

THE MIRACLE FINISH: WIPING VARNISH

Incredible New Jigsaw
Blades from Bosch



POPULAR Woodworking

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NOVEMBER 2008 #172

Dirt-simple Jigs For Tricky Cuts

11 Causes of Nasty Kickback

Why You Need A Big Bowsaw

Your First Fan Carving

5 Rules for Copying Famous Furniture

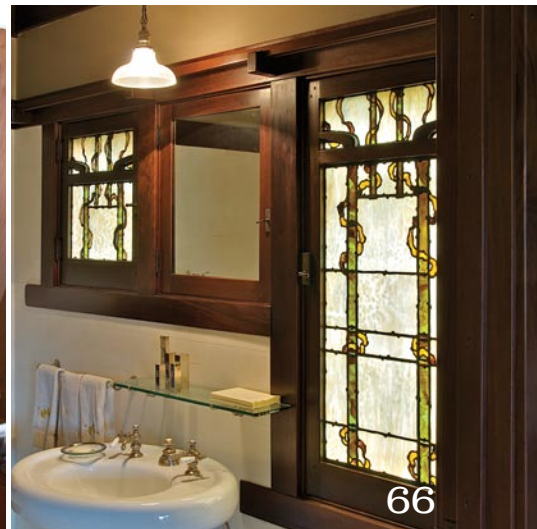




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BY GLEN D. HUEY

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With just five tools and a little bit of practice, you can easily create this classic design feature to enhance any traditional project.

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Many furniture designs are instantly identifiable – think Eames and Wright. That might also be a good indication that the designs are legally protected. Before you copy any famous (and even not-so-famous) pieces, it's a good idea to start with some legal research.

BY JON SHACKELFORD

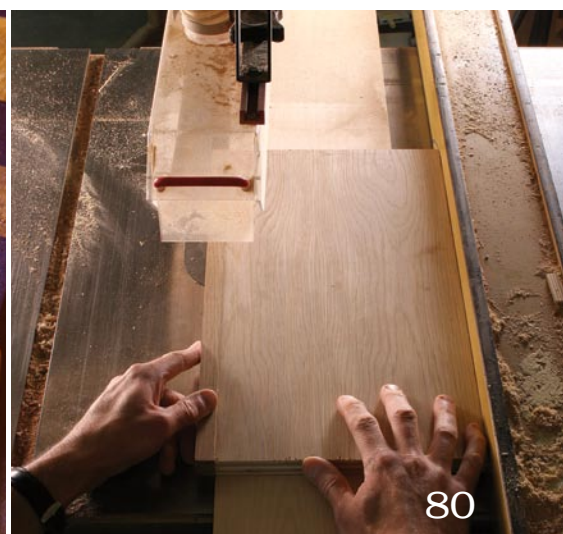
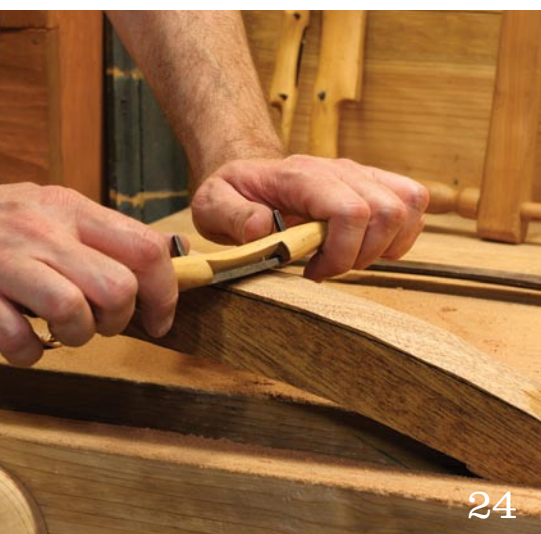


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Many woodworkers are intimidated by the housed sliding-dovetail joint. But it's easy with the simple router jig on page 36.

COVER PHOTO BY AL PARRISH





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Bowsaw Dovetails in 3 Minutes

You've never seen dovetails like this before! In just three minutes, master cabinetmaker Frank Klausz marks and cuts a full set of dovetails (paint-grade dovetails) with a bowsaw.

popularwoodworking.com/video

The Wood Whisperer

Sure, mineral oil and wax are a great (and traditional) way to finish a cutting board, but a couple coats of thinned varnish does the job, too – more quickly. And, it lasts longer.

popularwoodworking.com/video

Sliding Dovetails

With the help of Senior Editor Glen D. Huey, you'll be cutting sliding dovetails like a pro in no time at all. With this simple router jig, it's much easier than you might think.

popularwoodworking.com/video

New Tools from IWF

Log on to popularwoodworking.com and the magazine's blog for the newest, coolest and oddest woodworking equipment we came across at the 2008 International Woodworking Fair in Atlanta (including the new Delta Unisaw that's made in the United States!).

popularwoodworking.com/IWF08

New This Month: Slide Show

Everyday Greene & Greene

In this downloadable pdf slide show of never-before-published pictures, you'll get a look at the private side of 10 iconic Greene & Greene homes, including details of kitchen and bath cabinets that few people have ever seen.

popularwoodworking.com/nov08

On the Blogs

New Arts & Crafts CD

The revival of the Arts & Crafts Movement isn't just in the furniture store. Woodworkers of all levels of experience have named it one of their favorite styles to build in their workshops. Why? Clean lines and honest joinery.

So we've put together a new CD that features our 49 favorite A&C articles (in pdf format) from *Popular Woodworking* and *Woodworking Magazine*. It's just \$15 – including shipping & handling for U.S. orders. You can read more about it on our blog, or order now at:

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Frank Klausz At the age of 14, Frank entered the Hungarian trade school system, earned his journeyman cabinetmaker certificate and later became a master cabinetmaker. His apprenticeship may have been tougher than most, for he had an exceptionally tough master – his father. Today, Frank builds fine furniture in his New Jersey-based shop, and teaches at various schools and woodworking shows (he'll be at the Woodworking In America conference Nov. 14-16). You can see a gallery of his work at frankklausz.com.

In this issue, Frank writes about bowsaws and why you should have these tools in your shop (page 42).



Jon Shackelford is a lawyer specializing in intellectual property, an area in which he has practiced exclusively for more than 20 years. Jon has been working wood (and coveting tools) since childhood, and enjoys furniture building and home renovation projects. He recently built a cedar strip canoe, and is planning to expand the fleet this winter with a wood-strip kayak. Like many woodworkers, Jon is also an amateur inventor; he has one patent currently pending for a novel panel gluing and clamping press. Jon and his family live in Chelsea, Mich.

In his first story for *Popular Woodworking*, Jon writes about legal issues to consider when imitating furniture designs. It begins on page 76.



Kerry Pierce, a four-year cancer survivor, has been building Shaker and period furniture for more than 30 years and has been writing about the genres for almost 20 years. His 18th book, "Chair-making Simplified," was recently published by Popular Woodworking Books. He and his wife, Elaine, are the parents of two adult children, Emily and Andy.

For this issue, Kerry built an 18th-century plate rack out of walnut. The story begins on page 53.

Hunter Lang is a 16-year-old woodworker from Cincinnati, who has had an enthusiasm for woodworking since he was a young child. He started out by gluing scraps of wood together in his father's shop (his dad is Senior Editor Robert W. Lang), and has since moved on to many other fun-related woodworking activities such as pinewood derby cars, toy guns and birdhouses. For his first story for *Popular Woodworking*, Hunter made a vacuum-pressed skateboard (page 72).

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My Weird Relationship With My Router

Perhaps it was the flames shooting out of the vent holes of the plunge router that first soured my relationship with the tool. But for some reason, I have always had an uneasy truce with my routers.

To be fair, the flames were my fault. I had just changed the brushes in the tool and had done a poor job of lining things up. So when the tool's commutator spun up, it barbecued the little suckers and announced my error with a belch of fire.

This small incident pushed me to rethink how I do things in the shop. For example, one of the biggest strengths of the router is its ability to cut hundreds of moulding profiles. The problem is that these profiles still need sanding, which is a time-consuming process for complex profiles. And if you get lazy on this point, you'll lose the crisp lines that are a hallmark of good work.

So I learned to use moulding planes, which leave a beautiful, ready-to-finish surface. Truthfully, however, moulding planes have their difficulties. Holding the work can be a challenge, and you have to be real picky about selecting your wood, otherwise it will tear out grotesquely.

So most days it's a toss-up for me: Spend a lot of energy sharpening, setting up and using my moulding planes, or fire up my router table and make 100 feet of moulding in a morning (and spend the next two days sanding it). What's the lesson here? Good work—by hand or power—takes a sharp eye and a bucket of patience.

How about joinery? I like cutting dovetails by hand, but typically that's for a piece that has four to six drawers. In the coming year, I'm planning to re-do our kitchen's drawers and build some additional cabinets for that room. I have a couple dozen drawers to build, plus I have a wife, two kids, three cats and a day job.

I think that my dovetail saw is going to get coated in a fine film of dust as I fire up my router on a dovetail jig. Yup, I know they won't look "handmade" but they will look "done."

The lesson here? Every operation in woodworking is a trade-off between perfection and completion.

And finally, there are tasks for which the router is a miracle worker. Making slid-

ing dovetails and stopped dados and grooves by hand is a chore. And I've personally struggled to master those for years now.

Then Glen D. Huey (a senior editor at this magazine) showed me some of his router tricks and the dirt-simple jigs he uses for cutting these complex joints. For these essential joinery chores, the router has no equal, and I asked Glen to share some of these tricks with us in this issue.

The lesson? Always get the spring behind your router's brushes lined up just right. You're going to need this tool. **PW**



Christopher Schwarz

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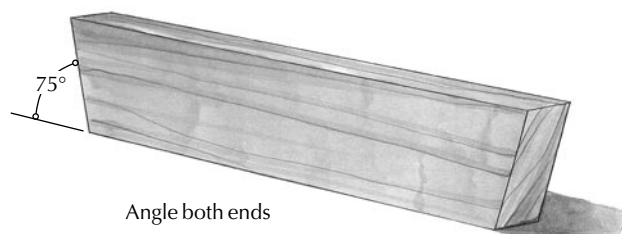
Safety Note

Safety is your responsibility. Manufacturers place safety devices on their equipment for a reason. In many 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.

Curved Bricked Rim Can be Constructed from 9 $\frac{1}{4}$ " Pieces

On the *Popular Woodworking* blog in mid-August, I chronicled the building process for a 36"-wide demilune table I made in Philip C. Lowe's class at the Marc Adams School of Woodworking (for pictures and stories, see popularwoodworking.com/nov08). The rim, which has a finished size of 34 $\frac{1}{4}$ " x 3 $\frac{3}{4}$ ", was made of a number of bricked pieces that were pattern-routed layer by layer. Several people commented that they'd built half-round tables in this manner, but with 5"-long pieces, and asked the dimensions of these longer pieces.

Each one is 1 $\frac{5}{16}$ " thick, 1 $\frac{3}{4}$ " wide and 9 $\frac{1}{4}$ " long at the long side; the angle on each end is 75° (a.k.a. 15° off 90°), and thus 8 $\frac{3}{8}$ " long at the shorter side. We rub-jointed chevrons out of 36 of the pieces, screwed the bottom layer of five chevrons around the edge of the pattern (with screws countersunk through the bottom) then routed it to shape. The next layer was bricked with four chevrons, with half pieces on either end. The third and fourth layers followed suit. Pieces added to the back



of the form with each layer served as support when routing.

Though screws and glue secured each layer to the preceding one, glue alone would impart sufficient strength with enough set-up time.

After the final layer was routed to shape, the rim was removed from the pattern, and trimmed at the band saw along the interior curve to a finished thickness of 1".

— Megan Fitzpatrick, managing editor

Cutting Dovetails on Edge Grain Is Asking for Trouble

I have a question about dovetails. I want to make a couple items for my granddaughter: an old-fashioned hooded cradle with canted sides (life-size, not doll) and a frame-and-panel hope chest.

I've cut dovetails on silverware trays with canted sides and learned that the grain of the tails is supposed to run parallel with the wood so as not to weaken the tails. However, I saw an antique mahogany cradle (way out of my price range) that did the opposite. The grain in the tails ran perpendicular to the angle of slope without a single broken tail. Which is correct?

Second, I ran across a frame-and-panel chest in a shop with the corner stiles joined with dovetails. Of course, that makes the direction of the tail perpendicular to the grain of the wood. That should be a really bad idea, yet the joints are holding up extremely well. Can I safely do the same with my chest?

