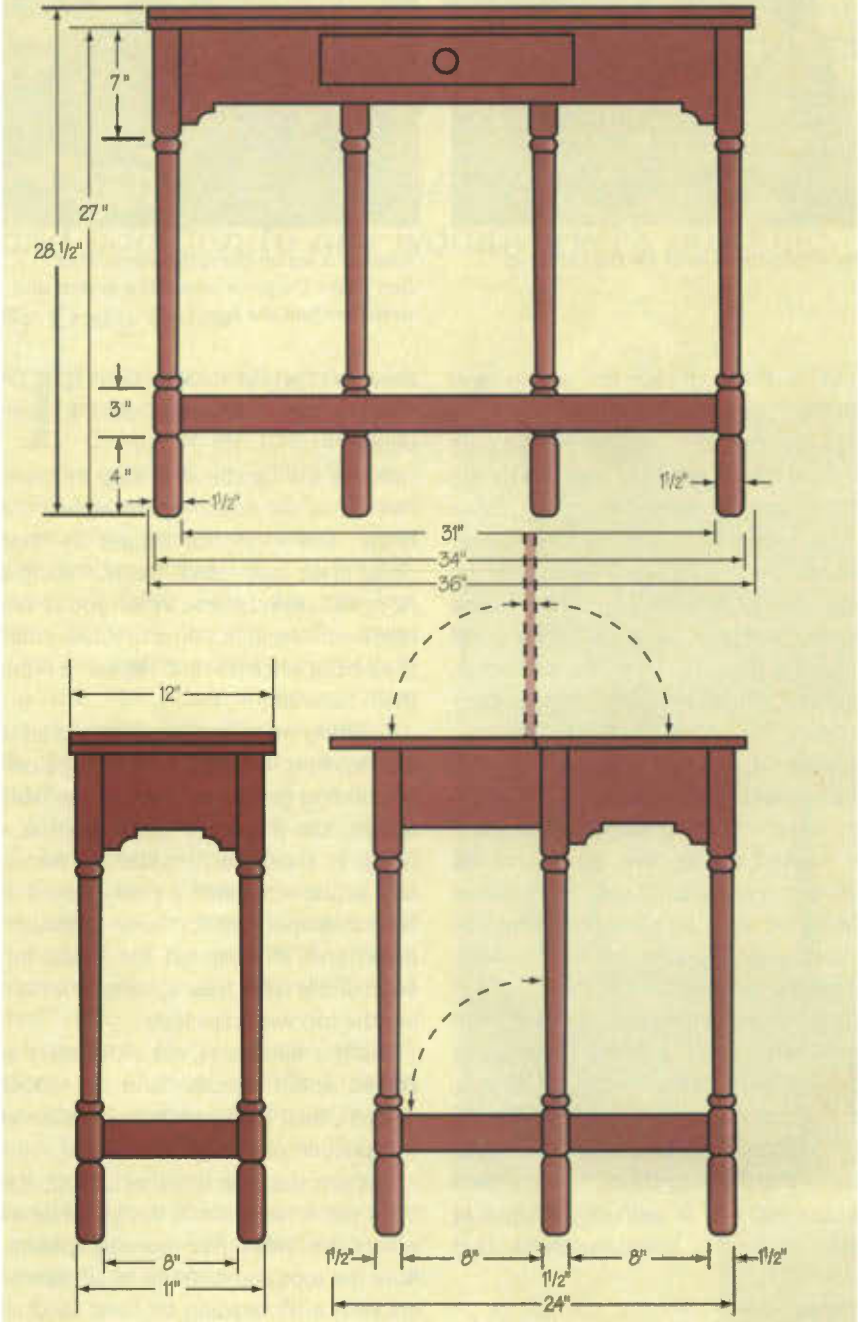
Prepare the five stretchers. Note the front piece has a scroll design while all others are plain ***(see opening photo)***. Rout the tops and bottoms of all stretchers with a ½" beading bit, and sand all the pieces smooth.

Place ¼" dowel centers in the holes already drilled in the legs. Raise the aprons and stretchers on a ⅜" thick block, and carefully push them into the dowel center pins. Markings should be centered on the ¾" thickness of the board. Drill ¼" holes ⅝" deep where indicated from dowel centers.

Cut ¼" dowels in 1" lengths, then dry fit the pieces. Don't attempt to assemble and glue the table base together at one time. Instead, glue-up the front legs, apron and stretcher first, then clamp with pipe or bar clamps. Follow with gluing and clamping rear legs and

With the top and gate legs open, the table is 24" x 36". The top is hinged at the back of the table top. In this position, the stencilled design on the top would show. With no rail between the back legs, the table is suitable as a desk.

Dimensions



While the front frame is clamped, you'll want to check to make sure it's square.

apron. You should then check all assemblies with a square.

After similarly joining the apron and stretcher to each gate leg, hold the completed gate leg assembly in position against the table. Swing the legs open and closed, observing how the hinges must be oriented. Each stretcher uses one hinge, while the apron uses two. Screw the hinges to the gate leg stretcher and apron first, maintaining the typical ⅜" setback from the face of the leg relative to the stretcher. Finish by screwing the hinges to the rear table legs.

Build the drawer next. If you're using purchased drawer guides, follow the manufacturer's instructions for fitting allowances. The drawer box for this table is a simple dovetailed box with a separate, finished front. The dovetails are machined using a ½" flush dovetail jig. After dry fitting, take the inside measurements and add ½" to the length and width deriving the finished dimension of the drawer bottom. Disassemble the drawer. Next make a groove for the drawer bottom. Rout or saw a groove 5/16" deep, ¼" wide and ¼" up from the bottom edge of all four pieces. Glue the drawer box together. Do not glue the

Schedule of Materials

✎	No.	Name	Th.	W	L
❑	2	Top	¾"	12"	36"
❑	6	Leg	1½"	1½"	27"
❑	1	Front Apron	¾"	5½"	31"
❑	1	Rear Apron	¾"	5½"	31"
❑	2	Side Apron	¾"	5½"	7⅞"
❑	1	Front Stretcher	¾"	2⅝"	31"
❑	2	Side Stretcher	¾"	2⅝"	7⅞"
❑	2	Gate Leg Apron	¾"	5½"	10½"
❑	2	Gate Leg Stretcher	¾"	2⅝"	10½"

✎	No.	Name	Th.	W	L
❑	6	Scallops	¾"	1½"	3"
❑	2	Candle Slides	¾"	5½"	6½"
❑	2	Candle Slide Stop	¼"	1"	4"
❑	1	Drawer Front	¾"	4½"	18"
❑	1	Drawer	Build to Fit		
❑	1 pair	Large Pulls	1½" dia.		
❑	1 pair	Small Pulls	1" dia.		
❑	¼" dowel		6 ft.		

***Above.** The unfinished table without its top. From this position, you can see the drawer and candle slide.*
***Right.** Here you can see the open gate legs and the closed candle slide.*

bottom, since it must float in the grooves to accommodate bottom expansion and contraction.

To complete the drawer work, cut the drawer front, selecting stock with a grain pattern that closely matches the front apron. Rout all four sides with a ½" beading bit. Rout all four edges of the drawer front with a ¼" r. beading bit. Mark the drawer front for drawer pull placement. Center the front on the drawer and clamp together. Drill ¼" holes through both pieces for the pulls. The oversized holes for the pulls' screws will allow a final fitting adjustment of the drawer front when installed.

Cut out the candle slides and attach the stop blocks and hinge. Fit the slide into the apron, check for fit and screw the hinge in place. Remember, this slide will have a finish applied, slightly adding to its thickness. Radius the ends of the ⅛" x 1" x 6" brass plates. Drill and countersink the screw holes, then attach the wood pull with a 3/16" x 1½" dowel screw.

Cut the table tops square and to final dimensions, then sand. Check both tops for flatness, since even slight cupping or warping will show up later when the tops are in the closed position. If one top is slightly cupped or warped, attach it to the table frame. The table clip fasteners will help pull the top flat. Clamp both tops together and rout the front and end edges with a ½" beading bit. Don't rout the long edges where tops will be hinged together.

A pair of 2" x 3" solid brass cabinet hinges are used to hinge the tops. These are first ground and filed into a butterfly shape as shown. Be patient, work slowly, and shape the hinges carefully. Brass is soft and works easily. Use a slow speed bench grinder, 1" belt sander and hand files to finish the metal work.

Position the hinges on the tops and trace around their outline with a sharp hobby knife. Cut these mortises very carefully using hand chisels, or a router and straight bit, leaving the outlines to be finished by hand. Double check the screws' length before attaching the hinges, since they may be too long after mortising for the hinges.

Place the tops upside down on a clean, padded surface. Place the table frame upside down on the tops. Close the gate legs against the table. The table top's back edge and the gate legs' outside edge should be flush with no overhang. Center the table base side to side on the top. Attach the top to the frame with six table top clips, using two on the long sides and one for the ends.

Before final sanding and finishing, remove all screws, hinges and hardware. Finish sand with #220 grit sandpaper, then wipe the table with a tack cloth to remove dust.

Begin the finish process by applying Minwax Early American stain, following can directions. Next, apply two coats of clear latex finish. The clear coats are then rubbed with a fine Scotchbrite pad. The drawer box is only finished clear.

The top corner design outlines are transferred to the top using carbon paper, then painted with gold metallic enamel. After the gold enamel dries, the designs are outlined in black enamel using only one coat of black. Any unevenness in the coverage gives the design an attractive, aged look.

Two more coats of clear finish are applied to the entire table. As a final step, rub the table with a paste wax and #0000 steel wool, then buff after a haze appears using a clean, soft cloth and liberal elbow grease.

Remount the hardware and fasten the top to the base. Cut two pieces of adhesive-backed felt, 1½" square, and apply to the top of the gate legs to protect the table top from scratches from the swinging gate legs.

Now complete, step back and admire your work. As you begin to picture it standing proudly in your home, you'll discover the biggest error in undertaking this project—building only one of these versatile tables. Now you're faced with the tough decision (or argument with your spouse) about where and how to use your latest creation—a server in the dining room, sofa table in the den, a writing desk in the study, an occasional table in the foyer, a lamp table in the living room. PW

A Traveling Lawn Chair

This folding chair is lightweight, portable and easy to make.

By Ken Textor

The inspiration for this go-anywhere chair was my boat. I needed a stowaway seat that wouldn't succumb to salt-water corrosion. But the standard stainless steel, collapsible chairs on the market were out of my price range.

So wood was the obvious answer. But just copying a collapsible chair in wood had drawbacks, too. The humidity changes on the Maine coast are tremendous, making wood swelling and shrinkage inevitable. On some days a wooden collapsible chair might fold up on its own; other days it might take a block-and-tackle to close it. So this stowable chair has no moving parts.

It does, however, have several arcs in its design. If you've never scribed arcs, don't worry. Scribing arcs is a very simple procedure once you understand what's involved.

As a former boatbuilder, I know the easiest way to scribe an arc is with a wooden batten. Battens are usually made out of softwoods. Most pines, cedars and spruces make very good battens. But the most important batten characteristics are flexibility and a tight, straight grain.

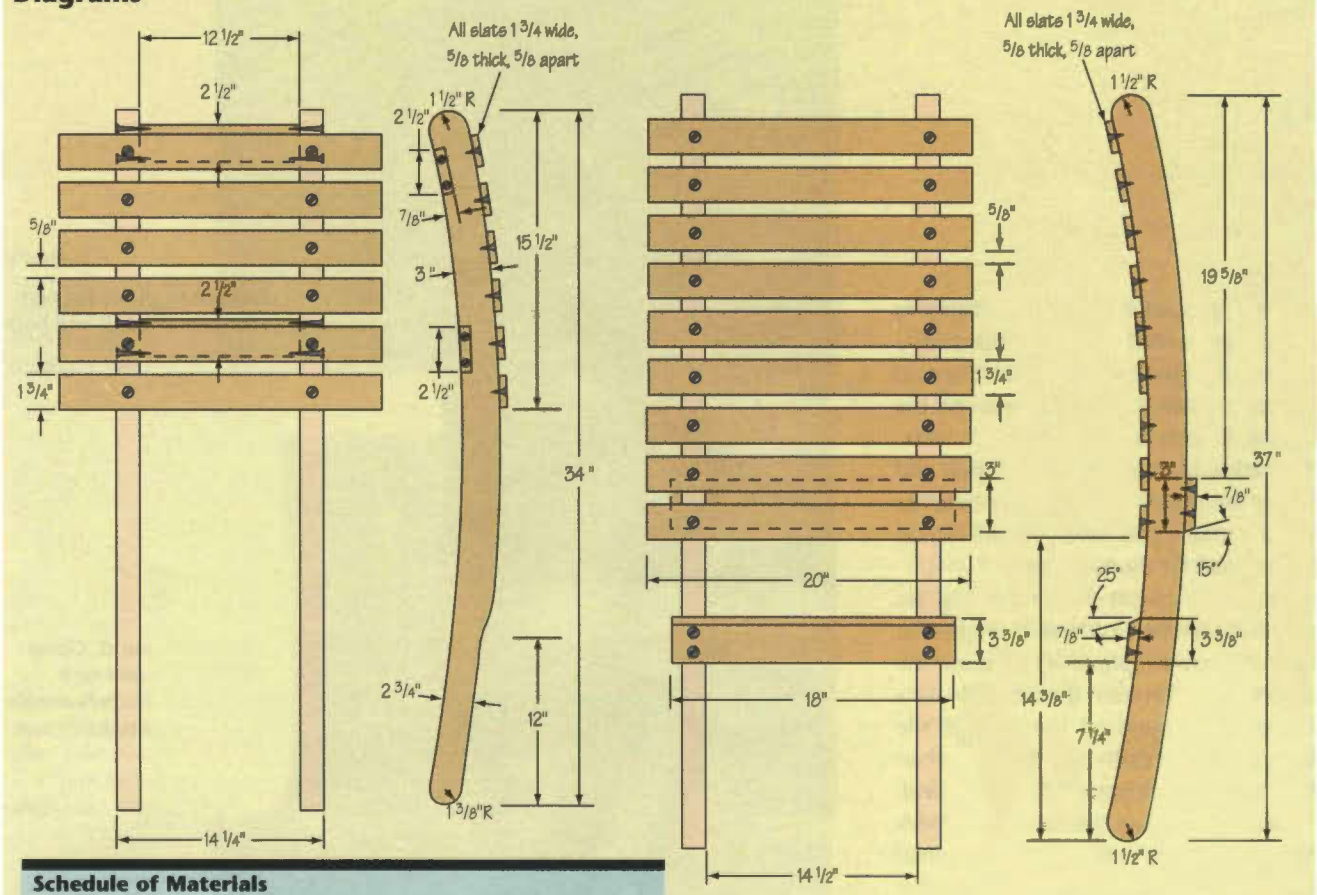
Photo 1. *Making the back arc starts with marking a straight line 1" from the edge.*

Photo 2. *After marking the center and 37" marks, lightly clamp the ends.*

Photo 3. *Push the batten to the 2½" mark and tighten the clamps. Then draw your arc.*

Ken Textor *is a contributing editor for* Popular Woodworking, *who works wood and writes about it in Arrowsic, Maine.*

Diagrams



Schedule of Materials

No.	Name	Th.	W	L	Notes
15	slats	5/8"	1 3/4"	20"	
1	lower support	7/8"	3 3/8"	18"	25° bevel, 1 long edge
1	upper support	7/8"	3"	18"	15° bevel, 1 long edge
2	back stringers	7/8"	3"	37"	2½" arc overall
2	seat stringers	7/8"	3"	34"	taper to 2 3/4"
2	anti-rack pcs	7/8"	2½"	12½"	butt between seat stringers
16	#8 screws	—	—	1 1/4"	non-ferrous, flathead
30	#8 screws	—	—	3/4"	non-ferrous, flathead

Photo 4. Use a marking guage to define the 3" width of the arc.

The batten I used for this chair's arc was made of white pine, 4' x ¼" x ¼". From experience, I knew white pine in those dimensions would give me the flexibility I needed. With other woods, you may have to experiment a bit, try different dimensions, maybe even break a few before you get one that's serviceable.

In any case, once you have a usable batten, the next step is to lay the batten on the ⅞" thick board out of which you intend to cut the chair backs. Since the chair back is going to be 37" long, a plank slightly longer (say, 42" x 8") is needed. This gives you enough surface for clamping the batten to the board.

The height of the arc to be scribed is 2½". I've found this makes the most comfortable curve for a seat for me. But don't be afraid to adjust for your own body perhaps an inch or so. (Don't be tempted to make straight backs. I tried it once and everyone agreed it makes a very uncomfortable chair.)

Measuring is next. About 1" in from one edge, draw a straight line along the entire length of the board. You must come in 1" from the edge to allow for a sufficient clamping surface. At the center of that line, measure another 2½" in from the edge and make a mark. Then, on the line itself, measure out from the mid-point 18½" in both directions, giving you a total of 37" along the line. At either end of this 37", make another mark. ***(photos 1 & 2).***

The batten is then clamped lightly at the beginning and end of the 37" length. At the mid-point, gently push the batten in from the edge of the plank until the batten's upper edge touches the 2½" mark you made. Clamp everything in place and scribe the arc along the edge of the batten ***(photo 3).***

The procedure with the clamps and the bending batten may have to be repeated a couple of times to get it just right. If you're having trouble, try this

alternate procedure: Instead of clamping the batten at the two end points, simply drive two light finish nails at the end points. Center the batten between the nails and push in toward the 2½" mark. The ends of the batten stay put and when the middle of the batten reaches the 2½" mark, you have your arc. Scribe it and head for the band saw.

Once you've got that first crucial arc cut, the rest are easy. Use a single-slide marking gauge ***(photo 4)*** to draw the second arc 3" in from the first arc. Use a compass to round off the ends of the chair back stringer. Use the first chair back stringer as a pattern for the second.

Once you have the two chair back stringers done, make the horizontal stringer using the arc from the vertical parts. At 34", the horizontal seat stringers are slightly shorter than the vertical back stingers, but the arc from the vertical stringers still work fine here. You end up with an arc of 2½" or so and this works fine throughout the rest of the project.

Again, for the horizontal stringers, I used the ⅞" stock. You can use lighter stock (⅛" thinner) if you're using a rot-resistant hardwood like white oak or teak. But I recommend making these chairs out of a lightweight wood, something like sassafras, white cedar or white pine. It makes the finished chair easier to carry around. When you use lightweight stock, it's more sturdy with the ⅞" and ⅝" stock specified on the parts list. (See accompanying parts list.)

The next step is easy. Cut out the 15 chair slats as specified on the parts list. Remember that people in bathing suits may be sitting on these chairs, so be sure the slats are well-sanded (up to 180 grit) and the comers rounded off, preferably with a ¼" radius router bit.

Before you begin assembling the seat, be sure the horizontal stringers of the seat have been tapered. The tapered area is the first 12" of the end of the seat stringers that will *not* be covered with slats. This 12" length should be 2¾" wide. The rest of the horizontal seat stringer is 3" wide. The difference between the two is tapered freehand. The narrower end is necessary to make the seat fit into the chair's vertical back when not in use ***(photo 5)***.

Begin assembly with the seat of the chair. The two anti-rack pieces should be installed first ***(photos 6 & 7)***. These pieces will ensure a long, non-creaking life for the chair. They are also pretty handy when you want to store a section of the Sunday paper while you get another iced tea. They should be installed with #8 x 1¼" flathead, non-ferrous wood screws. As with all screw fas-

Photo 5. *The closed chair shows the nesting relationship between the seat and back rails.*

Photo 6. *Clamp the anti-rack pieces between the seat rails.*

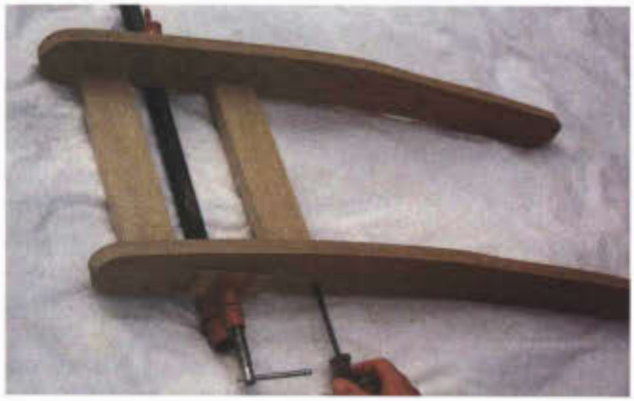


Photo 7. *Attach the anti-rack pieces, remembering to countersink the screws and cover with wooden bungs.*

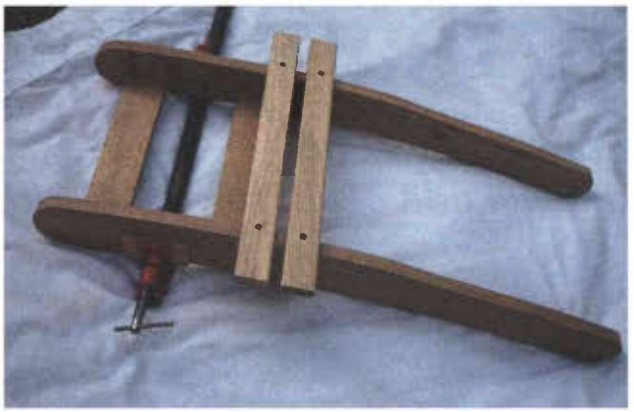


Photo 8. *Start attaching the slats 15¼" down from the non-tapered edge.*

Photo 9. *Continue assembling the slats maintaining a ⅛" gap between each slat.*

Photo 10. *Placement of the lower and upper supports will be important for the overall strength of the chair.*

tenings in this project, I countersunk them so the head of the screw could be covered later with a wooden bung.

The six slats themselves are next. As the plans and photos show ***(photos 8 & 9)***, start fastening the slats 15¼" from the non-tapered edge of the seat stringers. A single #8 x ¾" screw holds them in place. Again, for maximum comfort, the screws should be countersunk and bunged. Don't be tempted to widen or narrow the ⅛" gap between the slats. Such adjustments will make the seat uncomfortable.