— Gary Long, Norfolk, Virginia

It's common to see all sorts of strange constructions in antique furniture. Just like today, there wasn't "one way" to do things back then.

That said, cutting dovetails on edge grain is almost always asking for trouble. The joint may go together. It may hold up in use (perhaps due to the surrounding assemblies in the piece). But it is a compromised joint and does not exploit the inherent strength in a properly made dovetail.

And in some cases, such as the cradle you described, there could be a cross-grain construction. That joint could be stressed every season when the wood expands and contracts.

My recommendation: Keep your tails and pins parallel to the grain of your wood.

— Christopher Schwarz, editor

What's Causing Cupping?

I'm an experienced woodworker who has just started a small furniture shop. I love building chests, and I recently started to market a small box.

I have had some cupping issues with the

tops (usually a two-piece edge glue-up) and want to know your thoughts. I have avoided using cleats up until now. Will it always be risky not using cleats of some type, even on a small top? Or do you have any hints that would ensure more success? I have extensive history with gluing. However, this smaller-scale project is fairly new. It's a high-end box with a natural finish. I'm hoping to keep the top on the lighter/simple side.

My shop conditions were less than ideal as far as temperature/moisture consistency in comparison to home conditions – which is probably the cause of the cupping as much as anything. In my new shop those conditions have changed, but are there other things that could be causing the problem?

— Christopher Perry, via e-mail

There are a couple things that might be causing your problems. First, are you using air-dried or kiln-dried lumber? Air dried is usually a bit higher moisture content than kiln-dried lumber, and I believe air-dried stock is a bit less stable (due to

additional moisture). This is also a good reason to allow materials to acclimate for a week or two to your shop's environment prior to milling.

Are you milling stock from a thicker board and flipping faces as you mill so as not to remove the bulk of the material from any one face? If you take the majority of the waste from one face you open the stock to areas of unequal moisture content because the middle of a board is higher in moisture than the outer surfaces. As that stock dries it can cause the piece to cup. This compounds if you're attempting to bookmatch pieces resawn from 8/4 stock, so after you make a bookmatch cut, you need to allow the pieces to acclimate before milling to your final dimensions.

The trick is to begin the milling process but then wait for a time before going to your final thicknesses. Allow the material to rest for a few days, then finish milling by working the pieces as you would normally.

Finally, I would look at the amount of clamp pressure you're using as you glue the panels. You need only enough pressure to close the joint. Further pressure adds stress to the wood which can, after 24 hours in clamps, cause the pieces to distort.

All in all, you shouldn't have problems if you follow these guidelines. Give them a try and see if they help.

— Glen D. Huey, senior editor

Overcome Slop in Biscuit Joints

I have been struggling with my biscuit joiner and have nearly given up. But I re-read your article from the February 2007 issue (#160) and a glimmer of hope remains.

I originally bought the biscuit joiner to try to straighten up longer boards for glue-ups. However, there was so much slop in the fit that there was no way the biscuits would line up the boards and hold them. The biscuits moved up and down 1/2" or so. I think I was making all of the mistakes possible and some that didn't seem possible. I was even thinking of getting back into the doweling thing again.

— Ira B. Rothenhoefer, Clubb, Missouri

The slot should be tight in the thickness of the biscuit. The biscuits can swell and shrink with changes in humidity, but generally they can be pushed in by hand or you might need a light tap with a hammer. Going the length of the biscuit, you'll be able to move them back and forth, depending on the depth setting of the machine.

If they are as sloppy as you describe, there is



definitely a problem that could be the machine, its cutter or your technique. The first thing I would check is the cutter. It's possible (but not likely) that a tooth is bent, resulting in a wider than normal slot. A more likely problem is the plunge mechanism of the tool. It should move smoothly in and out, without any up-and-down movement.

The last thing to look at is your technique. If you tilt the machine as you plunge, the slot will be wider than it ought to be. Hold the fence down firmly, lock your arms and try pushing with your legs and body. It's easy to introduce some swing into the motion if you try to use your hands and arms alone.

— Robert W. Lang, senior editor

Latex Paint Blocking Woes

I painted an entertainment center with interior latex semi-gloss, and I am having a real problem with blocking, which makes the doors stick. To stop the sticking, can I topcoat the edges of the doors with shellac and then polyurethane? I'm very frustrated – and I should have stuck with milk paint.

— Terry Kelly, Presque Isle, Maine

You're right that latex paints "block" – that is, stick. It's one of the really big downsides of latex paint that no one talks about.

One suggestion would be to apply wax to the doors, but it may not work for long and it will have to be reapplied now and then. This is the easiest thing to try, though.

Your idea of shellac and polyurethane sounds fine to me, but that's a lot of work to do to the entire cabinet. I wonder if you can simply coat the door edges.

Also, I don't see why you'd have to use both shellac and polyurethane. Why not shellac alone

or polyurethane alone? Or what about coating the edges with an alkyd paint or milk paint of the same color and sheen?

If you do try the wax first, then you'll have to remove it very well with mineral spirits or naphtha before applying polyurethane or paint. In this case I would begin with the shellac because it may be difficult to get all the wax off. See if the shellac works by itself.

There's also a white-pigmented shellac called BIN if the project is painted white.

The problem with all these suggestions, except the wax, is that you're building thickness, which makes rubbing more likely. So continuing to think out loud, why not try wax on one door and see if it works. If it doesn't, clean it off as good as possible and apply a thin coat of shellac or BIN.

I've heard of adding cornstarch or talcum powder to latex paint to prevent the blocking, but I've never tried it, so I can't tell you how much to add or if it works. But it makes sense to me that it could.

— Bob Flexner, contributing editor

Omnijig Review Clarification

In our review of the new 24" Omnijig in the August 2008 issue (#170) we stated that additional bits were required to cut dovetails in material other than 3/4" thick. Actually, the dovetail bit included with the jig allows you to cut dovetails in any thickness up to 3/4". PW

Question? Comment? We want to hear from you.

Popular Woodworking welcomes comments from readers about the magazine or woodworking in general, as well as questions on all areas of woodworking. We are more than happy to share our woodworking experience with you by answering your questions or adding some clarity to whatever aspect of the craft you are unsure about, and if you have a complaint, we want to address it whenever possible.

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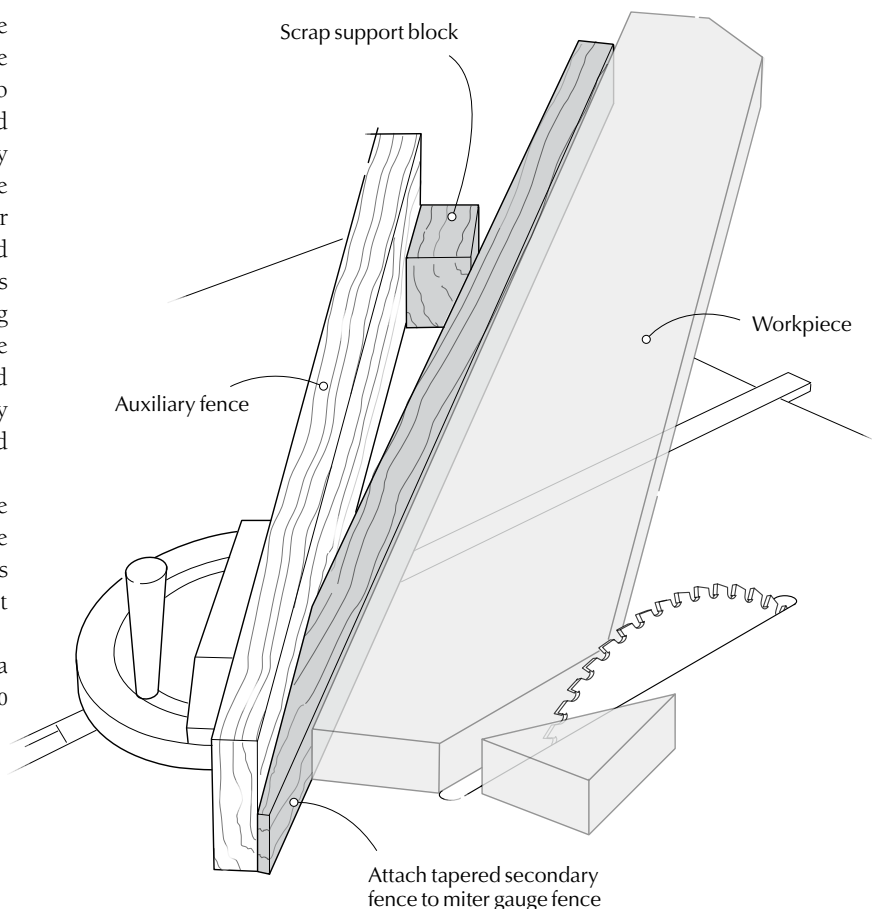
More Angle from a Miter Gauge

Every once in a while, I find I need to make a miter cut on the table saw that exceeds the capacity of my miter gauge, which only tilts to about 50°. To solve the problem I add a tapered secondary fence to my miter gauge's auxiliary fence, as shown in the drawing. The angle of the taper isn't critical because you'll pivot the miter gauge for fine adjustment. Fasten the tapered end of the secondary fence to the miter gauge's auxiliary fence using double-stick tape. (Using the taper offcut as a temporary shim, clamp the pieces together for a few moments to ensure a good bond.) Also tape a scrap block to the auxiliary fence at the opposite end to support the free end of the tapered fence.

To set up for the cut, position the miter gauge as necessary, gauging the angle between the blade and the face of the tapered piece. Then cut as normal, holding the workpiece firmly against the tapered fence.

— Ken Burton, New Tripoli, Pennsylvania

CONTINUED ON PAGE 20



Cash and prizes for your tricks and tips!

Each issue we publish useful woodworking tips from our readers. Next issue's winner receives a \$250 gift certificate from Lee Valley Tools, good for any item in the catalog or on the web site (leevalley.com). (The tools pictured at right are for illustration only, and are not part of the prize.)

Runners-up each receive a check for \$50 to \$100. When submitting a trick (either by mail or e-mail) you must include your complete mailing address and a daytime phone number. If your trick is selected for publication, an editor will need to contact you. All entries become the property of *Popular Woodworking*. You can send your trick by e-mail to popwoodtricks@fwpubs.com, or mail it to Tricks of the Trade, *Popular Woodworking*, 4700 E. Galbraith Road, Cincinnati, OH 45236.

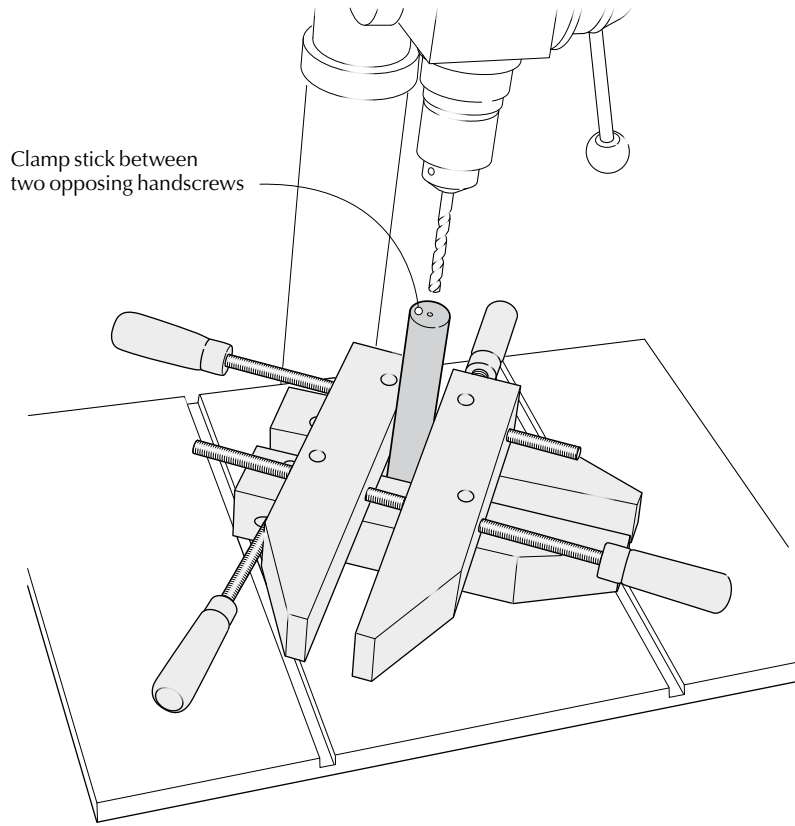


Handscrew Headstand

Here's a neat trick I learned from my dad for drilling a hole into the end of a short dowel or other stick at the drill press. The challenge, of course, is securing the stick in a vertical position. Clamping the work to a vertically tilted table is a hassle, and I don't have a drill press vise for holding such a piece.