Repeat the slat-fastening procedure for the nine slats fastened to the vertical chair back stringers as shown. As you do this, be sure the distance between the vertical stringers remains a consistent 14½". Otherwise, the finished chair seat will not nest properly into the finished chair back.

Placement of the lower and upper supports on the vertical piece is important. These pieces will take the entire weight of a person sitting on this chair ***(photo 10)***. You should use four #8 x 1¼" screws for each piece, two per side. Be sure the bevels are in the right position and location as the plans show.

At this point, you're ready to put your chair together. In either the sitting position ***(photo 10)*** or carrying position ***(photo 5)***, the fit should be snug but not tight. Adjustments, if any, can be made with a hand plane.

Nearly all of the finishing options available to any woodworking project can be used on this chair. But be sure that if paints or stains are used, they won't chalk off. Also be wary of oils that might stain clothing. Best of all, though, you can skip finishing altogether if you've used a good, rot-resistant wood. PW

An Elegant Plant Stand

Modeled from an 18th century wash stand, this challenging undertaking will add depth to your abilities.

By Joseph Olivari

Originally produced in England around 1740 in the Chippendale style, this piece was used as a wash stand with the top ring serving as a nesting place for a basin. Today it serves as an elegant plant stand. I used cherry for all exposed surfaces and birch for the drawer interiors, but walnut or mahogany are also attractive options.

Begin by making the top ring ***(A)***. I glued two pieces of ¾" x 12" x 12" lumber to make a 1½" thick piece that was then planed to 1¼" thickness. Mark the circle to size **(diagram 2)** using an 11¼" outside diameter and a 7" inside diameter. Cut both circles using a band saw for the outer circle and a jigsaw for the inner circle. Sand the edges smooth and shape the top outside edge detail with a router.

Next, make the triangular lower leg support ***(B)*** using 1½" x 13" x 13" stock cut to shape per plan. Sand all the edges including the top and bottom. Bore ¾" holes at each point 1¼" in from the blunted corner. These will later receive three turned spindles ***(C)***.

Now make the three legs ***(D)*** using 1½" x 2½" x 14" stock. Copy the shape of the legs onto the wood with the grain running the length of the leg. Next, cut out the leg pieces on the band saw and shape the rounded surfaces with a spoke shave and lots of sanding.

Now go back to the lower leg support triangle and cut the tails for the dovetail joint at each clipped corner; these will receive pins on each leg. I used a ⅜" dovetail bit for this operation. Trim out any excess with a chisel to make the tails on all three blunted points. Using a back saw, I cut the pins of the dovetail on each leg, trimming carefully to fit the tails. Glue each leg in place. Set this assembly aside to dry.

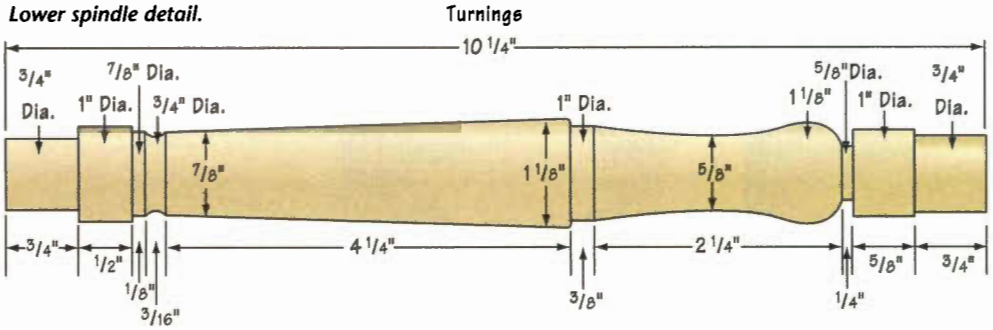
Next, work on the drawers. Cut the tri-

PHOTO BY WIRONEN STUDIOS

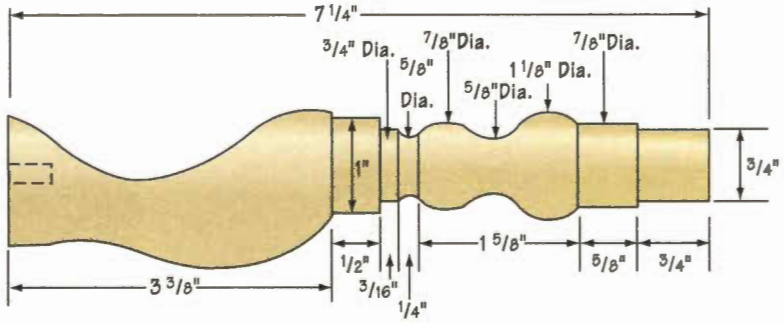
Joseph Olivari *is retired and works with wood in Gardner, Mass.*

DIAGRAM 1

Lower spindle detail.



Make 3 from 1 1/4 stock



Make 3 from 1 1/4 stock

Upper spindle assembly detail.

Schedule of Materials

PART	QTY.	ITEM	SIZE (Th W L)
❑ A	1	top ring	1¾ x 12 x 12
❑ B	1	base leg support	1½ x 13 x 13
❑ C	3	lower spindles	1¼ x 1¼ x 10¼
❑ D	3	legs	1½ x 2½ x 14
❑ E & F	2	drawer section top & bottom	½ x 12 x 12
❑ G	2	drawer section blocks	1½ x 3¾ x 5½
❑ H	1	drawer section blocks	1½ x 2½ x 5½
❑ I	1	plywood drawer support	¼ x 4 x 7
❑ J	2	drawer section sides	3/16 x 6 x 10
❑ K	2	drawer section fronts	3/16 x 1½ x 6
❑ L	2	drawer section sides	3/16 x 1½ x 6
❑ M	1	drawer section back	3/16 x 1½ x 6
❑ N	3	upper spindle turning	1¼ x 1¼ x 3⅜
❑ O	3	upper spindle extension	1¼ x 1¼ x 3⅜
❑	1	face plate turning	1 x 6 x 6
❑	2	drawer fronts	⅜ x 2½ x 6
❑	4	birch drawer sides	⅜ x 2½ x 4
❑	2	birch drawer backs	⅜ x 2½ x 5
❑	2	drawer bottoms	¼ x 3¾ x 5¾
❑	4	drawer guides	¼ x 4

angular top and bottom ***(E & F)*** using ½" x 12" x 12" stock. Don't bore the holes in the bottom piece as shown on the pattern, but do drill the top. The bottom holes will be matched up with the spindles later in the assembly. Round the edges on all sides and corners.

Now make the solid blocks ***(G & H)*** that form the sides and back of this section. I used birch lumber for these pieces (1½" stock). On the two matching blocks, cut mated grooves to hold the plywood drawer support ***(I)***.

Parts **J** through **M** form the outer "veneer" of the drawer section. These pieces should be cut now and dry fit with the blocks and top and bottom. Dry-fitting allows you to adjust the corner miters of the side pieces.

Once you're satisfied with the fit, glue the blocks in place on the top and bottom and clamp. Next, attach the side "veneer" pieces. I held these parts in place with a few small brads that were then set and puttied.

Next, cut the plywood drawer support **(I)** and place in the grooves cut earlier. A little glue will hold this in place.

Drawer section above shows left side (G) and back (H) blocks placed. Note dado cut for drawer support (I). Section will later be covered with ¼" solid cherry "veneer."

Now it's time to turn the lower spindles using 1¼" x 1¼" x 12" cherry stock. Sand each one thoroughly.

Proceed with marking the three holes in the bottom of the drawer assembly that will receive the three lower spindles. I did this using three short pieces of ¾" dowel rod. I drove brads through the length of the dowels, then set the three in the bored holes of the lower leg support. Carefully position the drawer section on top of the dowel points and after pressing, you'll have the correct location to bore the ¾" holes. When drilled, glue the three lower spindles to the drawer unit making sure the spindles are square to the vertical and let dry.

After turning the three short pieces *(N)*, glue the 1¼" x 1¼" x 3⅜" block *(O)* to each as shown on **Diagram 1**.

Clamp each in place and let them dry. Mark and cut the upper shape (as per plan) on the band saw. Using a small spoke shave, work to achieve your finished shape, then sand.

Glue the spindles in place on the top of the drawer section. Make sure they face out as shown in the opening photo. Again using ⅜" dowels, place the upper ring in position so it's even on all sides. Using dowel centers, mark the drilling location and bore three, ⅜" holes in the bottom of the ring. Glue and clamp in place until dry.

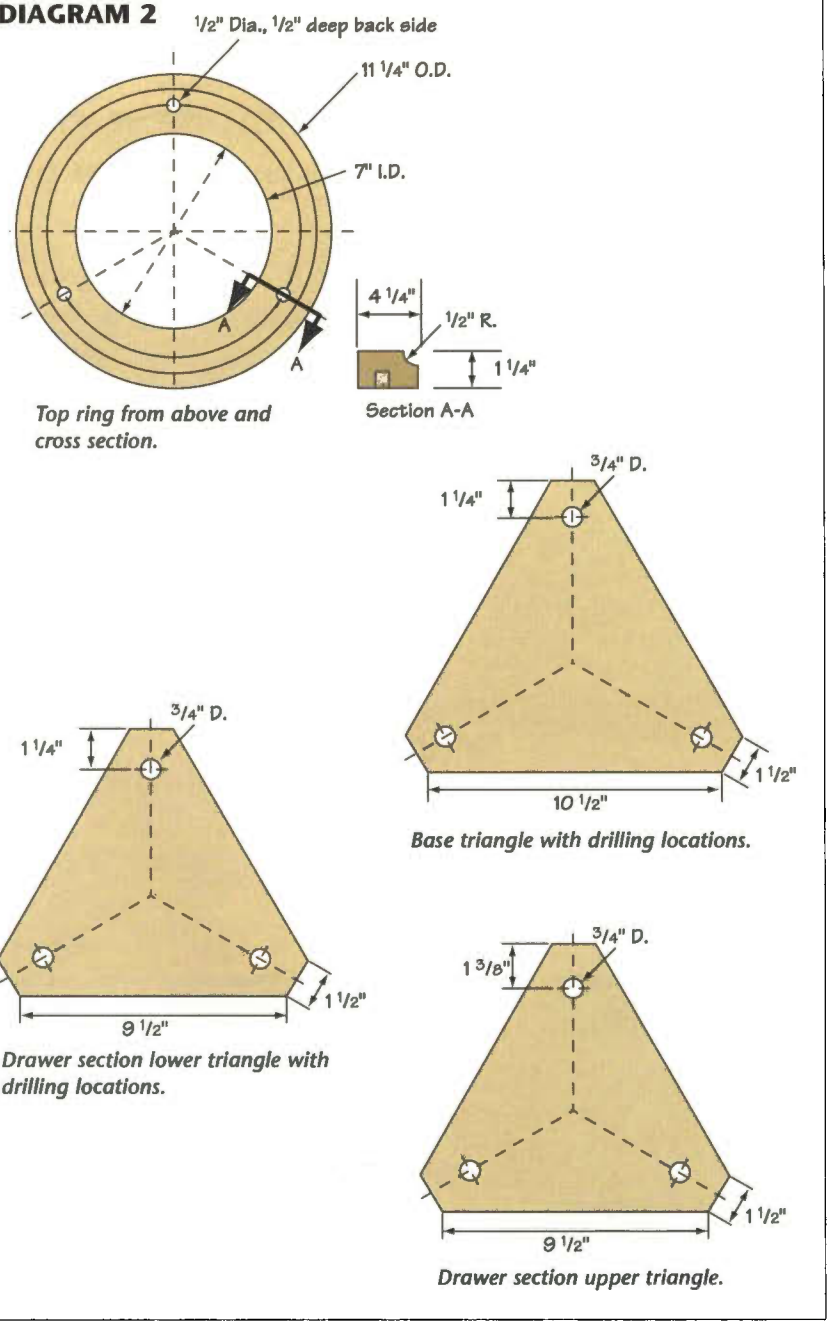
At this juncture, make the face plate turning that goes in the center of the lower base and leg support. After turning and sanding, find the center and glue in place. This can be held in position by a #10 x 2¼" wood screw from the bottom.

Now make the two drawers using the sizes on the materials list. The sides of the drawers have ¼" deep dadoes cut to accept the drawer backs. All pieces should also be grooved to accept the plywood bottoms. Assemble the drawers using glue and brads.

Next, fit the drawers using small spacers on the sides, bottom and top. Attach the two guides to each drawer and fit so they work smoothly. Mark the center of each drawer front for the two brass knobs and drill.

I finished my wash stand with Minwax cherry stain wiping evenly. Apply two coats of satin finish afterwards, sanding lightly between coats. When it dried, I rubbed with oil and #0000 steel wool for a nice finish. PW

DIAGRAM 2



Popular Woodworking· No. 83

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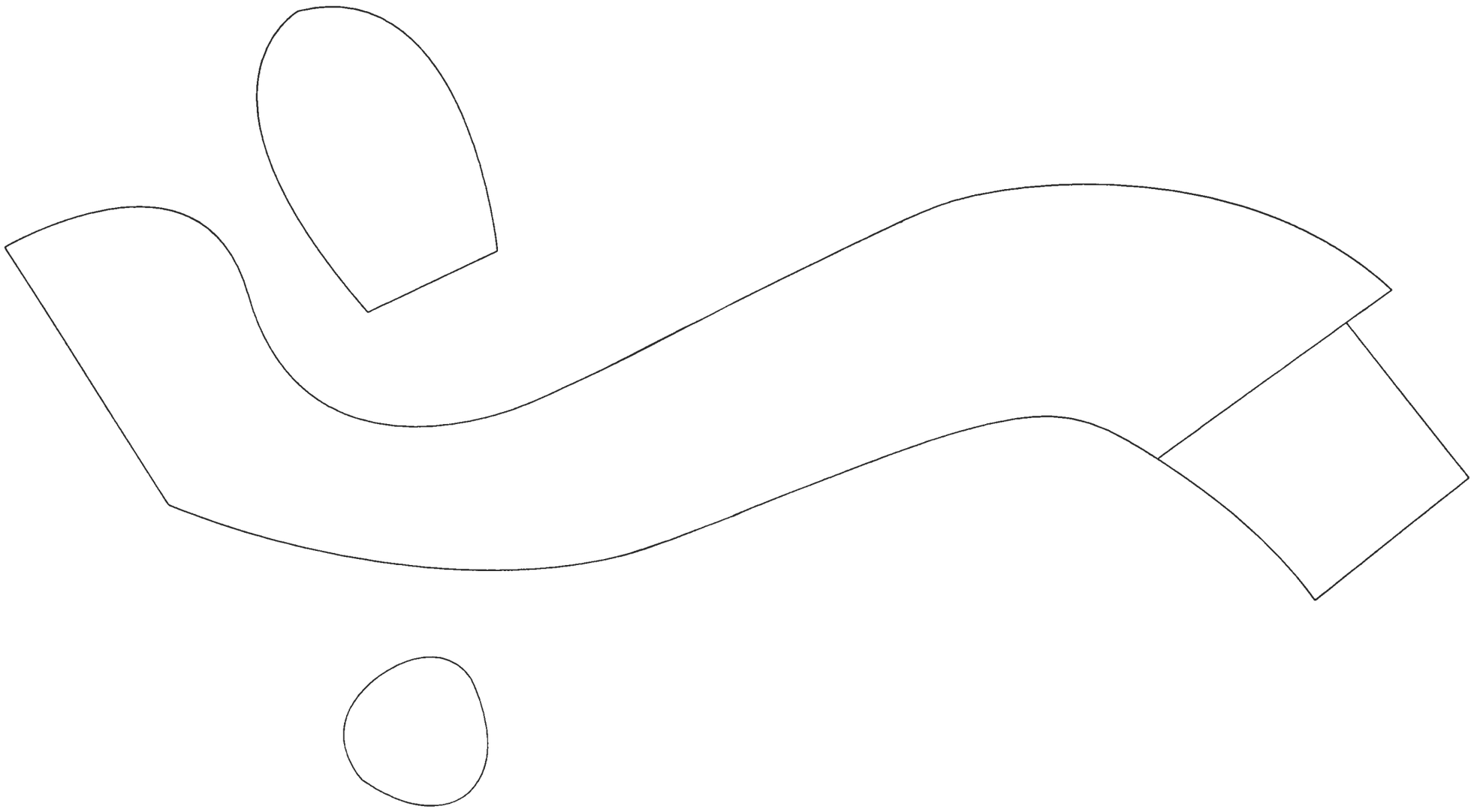
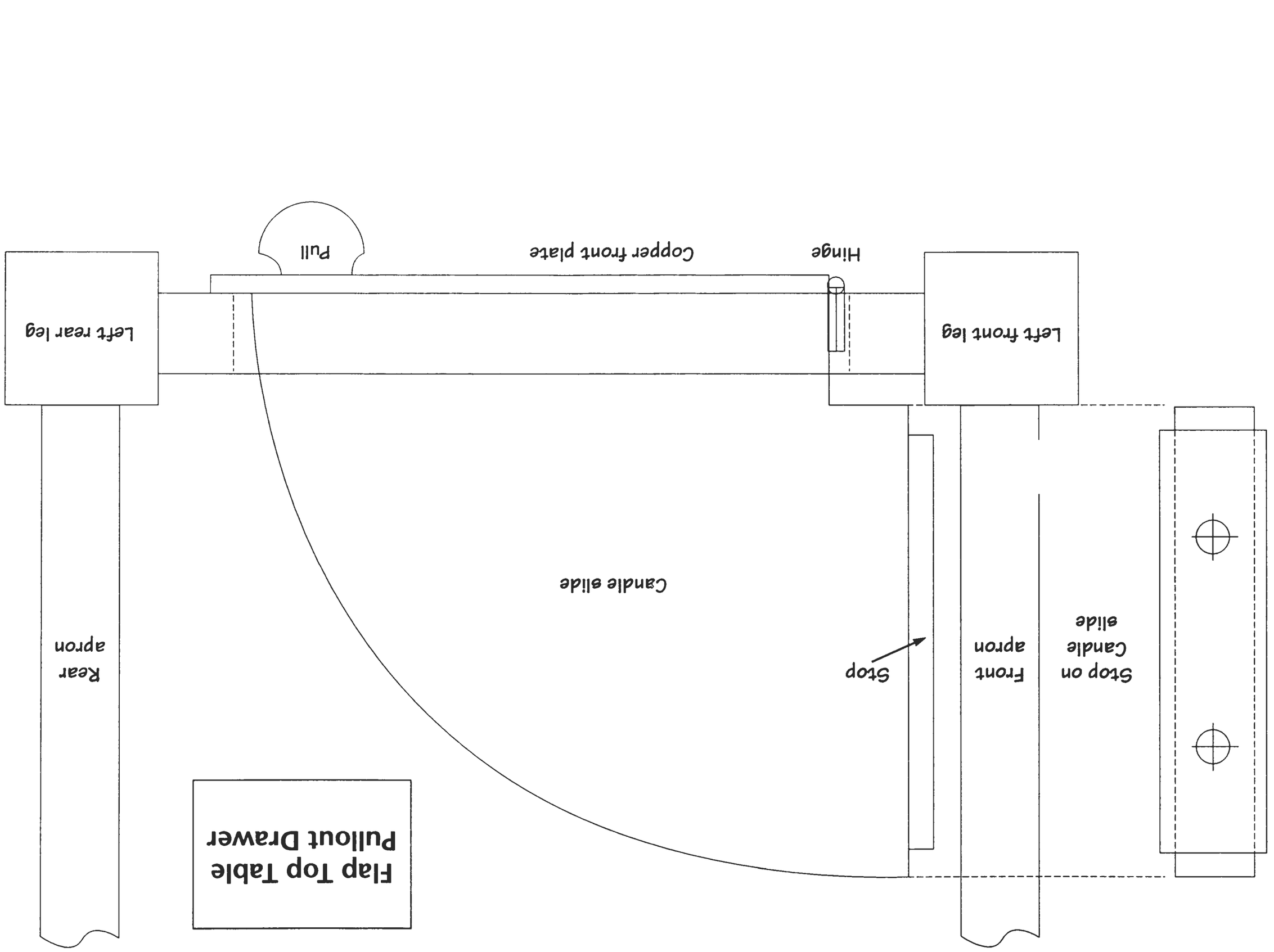
PullOut™ Plans

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

Plant Stand Leg



Flap Top Table Pullout Drawer



E

N

W

B

X

S

C

A

Y

D

O

H

G

F

J

K

I

Lawn Lantern Bird Feeder

This ornamental feeder project combines turning and angle cutting exercises.

By Howard French

The real attraction of this lantern style bird feeder is its flexible design and use of readily available materials. To find a suitable feed container, visit your kitchen recycling bin! The bottle used for my feeder is a two-quart apple juice jug, measuring 5" in diameter and approximately 8½" tall. The final design grew out of the bottle's dimensions.

Turnings

You'll note that four of the feeder components are turnings; the top *(H)* and bottom *(G)* finials; bottle neck support *(I)*; and 1½" diameter mounting arm. The dimensions are not given for *G* and *H* as they may become whatever you desire. The bottle neck support may be changed as required to fit and support your bottle. Regardless, cross-drill the 1" diameter hole as shown (before turning *I*) to allow the feed to escape into the dish formed by part *D* and the four parts *F*. The remaining turning (1½" diameter by the desired length) can be from dowel rod.

BASE SUB-ASSEMBLY

Cut out the base *D* at 5¾" square. Bevel and notch this piece in the same manner as *B* following the diagram. Then cut out the four parts *C* ¾" x ¾" x 10½". This is the finished length after the compound 15° angles have been cut on both ends.

Drill a 1" diameter hole at the center of *D*. Turn the base support *G* from 4 x 4 stock as shown, or as you desire. Turn a 1" diameter x ¾" long tenon at the top of *G*, or drill a 1" diameter hole in the centerline to accept a short length of 1" dowel rod.

Drill the 1½" diameter mounting hole through two opposing faces on *G*. Then drill a 3/16" diameter hole into one of the other two flat surfaces of *G*. This hole will be perpendicular to, and centered on, the 1½" mounting hole. This hole will also be used to affix the completed assembly to the perch.