What I do have are a couple handscrews, which work great for the job. Just secure the stick between two of these clamps, orienting them at 90° to each other as shown. They'll solidly hold the piece upright for locating and drilling the hole.

— Nate Roberts, Dubuque, Iowa

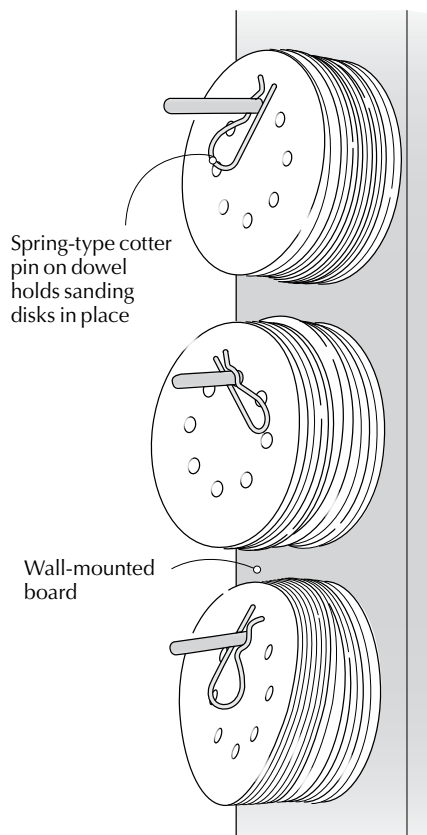


Better Sanding-disc Storage

In my work, I use a lot of random-orbit sanding discs, which I previously stored in their boxes stacked on shelves. This meant sorting through the boxes to retrieve the necessary grit, with the boxes eventually scrambled and sometimes falling to the floor. I finally developed a wall rack to organize the discs in an accessible fashion.

The rack is simply a board with 5/16"-diameter dowels that serve as hangers for the discs. I organize the discs on the board in successive grit order, ranging from coarse to fine. To keep them neatly in place, I secure the disks onto their dowels with spring-type cotter pins (also called "R" pins or hitch pins), which are available at hardware stores. By removing the pin from the grit in process, it's obvious which grit is to be used next. The setup makes retrieval quick and helps with inventory control because I can see at a glance when I am low on a particular grit.

— Joe Zeh, Worthington, Massachusetts



Stopping Set Screw Spin

Many zero-clearance inserts, router mounting plates and other fixtures are made from hard materials such as Lexan, phenolic or aluminum, and include set screws for fine adjustment. Unfortunately, in these hard materials the screws can loosen from the vibration of the machinery, causing inaccurate or out-of-square cuts.

I've noticed that the set screws on some commercial products include a plug or coating of nylon or other soft material to lock the screw in place. I decided to try something similar when making some phenolic zero-clearance inserts. I used a toothpick to apply a drop of rubber cement on the threads of the height-adjustment set screws, then allowed it to dry. When screwed into the insert, the film of rubber cement provides enough turning resistance to keep the screws from losing their adjustment during normal use.

— Steve Sawyer, Livonia, Michigan

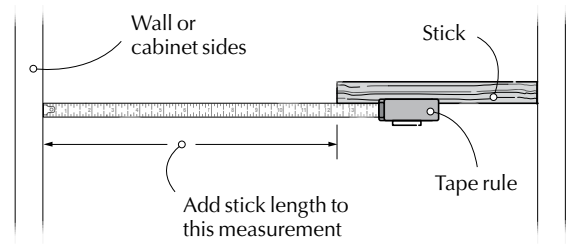
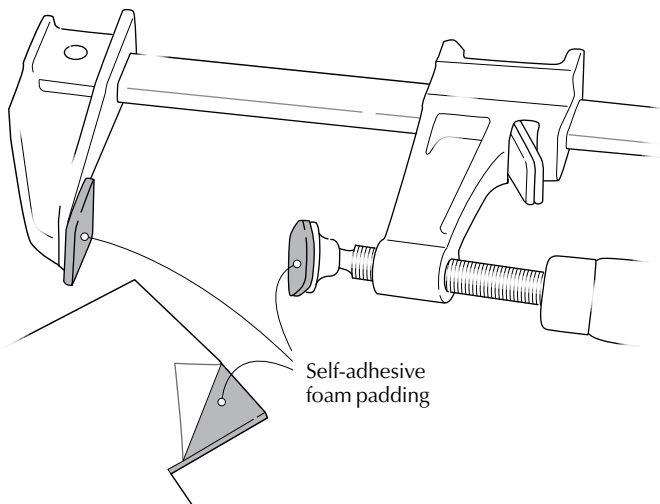
CONTINUED ON PAGE 22

Self-adhesive Clamp Pads

To prevent marring my workpieces, I like to use pads on my F-style clamp jaws. Commercial slip-on plastic pads are available, but they're pretty expensive. I also can't find them in sizes to fit my smaller clamps. Attaching leather or other material with contact cement works, but takes time to apply.

A visit to a hobby/craft store turned up the perfect solution: self-adhesive foam. Sold under brand names such as "Foamies," the thin material is made for kids to cut up into fun shapes to apply to notebooks and the like. Applying it to clamp jaws is child's play, too. Simply cut it to an approximate shape to suit your jaws, peel off the backing, then press it into place. It only costs about a buck for a 9" x 12" sheet, which will cover lots of clamps. And the material lasts a long time in use.

— S. D. Luther, Great Neck, New York



Stick and Tape Rule Measuring

Using a steel measuring tape to take inside measurements can lead to inaccuracies. For one thing, it's impossible to tuck the bent end of the tape all the way into a corner. (Simply adding the length of the tape rule body isn't very accurate.) Also, any tape sag adds to the overall measurement. A steel rule, rather than a tape, would add accuracy.

However, if a tape is all you have available, I've found a more accurate approach is to use a $\frac{3}{4}$ "-square stick in conjunction with the tape rule. I butt one end of the stick into, say, the inside right-hand corner, then use the tape rule to measure over from the inside left-hand corner to the opposite end of the stick. I then simply add the stick length to the tape measurement. For easy calculation, cut the stick to some foot increment or to a whole number that's easy to add, such as 50 inches. The technique has proved particularly invaluable when measuring wall, floor, and ceiling distances for long lengths of room trim or cabinet installations.

— Gerry Chiusano, Mt. Bethel, Pennsylvania

Zero-clearance Saw Top Skin

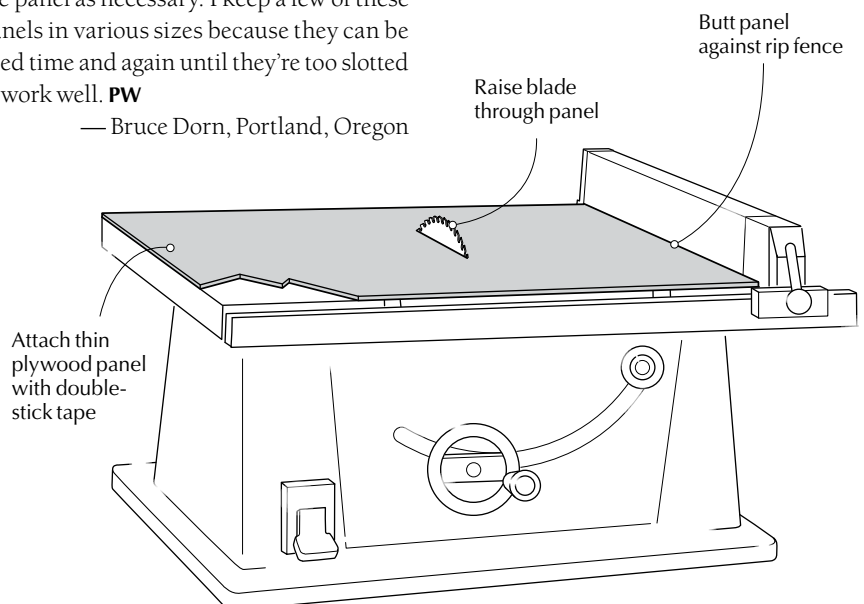
I recently thought I'd outfit my portable "benchtop" table saw with a zero-clearance throat plate to reduce tear-out and to prevent narrow strips from falling down through the wide throat opening. Unfortunately, the throat plate opening is very shallow and requires accommodating numerous odd-shaped tabs, so making a custom throat plate wasn't so easy. I decided to take a simpler approach.

I set the rip fence for my intended rip, and measured the entire saw table area to the left of the fence. I then cut a thin plywood panel to match the area. After resetting the rip fence for my desired original cut, I attached the panel to the table with double-stick tape at the saw table edges and near the blade slot. I temporarily clamped down a board near the center of the table, then raised the blade through the panel. Voila! I had a zero-clearance blade slot.

After making my rip cut, I stashed the panel for future use when making a similar or nar-

rower rip cut, which simply involves shifting the panel as necessary. I keep a few of these panels in various sizes because they can be used time and again until they're too slotted to work well. **PW**

— Bruce Dorn, Portland, Oregon

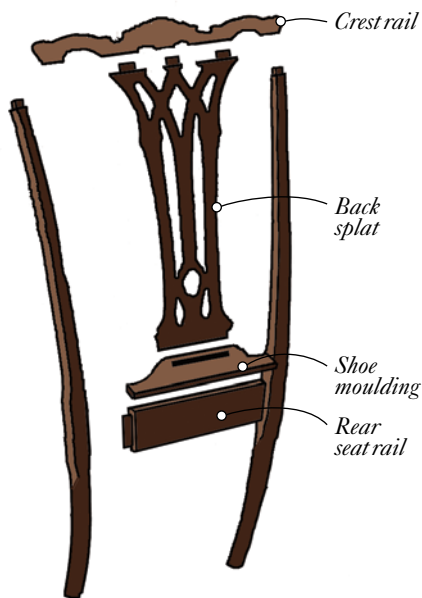


18th-century Chairmaking

Building a Philadelphia Chippendale chair – PART 1

There are few pieces of furniture more difficult to build than a formal chair. The structural requirements of any chair are tricky. But when curvilinear elements and angles are introduced, the construction is further complicated by a lack of good square reference faces. Reducing the number of structural elements to four legs and a back doesn't seem to simplify things in this case. It just means the design is less forgiving of joinery errors.

The need to make the overall form appealing in line and mass is enough to frustrate. Not only are good plans not commonly available, the curved shapes and angles would make any two-dimensional plans difficult to use.



Curves and angles. The diagram above illustrates the parts of a formal chair back. The shoe moulding is glued to the top of the rear seat rail. Everything else is held together with mortise-and-tenon joints. I've seen no slots or dowels on 18th-century chairs. And on formal chairs, the legs joints are often pegged but the other joints, such as those at the crest rail, are not.



Start at the back. I've begun my Philadelphia Chippendale chair with the back as I did with the rush-bottomed chair I made earlier this year (issues #169 and #170). The shoe at the bottom of the back splat must be shaped before I can glue these parts together, but I'll cover that detail in a future article.

Add to this the need for carved ornamentation, and you've got one challenging woodworking project on your hands.

If you're thinking that the combination of joinery, artistry and carving ability provides a test of your skill as a craftsman, rest assured it's a test few in history have taken. The finest Philadelphia chairs were almost always designed by one person, constructed by another and carved by a third. In 18th-century Philadelphia, it may have been the case that a fourth specialist applied the finish, and a fifth upholstered the seat. I've extolled the capabilities of period craftsmen (and their tools) for the variety of work they could and did produce. But clearly, they had their limits.

And on that merry note, I am going to arrogantly attempt to push my limits. I'm facing my chair phobia head-on and will attempt to build a Philadelphia Chippendale chair. The series of articles that will follow will trace my efforts. I'm not auditioning or attempting to impress you with my skill. Failure is not only possible, it's likely. And you'll hear about it here. Why should I be the only one to learn from my mistakes?

In this article, I'm going to begin with the chair's back structure. My goal here is to execute the joinery first and worry about the artistry second. This is a choice period craftsmen didn't and couldn't make.

Start with the Back

The back legs of Philadelphia Chippendale chairs were typically full 8/4 stock. So 1³/₄" is typical, with 1⁵/₈" to 1⁷/₈" not uncommon. I suspect patterns were used to mark the stock. The patterns can be "nested" to get several legs out of one piece of stock. Philadelphia chairs featured characteristic "stump" rear legs. The lack of a foot may have allowed chairmakers to get more legs out of a given width of stock, nesting them closer together. I wondered if the patterns weren't such that a single saw kerf could define the front of one leg and back of another. If possible, this would be a significant time savings.