Align the 1" hole in *D* with the turned tenon (or dowel) of *G*. Apply waterproof glue and nail the two components together.

TOP SUB-ASSEMBLY

The top of the feeder is formed by laminating parts *A* and *B* together with waterproof glue. First cut the two pieces 10⅝" square (from ¾" stock). Bevel cut all four edges of *A* at 15°, and all four edges of *B* at 75°.

Next, notch out all four comers of *B* to accept the corner posts *C*. Pay attention to the compound angles used on these notches. Once these cuts are made, laminate *A* and *B* together, making certain their respective grain patterns are at right angles. Clamp the two pieces and set them aside to dry.

Once dry, lay out the 5" diameter hole (or whatever dimension is required for your bottle) and cut it out. This sub-assembly is now complete.

SUB-ASSEMBLY

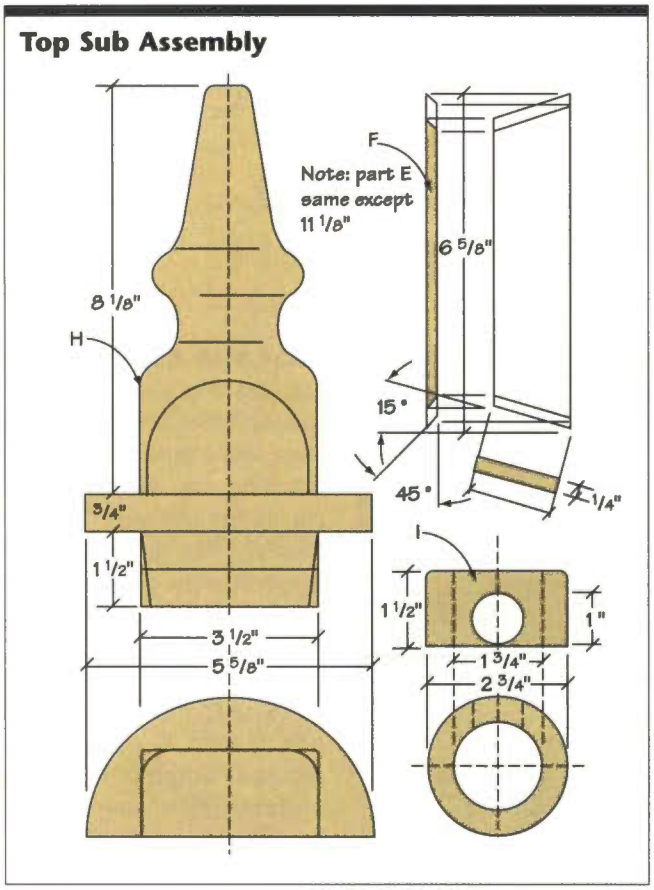
Place the lower sub-assembly *D & G* in a bench vise so that it's supported vertically. Fit four parts *C* into their notches, and secure with waterproof glue and finish nails. Align the upper sub-assembly with the upper ends of the four comer posts. Again, use waterproof glue and finish nails to attach the posts to sub-assembly *A/B*.

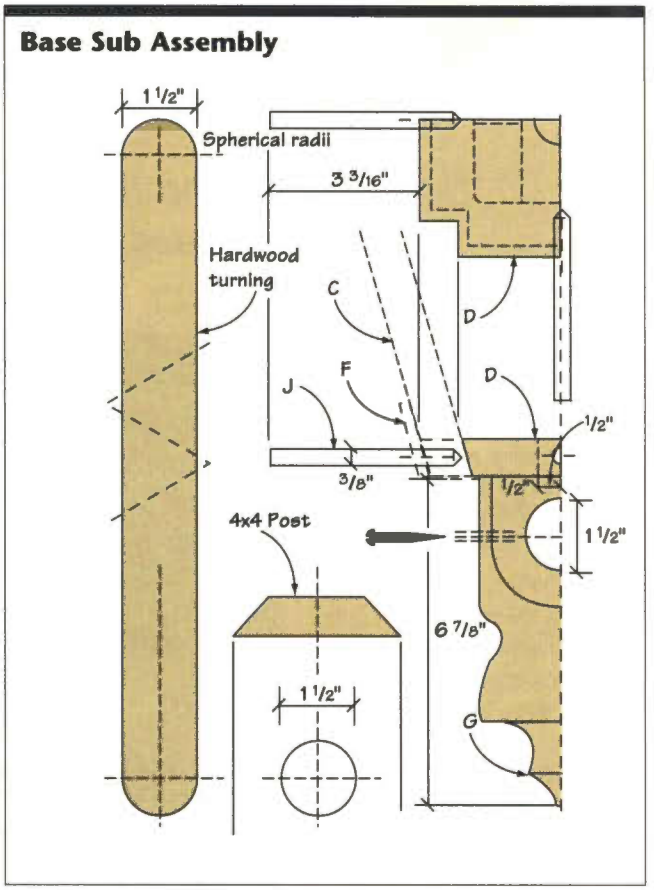
TRIM PIECES

Cut sufficient ¼" x 1⅜" lengths to provide both the top *(E)*, and base trim *(F)*. You will need about seven lineal feet. Note that compound cuts are required on both ends of each of these eight pieces.

Fit two pieces of top trim onto the opposite surfaces of *B*. Next fit two pieces of bottom base trim onto the opposite sur-

Howard French *is a woodworker living in Abilene, Texas.*





faces of *D*. Glue and nail these components into place. Repeat the above process on the other two sides.

THE ROOF

All four roof pieces *K* were cut from a single siding shingle. Don't ask for asbestos shingles, ask for "mineral composition." I cut these pieces using an ordinary 8" circular saw blade, which is now a high-quality frisbee. The lifetime quality of the roof is considered to be worth the ruined blade.

Fit the roof sections *K* in place over *A*. Locate, drill and countersink the holes for #6 flat head screws. Mark these fitted sections, and lay them aside for now.

Schedule of Materials

No.	Letter	Dimensions	Item
❑ 1	A	¾ x 10⅝	top laminate
❑ 1	B	¾ x 10⅝	second top laminate
❑ 4	C	¾ x ¾ x 10½	corner posts
❑ 1	D	¾ x 5¾ x 5¾	base
❑ 4	E	¼ x 1⅜ x 11⅛	top trim
❑ 4	F	¼ x 1⅜ x 6⅝	bottom base trim
❑ 1	G	3½ x 3½ x 6⅞	lamp feeder support
❑ 1	H	3½ x 1½ x 10¾	composite finial
❑ 1	L	¾ x 5⅝ dia.	feeder access lid (see M)
❑ 1	I	2¾ dia. x 1½	bottle support, turn from hardwood
❑ 4	J	⅜ dia. x 4	perch dowel rod
❑ 4	K	⅛ x 4½ x 12⅜	roof section
❑ 1		1½ dia.	hardwood mounting arm
❑ 1		3½ x 3½	post (optional)
❑ 2	M	¾ x 3½ x 3½	lower lid components

Supplies

❑ 16 #6 x ¾" flat head wood screws to attatch roof

❑ 1 #12 x 1½" round head wood screw

THE CONTAINER

My feed container was formed by cutting the bottom from the aforementioned apple juice bottle. There are many ways to do this task, but I'll detail how I went about it.

Run a band of masking tape around the circumference of the bottle at a point near the bottom. Tape a second strip approximately 1/16" higher than the first. Fold a shop towel over your bench vise and open the jaws forming a secure cradle for the bottle. ***Note:*** Don't tighten the vise on the bottle. Using a Rem-Grit saw blade in my hack saw frame, I began lightly cutting between the two strips of masking tape while rotating the bottle. After about two rotations, the bottom parted.

Swipe or grind the newly cut glass edge by sticking sandpaper to a flat surface. Place the cut end of your bottle squarely on this surface and slowly "orbit" it against the grit. Check the results occasionally to see that all the small chips and checks have been eliminated. Use another piece of sandpaper to break any sharp edges at the opening.

THE PERCHES

The perches *J* are cut from ⅜" diameter dowel rod. Support the feeder on your drill press table so its centerline is parallel to the table. Locate and drill the four ⅜" diameter holes to a depth of approximately ¾". Slightly radius one end of each, and chamfer the opposite end. Using glue, place the perches into their respective holes.

THE FINIAL/LID

Turn the finial/lid component ***H*** as shown, or as desired. If turned as shown, the larger diameter disc (5⅝") was cut from ¾" stock, and the lower disc (3½" x 3½" x 1½", ***M***) was cut from two pieces of ¾" stock. These three pieces were then aligned and glued together.

The upper turning (3½" x 3½" x 8") was made from 4x4 stock and sanded on the lathe. The entire assembly was then aligned, glued and securely nailed together.

FINAL ASSEMBLY

Support the feeder in an upright position. Place the bottle support ring ***I*** in position. Insert the neck of the bottle in the radiused end of the support ring. Check for a close fit where the base of the bottle mates with the hole in part ***A/B***. Sand to fit if too tight, or glue a band of felt around the hole if too loose.

Temporarily install the roof sections ***K***. Fit the square end of the finial/lid into the 3½" x 3½" opening left by the roof sections. The lower end will probably come to rest directly on the cut end of your bottle. Sand an appropriate radius (tapered) on each of the four lower corners so that it enters, but does not exert force on, the support piece ***I***.

Disassemble the piece, and prepare for painting. I finished my project in gloss white enamel, except for the support piece. This was finished in metallic brass to simulate a mogul lampbase.

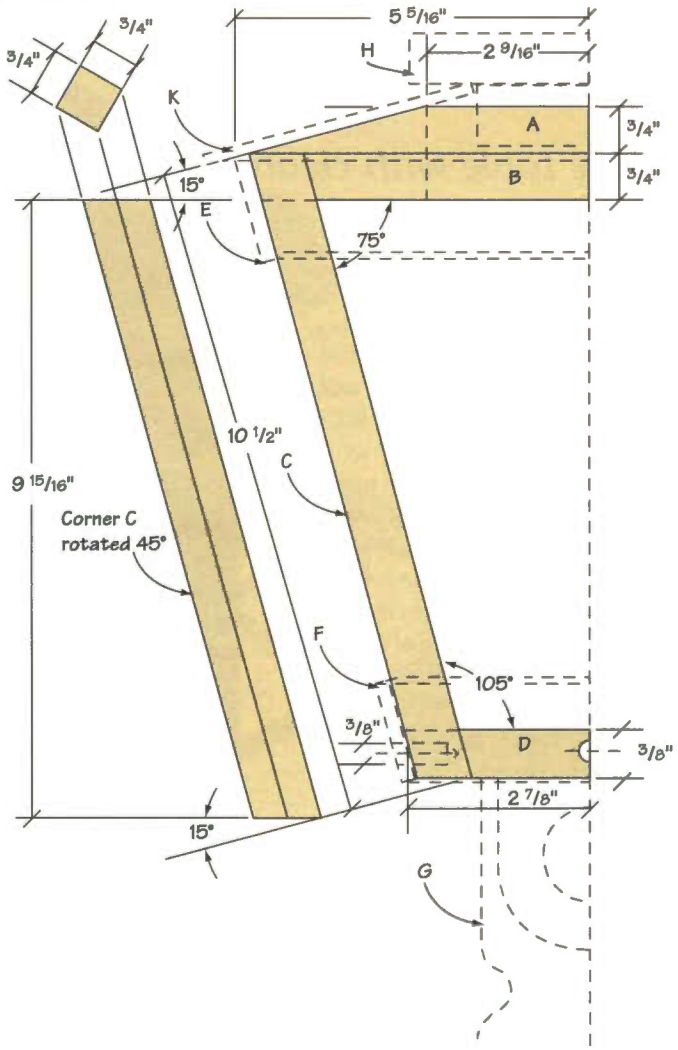
MOUNTING

A Wolmanized 4x4 was used as a lamp post, with the top edges beveled at 45°. A 1½" diameter hole was drilled through the post a few inches from the top. I used a 1½" diameter hardwood turning as a mounting arm which was placed in the hole and secured in place.

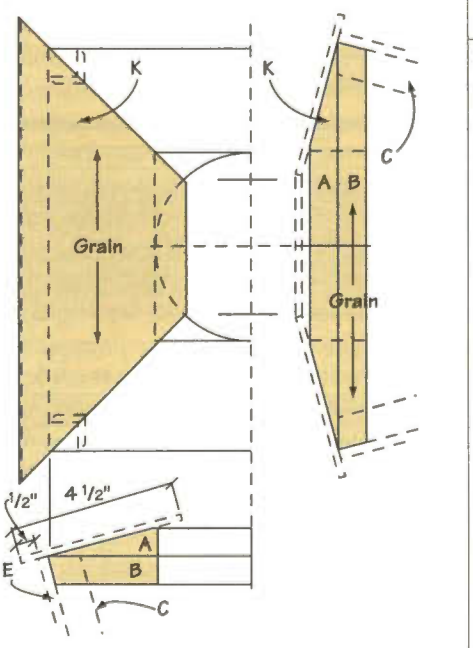
With the post plumb, the lamp feeder assembly is slipped in place over the spherically radiused free end of the feeder mounting arm, and rotated so its centerline is parallel to the centerline of the post. Attach the assembly using a #12 x 1½" wood screw. One screw works adequately to prevent slippage or rotation, while providing for easy removal if necessary.

All that remains is to slip the bottle in place, re-install the roof and fill the container. PW

The Container



Roof Detail



Master Craftsman Project

American Pier Table

This side table with clean, simple lines holds a "secret" for the owner.

By Kenneth B. Sadler

Pier Table from master craftsman Ken Sadler.

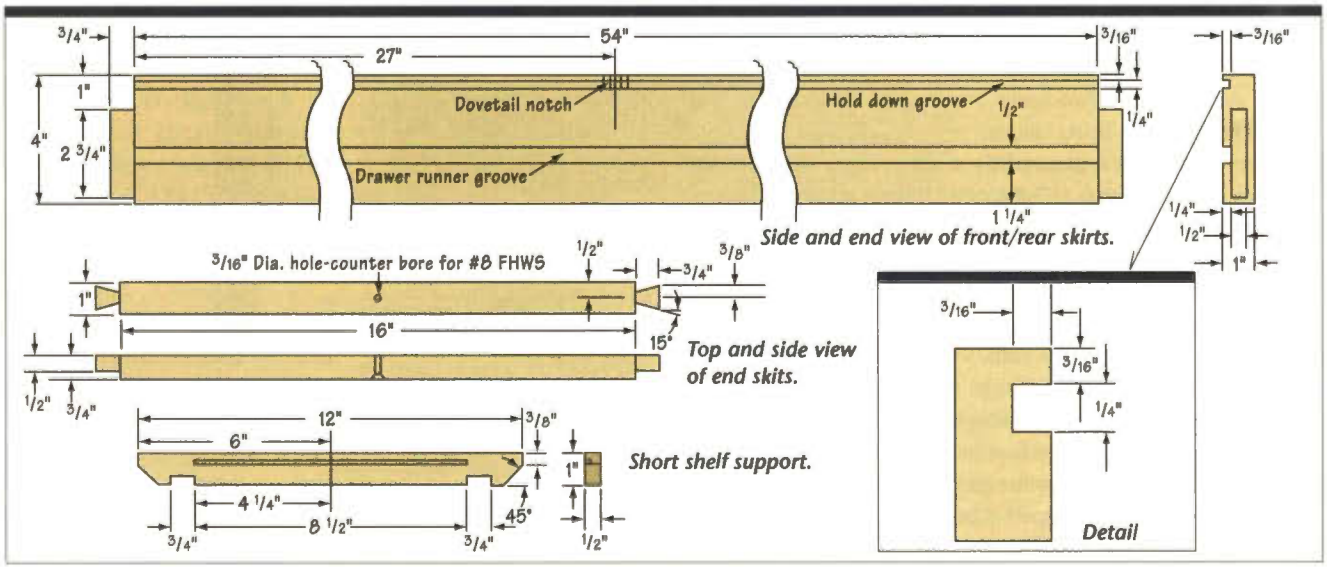
This piece best represents a type of American table built between 1790 and 1860. They were referred to as pier tables or sometimes side tables. I prefer Pier table over side table, so there you have it. But, I asked myself, "What does pier mean as applied to furniture?" The definition was, "a table designed to stand against a wall between and below two windows." That's nice, but not the only place it can be used. It would look nice as a sofa table, and would enhance the appearance of a large hallway or entrance.

Beyond these benefits, there's another feature that only this table has. Each of the drawers features a secret compartment that only you will know how to open.

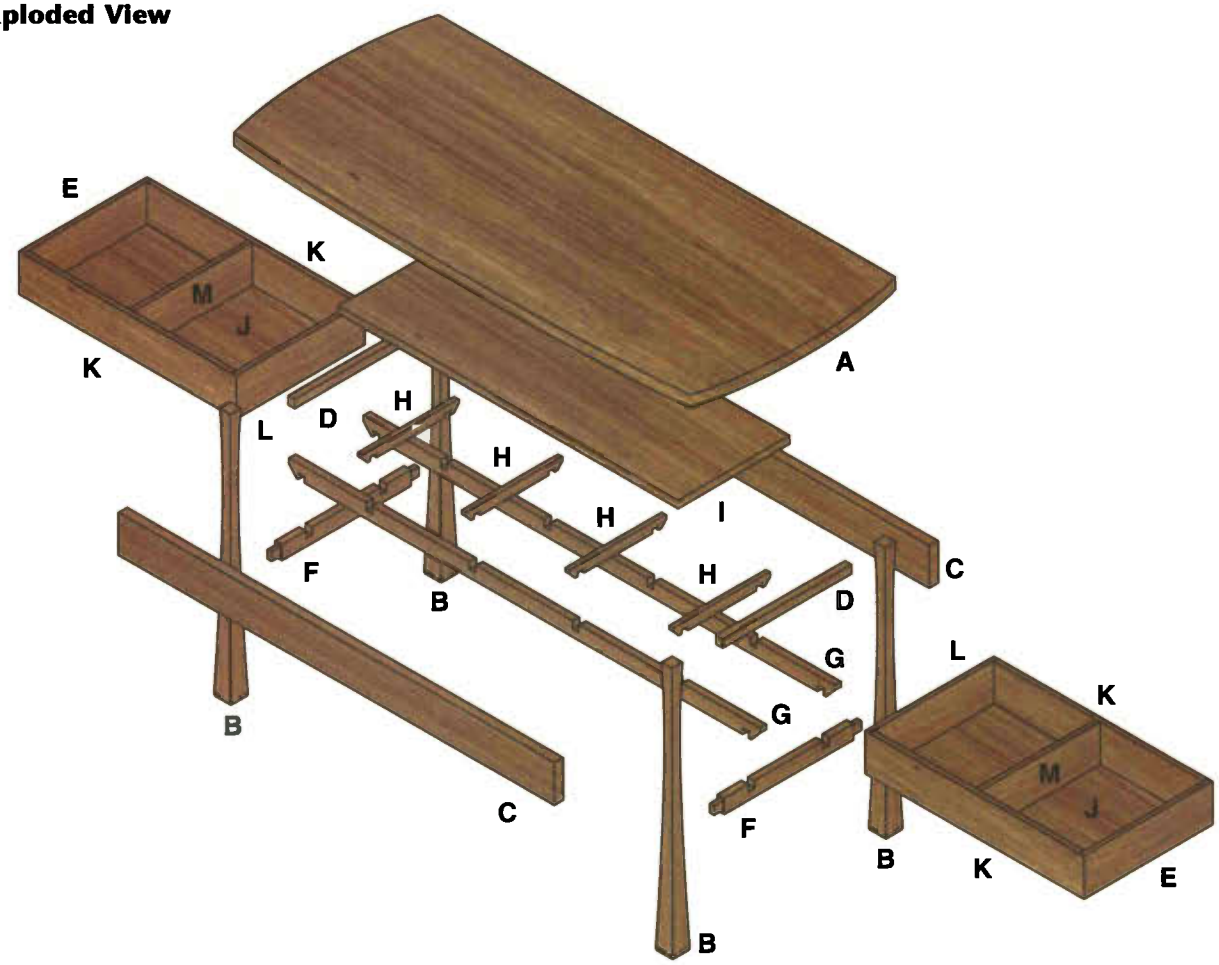
Most antique pier tables were more elaborate than this one, but I've always believed furniture should have a look of simple elegance and the wood should provide the beauty in the piece. This table follows that principle. The two most visible parts are the top and shelf, therefore the wood for these parts should be chosen with particular care. The top, which finishes 22" x 60" x ⅞" thick, will, unless you're very lucky, have to be glued up from three, or possibly four, boards. In choosing them, look for closely matching grain patterns that will look as though it was made from a single board. Also look for grain patterns that are distinctive. If you find a 2" x 12" x 62" board with a beautiful grain, resaw into two 1" x 12" pieces and bookmatch them. There are endless possibilities, so take your time and find the right one.

The next step is to make all the base parts except the legs. Start with the 1" thick front and rear skirts. The drawing shows how these are made. The most important dimensions to hold are the distance between the tenon shoulders, the width and the distance of the bottom of the drawer runner groove from

***Ken Sadler**, a Contributing Editor for* Popular Woodworking, *is a furniture craftsman and author who resides in Portland OR.*



Exploded View



Schedule of Materials

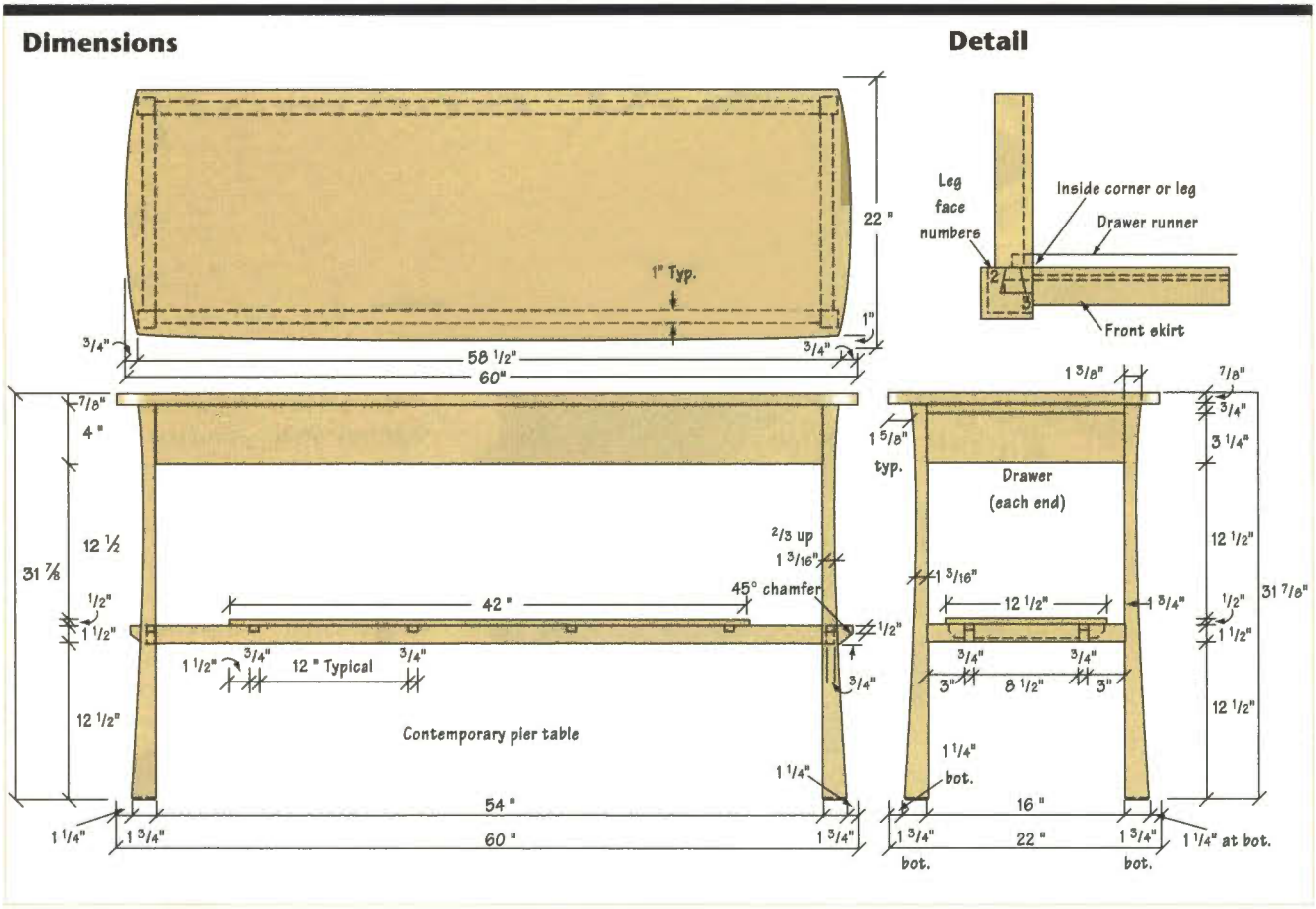
Qty.	Item	Name	Size (Th x W x L)
❑ 1	A	Top	⅞ x 22 x 60
❑ 4	B	Legs	1¾ x 1¾ x 31
❑ 2	C	Front skirts	1 x 4 x 55½
❑ 2	D	End skirts	1 x ¾ x 17½
❑ 2	E	Drawer fronts	¾ x 3¼ x 16
❑ 2	F	Side stretchers	¾ x 1½ x 17½
❑ 2	G	Shelf support (long)	¾ x 1½ x 58¼
❑ 4	H	Shelf support (short)	½ x 1 x 12
❑ 1	I	Shelf	½ x 12½ x 42
❑ 2	J	Drawer bottoms	5/16 x 15½ x 27⅝
❑ 4	K	Drawer sides	½ x 3¼ x 26⅝
❑ 2	L	Drawer backs	½ x 3¼ x 16
❑ 2	M	Drawer dividers	see story/bld to fit

the bottom edge of the skirt. These must be exactly the same on all pieces. Because it's important that the end skirts and the drawer fronts match in color and grain pattern it's best to cut them all from the same board. The board should be straight grained with no figure, making it easier to match. Cut the center brace from this board, too. Only rough out the drawer fronts at this time.

Make the side stretchers at the same time as the end skirts. The important dimension is the distance between the tenon shoulders on the stretcher and the dovetail shoulders on the end skirt. They must be exactly the same. These distances are vital to squaring up the base structure. The other important dimension on the side stretchers is the distance between the two notches in the top edge. It must be exactly the same on both stretchers or the shelf support structure will not fit together.

Use a dado head to cut the notches in the parts making up the shelf support. In my experience many dado heads do not cut the advertised widths. If you are working with standard ¾" thick material, the mating parts may not fit the notch. To forestall such an event, I suggest that you shim out your dado head to ¾" or mill your stock to fit your dado set.

There are two long shelf supports and four short ones. Make the long ones as shown in the drawing but don't cut the two notches in the bottom edge at this time. Now make the short supports according to the drawing. The distance between the notches on these parts must be exactly the same as the distance between the notches on the side stretchers. The long

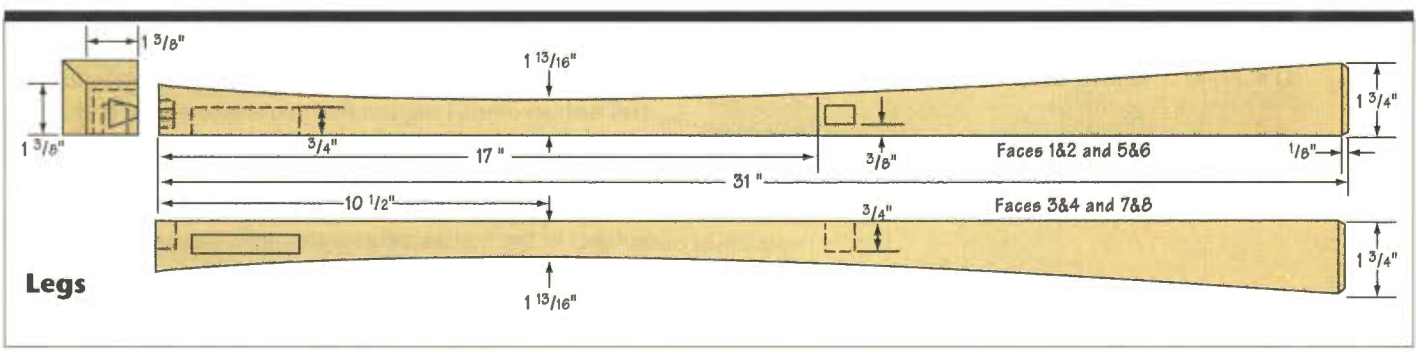


supports fit into the notches on the side stretchers and the short supports fit into the notches on the upper edge of the long supports. **(See diagram.)** The depth of these notches is shown as ¼". This is nominal, the exact depth is determined by placing the short support in a notch on the long support and finding out the necessary depth of the notch to bring the top edges of both parts flush. When all the parts have been made, put the structure together to make sure that everything fits as it should.

The legs are next. There are four just alike made from blanks 1¾" square x 31" long. Don't shape them at this time. Instead, select a top end and mark, group them with marked ends up, in a square. Number the top edge of each mating face from 1 through 8 beginning with the nearest left hand face. Faces **1** and **2** will be the left end frame and **5** and **6** the right. The end stretchers will connect faces **1** and **2**, **5** and **6**. The front skirt will connect faces **3** and **4** and the rear skirt faces **7** and **8**. These faces are marked on the leg drawing which show the proper mortises for each face. Notice there are no dimensions on the mortises except the depth. The mortises and the dovetail pockets are laid out from the tenons and the dovetails that will fit in them. How each corner fits together is shown in the corner assembly detail drawing.

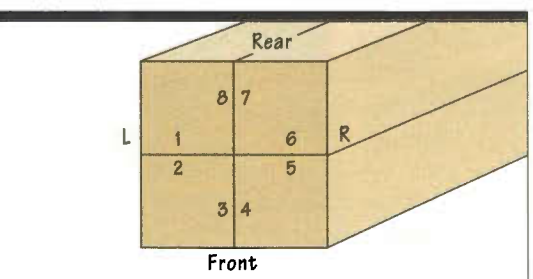
Take the two end skirts and mark dovetails **1** and **2** on one skirt and **5** and **6** on the other. Properly position the front skirt and mark the left tenon **3** and the right tenon **4**. On rear skirt mark **8** on the left and **7** on the right. To mark the dovetail pockets, place leg marked **1** and **8** vertically in the vise and place the side skirt dovetail **1** on top of the leg at face **1** with the inside edge of the skirt flush with face **8** and mark the dovetail with a sharp knife. Make this mark as deep as you can, it will help when cutting the pocket. Mark dovetails **2**, **5**, and **6** the same way. Mark the depth of the pockets from the thickness of the tail, cut and fit all four.

The side stretcher mortise goes on the same face. With the leg flat on the bench, face **1** up, face **8** toward you, draw the



End view of Pier Table shows close fitting drawer front side clearance.

line indicating the top edge of the stretcher as shown on the leg drawing. Place the stretcher with the tenon overlapping the leg face, the top edge on the line just drawn, and mark the horizontal limits of the mortise with a sharp knife. Between those lines and ⅜" from face **8**, scribe the inside vertical edge of the mortise. Measure the thickness of the tenon and measuring from the inside vertical edge, scribe the outside vertical edge. Lay out the other three stretcher mortises the same way.



Orientation of legs for matching leg to skirt joints.

The front skirt mortises go on faces **3** and **4** and are laid out much the same ways as the stretchers mortises. Working with face **4** and from face **5**, the top edge of the skirt must be flush with the top of the leg when marking the horizontal limits of the mortise. The inside face of the skirt must be flush with face **5** when marking the vertical limits of the mortise. All four front and rear skirt mortises are marked the same way. I have found that the easiest and most accurate way to cut a mortise is to drill out the waste using a drill about 1/16" smaller than the width of the mortise, then finish it to size and square up the sides with a butt chisel. I use a depth gauge to check for correct depth throughout and as a square to square up the side.

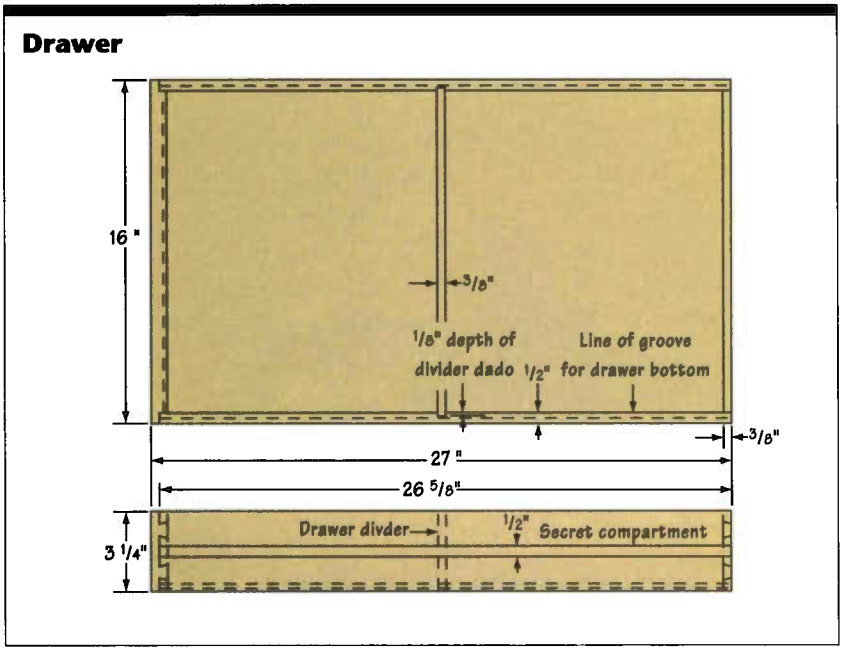
With all the mortises and dovetail pockets cut and fitted, put the base assembly together. The fits should be firm push fits, no tighter. Too tight a fit can cause trouble when gluing because the glue will swell the sides of the pocket and prevent the joint from going home. Be sure the assembly is square and all joints are completely closed. Correct any problems now. Once shaped, the legs will no longer have flat, square surfaces to work with. While the assembly is together, mark the dovetail pockets for the center brace. Once you're satisfied that all is well, take the assembly apart. Before shaping the legs, cut the ⅛" bevel on all four bottom edges of each leg.

To shape the legs, make a full size template from either of the leg views on the drawing. Place the template on one inside face and draw the line. Bandsaw the cut leaving the line. Do this on all four legs. (Save the cut off pieces, they will come in handy as clamp blocks when doing the final glue up.) Smooth this cut surface down to the pencil line with a spokeshave., a very handy tool and not terribly expensive. Now, position the template on this shaped surface and draw the line. Bandsaw and smooth as before, then finish sand, breaking all corners except the inside corner. Be careful sanding the surfaces around the mortises and dovetail pockets, they must stay flat.

Mark the depth of the center brace dovetail pockets on the front and rear skirts and cut the pockets. Finish sand the skirts and stretchers, then glue the assembly together. Do this in two operations. First glue the end frames and then, after they are dry, connect them with the front and rear skirts.

A word about applying glue. Never put glue on the tenons or dovetails. When clamped check to make sure it's square.

Now mark and cut the two bottom notches in the long shelf supports. Place one support in the notches on the side stretch-



ers extending equally beyond both. Mark the position of the notches. The depth of these notches must be such that the support and the stretcher top surfaces are flush. Cut the notches just marked and proceed with marking the bottom notches on the second long support. If you have done this carefully, the short supports will fit neatly into the long supports and the entire assembly will fit. When putting this assembly together, be sure that the short supports in the two outer positions have their hold down grooves facing inward. Check the fit and glue it all together.

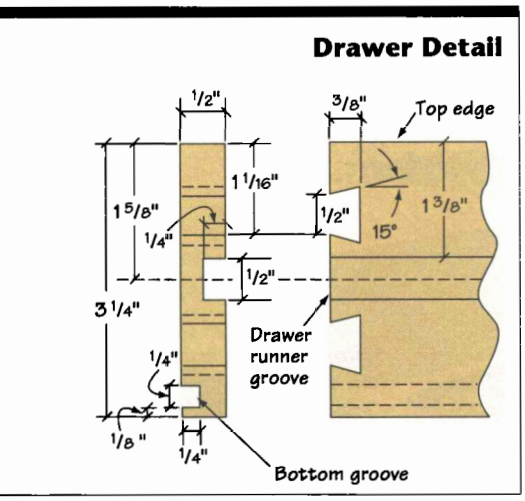
While all this is drying, cut and fit the drawer runners. They are 27" x ½" x whatever is necessary to make a firm press fit into the drawer runner grooves on the front and rear skirts. The rabbet in the end is on the ½" dimension. The shoulder of that rabbet goes against the inside of the leg as shown in the detail drawing of the comer assembly. The leg on that rabbet is a little longer than necessary, the reason for which I'll come to later. At this time just press the runners into their grooves dry.

Now is a good time to make the drawer bottom panels. They require glue up and can dry while making the drawers. The panels should be 5/16" x 15½" x 27⅜". Your going to ask me, "Why can't I make them out of ¼" plywood?" I've always believed that plywood had no place in a piece of fine handcrafted fumiture.

To make the drawers, start with the sides. their dimensions are 26⅝" long x ½" thick. Their width depends on the thickness of the end skirts. The reason is the ends with the drawers in place should look like the front and rear of the table. Cut all four sides to those dimensions. Set up your dado head for a ½" wide cut, but place a 3" diameter piece of cardboard 1/32" (approx) thick in the center of the head to shim it out. Set for a ¼" deep cut. Now measure the distance from the underside of the end skirt to the top of the drawer runner and set the rip fence this distance from the inside of the dado head. Run a piece of scrap and test it to see that it clears the underside of the end skirt by at least 1/32". Lay out and cut the dovetails. It is important that these tails be laid out as shown both front and back. Lay out and cut the dadoes near the center of the side as shown.

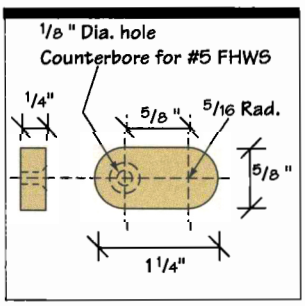
Now make the fronts and backs. Both of these parts should fit between the legs with paper thickness clearance on each side. Remember that you set aside the material for the fronts when you cut the end skirts. Lay out and cut the pins. Notice that it's a lap joint at the front and a through one at the back. When you have cut and fitted all the joints, assemble the drawers dry. Try them on the runners to see that they fit properly. Now cut the drawer runners to length. Push the drawer in as far as it will go. The front will protrude in front of the end skirt by a small amount. Measure it and trim those drawer runners by that amount. You want these surfaces to be exactly flush and the space between barely noticeable. This is a ticklish operation so take your time and get it right, then disassemble and run the bottom groove on all four parts. Rip off the bottom of the back up to the top of the groove. Reassemble the drawers with glue in the joints, make sure they're square, and slide

The end drawer fronts are integral to end skirts.

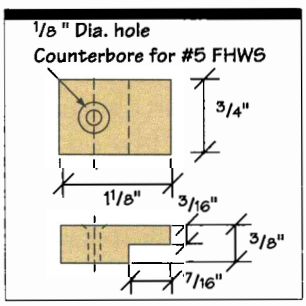


them in the table base to dry. When they're dry, check again that the drawers are stopped with their front face flush with the end skirt. When you're satisfied, glue the runners in place. A few spots of glue along the bottom of the groove will do the job.

To size the bottom panels, measure the width between the bottoms of the side grooves and the length from the bottom of the front groove to the outside edge of the back. Cut each panel to length, and the width 1/16" less than you measured. Using scrap, determine a thickness that will slide easily in the bottom groove. Set this thickness x 3/8" and run a rabbet on the sides and the front. Fit them to the drawers (the flush face should be up) and fasten them at the back with two flat head wood screws spaced equidistant across the back. The last operation on the drawers is to cut and fit the dividers. They should be glued in the dadoes but not the bottom; which must be removable.



Drawer stop cam details.



Hold down clip details.

Now we come to the secret drawer compartment. Look at the drawer stop cam drawing. Make two of them. They are fastened to the inside edge of the end skirts, at about the center of the table width, with a #5 x 5/8" flat head wood screw so they clear the bottom and top edges of the end skirt, but when turned 90° they will not protrude above the top edge of the skirt. The screw should be tightened enough that the cam doesn't fall by its own weight but not so tight that you can't move it. This is the way it works, when the cam is turned down so that it protrudes about 1/4" below the bottom edge of the end skirt, the drawer can only be opened to the divider. The rear compartment remains hidden. If you reach in and push the cam up so that it clears the bottom edge of the end skirt, the drawer can be fully opened.

Now you can go to work on the two panels you made at the beginning of the project, the top and the shelf. Start with the top. Clean up and smooth the panel and then draw centerlines down the width and length. You lay out the shape from these lines. Here's an easy way to draw the curved edges. Locate and mark the four corner points, and drive a small brad just outside each point. Mark the full length and width on the centerlines. Make a stick approximately 1/8" x 1/4" and as long as the panel plus a couple inches. For the front line, place the stick with the 1/4" face down against the inside of the brads and pull the center to the mark on the centerline. Hold it there and draw the line. Do the sides the same way. In order to get the amount of curve you need on the sides it may be necessary to set the stick on its' 1/8" face. Bandsaw the curves leaving the line. If the panel is too large to handle alone on your bandsaw, use a jigsaw.

Clean up the curved edges to the line with a spokeshave. I suggest a small 1/8" bevel on the top comer of the sides and front. It's more elegant than a radius. This is a tricky cut because the bevel must be of uniform width throughout and it must have sharp edges and a clean smooth surface, so be sure your spokeshave is very sharp and use it carefully. Do not sand the face of the bevel.

The last parts to make are the hold down clips, clearly illustrated in the drawings. Make 16 of them, 8 for the top and 8 for the shelf. The top is held in the center with #8 x 1 1/4" flat head wood screws through the end skirts and the center brace, and with the hold down clips along the front and rear skirts. The shelf is held in place entirely by the clips. The easy way to do this is, with the table in the upright position, carefully position the shelf, clamp it in place with C-clamps at the ends, turn the assembly over, and install the clips.

For finishing, I recommend removing the top, shelf and drawers and finish all the elements separately. It will be much easier. As to a finish, please do not use any stain. It will muddy and perhaps completely mask the subtleties of the grain patterns you have spent so much time finding and matching. Use a clear rub on finish such as Formby's Tung Oil Finish or Poly Finish. It should be a low gloss formula and, depending on the wood, will require from three to five coats to get the sheen that you want.

Remember the rear drawer compartments are your secret, so, when you show the table to friends, don't show them how it works. PW

Cedar-Lined Hope Chest

This family heirloom will be passed down for generations.

By Robert J. Black

Building this hope chest may offer you a first attempt at multiple-raised panel construction in a relatively easy project. Note: The completed chest pictured here shows half lapped bread board ends on the top which are not used or discussed in the text.

This hope chest is ideal for the beginning-to-intermediate woodworker because it's relatively easy to make, yet offers some technical challenges. Cedar-lined hope (or blanket) chests have long been a part of Americana. They're given to young ladies upon graduation from high school, or in anticipation of becoming new brides. Fathers are frequently the givers, and the chests are intended to hold domestics like linens, glassware, silver and special personal treasures. They've earned places in our homes because of their usefulness—great for storing blankets, sweaters and other woolens.

SELECTING MATERIALS

Pine is attractive and easy to work, but I recommend furniture-grade hardwood. Approximately 26 board feet (b.f.) is required for the front and sides and 12 b.f. of aromatic cedar for the back and bottom (a 30% margin for waste is included in these estimates). Cedar closet lining is not a good choice since it's too thin to provide adequate support for a fully loaded chest. I've achieved excellent results building this project from oak, walnut, padauk, cherry, gonçalo alves, purple heart or combinations of these woods. You can also build it from solid cedar which, when finished, is stunning.