While I don't doubt it was possible, I was unable to make this work. I hadn't used my frame saw in a while and the first few strokes snaked back and forth across the line. Some would have thrown in the towel there and then. Mahogany is too expensive to waste with a crazy handsaw. But lacking any other suitable tool, I stuck with it and in an inch or so, my technique returned. Patience and a



Missing a few details. This chair, sometimes called a "centennial chair" by antique dealers, is a reproduction made in the 1870s or '80s. Though the details are somewhat lacking, it's a fairly close dimensional copy of 18th-century Philadelphia Chippendale chairs.

light touch are helpful with frame saws. An inch later, I was successfully splitting the line I had marked. And so it went.

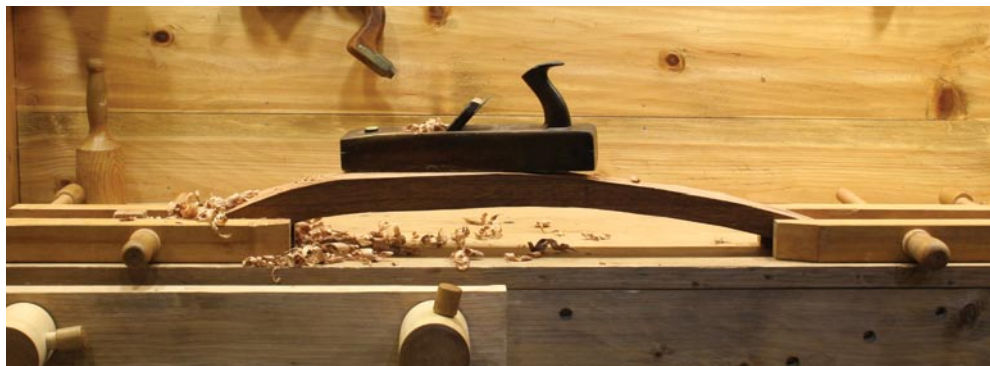
Good saw cuts like these impress me and I was proud of myself – until I saw the back side of the piece. I had held the line but blown square. This wouldn't have been so terrible had it not been in the one area I needed a square section – the area where the seat rails join. Scrap. A few minutes later, I had two new legs. This time I gave myself ³/₁₆"-¹/₄" of space between the patterns. Ironically, these cuts



Tricky driving. This frame saw is fitted with a ³/₈"-wide blade. It's basically a huge coping saw. It cuts fast, but can be tricky to use. Steering the cut requires a light touch and constant attention, especially as the cut gets closer to parallel to the grain. Even though these teeth are filed for ripping, the wood's grain can grab the blade, pushing it one way or another. It's much easier to use it at some angle to the grain. Unfortunately, the most critical part of this cut, the area where seat rails attach, was purposely oriented with the grain.

were squarer, but the experience humbled me nonetheless. In the first 30 minutes of this project, my most basic woodworking skills were already challenged.

With the legs roughed to shape, I planed the flat spot where the side seat rails attach. This is the one true reference face for the back



Good clamping, easier work. I clamped both legs together using my homemade handscrews. My bench's planing stop is trapped between the left clamp's screws. This allowed me to push or pull my planes and shaves to easily shape the leg stock.

legs. Plane this flat, mark it and don't touch it again.

I shaped the legs using my drawknife and two spokeshaves. One shave was set up like a jack plane, the other like a smoothing plane. (Jack shave? Smooth shave?) When the legs were done, I joined them with the rear seat rail. The seat rail has an angled shoulder, but aside from that, this was nothing special. In fact, I used the same tools and techniques I described in my last article. I glued and drawbored this joint. The only trick here was that the rear seat rail is actually flush with the back surface of the legs. You need a little flat on the backs of the legs to accommodate this. You can define this as second reference face if you wish, and plane it parallel to the first. Or you can simply set your mortising gauge from the front face and clean up the legs later.

Crest Rail

The crest rail joins the legs with two narrow $\frac{3}{8}$ " tenons. These tenons are aligned perpendicular with the crest rail, so that the crest rail can slide straight down.

With the crest rail in place, I was left with a basic mortise-and-tenoned frame like so many others I had done. The legs are the stiles, and the rear seat rail and crest rail are the rails. So far, so good. Because I left the legs uniform in width, the angle at the seat rail was the same as the angle at the crest rail. It's just a trapezoidal box.

Back Splat

The attachment of the back splat is one of the trickier structural elements. The splat is tenoned into the bottom of the crest rail and tenons into a separate piece glued to the top of



A close match. I used spokeshaves to smooth the legs and get them similar to each other. I found this work to be particularly enjoyable. Spokeshaves really are like wood planes with very short soles. This process reminded me of match planing.

the rear seat rail called the "shoe moulding." Some splats are flat. So you simply have angled mortises in the crest rail and shoe. Some splats are curved side to side. My splat is curved similar to the back legs of the chair. This really complicates the attachments. Despondent, I called Colonial Williamsburg. Journeyman David Salisbury has made more than a hundred of these chairs. His advice: Shape the splat first.

I began the splat with $\frac{5}{4}$ stock. I used the back leg template as a starting place for the curve, but finished by freehanding it. The back splat is flatter than the legs. Its front sits flush with the crest rail at the top and its back sits flush with the back legs (and shoe) at the bottom. Because of the carvings, I shot for $\frac{1}{2}$ " thickness. I started the shaping by hollowing the back side with a gouge. When I got close to the line, I smoothed with the grain with a shallower gouge and finished with my spokeshaves. I found this job intimidating.

Making the Shoe

You need a thick block of wood for the shoe. This is typically made from the leg stock waste. It's a short piece, beveled on either end to fit between the legs atop the rear seat rail. I'm going to shape it in a future article. I beveled the ends and cut a $\frac{3}{8}$ " mortise about $\frac{1}{8}$ " from its back. The mortise needs to be angled about 5° in the same direction as the chair back. That gives a little more strength to the mortise and a little less curvature to the splat.



Rough work. I rough-shaped the curve in the back splat with a gouge. Even now, looking at this picture, this seems a preposterous way to shape this part. Surely there must be a better way with some sort of sled and a router perhaps? But truth be told, this didn't take that long. In not more than 10 minutes of fairly pleasant work, I had the splat gouged to shape. Five or 10 minutes later, my spokeshaves finished the job. I'll bet I could do it in half that time next time.

The splat fits in the shoe with no shoulder in front. With that joint done, I put the chair together, placing the top of the splat behind the crest rail. I knifed the interface. Three strategically placed tenons join the splat to the crest rail. At this joint, the tenons have shoulders only in front. The material between the tenons will get cut away later but that was no help to me. All this had to be tight and glued together before that work starts.

Fitting the Whole Thing Together

I don't want to mislead you. With tenons on the tops of the legs, the fit at the shoe, and the tenons at the top of the splat, I had to do some custom fitting. All of those joints had to be good and not just at the surface. A lot of times, I undercut tenon shoulders to get them to look nice at the surface. But in this case, I needed good contact at the shoulders through the full depth. I don't want my carving to reveal gappy joints. So I had to go around a couple times and clean up my joints with a sharp chisel and a crosscut saw.

Conclusion

In the beginning of this series I talked about my fear of making chairs. And there is no chair that scares me more than this one. But for this portion of the construction at least, I felt fine making the basic frame structure.



Room for carving. The tenons at the top of the leg are oriented to allow the installation of the crest rail. Notice that they are biased to the outside of the leg; This is done to allow room for carvings that will decorate this joint later.

CONTINUED ON PAGE 28

This was simple mortise-and-tenon work. The construction of the splat gave me a bit more trouble. The problem I encountered was not knowing what angles to make the joints, or what to cut first, or what to measure where. This was a design problem that, with thanks to Salisbury, I got through OK.

So overall, I think I did alright. But I want to let you in on a little secret. Remember the leg I undercut and scrapped? Well I didn't really scrap it. If you look closely at the pictures you'll see I hastily and poorly spliced a piece onto the back of that leg and continued with the construction. There are gaps in the joint and the splice wasn't long enough to fill the undercut area sufficiently. I'm predicting more trouble ahead so maybe this is my coping strategy. I don't want the pressure of building some masterpiece hanging over my head. As it is, this chair can never be more than a practice chair that will never leave my shop. And with the work I have ahead of me, that may be for the best. **PW**

Visit Adam's blog at artsandmysteries.com for more discussion of traditional woodworking techniques.



Paring technique. The mortise in the shoe is angled. I used my bevel gauge as a reference and the mortising technique I described in my last article. I thought that technique was really helpful. This mortise is 6" long. With my paring technique, the chisel lies down in the mortise and really helps keep the joint nice and straight.

Rare Book Provides Glimpse of 18th-century Shop Practices

A rare 18th-century text was recently acquired by the Philadelphia Museum of Art (philamuseum.org). Titled simply "Price of Cabinet and Chair Work" and dated Philadelphia 1772, the book was secretly provided to guild members for the purpose of fixing retail and labor prices for furniture. Various furniture forms are listed alongside the guild's suggested retail prices and the price to be paid to a journeyman to construct each.

This book gives us the opportunity to learn how long it took 18th-century craftsmen to build specific pieces of furniture, but some significant assumptions need to be made: It's not entirely clear what the journeymen started with. I don't think they began with a tree. It's very likely their stock was fairly well suited and sized to their work. Also not clear is whether they had apprentices to assist them. I say they didn't, but we just don't know for sure. Lastly, and perhaps most important, there is some difference of opinion regarding the daily wage of the journeymen. Everything I've seen suggests Philadelphia journeymen working in the third quarter of the 18th century were paid 5 shillings per day.



Page 6 begins the list of chairs. The first entry, under "Chairs with Crooked Legs," reads as follows: "Chair with plain feet, and banister with leather bottoms."

The chair described sounds like a Queen Anne-style cabriole leg, solid back splat (banister) with a plain leather seat cushion (leather was generally cheaper than fabric then). With a labor price listed at 9 shillings

this chair was the cheapest to build. At 5 shillings per day, we can surmise that the basic chair frame, not too terribly different than the one I am building thus far, was less than two days' work for an average 18th-century workman.

As I move forward with this project, this information has not left my mind. Are the methods I'm using authentic to the period? Could 18th-century craftsmen have possibly gone to this much trouble? Did they use different techniques or were they just faster with techniques I'm using? There are some who would tell you there are no lost arts and mysteries, no secret tricks to building furniture. The 1772 "Price of Cabinet and Chair Work" suggests otherwise. This little book offers us a chance to validate our techniques as well as our workmanship.

— AC

Varnish on a Butcher Block? Yep!

There's nothing wrong with tradition – but tradition is time consuming.

OK, raise your hand if you've made a butcher block in the last two years. I am willing to bet my best Fujihiro chisel that more than half of you have your hands up right now. Butcher blocks, more specifically end-grain butcher blocks, have become incredibly popular amongst woodworkers. And why not? They are fun to build, they help us hone our milling skills and they make great gifts. But despite the abundance of these beautiful boards, there is one lingering question that pops up at least once a month in the woodworking forums: "What's the best finish?" This is a very sensible question, considering this is not your typical woodworking project.

Generally speaking, mineral oil is king! It's odorless, tasteless, easy to obtain and safe. You can even drink it right from the bottle if you were so inclined. Just be sure to have a stack of your favorite woodworking magazines at the ready because you'll need them (mineral oil is generally marketed as a laxative). For more protection, melted paraffin wax and beeswax can be added to the oil.



Cut to the finish. Using thinned varnish – instead of the traditional mineral oil and wax – takes a big slice out of the time it usually takes to finish a butcher-block cutting board.

After finishing my first five or six boards in the traditional way, I found myself echoing the questions of the cutting board creators before me: "What finishing options do I have?"

I was just tired of the old oil and wax routine. Those finishes are time-consuming, tedious and messy. And the maintenance schedule for oiling the board is just another chore that I really don't want on my to-do list. And despite all the effort, the wood may still absorb liquids, causing the cutting board to expand and possibly result in cracks and weakened glue joints.

I wanted an effective and convenient solution, and I found one in plain old varnish. Feel free to spend the extra money on a "salad bowl finish," but I am going to make a bold speculation here and say that most of those "salad bowl finishes" are probably just repackaged

product from that company's regular line of varnish. And until someone invents magical mineral spirits or non-toxic naphtha, I'm pretty sure it's all the same solvents as well. I wouldn't be overly concerned about food safety here either. Once the finish cures and the solvent evaporates, the surface is safe for food contact. (For more information on food-safe finishes, see "The Folly of Food-safe Finishes" by Bob Flexner at popularwoodworking.com/finishing.)



Tradition. Mineral oil, paraffin wax and beeswax are traditionally used to finish cutting boards. It's a time-tested – but time-consuming – finishing option.

Online EXTRAS

To watch a video of Marc's application of a varnish finish to his maple and purpleheart cutting board, go to:

popularwoodworking.com/nov08

Dilute for Good Results

Now don't go slathering on varnish until your cutting board looks like the bartop at your local watering hole. The key to success, as with most finishes, is the process.

Start by sanding the board to #220 grit. Dilute the varnish by about 75 percent with naphtha or mineral spirits (dilute the finish by only 50 percent if you are starting with a wiping varnish). Flood the surface with finish and keep it wet until you can see finish seeping through the underside. At this point, flip the board over and coat the underside. Give the varnish a minute to soak in before wiping the entire board thoroughly with a clean cloth and setting the board on its edge to dry overnight. This strategy helps trap the finish in the grain and prevents it from dripping out of the bottom.

The next day, sand the entire board again with #220 grit sandpaper and repeat the flooding process. By the third coat, the wood usually stops actively soaking up the finish. At this point, use a clean cotton rag to wipe on one last thin, even layer.

It is important to note that we do not want to create a noticeable film, although that is usually the goal with most finishes. The film just wouldn't hold up to daily slicing and dicing, resulting in trapped moisture, a compromised finish and a poor appearance. So why is this method acceptable? Well, think of end grain like a bunch of straws bundled together. Our ultimate goal is to fill the inside of the straws to seal them up, as opposed to putting a blanket of varnish over the top. Once the "straws" are completely sealed, there is no need for a film that thick.

Maintenance Schedule

A butcher-block cutting board treated with this finish offers excellent water-resistance and low maintenance. Liquids tend to evaporate before they have a chance to be absorbed! And the durable finish allows you to scrub the board with soap and water after each use, without damaging the wood.

But keep in mind that no matter how your board is finished, the day will come when it needs to be resurfaced. Fortunately, this is very easy. I scrape off the top layer with a card scraper and follow up with a quick round of sanding up to #220 grit. After wiping on a couple light coats of diluted varnish, I am left with a board that looks brand new and is ready for another year of service.



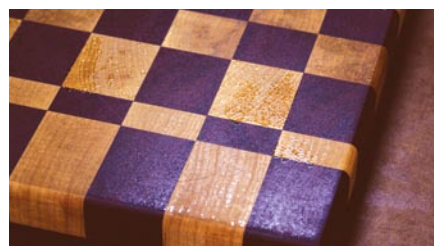
Prepped and ready. The varnish, diluted about 75 percent with mineral spirits, is ready to use.



Quick work. The varnish quickly soaks into the end grain.



Travelin' through. The varnish travels through the grain and seeps out on the other side. Once it starts to soak through and you've coated both sides, let it dry in this position overnight.



No pools. Some finish may pool on the surface and will need to be sanded away.

By no means do I want to discourage people from using mineral oil or wax. These finishes represent a piece of our culinary history and they certainly deserve our respect. After all, butchers have been hacking away at wax-coated blocks of wood for a long time! But for those who have experienced similar frustrations to mine, the varnish method offers a reasonable alternative.

I have been road testing this finish for several years now and I couldn't be happier with the results. Personally, I think it's easier and looks better, but all I can do is speculate and bring a little experience to the table. I know some folks will still be uneasy about this finish, so I recommend you do some research, gather as much information as possible from trusted resources, then add the final ingredients: Your experience, opinions and common sense. Now that's a recipe for success! **PW**

Marc is a professional woodworker as well as the creator and host of *The Wood Whisperer* (thewoodwhisperer.com). *The Wood Whisperer* (an instructional Internet woodworking show) represents Marc's three passions: woodworking, technology and education.

About This Column

Our "Wood Whisperer" column features woodworking thoughts and ideas, along with shop techniques from Marc Spagnuolo. Each column has a corresponding video related to the techniques or views expressed in the column available at popularwoodworking.com/video.



Triton's Bargain Sander

A nice price and extra sanding sleeves make this spindle sander a good choice.

With a price tag of about \$150, the Triton TC450SPS seems a bargain for anyone who wants an oscillating spindle sander. But the question at the back of your mind has got to be: Does it do the job?

I've used and tested a variety of oscillating spindle sanders in my years here at the magazine, from industrial floor models to the Delta B.O.S.S., the popular benchtop machine that many people consider the standard.

The Triton isn't designed for a production shop, but I was surprised by how much power the little guy has. It handled our work-a-day shop chores with ease, and when we tried to bog down the machine with thick work and heavy pressure, the Triton kept on sanding.

The Triton's spindle spins a little faster than its competitors at 2,000 rpm, but it has a smaller up-and-down stroke— $\frac{5}{8}$ " compared to $\frac{3}{4}$ " and $\frac{7}{8}$ ". From a practical standpoint, however, the Triton was about as aggressive as other machines I've used.

In fact, the only real difference I noticed is that the Triton was noisier than other oscillating spindle sanders that have slower induction-style motors. The Triton's motor and fan had a high whine that put out 82 dB, which was about 4 decibels more than the other sanders in our shop.

Another difference is that the Triton comes with six sanding sleeves, while some other machines come with fewer.

The Triton has a $1\frac{1}{2}$ " dust port at the rear of the machine, which works fairly well (no one makes a dust-free spindle sander that I know of). The table is a bit smaller than the Delta's, though I thought the Triton had more than enough real estate to support the work I do.

Assuming the Triton holds up in the long



Triton TC450SPS

Triton ■ 888-874-8661 or
tritonwoodworking.com

Street price ■ \$150

For more information, circle #152 on Free Information Card.

run (it has a three-year warranty), I think this Australian company's tool is a good deal for the home workshop.

—Christopher Schwarz

New Bosch T308B Blades Clean House

Jigsaws excel at certain tasks, but have never been known for making nice cuts. After cutting the odd curve, you need to follow behind to remove the telltale saw marks. Until now. What has changed is the blade, and Bosch has come up with a real winner.

The new blades, called "Extra Clean for Wood," feature two distinct types of teeth. The pointed teeth on the upper part of the blade cut on the down stroke. The lower teeth cut on the up stroke. Both the top and bottom surfaces cut clean, and the edge in between is quite smooth.

We've been using these in our shop for sev-

eral months and have found that in addition to making cleaner cuts, these blades work with less effort and a greater degree of control than any other blade we've ever used. Cleanup on the cut surface is minimal—no more rasping, filing or spindle sanding.

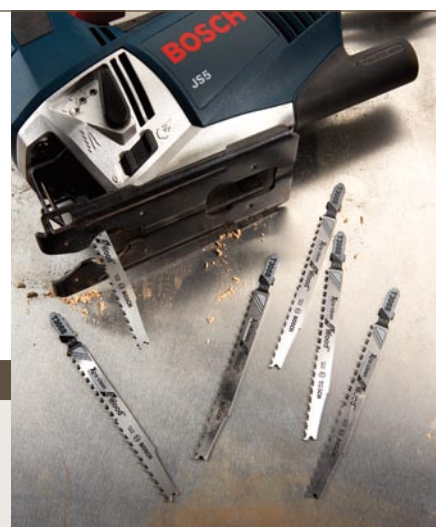
—Robert W. Lang

Bosch T308B Jigsaw Blades

Bosch ■ 877-267-2499 or
boschtools.com

Street price ■ \$14 for 5, \$65 for 25

For more information, circle #153 on Free Information Card.



Handmade Hamilton Marking Gauges

Traditional marking gauges look good to the eye, but they don't always fit comfortably in your hand. Two marking gauges by Hamilton Woodworks are shaped so you can lay a precise line with ease—your finger pressure goes right where you need it for a steady stroke.

The gauges come in two sizes—the small one has a 4"-long beam; the large one a 6" beam—so you can pick the tool that suits your hand. But there's more that's unique about these gauges than just the different sizes.

The fence is attached to the beam of the gauge with a sliding dovetail that is made with very tight tolerances. To adjust the blade you loosen the brass thumbscrew and the fence slides smoothly but precisely on the beam. Because the beam is made from quartersawn cherry, the fit between the beam and blade remained snug all year round in our shop.

The business end of the gauge is a 1/4"-wide steel knife with a thumbnail shape. This style of cutter makes a more precise knife line than

a traditional pin (which scratches the work).

The cutter is secured in the beam with a brass machine screw. By loosening the screw you can increase the depth of cut to make deep lines. You also can easily remove the cutter for sharpening, or turn its bevel around so you can mark out the walls for hand-cut mortises.

The fence is also thoughtfully crafted. The curves on the fence—which make it look vaguely like a bat's wing—are perfectly placed for your index finger and hand. Jeff Hamilton, who makes these gauges in Tontitown, Ark., also inlays a brass wear strip on the fence, which extends the life of the tool.

All in all, the Hamilton marking gauges are a huge improvement compared to the tra-



Hamilton Marking Gauges

di legno ■ 877-208-4298 or
dilegnosupply.com

Street price ■ \$47.50 to \$49.95

For more information, circle #154 on Free Information Card.

ditional pin-based marking gauges and will delight those of you who incorporate hand tools into your shops.

The small gauge is \$47.50; the large one is \$49.95. —CS

Dual-disc Sander Reduces Vibration

In the previous issue of *Popular Woodworking* (#171), we reviewed variable-speed random-orbit sanders. We had this 5"-diameter Craftsman Professional Vibrafree sander (#25927) prior to testing, but this is a single-speed tool (12,000 orbits per minute), and thus didn't qualify for our test. But this sander is something to talk about.

This Craftsman is different from any random-orbit sander we've seen. The tool has an innovative sanding-pad design, with two sanding areas—an outer ring and an inner pad (see the photo below).



Special sanding discs. Dual sanding discs are a concern. Unless you cut your own discs, sanding grits are limited to fine, medium and coarse.

That alone is inventive, but it's just the beginning. The two sanding discs rotate in the same direction, but each shifts in opposing directions. For example, when the outer ring is fully toward the right, the inner pad is fully to the left. That opposing movement is designed to reduce the vibration. According to Craftsman, vibration is reduced by more than 40 percent compared to the company's previous model.

We evaluated this sander for comfort, aggressiveness and dust collection. We sanded using new #120-grit, hook-and-loop sanding discs. This sander is not too aggressive; waste removal in our five-minute test was only .256 ounces compared to the .192 to .512 ounces removed by other tested sanders.

The sander operates smoothly with no wobble or jittering in use. It feels comfortable in the hand, and the sealed rocker-style on/off switch is easy to reach and to operate.

Also, this sander has a cyclonic dust-air separator collection system. It works. All but a trace of dust was collected in the molded plastic dust canister, which attaches to the sander by way of small plastic clips. (I don't think the clips would be acceptable if it weren't for the spring-loaded lever that opens the rear of the canister for easy emptying.)



Craftsman Vibrafree Sander

Craftsman ■ 800-549-4505 or
craftsman.com

Street price ■ \$100

For more information, circle #155 on Free Information Card.

The kit comes with a set of sanding discs—five each of #60, #120 and #180 grit. Additional pre-packaged discs are sold as described above for \$8.99 each, only at Sears stores.

This is a good sander, but I'm a bit concerned about sanding disc availability. **PW**
—Glen D. Huey

Dirt-simple ROUTER JIGS

BY GLEN D. HUEY

*Tricky joint; simple jig.
Three pieces of plywood are all you need
to cut a housed sliding
dovetail socket.*

Improve your router techniques with simple, shop-made jigs that are easy to use and just as simple to build.

I'm a power-tool woodworker. Sure I use hand tools for some parts of furniture building, specifically when cutting dovetails. But I doubt you'll ever catch me with a Bridge City Tool Works VP-60, Veritas router plane or a Lie-Nielsen shoulder plane if I'm trying to complete a project quickly. It's just not my thing. The jobs completed with those tools, I accomplish with my router and a router jig.

The next time you venture into your shop to work on a project, take a survey of what's stacked around your shop. I'll bet you have the material to create a boatload of simple, useful jigs that, when combined with your router, will increase your woodworking abilities. The routing techniques shown in this article are a combination of the correct router bits along with dirt-simple jigs made from leftover pieces from other projects, such as scraps and plywood.

A Square-platform Jig

We all know you can guide your router by placing the router's base against an edge to make a straight cut, but who wants to calculate the offset of the base each time you go to use it or struggle with clamping requirements? If you use my favorite router jig along with a pattern bit, you have a setup that is a multi-tasker and is as easy as can be to position for accuracy.