GETTING STARTED

The most tedious part of this project is gluing-up the big panels. A total of eight are required, plus one block. I suggest you make each panel a full inch wider and longer to allow for squaring and cutting to size later. (See related article in this issue on preparing stock.) Professional furniture clamps will do well for the panels and the cabinet construction.

Select the best stock for the top, and cut to rough size. Joint the edges by hand or machine, then glue and clamp them together. Be sure to swap ends on each piece to reduce the risk of warping.

Next, select stock for the front and end panels, and machine, glue and clamp them. If you're short on clamps, make these panels long enough to get two or three from one length glued to the proper width.

Glue the bottom and back panels from solid, aromatic cedar. The bottom requires special handling. First, glue-up the panel according to the materials list. When dry, glue the bottom end rails (from the primary stock), and trim to finished width when dry. Last, glue on the bottom face rail (from the primary stock) to the bottom's end and trim to length when dry. If you wish, you can use tenon and groove joints for this process as shown in the photos.

If it's difficult to obtain your hardwood in full 2" stock for the corner stiles, I've found it just as easy to glue-up a block, cutting the corner stiles from it later. To do this, make 12 pieces ¾" x 2¼" x 17" and face glue them into a block 2¼" x 17" x 9". By making a big block instead of four separate ones, you save

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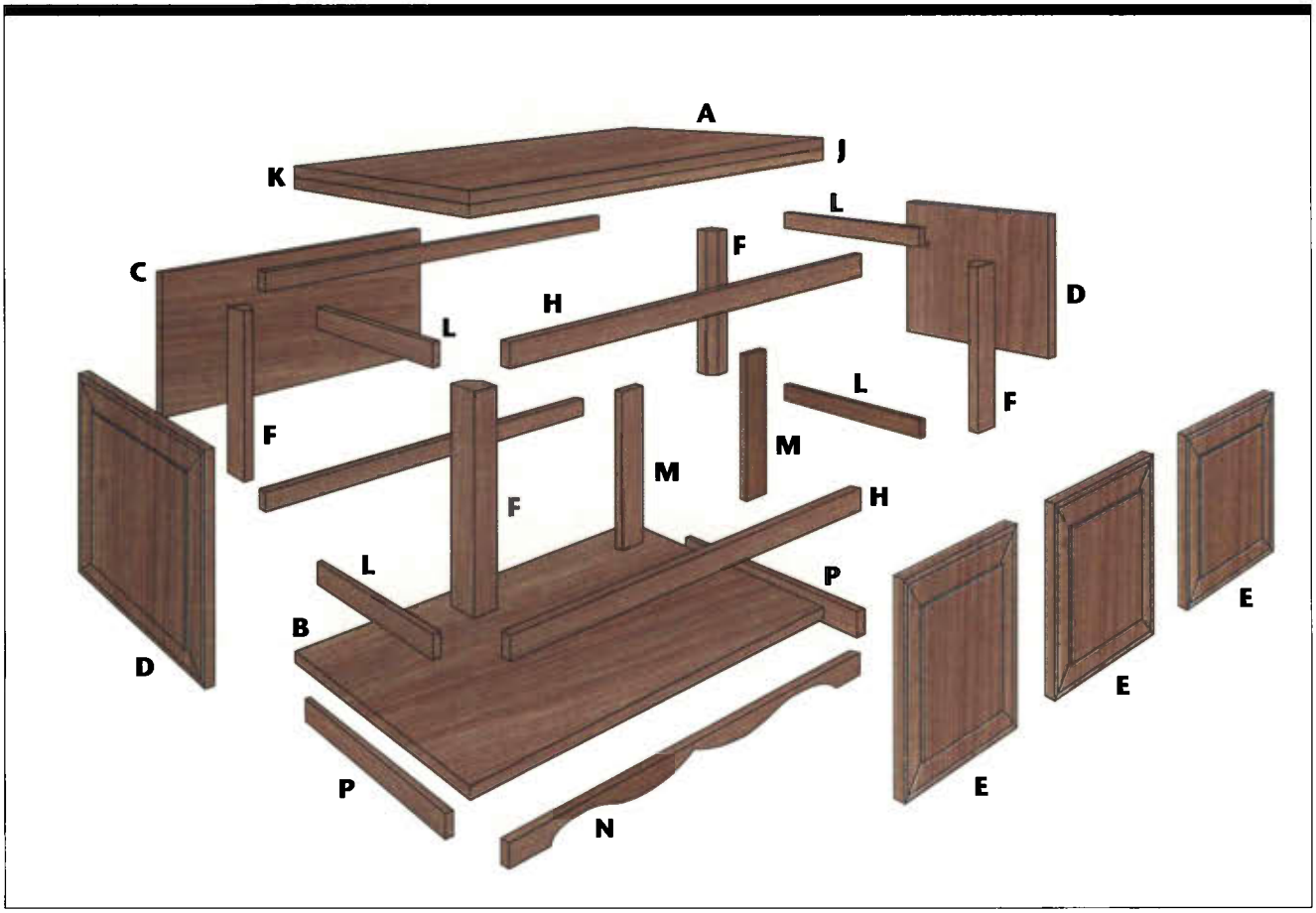
***Robert Black** is a Mare Island, Calif.-based woodworker who specializes in free-standing furniture.*



Materials List

✎	QTY.	ITEM	NAME	SIZE (Th x W x L)
❑	1	A	top	¾ x 20 x 43½
❑	1	B	bottom	¾ x 18 x 39½
❑	1	C	back	¾ x 16 x 39
❑	2	D	end panels	¾ x 15⅝ x 12⅝
❑	3	E	front panels	¾ x 11⅞ x 12⅝
❑	4	F	corner stiles	2 x 2 x 16
❑	1	G	bottom front rail	¾ x 2 x 43½
❑	2	H	front frame rails	¾ x 2 x 38⅝
❑	2	I	bottom end rails	¾ x 2 x 18
❑	1	J	top molding face	¾ x ¾ x 43½
❑	2	K	top molding ends	¾ x ¾ x 20
❑	4	L	end frame rails	¾ x 2 x 15⅝
❑	2	M	center stiles	¾ x 2 x 12¾
❑	1	N	plinth base face (O-Gee curve)	1 x 3 x 37½
❑	1	O	plinth back	1 x 3 x 36
❑	2	P	plinth ends	1 x 3 x 16
❑	1 30" continuous brass piano hinge			
❑	1 locking lid support brass			
❑	1 lock (optional)			

clamps and time.

Each of the panels and block should be kept in the clamps overnight to allow the glue joints to gain full strength.

CUTTING TO SIZE

Now clean-up the glue joints of each panel using a hand scraper or belt sander. These panels require smooth, flat surfaces before you can accurately cut them to finished size. I recommend you start with the largest panel first, and work down in size.

Take each panel and joint one long edge true. Working with this edge against your cross-cut fence, square one end then cut to finished length from the other end. Then cut the other long edge to finished width.

Prepare one smooth flat surface on the block. Next, set your saw to rip 2⅛" wide and cut the four corner stiles from the block. Take each and rip again without changing the fence and then cut to finished length.

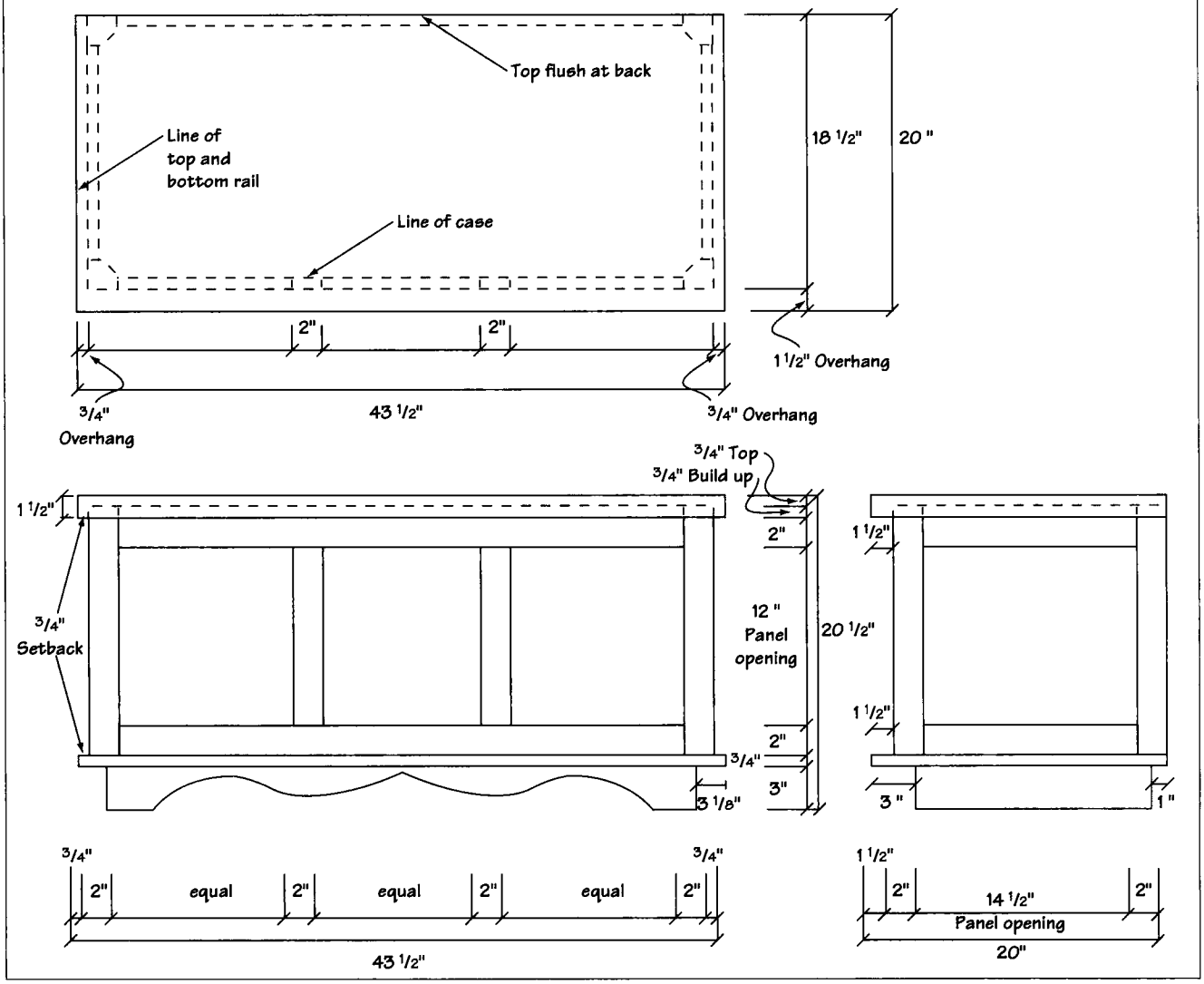
Cut all the rails and stiles at the same time. Rip them to finished width and trim to finished length.

Use a scroll saw, band saw or jigsaw to cut the O-Gee detail of the plinth face, plinth back and plinth sides.

MACHINE/MILLWORK

After sanding the top smooth, assemble the top molding face and ends from the underside with countersunk #6 x 1¼" screws, mitering the corners. Sand all the edges flush. For the best effect, put a big rounding bit (¾" r.) in your router and detail the top of the front edge and ends of the top piece and bottom. Leave the back edges square. Use a smaller radius bit for the bottom of the three edges.

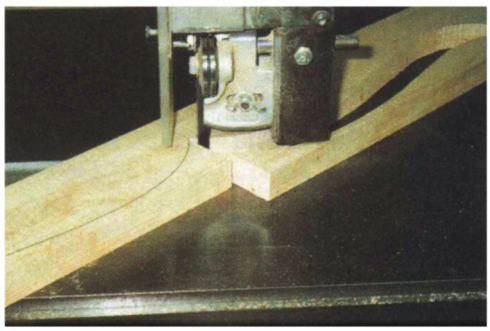
Dimensions



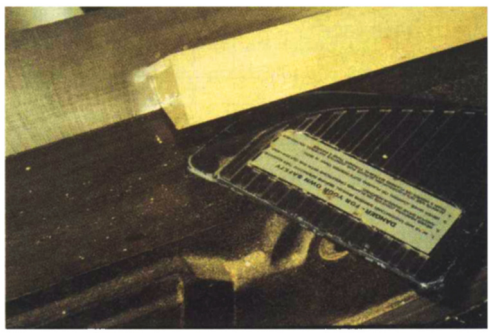
Sand the front and end panels smooth on both sides and cut them to size. Then shape the raised panel detail using a router with a raised panel profile cutter, a shaper or table saw. Choose the most attractive side to be the front. The profile should leave a tenon slightly less than 3/16" thick for a tight fit into the dados of the rails and stiles. The depth of the shoulder cut on these panels is a matter of personal choice, but I believe a more striking appearance is achieved with a deeper shoulder. Finish sand these panels now, paying special attention to the end grain of the raised panel profile.

Cut a 1/2" deep chamfer on the least good edge of the corner stiles. Set up your router with a cove bit. Starting 3" from each end, cove the center portion of the stile edge opposite the chamfer. Do not run the cove all the way to the end of the piece. **Note:** *Set up your tool, and make the grooves for all rails and stiles at the same time. This ensures continuity.*

I used a router table with a 1/4" straight bit projecting 3/16" above the table surface to cut all grooves on the stiles and rails. Clamp a bench stop to the table to use as a guide. Experiment on a piece of scrap to get the cut centered on the edge of the parts. You may want to make two passes to complete the full depth, avoiding over-stressing your bit. On the two edges of the corner stiles adjoining the chamfer, cut full-length grooves.



Bandsawing the O-Gee bracket base face.



Using the jointer (five passes) to make the chamfer on the corner stiles.

The corner stiles and back in clamps.

The case assembly in clamps were left overnight to allow the glue to thoroughly set.

Pre-drilling up through the bottom.

These can also be cut safely with a table saw.

Note: *Instead of the grooves, you can use a router to machine cope and stick joints for stiles and rails, making your casework look more professional. If you do this, I've found it easier and safer to cope the ends of the rails and intermediate stiles first, then change bits and stick all edges.*

You can now cut grooves in the remaining rails and stiles along one long edge. Take the two center stiles and cut grooves in both edges.

Sand the back panel on both sides, then cut it to size. Cut ¼" thick x ½" deep tongues on both ends. Then cut a 3/32" deep x ⅜" wide mortise for the hinge in the top edge of the back. Use the piano hinge as a pattern and center it. At the same time, cut tongues on both ends of the rails and stiles.

Some assembly is now required before any further millwork can be done.

ASSEMBLY

Assemble the two plinth ends to the plinth face and back, making sure the assembly is square. Be careful of how the butt joints are made, making sure the sides are behind the front piece. Plug the screw holes and sand the plugs and joints flush. Using the router with the small radius bit, round the outside and inside bottom edges all the way around, including the scroll cut curves. This helps the chest slide easily on carpet. Don't rout the straight edges at the top of the plinth. ***Note:*** *Use glue only on the rail and stile joints. Let the panels float free to accommodate expansion and contraction.*

Take two corner stiles and the back and fit them together. The opening for the hinge mortise must face outward. Use glue only on the frame pieces. Taking the remaining rails, stiles and corner stiles along with the raised panels for the ends and front, assemble them to form the casework. Now clamp the pieces, making sure the casework is square and true, and allow it to dry. Attach the plinth base to the bottom assembly 1⅛" in from the back edge (not routed), center it end to end, and mark for screw holes. Drill pilot holes down through the bottom, then countersink.

Sand the case carefully making all joints flush, then flip the case upside down, and locate the bottom assembly on the case with the square edge flush with the back. Assemble the bottom to the case, being very careful with the glue. Drill up through the bottom into the case and drive the screws home. Lightly break all sharp edges with sandpaper.

HARDWARE

Fit and mark the piano hinge and leave it in place. Set the top on the case, lining it up flush with the case back and mark the hinge location on the top. Drill pilot holes in both the case and top. Attach the hinge to the top first, then to the case. Test and adjust if necessary. Follow the instructions included with the lid support and install it. Use a lock set in the lid if desired.

FINISHING

Sand the entire piece one last time, paying special attention to the end grain of the frames. When sanded to your satisfaction, use a tack rag or a vacuum cleaner and remove all sawdust and particles.

Either stain or leave it natural, but you must apply at least three coats of finish regardless. I used a polyurethane finish, rubbing with #0000 steel wool between coats. Finish should be applied to all surfaces except the inside cedar surfaces. This allows the natural scent and protection of the cedar to endure for many years.

Note: *Over the course of years, cedar loses its pleasing and protective smell. To revitalize the cedar aroma, lightly sand it with 120 grit sandpaper.* PW

A Gentle Breeze Brings T. Rex Back To Life!

"Jurassic Park" could be playing in your backyard this summer!

By Gabriel R. Zuckerman

Thanks to the movie "Jurassic Park", we're all much more familiar with the Jurassic Period, when dinosaurs ruled the earth and Tyranasaurus Rex was the *dominant* dinosaur. With this wind powered mechanical version of T. Rex we can bring to life in our backyards a miniature replica of the most ferocious creature to ever inhabit the earth. In doing so, T. Rex will provide us with an entertaining, relatively easy and time-conscious project..

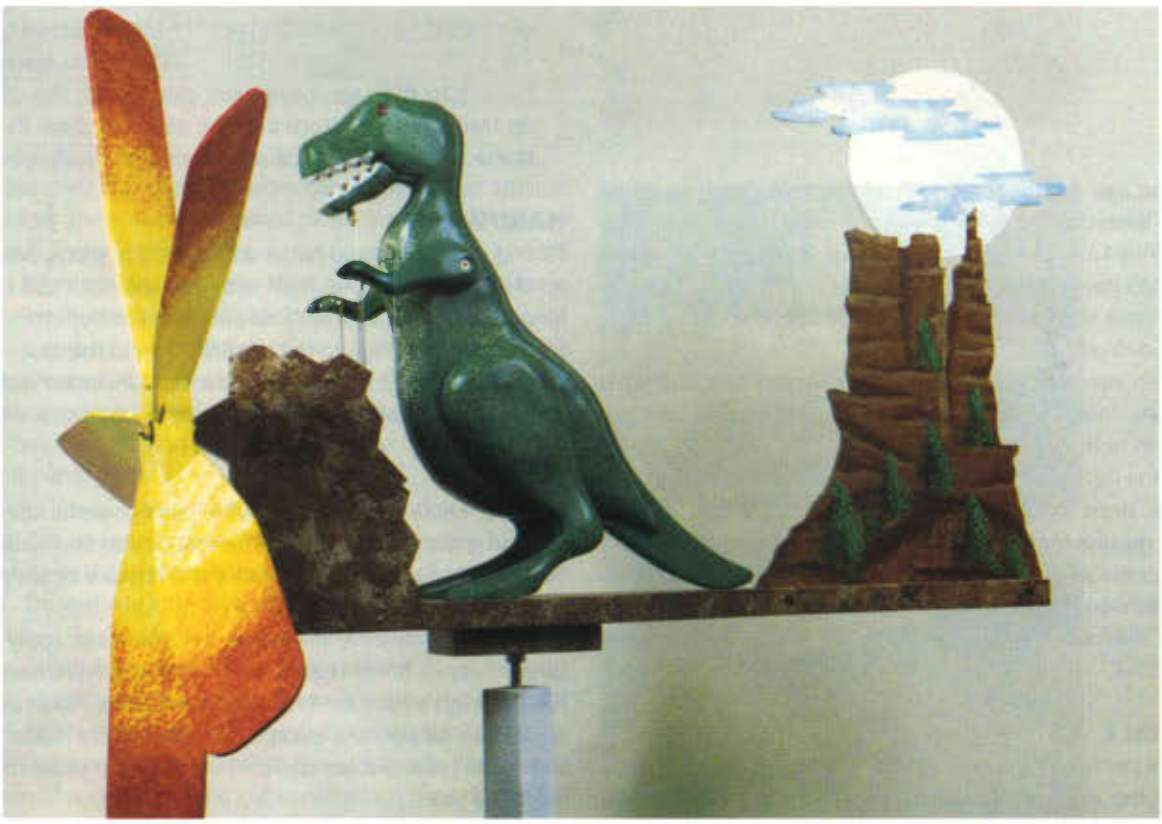
Begin construction by cutting out parts ***A–Q***. Full-size patterns are provided for most of the parts on the ***PullOut Plans***. Dimensions for all other parts are given in the materials list. Pine or poplar is suitable for all parts except the propeller mounting block ***(C)***, which should be made from maple or oak. Layout and cut all the pieces required at this time.

Build the dinosaur first. T. Rex's body is made by sandwiching the center body section ***(F)*** between two outer body sections ***(G)***, as shown in ***figure 1***. Use screws and exterior rated, waterproof glue for assembly.

Drill and counterbore the holes for the screws, and use plugs to conceal the screws. After the body is assembled, drill a ¼" hole through the cheeks with a drill press for the lower jaw hinge pin. This method produces holes that are in line and perpendicular to the plane of rotation of the lower jaw. T. Rex's lower jaw is made by sandwiching ***J*** between two lower jaw sides ***(K)***.

Before assembling the lower jaw, sand or plane ***J*** to reduce its thickness by 1/16" to allow the jaw to turn freely inside the head cavity. Drill a 5/16" hole thru ***J*** for the jaw hinge pin. Before completing the dinosaur's assembly, contour the body, lower jaw, arms and legs to the cross sectional shapes shown in ***figure 2***. Sand all the parts before completing assembly of the puppet.