That jig I call a square-platform jig. To make the jig, start with two pieces of plywood cut to the same size. Attach the two with glue and a few brads (keep the brads

away from the edges), then add a third piece to the front edge to act as a lip – similar to a bench hook – and the jig is ready for work. The key is to keep the edges of the jig straight and square with that third piece, which I call a catch rail.

This jig is best when used for cutting dados for shelves or for creating a dovetailed socket for drawer dividers. Due to its usefulness, I have more than a few of these jigs in my shop made in different sizes and thicknesses for different techniques and for use with different router bits, but my favorite setup is a 1"-thick jig (two pieces of $\frac{1}{2}$ " plywood). This thickness is perfect for working with a $\frac{3}{4}$ "-diameter, top-mount bearing router bit with a 1" cutting length.

The greatest thing about this jig is the ease of clamping. No longer is it necessary to use more than a single clamp. One clamp holds the jig to the workpiece and does not allow any movement of the jig. When a clamp is positioned at the lower left-hand corner of the jig as shown in the photo below, the jig cannot move away from the workpiece due to the clamp. And the jig cannot slip to the left because the front piece acts as a catch. As long as the clamp is secure, no amount



Keep it square. The key to this jig is to keep the edges perfectly square with the catch rail that is attached to the bottom face of the jig. Glue and brads are the joining force.



Quick and secure. The design of the platform jig allows a single clamp to hold the jig in place. This allows the jig to move to the next layout line quickly. Once the clamp is tight, it's all but impossible to slide the jig in either direction.

of force will allow a shift in the jig. This makes it easy to clamp and quick to adjust from one work area to the next.

To use this jig, do any layout work, then slide the jig into position, always aligning the jig to the left of the work area because the normal operation of a router pushes the tool to the left (if the jig were set to the right of the work area, it would be a struggle to hold the router firmly against the jig in use). Next, add a clamp keeping a clear path for your router base and allow the pattern-bit bearing to ride along the edge of the jig. With this setup, wherever the jig is, the router bit follows.

Use the Same Jig for Dados

I began using this jig due to the ghastly dado bottoms produced by my older dado stack. My stack had exterior blades that were slightly higher than the chippers and this caused an unwelcome profile at the bottom of the dado. When bookcase shelves were routed through, that shape showed – and it wasn't pretty.

Because most bookcase units I built were 12" or less in depth, I made my first platform jig 16" long. At that length, the jig stretched across the entire width of the sides and created a dado in a single pass.

To make the cut, allow the router base to sit on top of the jig while the bearing rolls against the jig's edge. Use a pattern-routing bit that is $\frac{3}{4}$ " in diameter and the resulting cut is exactly $\frac{3}{4}$ " wide with a bottom that's flat. There is no ghastly profile to try and hide. Cut one dado or 100 dados and the results are the same – predictable and accurate.



Designed to fit. The equal width of the bushing and the widest portion of the dovetail bit is what makes this setup work. The dovetail bit cuts exactly to the outside edge of the bushing. As the bushing travels the edge of the jig, the dovetail slot is perfectly aligned.

Perfect Sliding Dovetails

Having so much success creating dados with this jig, I wondered what other operations I could make easier by using this setup. One area that came to mind was drawer dividers. Most chests I build use sliding dovetails for joining dividers to the case sides. How could I adapt this jig?

What I discovered was that I had to change the router setup, not the jig. I typically use a $\frac{3}{4}$ " dovetail bit when cutting the socket for my dividers, but I didn't have a bearing to ride against the jig. I had tried bearings on dovetail bits, but I wasn't satisfied with the results. So I turned to a $\frac{3}{4}$ " outside-diameter bushing. You might think it's impossible to use a $\frac{3}{4}$ "-diameter dovetail router bit with a $\frac{3}{4}$ " outside-diameter bushing, but if the bit extends below the bushing (aim for at least a $\frac{1}{2}$ "-deep socket into the case sides), everything works perfectly.

Again, simply align the jig with your layout marks, add a clamp, then cut the dovetail socket into your workpiece. Cut into the case side to the width of your divider and you're golden. This creates a perfect sliding-dovetail socket, and it's a simple move from a completed socket to the next socket area. Additionally, remember to use the same router bit to create the male part of the joint. The second half of this operation is completed at a router table.

If you're wondering about hogging out the waste with a straight bit prior to cutting with a dovetail bit, I seldom, if ever, take the time to work this way. My router bits are sharp and able to make this cut without difficulty. If this extra step is important to you, I would mount a $\frac{3}{4}$ " bearing on a $\frac{1}{2}$ " straight bit so I was always registering off the jig.

How about housed dovetail sockets? The beauty of this jig is that you simply make a first pass with the $\frac{3}{4}$ " pattern bit to make the shallow dado. Then follow up with the dovetail bit in a second router, as shown in the opening photo of this article. The entire operation is completed with one clamping setup.

Also, here's a tip: Create the dovetail slots while your case sides are wider than the final dimension by $\frac{1}{8}$ ". Once the joinery is complete, trim the extra material from the edges to leave a clean front edge.

Are you wondering why I suggested you keep the brads located away from the edges of the jig? When you nick the jig's edge – and you will ding it with your router bit spinning – you can simply take a pass at the jointer to straighten the jig's edge.

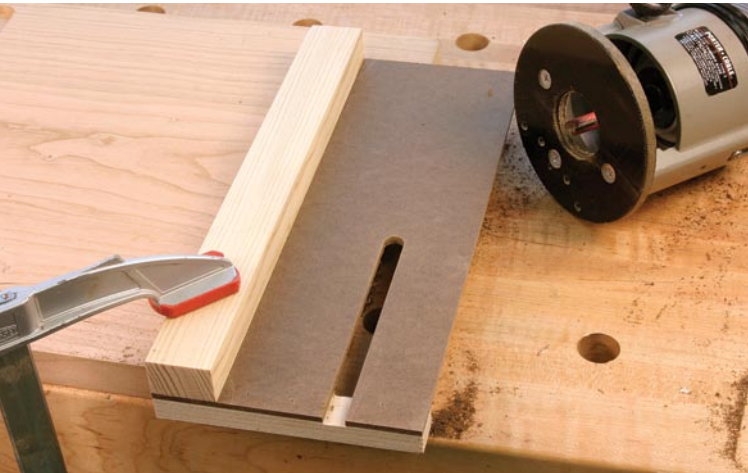
A Simple Jig for Smaller Router Bits

Another jig I use, which is not far from the design of the platform jig, is based off of a circular saw guide's jig. When using those saw guides, the base of the saw rides on top of the guide while the blade cuts at the edge. This setup is great for aligning the guide to the cut line. I adapted this idea to use with my small router bits in lieu of guide bushings or bearings. It works great for plowing small grooves or dados such as when routing out cubbyhole dividers in desk interiors.

Constructing jigs such as these is simple. Here, too, I have a few scattered about the shop that work with specific router bits. I even take the time to label each jig so I know with which bits it works. Begin with a piece of $\frac{1}{8}$ " tempered hardboard or $\frac{1}{4}$ " plywood that's about 5" wide and 10" or so long. Next, add a piece of $\frac{3}{4}$ " material along one edge of the plywood



One-pass dado. The correct router bit along with this jig provides a simple and quick method for cutting dados that are through, or simply stop before reaching the end of the workpiece to create a stopped dado.



No bearing is no problem. Design this simple jig to have the base plate rub the fence as the cut is made. Make one for each router bit.



No guesswork needed. Once built, the jig is a snap to align with layout lines; hit the mark every time.

to act as a fence. Add a front piece to this setup just as in the platform jigs – it's important to keep the relationship of the front piece at an accurate 90° to the fence piece.

To complete the building of the jig, install a router bit into the router, set the depth of cut to a bit stronger than the hardboard or plywood, then with the router base running against the fence, make a cut. The newly created edge is the exact cutline of the router bit and aligning this jig is as easy as clamping to your layout lines.

A Simple Straightedge Jig

Not all the best shop-made jigs are pieces of plywood arranged in some design. One of the most useful jigs is simply a straight piece of stock or two pieces stacked together, what I call a straightedge jig. There are a couple operations where these shine. One use is for simple straight cuts on pieces too large or too awkward to hoist onto the table saw. A second use is to create a tenon for installing breadboard ends on a tabletop. Or, you can use this to create everyday, run-of-the-mill tenons.

Each of these operations works with a pattern bit; the depth of cut determines the layers of plywood needed for the jig. If I plan to create a smooth cut across an edge, a single thickness of plywood is best. This style of jig allows the standard pattern bit with a 1" cutting length to extend completely through a 3/4"-thick workpiece while the bearing rubs the jig.

For example, if I were trying to cut the angled slope on a case side of a slant-lid desk, it would be nearly impossible to hoist the panels up to a band saw, or to control a panel at a table saw. But trim close to the line with a jigsaw, clamp a plywood straightedge at the

layout line, then make a pass using your router while the pattern bit rides smoothly along the guide. The completed cut is square and needs little sanding or smoothing before finish – it's that smooth.

The same operation is perfect for squaring large panels, too. You know how hard it can be to trim a large top with a panel-cutting sled. Once you achieve parallel sides at a table saw, use a square to lay out one end cut, position a plywood straightedge at the layout line, clamp the jig in place and trim the end square. Repeat the same steps at the opposite end of the top.

I don't like to perform this operation with a circular saw – as you may have seen done a number of times – due to the sometimes-wonky finish of the cut. It's easier to sand a routed cut than that of a circular saw – but I will trim the end close with a jigsaw prior to routing.

Change the Thickness, Change the Cut

If you require a cut that's not a through cut such as making a tenon, you will need to stick two pieces of plywood together because of



Ideal edge treatment.

A pattern bit matched with a single layer of plywood is a perfect way to trim ends of wide panels or large tops. With the bearing running along the guide, a clean, straight cut is achieved.



Two layers for tenons.

A second layer of plywood builds the jig to make it possible to rabbet the end. This is a great setup for the first step for breadboard ends.



Possibilities abound. Teaming plywood patterns with a pattern-routing bit opens the door to design and detail – and it makes repeatability achievable.

Fundamental pattern routing. A bottom-mount bearing follows the pattern as a smooth and accurate cut is made on the work-piece below.



Another simple setup. One hole in the middle of the circle-cutting jig, plus a guide bushing, equals a great method for creating circles.

the cutting length of the router bit. A single thickness of plywood is sometimes not thick enough to allow the bearing to ride against the guide without cutting into the workpiece too deeply. A second thickness of plywood remedies that problem. Now it's possible for the bearing to ride the jig and set the depth of cut where needed.

I use this two-piece setup to create tenons on large panels or tabletops. I cut a 1 1/4"-long tenon to create a breadboard end (the 1/4"-thick tenon slides into a matching slot formed in the breadboard end). To do this, just set the two-thickness guide on your layout lines, adjust the depth of cut on the router, then waste away the excess from each face, leaving a tenon intact and centered. By using a pattern bit and plywood jig or guide, you

clamp directly on your layout lines and go for it. That's much easier than determining the offset for the router base.

More Work for a Pattern Bit

As you can tell, I use a pattern bit with plywood jigs for many operations. And bit diameter is not important. I use a 3/4"-diameter bit as well as a 1/2"-diameter router bit. Additionally, I use bits with either a top- or bottom-mount bearing.

Until now we've primarily discussed work accomplished with straight jigs. However, plywood is also where I turn for intricate work with patterns. I've built quite a few tea tables over the years and the most fancy was a Massachusetts design with extremely scalloped aprons at both ends and sides.

Instead of transferring the design onto each apron separately, I drew the design one time onto plywood – use a piece that's 1/2" thick at minimum – and used that to repeat the layout on each piece. But the plywood pattern did double duty. Not only could I use the piece to trace the pattern onto the aprons, I used the plywood and a pattern bit to cut the intricate design at a router table.

If you attach the plywood pattern on top of the workpiece, you'll need a bottom-mount bearing, but a top-mount bearing is used if the pattern is positioned below the workpiece. As you make the jigs for this type of work, make sure to extend the ends of the pattern an extra inch or more to allow contact between the bit and pattern prior to cutting the work.

There are a number of techniques where this setup works great other than table aprons. Before I added a spindle sander to my shop, I would create a pattern for bracket-style feet



Safe and secure. The guide bushing turns in the hole as the circle is cut. At no time is it necessary to remove your hands from the router. Elevate the workpiece or the bench is will also get a groove.

and cut the design using my router. It's more efficient to create the feet other ways, but this works if needed. Furthermore, I use this technique for high chest aprons and sculpted drawer dividers such as those on block-front or serpentine chests.

Running in Circles

Step into most woodworking stores and you'll find many commercially made jigs for cutting circles of all sizes. In fact, these jigs are so involved that you have to read the instructions before beginning work (something we all hate to do). For the most part we use a few sizes of circles specific to our work. We don't need all those settings. I looked for something different.

My first circle-cutting jig was an elongated base added to my plunge router. I used the existing bolts to affix the base to the router, then cut a circle. Seemed easy enough. But I ran into an issue. With the router bolted to the jig, there's a point as you rotate and make a cut that you have to let go of the handles in order to complete the circle because the router doesn't turn as you spin the jig. Your hands should always be in control as you use a router.

To eliminate the handle problem, I turned to a guide bushing. Again using plywood, I fashioned a jig for circle cutting. This time, instead of affixing the jig to the router base, I positioned a $\frac{3}{4}$ "-diameter hole where the router bit would be located. The hole, which could be sized to match any size guide bushing, allows the bushing that's installed in the router to spin freely as a circle is cut. The ability to spin during use means my hands stay in contact with the router throughout the cut.

Using the jig is a walk in the park. Select a guide bushing that matches the hole in the jig, then install the desired router bit and the bushing to the tool. Measure accurately for your needed diameter and pin the jig to the workpiece with a dowel. All that's left is to cut a circle. Use a plunge router for this technique and step through the cutting process; don't try to complete the cut in a single pass.

You don't need scads of money. You don't need complicated commercial jigs. You don't even need to keep the jig once it serves its purpose. All you need is a few pieces of plywood used in conjunction with certain router bits and you can increase productivity in your shop. It's as simple as plugging in a router. **PW**

Glen is a senior editor of this magazine, a published author and the host of the Woodworker's Edge DVD series. Contact him at 531-513-2690 x11293 or glen.huey@fwpubs.com.

Router Bits For Every Shop

There are router bits that I use on a day-in, day-out basis on many of my projects. However, there probably aren't as many as you might expect. I find myself using a few unique bits for most of my operations (many of which are described in the accompanying article), and I find there are but a few profiles that I have in my shop and like to use.

I purchase high-quality router bits and have yet to have one sharpened or touched-up. When the bit becomes dull I replace that profile with a matching design. Router bits are not that expensive. Also, I don't have manufacturer loyalty – although I must repeat that I buy only high-quality bits.

Here's a list of some of my most-used router bits – the brief description of uses is just the tip of the iceberg:



$\frac{3}{4}$ " TOP-MOUNT-BEARING PATTERN BIT

This is the most-used router bit in my shop. I use it with a square-platform jig for dados as well as for pattern shaping of gentle curves.



$\frac{1}{2}$ " BOTTOM-MOUNT-BEARING PATTERN BIT

This router bit has a number of uses including shaping intricate parts from plywood patterns and flushing face frames to cases.



$\frac{3}{4}$ "-DIAMETER, 14°-DOVETAIL BIT

I use this bit for drawer-divider sockets. It sees use on most of my case pieces. (Use this bit with a $\frac{3}{4}$ " outside-diameter guide bushing.)



$\frac{3}{16}$ " ROUNDOVER BIT

This is the profile I use on most of my lipped drawer fronts. I try to make the lip a bit more than $\frac{1}{4}$ " thick. So with a slight fillet, I nearly achieve a complete roundover profile.



$\frac{5}{32}$ " CLASSIC OGEE BIT

I like this design so I find myself using it on most of my work unless I'm trying to match a certain moulding profile.



RABBETING ROUTER BIT

It's not possible to build furniture without this bit. This is the bit I use for all my everyday rabbeting operations.



$\frac{1}{16}$ " STRAIGHT BIT

This is my primary inlay router bit. I don't feel the need to venture below this size for stringing.



$\frac{1}{4}$ " THREE-WING CUTTER

I use this bit at a router table to cut the grooves for drawer bottoms. You can adjust the depth of cut with bearings, or simply use a fence. — GH

Bowsaw Basics

BY FRANK KLAUSZ

Why should you own a bowsaw? Why not? You have many other tools that you use only when you need them. Seriously, if you make 18th-century-style furniture, or you make furniture with hand tools, you should own a couple of bowsaws.

In my shop, which has all the machines you can imagine, I use bowsaws. If I cut dovetails in material thicker than $\frac{1}{2}$ ", I reach for my bowsaw. I keep my material behind my shop in a pole barn. If I have to crosscut a board for one piece, the fastest way is with a bowsaw. I put the board on a couple horses, cut it, put the leftover back on the rack and take the piece in the shop. There's no extension cord or machine to put away.

In my native Hungary, I grew up without electricity. Therefore in the shop, the bowsaw was the main tool used for crosscutting, ripping, dovetailing, for mortise-and-tenon joinery and more.

My father came for a visit to the United States in 1974, and he spent some time working with me in my shop. He started looking for the frame saws. I told him, "Sorry Dad, this is America; we cut wood with machines."

A year later he came for another visit and brought a dozen different bowsaw blades: Five teeth per inch (tpi) for ripping, 4 tpi for rough crosscutting, 12 tpi for joinery and a dovetail cutout saw – which is a blade with a 90° twist in it. He made frames, handles, stretchers and toggles and used upholstery twine (look for "Ruby Italian" twine from an upholstery supplier) for tensioning the blades with toggles. He kept a saw close at hand, sometimes hanging it on a peg next to the bench. We did furniture restorations, and he used the saws very often.

He said to me: "By the time you walk to the band saw, before you start it, I am done with the cut, very comfortably without going to the middle of the shop. For a corner block or a $\frac{3}{8}$ " dowel rod, you don't start a machine.



The corner block you cut with a bowsaw; the $\frac{3}{8}$ " dowel rod you cut with your small dovetail saw."

This year I am the same age as my father was in 1975, and I truly agree with him.

Japanese Teeth; European Frame

Recently, I got a classic frame saw from Highland Woodworking. They put a Japanese blade onto a classic European saw frame. This Ger-

man-made classic frame saw's ergonomically curved cheeks and handles are made from plantation-grown tropical hardwoods, and the stretcher is made from cedar, which makes it lightweight.

The frame is beautifully sanded and finished. Tension is applied through a stainless steel rod and thumbscrew, which works very well. However, I changed mine to the traditional twine and toggle. This looks and feels

An ancient European tool that still has a place in the modern American shop.



A time and back saver. It's much easier to take a bowsaw to your lumber than it is to drag the stock into the shop. And, there's no hassle with extension cords.

An old friend. When my father came to the United States for a visit, I was reintroduced to a saw that once was my "go to" saw in woodworking. My bowsaw quickly reclaimed that exalted status.

better and is very easy to tension and to relieve the tension before hanging it up. The saw is light and fits in your hand very comfortably.

The heart and soul of this saw is its impulse-hardened Japanese blade. The tooth profile allows fast, clean cutting in any direction with very little set to the teeth. The 12 tpi "Turbo-Cut" blade cuts faster than my 5 tpi blade. I cut a 10"-wide, 1"-thick mahogany board very easily and with a comfortable pace in less than

10 seconds with 10 to 11 strokes. This frame saw, called the "Classic 700" is 39" long (\$160). They also make a "Classic 400," which is 26½" long (\$125). I recommend the 700 for ripping and crosscutting and for large tenoning, and the 400 for all other joinery.

A Smaller Bowsaw

I also got a 12" bowsaw from Gramercy Tools (\$140). It is beautifully made and has a small



Old methods work best. New bowsaws are tensioned with a rod and thumbscrews, but I prefer twine and a toggle. The loose end is wrapped around and through the twine to hold it in place.



Check the tension. I determine the correct tension by holding the saw by the toggle to see how it hangs, as well as by how well the saw cuts. It's easy to adjust tension with a twist of the toggle.

frame. Three different blades are included with the saw. There is an all-purpose 18 tpi blade. For rough work or thick material, change to the 10 tpi blade. The 24 tpi blade will be the most useful on thin stock and fine, slow cuts.

To change a blade, loosen the tension on the saw by unwinding the toggle, then simply unhook the blade and hook on another. Position the blade so that it will cut on the push stroke. Because the blades have cross

pins they are easy to change and great for swinging in and out of pierced work. After changing blades, re-tension the saw by twisting the toggle.

I use the 12" bowsaw instead of a coping saw. It cuts much faster. I use it to cut out my pins and tails close to the marking-gauge line when I am dovetailing and I clean up with a chisel.

Whatever saw you are getting, be patient and cut with a gentle push and long strokes. With a little practice, it becomes part of you and much easier to control than other saws.

PW

Frank owns and operates a cabinet shop in Pluckemin, New Jersey. Find more about Frank and see photos of his work at frankklausz.com.

Supplies

Highland Woodworking

800-241-6748 or
highlandwoodworking.com

- Classic 400 Frame Saw with Turbo Cut Blade, \$124.99
- Classic 700 Frame Saw, \$159.99

Gramercy Tools

800-426-4613 or
toolsforworkingwood.com

- 12" Bowsaw
#GT-BOWSAW12, \$139.95

Prices correct at time of publication.



It's hip. A bowsaw makes quick work of ripping stock for your project. As you finish the cut, catch it with your hip. After a couple swings, it's a natural motion.

Online EXTRAS

To watch a video of Frank Klausz cutting a set of dovetails with a bowsaw in less than three minutes, go to:

popularwoodworking.com/nov07



A sum of all parts. A bowsaw is made with simple parts and basic joinery, but when assembled, you have a workhorse of a saw.



A great saw for detail work. A 12" bowsaw set up with a fine blade increases your control and produces a finer cut, such as when you are cutting dovetails.

COLONIAL-ERA *Plate Rack*



BY KERRY PIERCE

Although this project uses 40 feet of moulding, it's quite simple to make.

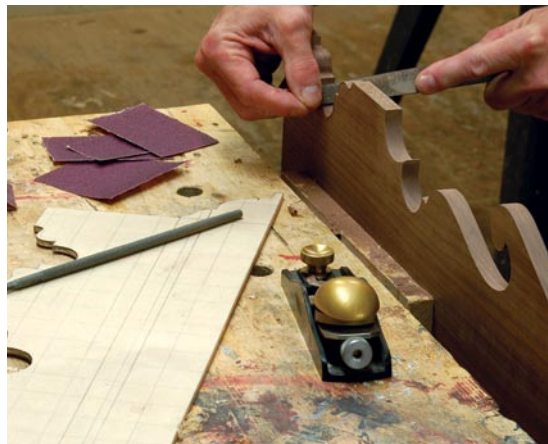
My wife and I recently attended our niece's wedding in Ft. Wayne, Ind. We realized after checking into the hotel that we had several hours to kill before the event, so we got directions to the nearest antique mall and spent two hours there, searching through 20,000 square feet of moderately valuable old stuff. As usual, I was looking for moulding planes while my wife hunted for anything that struck her fancy.

Included in the junk was a stack of woodworking magazines from the '40s and '50s. In several of these magazines, I found handsome measured drawings of Colonial-era furniture all rendered by a man named Lester Margon, and one of those Margon-drawn colonial-era pieces was this plate rack.

The circa 1765 original that Margon drew hung in a recreated tavern in Old Sturbridge Village in Massachusetts. It was made of pine, unfinished, and was assembled – like my reproduction – with brads.



Relief for a wide blade. The use of a $\frac{1}{4}$ " band saw blade requires a number of relief cuts so that the back edge of the blade can negotiate these tight circles.



Cleaning curves. I used a block plane to clean up band saw marks on some of the long downhill curves, then cleaned up the tighter circles with rasps and sandpaper.

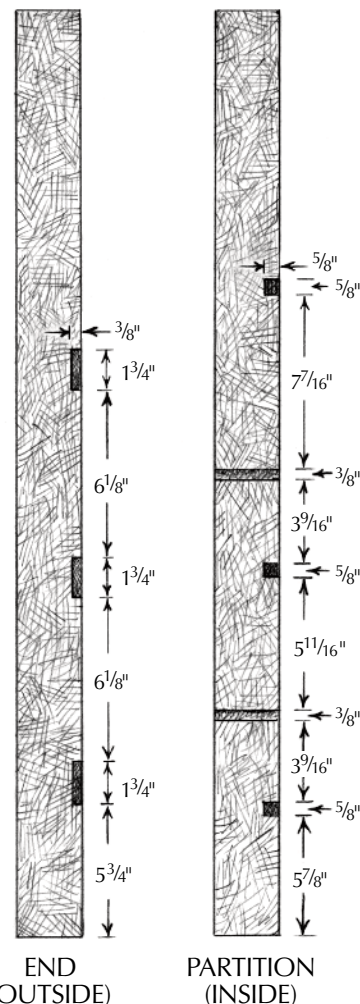
Scrolls and Mouldings

I sawed out my parts from two walnut 3x12s I'd been air drying for the last four years. Because this piece is assembled from thin stock, which sometimes exhibits a tendency to bow and twist after it's cut from thicker stock, I cut everything heavy, then I gave each piece a preliminary straightening on my jointer before sticking the material in my shop for two weeks in order to stabilize the stresses in the material. I then gave each piece a final straightening on my jointer and planed it to the final thickness.