Gabriel Zuckerman *creates whirligigs in Northport, NY.*



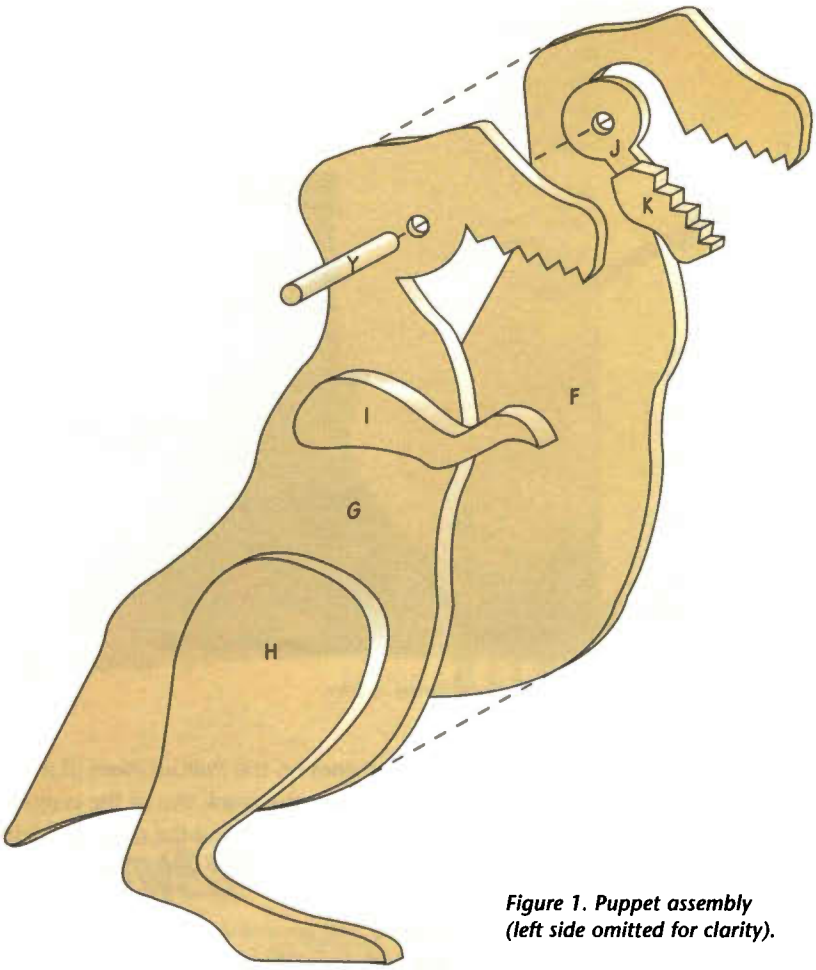


Figure 1. Puppet assembly (left side omitted for clarity).

Schedule of Materials

✎	ITEM	QTY	NAME	SIZE (Th W L)
❑	A	1	Chassis	¾ x 4 x 25½
❑	B	1	Top cowling	¾ x 3¼ x 3¼
❑	C	1	Propeller shaft block	¾ x 3¼ x 6
❑	D	1	Pivot block	¾ x 2½ x 4½
❑	E	1	Rudder	3/32 x 11¼ x 17
❑	F	1	Center body section	½ x 6¾ x 18½
❑	G	2	Side body section	¾ x 5½ x 15½
❑	H	2	Legs	¾ x 7 x 6½
❑	I	2	Arms	¾ x 1½ x 5
❑	J	1	Lower jaw center section	½ x 1½ x 4
❑	K	2	Lower jaw side section	¾ x 1 x 2¼
❑	L	1	Lower jaw hinge pin	¼ x dowel x 2
❑	M	1	Propeller hub	¾ x 5 x 5
❑	N	5	Propeller blades	3/16 x 3½ x 12
❑	O	4	Stand legs	¾ x 7½ x 10
❑	P	2	Stand feet	¾ x 3½ x 28
❑	Q	1	Stand post	1¼ x 1¼ x To suit
❑	R	1	Post pivot	3/16 x 6
❑	S	1	Cowling (aluminum)	8½ x 11½
❑	T	1	Drive shaft	⅛ x Rod x 9½
❑	U	1	Drive shaft arms	.064 x ½ x 12
❑	V	1	Propeller shaft	¼ x Rod x 5
❑	W	1	Drive shaft bracket	.032 x 4 x 10
❑	X	1	Jig	.032 x 4 x 10
❑	Y	1	Jig screw carrier	.032 x 4 x 10

The lower jaw is held in place by, and rotates around, ***L***. The legs are connected to the body with screws and glue. The arms are held in position and allowed to rotate on #6 x 1¼" brass wood screws at the shoulder. Drill and counterbore holes for these screws as shown on the full size pattern for ***I***. Paint the dinosaur's body with a base coat of dark green. Sponge several shades of lighter green over the base coat to create a textured effect. Paint on the mouth, teeth, eyes and claws using appropriate colors. Seal the entire painted surface with several coats of clear acrylic gloss varnish.

Make the rudder ***(E)*** from a piece of Lexan. Lexan is available at many building materials supply stores and is sold as safety glazing. You may prefer to substitute plywood for the plastic. Plywood, however, has a tendency to delaminate when exposed to the weather. Scuff both sides of the lexan plastic by sanding to prepare the plastic for marking and painting. Mark the outline of the rudder on the plastic and cut it to shape. Paint the rudder with acrylic paint applied with a sponge. Masking tape and stencils are useful for creating the design, which is painted on both sides of the rudder. The moon and clouds are painted white. The outline of the clouds is masked and the clouds are shaded a light blue along the edges. The buttes are painted several tones of brown applied with sponges and a stencil to create the crevices in the rocks. The trees are painted with a small piece of sea sponge using several shades of green. Seal and waterproof the painted surfaces with gloss acrylic varnish. ***Figure 3*** is a photograph of the painted rudder.

Figure 4 illustrates the chassis assembly. ***A*** and ***B*** are attached to ***C*** using #6 x 1¼" galvanized wood screws. Drill and counterbore holes for these screws as

shown on the ***PullOut Plans***. Again use wood plugs to conceal the screws. Drill and counterbore holes for the screws that will hold the rudder in the slot. The position of these holes is indicated on the ***PullOut Plans*** for ***A***. Paint the chassis before installing the hardware.

The drive shaft bracket ***(W)***, jig ***(X)*** and cowling ***(S)*** are cut from aluminum and bent as shown on the ***PullOut Plans***.

The interrupted lines on the ***PullOut Plans*** for these parts indicate bending lines. The cowling should be primed and painted now. The propeller shaft, drive shaft and connector used for the mechanical system of this whirligig are shown in ***figure 5***. These items are made from solid brass parts and can be soldered or brazed together so they will not rust when exposed to the weather. The brass rod and strips can be purchased at most hobby shops. The threaded brass rod for the propeller shaft is a section of a float arm from the flush mechanism of a toilet. It can be found in the plumbing department of most hardware stores. ***Figures 6*** **and** ***7*** show how the jig is used to relate the parts for brazing or soldering. The parts are not cut to length until after they have been joined. The individual pieces must be long enough to clamp in the jig. Clothes pins make convenient clamps.

Install the propeller shaft, drive shaft and dinosaur on the chassis. The position of T. Rex's feet and tail on the chassis are

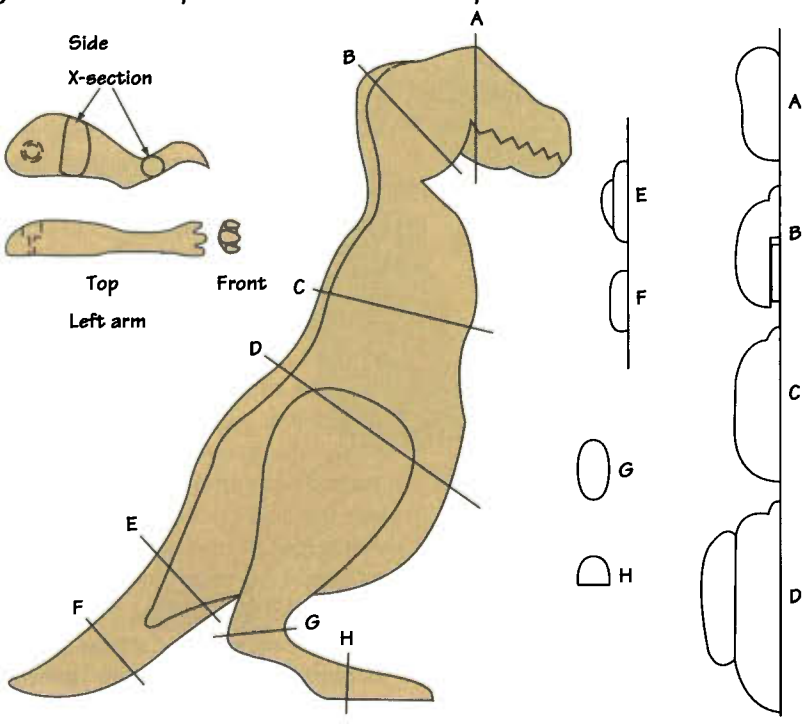
Figure 3. The painted rudder.

shown by the interrupted lines on the ***PullOut Plans*** of ***A***. Use 14 gauge wire rods to connect the crank arm of the propeller shaft to the "A" arm of the drive shaft and the dinosaur's arms and lower jaw to the "B" arm of the drive shaft. ***Figure 8*** shows the linkage assembly.

The following method will accurately establish the correct length for each wire rod: Lock the propeller shaft and drive shaft with their arms in the horizontal position. T. Rex's arms and lower jaw are immobilized in their mid-range position. With a pair of dividers, measure the length required for each wire link. Bend the wire links as shown in ***figure 9***. Use "Z" bends at the ends of the wire to retain them in the holes of the metal fittings. Make eye loops at the upper end of the arm rods. Use #4 x ½" round head brass screws to connect the eye loops to the arms. Release the propeller shaft, drive shaft, arms and jaw to install the wire rods. Test the mechanical system to make sure it works smoothly without binding or rubbing. Make adjustments as required. When the mechanism is operating properly, install the cowling on the chassis with #4 x ½" brass round head wood screws.

A propeller with five 12" blades is used to power this whirligig. The hub ***(M)*** of the propeller is a wood disc 5" in diameter and ¾" thick. Cut five evenly spaced kerfs into the perimeter of the hub to hold the propeller blades. The kerfs are cut into the edge of the hub at a 45° angle and are oriented to produce a clockwise rotation of the propeller. The width of the kerfs is determined by the thickness of the material selected for the

Figure 2. Contour all parts to the cross sectional shapes.



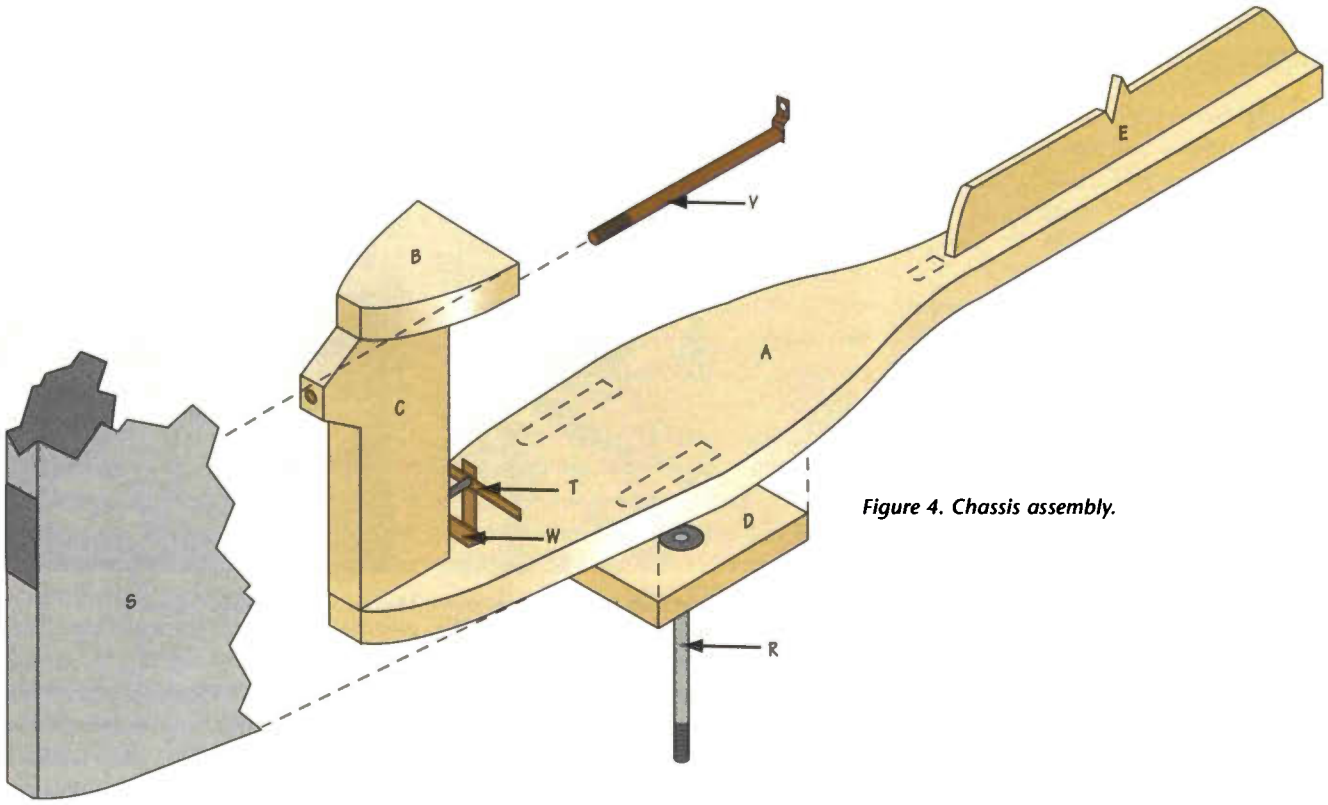


Figure 4. Chassis assembly.

Figure 5. Pivot block assembly.

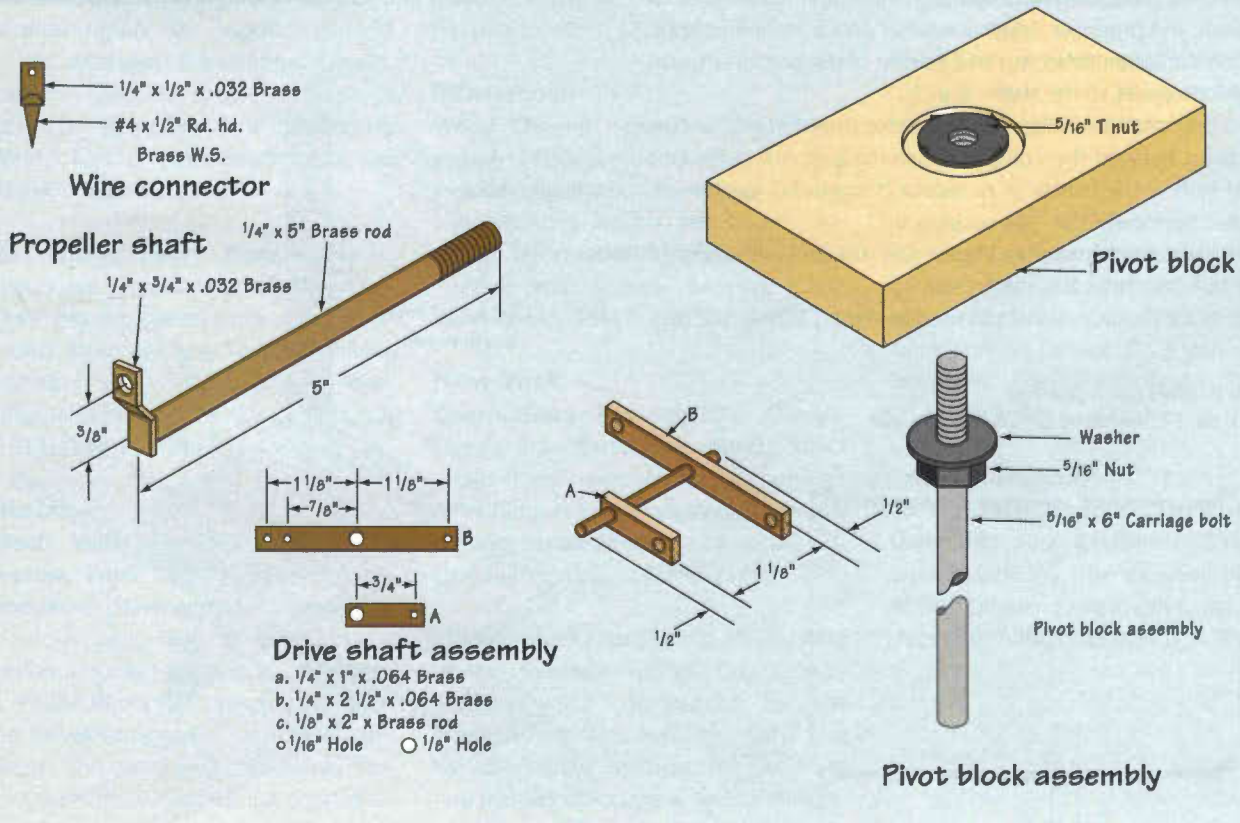


Figure 6. Clothes pins make convenient clamps when soldering

Figure 7. Don't cut part to length until they have been joined.

Figure 8. The linkage assembly.

propeller blades. I like to cut the kerfs first, then plane and sand the blades until they fit snugly into the kerfs. ***PullOut Plans*** are provided for the propeller blades ***(N)***. Attach the blades to the hub with super adhesive glue. After assembling the propeller, finish it with acrylic paint and seal it with the clear varnish.

Install the rudder and propeller on the chassis. The rudder is held in position with #6 x 1" galvanized wood screws. Secure the propeller to the propeller shaft as follows: Place two washers on the threaded end of the drive shaft followed by a ¼" x #20 locknut. Do not over tighten the locknut, which would prevent the shaft from turning freely. Place another washer on the shaft, the propeller, another washer and a second locknut. Tighten the locknuts behind and in front of the propeller securing the propeller to the shaft.

The post pivot must be installed under the whirligig's center of gravity. Balance the completed whirligig on the edge of a board to find the center of gravity and mark this location on the chassis.

The pivot block assembly ***(figure 5)*** is installed with the post pivot directly under this mark.

Figure 10 illustrates the stand used to display T. Rex. The post is removable to simplify transportation and storage of the stand. Note that parts ***P*** cross each other at their centers with a half lap joint. A ½" hole through the center of the joint allows water to drain from the stand when it rains. The post should display the whirligig at or above eye level. The post pivot fits loosely into a ⅜" hole in the top of the post. This forms a swivel connection allowing the whirligig to turn freely in the wind. The post pivot is made from a 6" x 5/16" carriage bolt with the head cut off. Round over and polish the cut end so that it turns smoothly in the ⅜" hole in the top of ***Q***. Paint and varnish the stand to match the chassis and you're ready to bring T. Rex to life. PW

Figure 9. Drive rod & jaw rod.
Notice the "Z" bends at the ends of the wire.

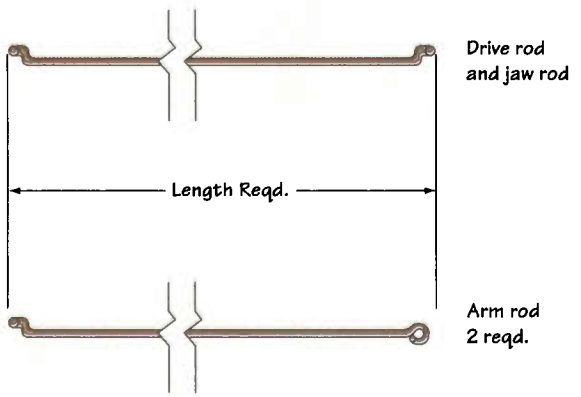
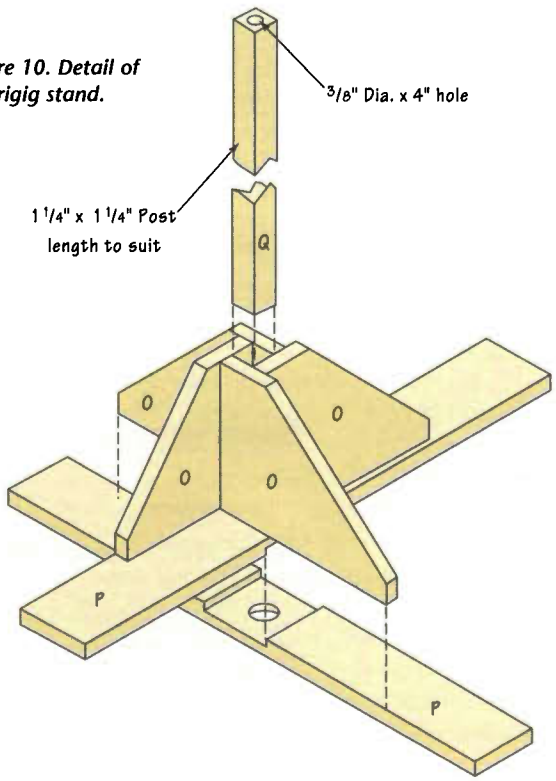


Figure 10. Detail of whilrigig stand.



Calendar

Events of Interest to Woodworkers

If your group is hosting an event and you would like other woodworkers to hear about it, please send all pertinent information (date, location, description and fees) at least four months before the opening date to: Calendar, *Popular Woodworking*, 1507 Dana Ave., Cincinnati, Ohio 45207.

Arkansas

White River Artisans School. Year-round courses are available. Class selection includes forged toolmaking, wood-strip canoe making, bamboo fly-rod making and more. Contact: White River Artisans School, 202 South Ave., P.O. Box 308, Cotter, AR 72626. (501)435-2600.

California

The 28th Annual Santa Clara Valley Carvers Show, April 8–9. The event will be held at the Prospect High School. Sponsored by Chapter 1 of the California Carvers Guild. Contact: Don Guidoux. (415)948-9869.

The 1995 Woodworking, Machinery and Furniture Supply Fair, August 4–7. Held at the Anaheim Convention Center, Aneheim, Calif. The theme of this year's show is "Expand Your Marketing World." For complete information, call (310)477-8521.

The Woodworkers' Place. Classes, offered year-round focus on building furniture. No experience is necessary; conducted Saturdays and Sundays. Private instruction also available. Contact: Mark Tudor, 4352 Beulah Dr., La Canada, CA 91011; (818)952-3177.

Illinois

Illinois Valley Woodland Expo: The Pleasure, Profit and Products of Good Woodland Stewardship, August 26, 8 a.m.–8 p.m. Held at the Marshall-Putnam County Fairgrounds. Sponsored by Prairie Rivers Resource Conservation and Development, a non-profit organization. This show includes demonstrations, exhibits, wood/natural crafts marketplace, seminars and more. For complete information, contact Prairie Rivers RC&D at (309)364-3979.

Kansas

The Woodworking Shows, February 17–19 at the Merchandise Mart, Hall B, 6800 W. 115th St., Overland Park. This show features machinery, power and hand tools, various supplies, as well as demonstrations, and free workshops. All skill levels of woodworkers are invited. For complete information call or write: The Woodworking Shows, 1516 S. Pontius Ave., Los Angeles, CA 90025; (800)826-8257; (310)312-6684.

Kentucky

Woodturning and Joinery Instruction. Classes are offered year-round. Topics include woodturing and joinery. For complete information, contact: Jim Hall, 415 Center St., Berea, KY 40403; (606)986-8083.

Maine

Center for Furniture Craftmanship. Call or write for a detailed brochure or registration information. Center for Furniture Craftmanship, 125 W. Meadow Rd., Rockland, 04841. (207)594-5611.

Minnesota

Wood Carving School. Offered year-round, these woodcarving classes include Introduction to Wood Carving and Whittling Angels and Hearts. For more information, contact: Wood Carving School, 3056 Excelsior Blvd., Minneapolis, 55416. (612)927-7491.

New York

Constantine's Woodworking Classes. Classes are offered year-round. Topics range from router basics to furniture refinishing, from wood inlay to spindle turning. Located in Bronx, New York. For information, call (718)792-2100.

Woodworker's Expo, March 25–26. Held at the Saratoga Springs City Center, Saratoga, N.Y. Sponsored by the Northeastern Woodworkers Assn. This two-day show features the work of regional woodworkers as well as demonstrations and lectures on related topics such as tools and techniques. Manufacturers will also exhibit. For an entry form write: Woodworkers Expo '95, Northeastern Woodworkers Assn., P.O. Box 94, Rexford, NY 12148-0094.

Pennsylvania

Traditional Windsor Chair Making. Classes are offered year-round. Private instruction available. Topics include woodturning and sharpening techniques for beginners to advanced levels. Located in Earlville, Pa. Contact: (215)689-4717.

Tennessee

Arrowmont School of Arts and Crafts 1995 Spring Workshop Program. One-week classes of various media will be held March 6–31. Wood related workshops include:

- March 6–10: Woodturning by Clay Foster.
- March 13–17: Woodturning: Vessel Forms, taught by Michael Peterson.
- March 20–24: Woodturning, taught by John Jordan.
- March 27–31: Techniques for Turned Lidded Vessels, taught by Michael Mode.

Fees: $195 a week. Room and board packages start at $170. For complete information call (615)436-5860.

Texas

Woodshop Inc., Woodworking School. A full range of classes (offered year-round) are available. For complete information, write or call: Woodshop Inc., Woodworking School, 1225 W. College, Ste. 612, Carrollton, Texas 75006. (214)466-3689.

Canada—Ontario

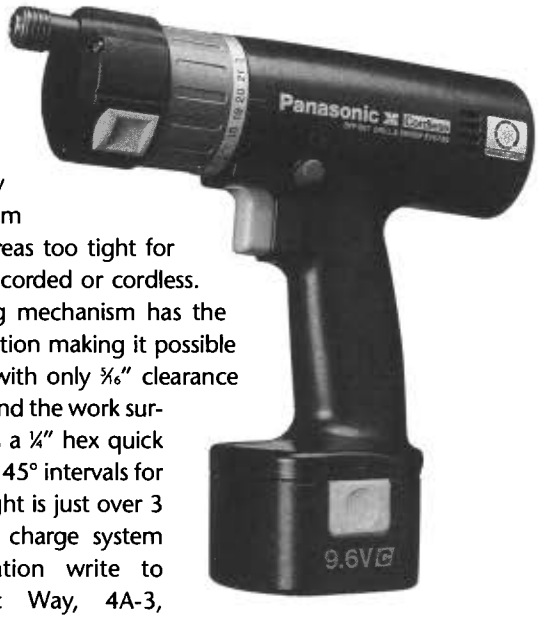
The Ottawa International Woodworking Show and Fine Woodcrafts Sale and Expo, March 3–5. The show will be held at the Ottawa Civic Center. For complete information call (519)351-8344.

News and Notes

FOOD SAFE FINISH

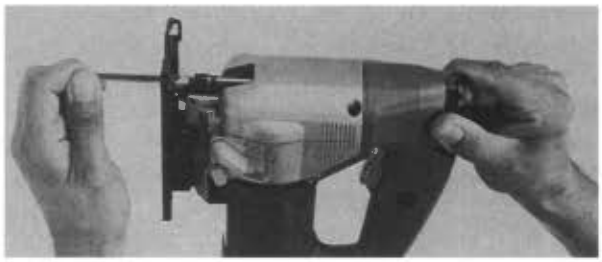
This all-natural oil finish, manufactured by Block Brothers, protects wood and is safe for use on countertops, butcher blocks and other food surfaces. Block Oil is made of a blend of oils and other natural ingredients that have been previously approved by the FDA for contact with food.

The oil (including lemon oil and vitamin E) penetrates, conditions and seals any unfinished wood surface, helping to prevent checking, drying and food odor absorption. Suggested retail price is $5.95 for a 12 oz. bottle. Block Oil is available in stores or by mail (add $2.00 postage and handling) through 'Laska Stuff, 3787 Broadway, American Canyon, CA 94589; (707)644-8303.



CORNER DRILL

Panasonic announces the Corner Master cordless drill and driver with a specially designed revolving mechanism that allows it to be used in areas too tight for any conventional power tool, corded or cordless. The Corner Master's revolving mechanism has the chuck located in an offset position making it possible to drive screws or drill holes with only 3/16" clearance between the drill or screw bit and the work surface. The 9.6 volt tool features a ¼" hex quick connect chuck with settings at 45° intervals for a total of eight positions. Weight is just over 3 lbs. including the 15-minute charge system battery. For more information write to Panasonic, One Panasonic Way, 4A-3, Secaucus, NJ 07094; (201)392-5334.



QUICK CHANGE JIGSAW

Bosch now offers the Clic™ quick-change system, a new method of changing jigsaw blades without a screwdriver or other tools.

To change blades, lift the knob at the top of the handle, turn three revolutions, change the blade, turn the knob until a click is heard and depress the knob. The tool is ready to cut.

The Clic system is available on four top-handle Bosch units and several barrel-grip models and the Bosch Sabre Plus in-line jigsaw. For more information write to: S-B Power Tool Co., 4300 W. Peterson Ave., Chicago, IL 60646; (312) 286-7330.

NEW GLUE

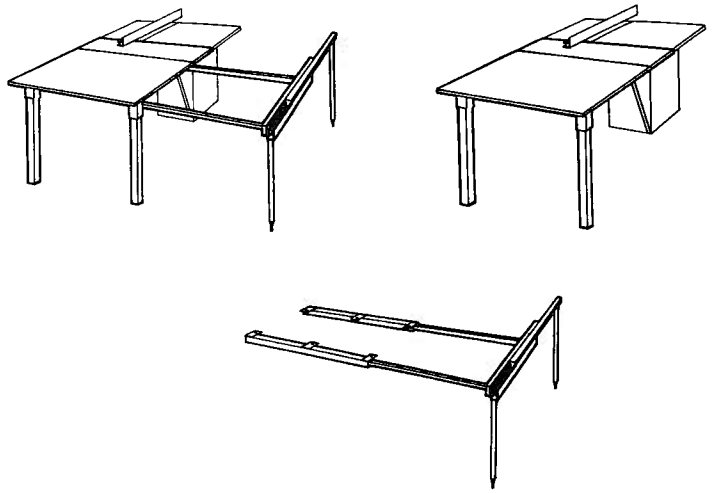
Gorilla Glue was originally developed as an epoxy alternative. Gorilla Glue offers a unique, environmentally friendly, single component, moisture-catalyzed adhesive, with no mixing required. Moisture in the air and/or in the material to be bonded will cause to glue to cure.

Gorilla Glue is 100% waterproof, pH neutral, stainable, is very stable, and will not become brittle over time. It will bond a variety of materials to wood including stone, aluminum and plastics. Clean up is handled with denatured alcohol, thinner or other common solvents. For more information write to: The Gorilla Group, P.O. Box 42532, Santa Barbara, CA 93140-2532; (805)963-2234.

FOLD DOWN SAW TABLES

Solo-Saw offers an answer to handling materials on the saw without assistance. Using a combination of outfeed tables and extension arms, Solo-Saw offers over 43 square feet of stable, sheet-handling surface area. When finished, the accessories quickly fold down out of the way. Solo Saw will also work with table saws using mobile bases.

The complete Solo-Saw System is available for between $500 and $600. For more information write: Solo-Saw, 1411 N. Fairfield Road, Beavercreek, OH 45432; (800)861-8484.



AFTERMARKET BANDSAW GUIDES

Carter Products announces a new band saw guide kit adaptable to the Jet 14" band saw. It features sealed, lubricated ball bearings for long, smooth operation

leading toward improved saw performance, reduced blade friction and increased cutting accuracy, according to Carter. The kit is sold complete with the upper guide assembly, lower guide assembly, brackets, mounting parts and instructions.

Carter currently offers conversion kits for many manufacturers including Delta, SCMI, Grizzly and others. For more information write: Carter Products Co., Inc., 437 Spring St., NE, Grand Rapids, MI 49503; (616)451-2928.

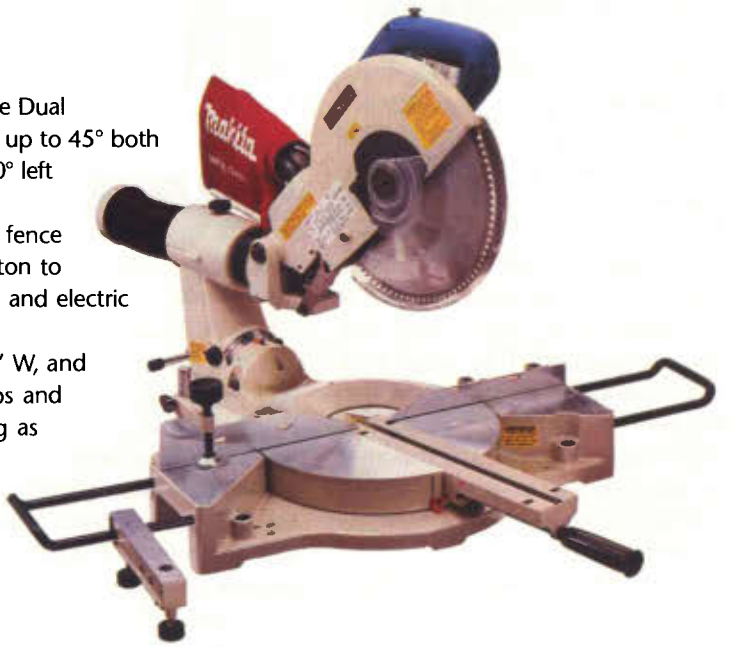
12" SLIDING COMPOUND SAW

Makita is introducing their new Model LS1211 12" Slide Dual Compound Saw. This 15 amp saw offers bevel cutting up to 45° both to the left and to the right and will cut miters up to 60° left and right with positive stops at 15 settings.

Other features include: narrow opening on the guide fence for improved back support of workpiece; lock-off button to prevent accidental starts; shaft lock for blade changes and electric brake for quickly stopping the blade.

Maximum cutting capacity at 90° is 3 1/16" H x 12 3/16" W, and at 45° is 3 1/16"H x 8 3/8". The saw weighs in at 51.2 lbs and comes with a carbide tipped saw blade and dust bag as standard equipment. Suggested list price is $1,550.

For more information write: Makita, 14930 Northam St., La Mirada, CA. 90638; (714)522-8088.



New Products to announce? Send a press release and color transparency or slide to the Products Editor, *Popular Woodworking*, 1507 Dana Ave., Cincinnati, OH 45207, and we'll consider them for News and Notes.

So You Say You Don't Have A Lathe ...

Well, there are options if you find yourself unable or unwilling to do your own turning. Read on.

The gist of these thoughts is that it's possible to incorporate turnings in your projects even if you lack the lathe to form them or, on occasion, choose to take the easy way out. The skilled woodturner may scoff at the thought of *buying* ready-to-use lathe work, but you don't have to be a purist to be a good woodworker. Buying a component can be the answer to producing a project that's not otherwise feasible.

There are woodworkers who don't own a lathe and there are others, including myself, who do but won't hesitate to admit that while turning one piece is enjoyable and creative, having to clone components, (such as four legs for a chair or table), is a production procedure to be tolerated without much enthusiasm, even if a duplicating accessory is available.

A fellow woodworker of my acquaintance takes another approach: Buy one leg and use it as a prototype to form the others. This eliminates the chore of having to design from scratch and is especially helpful when he's duplicating a piece of classic furniture.

Anyway, there is a cornucopia of ready-mades from which you can choose components. They range from an extensive collection of parts for toys and novelty projects, to sophisticated products like Queen Anne and William & Mary table legs. Also on tap are cabriole-type legs that require both a bandsaw and a lathe to produce.

Matt Burak of Matthew Burak Furniture, a manufacturer of quality furniture that also produces top-grade furniture legs, says, "There's a niche for my legs in the hobbyist/small shop market place. The concept was simple. Supply a well-detailed and market-proven selection of legs in different styles to people who are uninterested or unable to turn out a set of their own." Burak's company started with eight leg styles in two wood species and is now offering 16 leg styles in five wood species. The legs are mortised and ready for assembly. Matching aprons and stretchers are also available.

Country Sheraton legs from Matthew Burak Furniture.

Queen Anne carved legs from Matthew Burak Furniture.

AVAILABILITY

It's possible to find small parts (for toys and such) in hobby shops, and a variety of newels and balusters for stair work in good-size or specialty lumber yards. But generally, ready-mades is a mail order business. The most extensive collections are available directly from the manufacturers or via catalogs. (See source list.)

HOW ABOUT COST?

Overall, the cost of a finished piece compared with buying the raw material is not prohibitive, especially when you consider the time, effort and expertise required to produce some of the products. In the small parts area, car and truck wheels for example, the cost is almost insignificant. Checking current catalogs, I noted the following prices:

A set of four 2¾" spoked wheels in maple costs $5.25. Typically, if you buy in quantity, the cost is reduced. In this case, buying 10-plus sets brings the price down to $3.75 per set.

R.J. (Cris) De Cristoforo, is a woodworking and tool authority and is a Contributing Editor to Popular Woodworking.

By R.J. De Cristoforo

SOURCE LIST

ADAMS WOOD PRODUCTS
974 Forest Drive
Morristown, TN 37814
(615)587-2942

MATTHEW BURAK
P.O. Box 279
Danville, VT 05828
(802)684-2156

RAINBOW WOODS
20 Andrews St.
Newnan, GA 30263
(800)423-2762

TATRO, INC.
7011 Marcelle Road
Paramount, CA 90723
(800)748-5827

BEAR WOODS SUPPLY CO. INC.
Box 180
Bear River, NS
Canada B0S 1B0
(902)467-3703

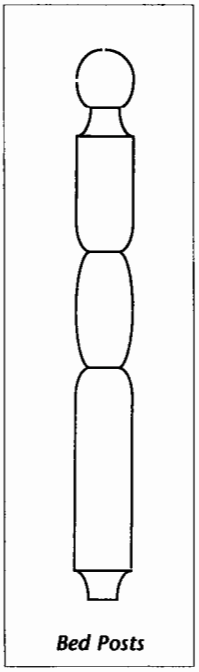
KLOCKIT (GENEVA SPECIALTIES)
P.O. Box 542
Lake Geneva, WI 53147
(800)556-2548

CONSTANTINE'S
2050 Eastchester Road
Bronx, NY 10461-2297
(800)223-8087

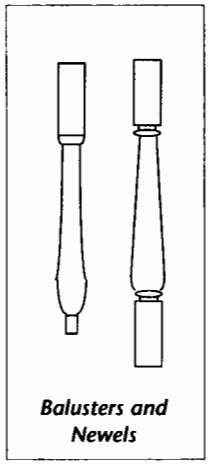
WOODWORKER'S SUPPLY
1108 North Glenn Road
Casper, WY 82601
(800)645-9292

WOODCRAFT
210 Wood County Industrial Park
P.O. Box 1686
Parkersburg, WV 26102-1686
(800)225-1153

CHERRY TREE
P.O. Box 369
Belmont, OH 43718
(800)848-4363



Bed Posts



Balusters and Newels

In the leg category, prices relate to the complexity of the design. A carved cherry Queen Anne leg with a carved knee for a dining table list for $62. A turned cherry Queen Anne leg, whose shape is essentially a taper that ends in a pad foot, is $39. William & Mary legs for a coffee table list at $19.50 in cherry, $18.50 in maple.

Regarding raw materials, when working from scratch I figure turning squares usually fall in the 4x4 and 2x2 range depending on design. Again quoting from current catalogs, 4x4s in cherry are about $22 a lineal foot; 2x2s about $3.50. Prices, of course, relate to wood species, with walnut being "up there" around $25 per lineal foot for 4x4s and about $4 for 2x2s. **Note:** These prices are a catalog average. Prices from your local lumber yard may differ.

So we have choices. If you're interested, the best bet is to check the sources of supply and write or phone for information or catalogs. If you're an enthusiastic turner you'll ignore these options, but I have a feeling there are readers who will explore the possibilities. PW

INDEX OF ADVERTISERS

Yellow Poplar
(a.k.a. Tulipwood)

Whichever name you're familiar with, this wood is an excellent, everyday selection.

Few domestic hardwoods have caused more confusion than yellow poplar, a.k.a. tulipwood, or any of its many other names. Nevertheless, it's worth wading through the misunderstandings to get a hardwood that's this versatile, attractive, inexpensive and a pleasure to work with.

General Description

The root of the confusion associated with yellow poplar (liriodendron tulipfera) may be that it's not really a poplar. It's actually in the magnolia family. True poplars, like cottonwood (populus deltoidus), quaking aspen (populus tremuloides), balsam poplar (populus balasamifera), lombardy poplar (populus nigra) and others, belong to the willow family. It's unclear how these names originally got mixed up.

Woodworkers buying yellow poplar should be specific when ordering. In addition to being called yellow poplar or tulipwood, it's also called tuliptree, tulip poplar, canoe wood, whitewood and ironically, the most common of all, just plain poplar.

Compounding the confusion over yellow poplar is that it's commercially harvested in the same general area as its namesakes. The southern Appalachians, and from the coast westward to the Mississippi, is prime yellow poplar growing area, although they can be found as far north as Connecticut and as far south as Florida. Pure stands are common, particularly in southwest Virginia, east Tennessee and western North Carolina. It's the state tree of Indiana, Kentucky and Tennessee.

Ken Textor *works wood and writes about it in Arrowsic, Maine.*

Yellow poplar trees favor deep, moist, well-drained soils, generally in the lowlands and midlands. Real poplars, on the other hand, like soggy soils, often near swamps, rivers and lakes. Nevertheless, yellow poplar is a lumberman's dream come true. It grows quickly and straight, often without branching for the first 20–25'. The tree can easily attain a height of 120 feet in 60 years, with a trunk diameter of 18–24". The tree is readily identified in the spring when it sprouts handsome, 2–4" tulip-like flowers, ranging in color from white to yellow-green with touches of orange or sometimes purple. The flowers are heavily laden with pollen, making them attractive to bees.

The wood of yellow poplar is moderately hard, straight-grained and somewhat colorful. The sapwood is generally a cream color and accounts for about a third of the usable wood in a plank. When first cut or planed, the heartwood often has a greenish tinge. Other heartwood colors range from olive through brown and sometimes have blue or purple streaking. (This isn't an indication of incipient rot.) When aged, these colors merge into various shades of brown. There are knots in yellow poplar, but in better grades many boards are shipped nearly blemish-free. The grain is less prominent than oak or pine, but remains visible after finishing. Ray fleck can be quite prominent in yellow poplar, sometimes resembling the ray fleck one finds in cherry (*PW* #56).

Shrinkage in yellow poplar is moderately high, on par with hard maple (*PW* #60). It's moderately shock and impact resistant, again close to maple. The wood bends easily when steamed, with little splitting or cracking. It is, however, prone to decay when used in damp areas or in contact with the ground.

Yellow poplar has become quite popular lately as an interior trim substitute for clear white pine. More traditional uses include cabinets, furniture, paneling, musical instruments, woodenware

All finished boards were cut from the same popular plank as the unfinished piece at top. The finished pieces were prepared alike by block sanding with 120, 180 and 220 grit paper. After color was applied, boards were clear coated with satin sheen lacquer using an HVLP sprayer. Three coats were sprayed with the finish wet sanded after the second and final coats. Wet sanding used 400 grit wet/dry sandpaper with mineral spirits as a lubricant.

and gunstocks. Lower grades are often used in slack cooperage, pallet stock, boxes, crates and excelsior (wood shavings used in packaging). In the pre-Colonial Southern states, American Indians burned and dug out yellow poplar trunks to make canoes, thus the name canoe wood.

Working Properties

Yellow poplar is a very easy and forgiving wood to work. When planing, you can take up to ⅛" off on preliminary passes, moving to 1/16" on the final passes. This approach produces boards that need little sanding. It's rare that grain anomalies produce rough spots. Almost without exception, though, rough spots can be taken out with a few passes of 1/32" each.

Virtually all of the other woodworking processes—hand planing, sanding, crosscutting and ripping—are problem free. Standard shaping and routing procedures usually yield better-then-average results, reminiscent of higher-quality hardwoods like mesquite (*PW* #73). The wood's hardness makes boring a little bit of a problem, but only with drills ¼" or smaller since small diameter bits tend to stick a little in the wood.

Lathe work with poplar is satisfactory, but not as good as a hard maple. In general, a yellow poplar turning requires more sanding than a maple turning, and very fine details are a little more difficult to obtain. Dust from working yellow poplar is no problem, giving the shop a smell akin to a fresh newspaper. Allergic reactions are minimal. For a hardwood that some people think is too soft, fastening yellow poplar requires all the precautions of an oak (*PW* #58 & 59)—predrilling, slow driving, high-quality screws, etc. The wood holds fasteners very well. Fastening near the ends of boards rarely results in splitting. All glues work well with yellow poplar and glue staining isn't a problem.

Color was achieved by two different methods. Boards 1 and 2 used Pratt & Lambert Classic Oak and Classic Mahogany pigmented oil stains. Boards 3 & 4 were sprayed with thinned Dayco Brown NGR (non-grain raising) analine dye. The darker color was achieved by spraying additional coats of NGR.

Finishing

This is where the real fun with yellow poplar begins. The wood is highly adaptable to lots of different finishing techniques, often with surprising results. For instance, cherry stains can make an otherwise uninspired finish look very much like real cherry. Since grain patterns in yellow poplar are often quite similar to cherry, few will recognize the difference. I found this is also true with some walnut stains.

Of course, any clear finishes—stains or other—must take into account the photo-reactive nature of yellow poplar. As mentioned earlier, the light-green, purple and blue tones found in freshly planed yellow poplar wood will turn a shade of brown when exposed to sunlight. I found this darkening process is essentially inevitable. Only yellow poplar kept completely in the dark will retain the original hues. Even closet shelving will eventually darken. Even ultraviolet-inhibiting varnishes have no effect on this inevitable process.

I found the best approach to using poplar is putting prospective finish boards in direct sunlight for a day or so. This quickly brings the coloring to its final natural color and makes working with stains more predictable. If you want to keep your work load down, stick with non-water-based finishes on yellow poplar. Water-based finishes raise the grain in the extreme, requiring vigorous sanding after the first coat.

Don't be afraid to use opaque paints, such as enamels, on yellow poplar. As a small-pore, closed-grain wood, it's a painter's dream. One base coat and another finish coat is usually all that's needed for a nearly flawless finished surface. Polishing, waxing and oiling seem to be poor finishing alternatives to the coatings already discussed.

Availability

Yellow poplar is widely available and its price has not fluctuated as drastically as some hardwoods. Just about anywhere east of the Mississippi, 4/4 face and better grade yellow poplar lumber can be purchased for between $1–$2.50 per board foot in the rough.

Most poplar is cut into 4/4 boards, but 5/4, 6/4, 8/4, 10/4 and 12/4 boards are also available. Sometimes 6/4 natural can be found. Obtaining particularly wide (10–12" or better) or especially long (up to 24') boards is relatively easy. Indeed, I found only a small premium applied to the cost of wider boards, usually only around 10% extra.

Yellow poplar plywood is widely available too, in all sorts of grades. Book matched, cabinet grades and others are generally available from plywood suppliers. Veneers, however, aren't widely available. Most veneer dealers told me that solid yellow poplar is just too cheap for many woodworkers to consider a less expensive veneer alternative.

In any case, yellow poplar is a wood well worth trying. And as poplar becomes more popular, we can eventually end the confusion connected with this versatile wood. PW

Cordless Drills Lighten Load

Bolstered by a slew of new features, these drills can provide increased efficiency and productivity.

There have been some dramatic changes over the past decade or so in cordless drills. But at this juncture, it's hard to imagine how much more can go into battery-powered driver drills than DeWalt has incorporated in its array of new units. The three we've reviewed, the 14.4, 12.0 and 9.6 volt, were subjected to normal, and some not-so-normal, usage.

Their features include: choices in power, infinitely variable speeds in two ranges, extended scope of clutch settings, reverse rotation, keyless chuck, pockets for screwdriver bits, extended-run batteries, electric brake, user-replaceable brushes and enough attention to physical enhancements (ergonomics) so the tools are well balanced and comfortable during extended use.

And even with all these features, the new tools are lighter than their predecessors. The 14.4 volt unit (which is the highest voltage cordless drill available in the U.S.), is actually a couple of pounds lighter than the 13.2 volt it replaces. A major reason for the change is the mid-handle design, a trait of all three drills. Aside from "compacting" the tool, the handle position combined with the battery weight located in its base, provides for better balance than in-line designs (pistol-grips) where handles and battery weights are at the rear.

This may be a personal preference since the point can be made that the latter models allow for applying pressure that is more on the horizontal centerline of the chuck.

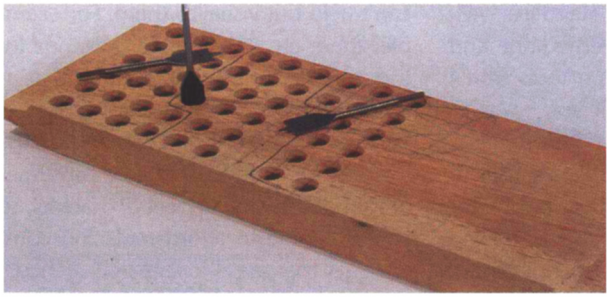
New driver/drills are similar in appearance but differ in voltage. All have mid-handle designs with a comfortable, anti-slip rubber grip. Torque settings are legible. Slide switches for changing speed and setting chuck rotation are conveniently located and easy to use.

The 9.6 and 12.0 volt units come with a spare battery pack so you need never run out of driving force. The one-hour charger's red light blinks during the charging period. A steady red light indicates charging is complete and the battery pack isn't harmed if left in the charger. A 15 minute charger is available as an accessory.

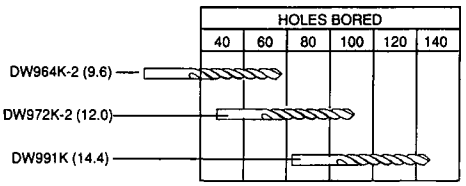
KEYLESS CHUCK

You'll come to love them despite some negative press. I'd say they do as well and maybe better than keyed varieties. During our in-use programs, we encountered no slippage whether boring holes or driving screws. Just grip one of the chuck's two rings in each hand and give a sharp twist—the bit holds. Reverse the procedure with a firm, but not heroic twist, and the chuck lets go. Simple. And no more looking for a key that has a tendency to hide.

R.J. (Cris) De Cristoforo is a woodworking and tool authority and is a contributing editor to Popular Woodworking.

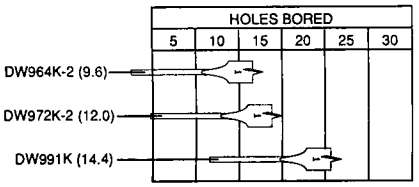


A second drilling test was done with 1" spade bits and with the tools in high-speed mode. Here too, each unit was capable of the chore, but again, the high voltage drills did more.



1/2" HOLES WITH TWIST DRILL THROUGH 1-1/2" PINE

The drills behaved in good fashion when forming ½" holes with a twist drill, but there was a difference in the number of holes each could produce before the battery pack began to fade.



1"HOLES WITH SPADE BIT THROUGH 1-7/8" FIR

Holes drilled through 1⅞" fir with a spade bit. A point to remember when buying is that the two lesser volt units come with a spare battery pack so the units have double staying power.

POWER

In our tests with the three drills, we found that differences were not so much in what each of the units could accomplish, but in the duration of the battery packs before recharging was necessary. All three units had no problem driving a ½" twist drill through 1½" pine, or a 1" spade bit through 1⅞" fir, but the number of times the units could accomplish the tasks depended on the voltage. In essence, one of the advantages of higher voltage is added power storage. But there's more.

One of the tests, with 1" pine, involved using hole saws ranging in size from ¾–2". Here, when we went beyond the 1" plus diameters, using both high and low speed ranges, there was a difference in what each tool could do. The higher voltage units didn't breeze through some of the tasks, but they required less "babying" to get the job done than the tool with less voltage.

CLUTCHES

Adjustable clutches that can be preset to slip at particular torque levels provide maximum control when driving or removing screws, thereby preventing you from burying the screw in the workpiece or snapping off its head. Settings are made by turning a large, numbered collar; the higher the number, the greater the torque and the larger the fastener you can drive. The wide range of torque settings plus speed control (the low speed range for high torque) provides for great versatility.

The 3½" thick test block for driving screws was made by laminating pieces so there would be crossing grain directions. Working with the 9.6 volt drill, I drove a large number of screws that ranged in size from #6 x ⅜" to #12 x 3". The idea was to check for power and for delicate driving. Frankly, I got tired before the drill did—and, since the "low" voltage unit did so well, I assumed its brothers could do as well, or better, before the batteries gave out.

To arrive at a precise torque adjustment, start at a low number and move up until the clutch slips when the screw is driven exactly right. Thereafter you'll know the setting to use for fasteners of particular size and shape.

When the drill is equipped with a "Versa Clutch" and is in the screw-driving mode, the clutch will not tum until you apply pressure in line with the fastener. The pressure activates the clutch and provides control over the rate at which screws can be driven.

DRILLING

I drilled various size holes in wood, metal and masonry, and found, as I came to expect, that all three drills could accomplish particular tasks as related to their power supply. The charts show the number of holes that were drilled with each tool, working with a ½" twist drill and with a 1" spade bit. In each case, the batteries were fully charged and a new bit was used for each test.

PARTICULAR SPECS

The chart lists basic specifications for each of the drills. A note about list prices: You can often do better than paying the list price for a tool. In this particular case, you can save as much as $100 by shopping around. PW

Specifications of the three test units.

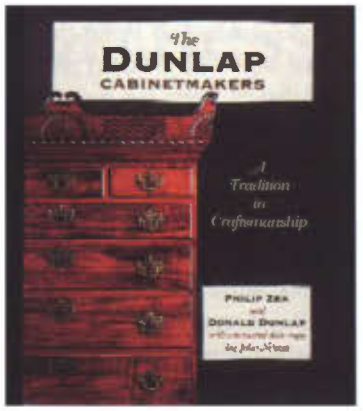
MODEL	SIZE	VOLTS	RPM	CLUTCH	CATALOG CAPACITIES		SOME FEATURES	WEIGHT	LIST PRICE
					WOOD	METAL			
DW 964K-2	3/8"	9.6	0-400 0-1200	**24 POSIT.	7/8"	3/8"	CLUTCH HAS TORQUE OVERRIDE – 2 BATTERY PACKS – 1 HOUR CHARGER	4.3	$324.00
DW 972K-2	3/8"	12.0	0-450 0-1400	16 POSIT.	7/8"	3/8"	1 HOUR CHARGER 2 BATTERY PACKS	4.2	$352.00
DW 991K	3/8"	14.4	0-450 0-1400	16 POSIT.	7/8"	3/8"	1 HOUR CHARGER	4.9	$370.00

* DUAL RANGE
** "VERSA CLUTCH"

ALL MODELS HAVE KEYLESS CHUCK AND AN ELECTRIC BRAKE

Book Reviews

By Hugh Foster



The Dunlap Cabinetmakers: A Tradition in Craftsmanship, *by Philip Zea and Donald Dunlap, with measured drawings by John Nelson, 210 pages, hardcover, $49.95, available from Stackpole Books, 5067 Ritter Road, Mechanicsburg, PA 17055*

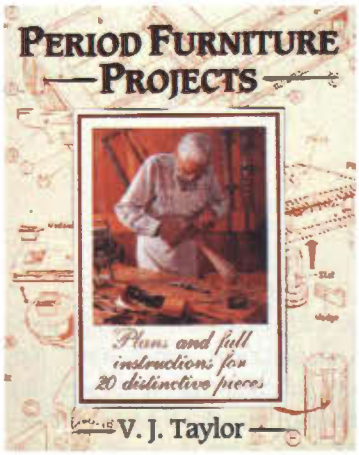
It's only fair that you become aware of these marvelous books the same way I did: both in the same sitting. More than any other books I've seen since the days of Andy Marlowe and Franklin Gottshall, these present classic projects for experienced amateur woodworkers who want to develop or maintain advanced skills.

In his book, "Period Furniture Projects: Plans and full instructions for 20 distinctive pieces," V. J. Taylor rates every project's difficulty from 1–5, 1 being the simplest. Most of the interesting and challenging work is rated a 4 or 5.

But I've always wondered about rating systems. Anyone who really wants to build something will find a way to do it. Many of us have been daunted by projects with high ratings, feeling perhaps, "I'm not good enough." Of course, if you believe you'll fail at a given task, you've all but guaranteed it. However, I would have to say, don't even consider these books if you're not feeling good about your work abilities.

Besides a good attitude, you'll need access to a pretty extensive shop to construct these items. In addition to what we might regard as the standard well-equipped shop, you'll need a lathe and a fair assortment of carving tools. You'll also need several years if you want to complete every project!

Small items presented include a Canterbury music stand (possibly for storing magazines) and a tripod, tip-top table. The Canterbury features intricate joinery and a 1 rating, while the tripod, tip-top table rates a 4. These two projects, Taylor suggests, might each be built in two or three weekends. More-involved projects, such as the oak gate-leg table, no doubt involve considerable amounts of time. In this case, you could spend a couple of week-ends just spindle turning—unless you're a veritable whiz.



Period Furniture Projects: Plans and full instructions for 20 distinctive pieces, *by V. J. Taylor, 160 pages, hardcover, $29.95, available from Sterling Publishing Co., Inc., 387 Park Ave. S., New York, NY 10016-8810*

In his text, Taylor refreshingly treats us like experienced woodworkers. By this I mean he doesn't feel obliged to detail steps of operations with which most users of the book should be familiar.

"Period Furniture Projects" is definitely a book for builders. Each project opens with a very good photograph of the original antique on which the project is based. The text is well-illustrated with a series of sketches and formal drawings showing the subtleties of each project. Drawings are so good that you can't help but visualize them. For example, there are 21 separate drawings for the tripod, tip-top table—and that is among the book's smaller projects.

Does one dare try a project like this? Despite the 4 rating, the table consumes only about 6–7 board feet of material, so you'll be able to afford replacing components that are "hopelessly botched." All you really have to lose is a bit of material and some ego. I say, "Go for it."

"The Dunlap Cabinetmakers" will look better on your coffee table, but it too offers wonderful opportunities for the experienced woodworker. You're probably familiar with the drawings of John Nelson—a lot of his work has appeared in these pages over the last 10 years. Here he achieves a new, higher level of excellence.

The book opens with nearly 50 pages of history about the Dunlap cabinetmakers. Suffice it to say that their legacy is important to everyone who admires excellent woodworking. Thereafter, we have 140 pages of projects. Each is illustrated with color and black-and-white photos of original pieces and reproductions, as well as Nelson drawings.

Dunlap has built some amazingly fine pieces with some extraordinary gorgeous American timber. People who doubt that amazing beauty can be found in domestic timbers need only look at the birdseye and curly maple in many of these projects.

As is the case with Taylor's book, one will need a good selection of carving tools to complete these projects. I'm particularly taken with the carved shell on the dressing table and with the basket-weave table aprons on the tea table. I believe these projects are beyond my skill, but I'm going to build them—only by doing so will my skills grow.

These are not books for the faint of heart—or wallet. They're expensive, hardcover editions. Recommendations? Buy them both—your local library won't let you keep either long enough to do you much good. Buy Dunlap first if you really want to look more than build. But if you want to build, by all means, the Taylor is as good as I've seen in a decade! PW

***Hugh Foster** is an English teacher, woodworker and author from Manitowac, Wis.*

Classifieds

ADHESIVES

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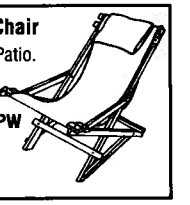

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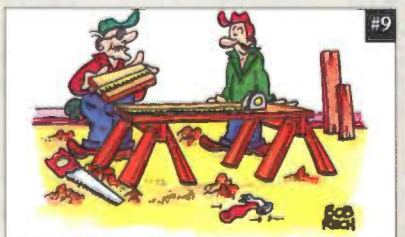
Submit your caption(s) for this issue's cartoon on a postcard to *Popular Woodworking*, Cartoon Caption #11, 1507 Dana Ave., Cincinnati, OH 45207. The entry deadline is March 15, 1995. Entries will be judged by the editorial staff. A winner and two runners-up will be chosen.

The winner will receive the new Skil 8" Drill Press, model 3380. Features include: ¼ HP induction motor, 5 speeds (620-3100 rpm), adjustable depth stop, ½" chuck with 2" spindle travel and 7" chuck to table clearance—10" to the base. There's a conveniently located chuck key holder and a drill bit storage compartment for 20 bits (1/64"—½"). The warranty lasts two years.

The two runners-up will each win a one-year subscription to *Popular Woodworking.*



"Wow!!! I'm glad I said 12" instead of a foot!"

The Winner of our "Caption the Cartoon Contest #9"

from the November, 1994 issue and recipient of the Skil Drill Press is:

R.J. Plambeck, Sr. from Cape Coral, Fla.

The runners-up receive a one-year subscription to *Popular Woodworking:*

Ed Cole, from Beaverton, Oreg., for:
"I said cut a "taper"!"

And Ronald W. Jones of Elgin, Ill., for:
"I know how much you dislike the metric system gramps... but that was my brand new tape measure!"

By Bill Houghton

The Birthday List

A wish list for the shop that has everything.

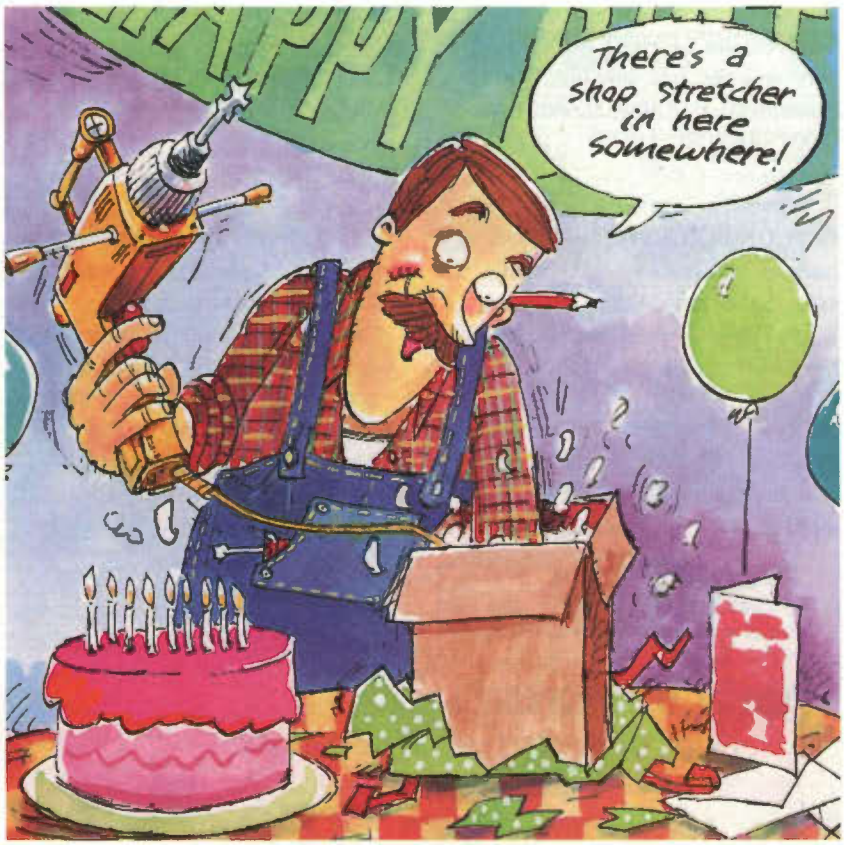


ILLUSTRATION BY JIM BENTON

My birthday is coming up, and I'm having a little trouble with my wish list. Not that there's nothing I'd like: Somehow I'm on the mailing list of every tool merchant known, and given half an hour with that stack of catalogs under the dresser, I could have a list ... *such* a list.

But I'm kind of embarrassed. I've already got more tools than my grandfather did, but he built more furniture in a year than I have so far my whole life. And still I keep stumbling over items at sales or garage sales that I just can't turn down: a table saw, jointer, bandsaw, lathe, drill press, old Shopsmith, 19 hand planes, seven rasps ...

Besides, the toolmakers aren't building what I need. They're trying, I guess, though they do copy each other a lot. One introduces a neat new tool and a year later everybody's selling one. There are now, for instance, enough random orbit sanders around to start a new solar system. But with all this flurry of new products, I can't find what I'd really like:

Item #1. Self-sharpening tools. After years of experimentation and careful practice, I've finally learned to sharpen edge tools, sort of. But even though I'm better at it than 20 years ago, it still takes up too much shop time that I'd rather spend cutting wood. I don't need tools to stay sharp constantly—that's unrealistic. What I want is—well, a few years ago, one of the car makers introduced a car with fenders that pop out again after you ding them. That's what I want. Let the tools get a little dull by day's end, and sharpen themselves overnight, so I can get right to work the next morning. Now that's a good birthday present.

Item #2. I mentioned earlier my tool-buying habits. Right now, there's only one spot in my shop where I can actually walk freely. The rest is so tight that I have to walk sideways, step over things, wiggle through narrow spaces. We are talking about a new, larger garage/shop—four times larger than my 11-foot-square space. But then, I know a man with a shop as big as a 14-car garage, and there are *two* spots in it where you can walk freely. We can build a new shop; but give me a year or two and I'll fill it. So I'm looking for a Shop Stretcher. I don't know how it will work—a really powerful fan, helium, something with microchips—but when I turn it on, the shop will expand to give me working room, no matter how many tools I acquire.

Item #3. A Time Stopper. Without question, this is the most important item. You see, I work at something else for a living, and I have two sons who always need help with something. And the old cars and older house break down on alternate weekends, and my doctor says I need more exercise to keep my blood pressure down, and somehow I get precious little shop time. Maybe I'll get the wood marked out and cut for a project, then not get back to it for a week ... by which time, I can't find it under the other stuff on the bench. I need a little black box that will let me shut the shop door and stop time until I can, for a change, finish a project.

Sharp tools, enough shop room and plenty of time to make sawdust. You know, that's not just a birthday list—it's Woodworker's Paradise! PW

***Bill Houghton** is a hobbyist woodworker in Sebastopol, Calif.*

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