I chose to begin by cutting out the plate rack's seven scrolls using a $\frac{1}{4}$ " band saw blade, though this blade required relief cuts in order to negotiate some of the tighter circles. I chose this blade because it is more stable on the long sweeping forms of the main scroll than an

$\frac{1}{8}$ " blade would be. In fact, by exerting slight lateral pressure on the work with my right hand (which forces the work against the side of the blade), it's possible to make those long cuts with little wandering of the blade in the cut. This combination of a stabilizing lateral pressure and relief cuts makes the $\frac{1}{4}$ " blade a good compromise when cutting a scroll like this, which features a mixture of tight and long curves.

This plate rack has more than 40 feet of moulded edges. Fortunately, most of those can be cut with a $\frac{5}{32}$ " Roman ogee router bit, which is a near-perfect match for the profile on the mouldings applied to the front edges of the ends, partitions and shelves. The partition and shelf mouldings are made from $\frac{1}{2}$ " x $1\frac{1}{4}$ " stock profiled on both edges, while the bottom and end mouldings are made from $\frac{1}{2}$ " x $\frac{7}{8}$ "

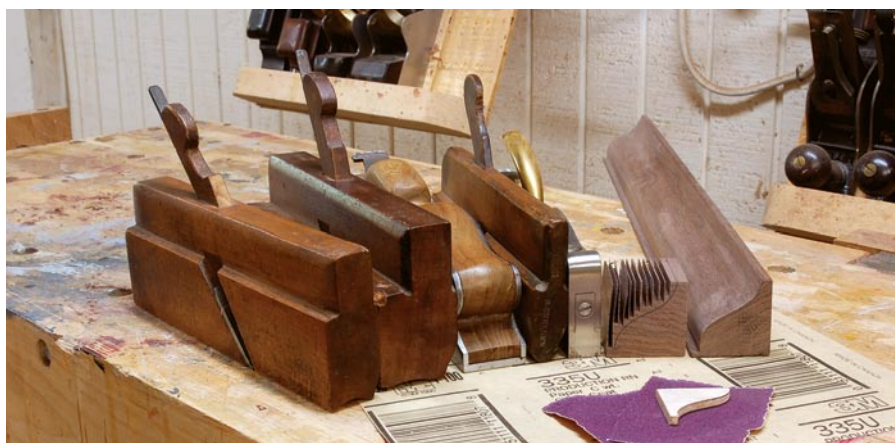


stock profiled on one edge only.

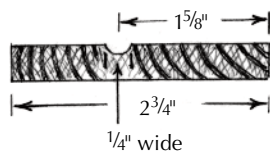
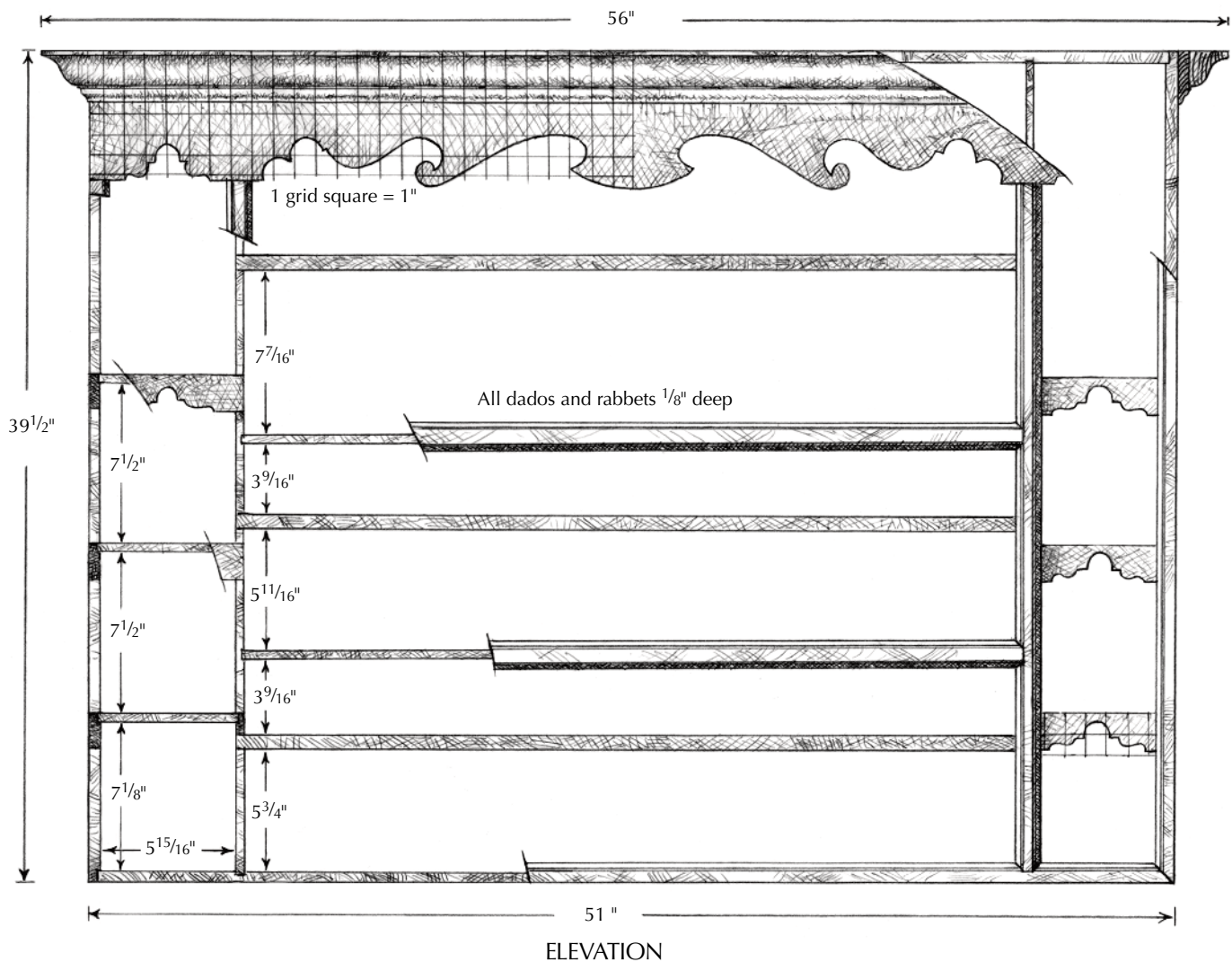
The two elements of the crown moulding were more difficult to fabricate. A shop equipped with a powerful router or a shaper might have cutters that could be used for these



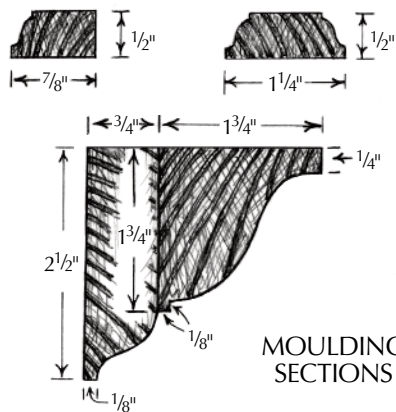
Kerf out the waste. I cleared most of the waste from the outer component of the crown moulding with repeated passes over the table saw. I left one $\frac{1}{4}$ "-wide section intact to support the blank as I fed it over the blade for the other passes. I then carefully cut away this section with a final pass over the saw, keeping the stock pressed tightly against the fence for stability.



The planes for the attack. I used this selection of planes to fair the moulding. Notice the second plane from the right. This plane – sometimes called a full round – looks like a conventional round, but it isn't because it cuts a half circle, unlike traditional rounds that cut only $\frac{1}{6}$ of a circle. This was the most important plane in this group because it was the only one that could reach into the concave area of both components of the crown moulding.



SHELF SECTIONS



Colonial-era Plate Rack

NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL	COMMENTS
		T	W	L		
2	Ends	1/2	2 3/4	39 1/2	Walnut	
2	Partitions	3/8	2 3/4	39	Walnut	
1	Large scroll	1/2	6 1/4	51	Walnut	
6	Small scrolls	3/8	2 3/4	6 13/16	Walnut	
1	Top	3/8	2 3/4	50 1/4	Walnut	
1	Bottom	3/8	2 3/4	50 1/4	Walnut	
2	Long shelves	3/8	2 3/4	50 1/4	Walnut	Center
6	Short shelves	3/8	2 3/8	6 3/16	Walnut	Sides
3	Safety bars	5/8	5/8	38 1/8	Walnut	
1	Thick front crown	1 3/4	1 3/4	56*	Walnut	
2	Thick side crowns	1 3/4	1 3/4	5 3/4*	Walnut	
1	Thin front crown	3/4	2 1/2	52 1/2*	Walnut	
2	Thin side crowns	3/4	2 1/2	4*	Walnut	
1	Bottom moulding	1/2	7/8	51*	Walnut	
2	End mouldings	1/2	7/8	33 1/4*	Walnut	
2	Partition mouldings	1/2	1 1/4	33*	Walnut	
2	Shelf mouldings	1/2	1 1/4	37 1/8*	Walnut	

* Cut all moulding long and trim to fit.



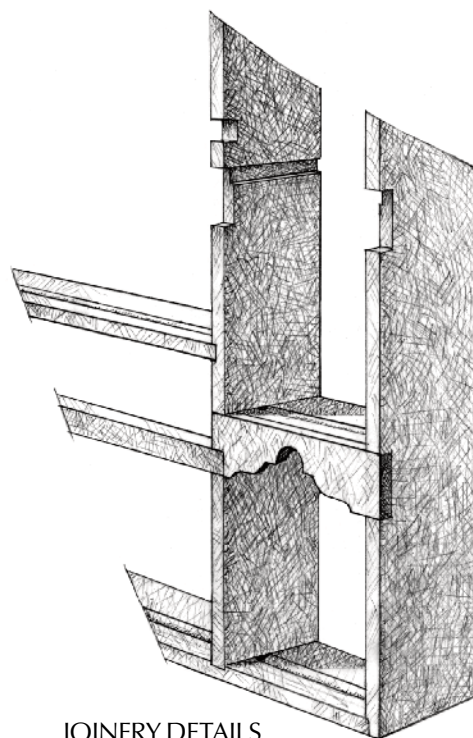
A flat place to work. I built a large plywood deck before I started assembly. I began with the middle shelves because if I had begun with the ladders on each end, there would have been no way to nail into the ends of the long shelves. (Notice the backing board clamped to the deck. This backs up the opposite ends of the shelves, giving me a stable nailing surface.)



Add the small scrolls. I nailed the ends into the top and bottom before I nailed the small scrolls into their notches in the ends and the partitions. I then turned the rack over, slid the small shelves into place and nailed them through the dados.



The scroll holds it square. Before I nailed the big scroll to the rack, I checked the squareness of the frame by measuring the diagonals. There was an error so I pressed the opposite end of the longer diagonal into this V-block and nailed the scroll into place. The scroll gave me a wide enough nailing surface to keep the rack square.



JOINERY DETAILS

forms, but I have neither tool, and none of my moulding planes are a decent approximation for these shapes, so I roughed them in on my table saw, then faired the profiles with a variety of handplanes, followed by hand sanding.

The Frame

Like the original, the frame on my rack is assembled with notches (cut on the band saw), nailed rabbets (with pre-drilled holes) and $\frac{1}{8}$ "-deep dados (which I left unglued because of the weakness of end-grain gluing). I relied on set brads, plus a large number of interlocking parts to hold the frame together. In this regard, the frame of this plate rack is a little like the nailed frame of a house. When you nail those

first few studs to their plates, the joinery seems flimsy, but as you add more nailed parts to the frame, strength accumulates until—when it is complete—those first few studs have become sturdy parts of a powerful whole.

I began by nailing the long middle shelves into place. I next added the frame's top and bottom and both ends, followed by the small scrolls, which were glued and nailed into their notches. I then turned the rack over and slid the short shelves into their dados and nailed them through those dados.

I knew that the only chance I would have to square up the frame would be when I nailed the wide top scroll into place because it was the only piece with a wide enough bite to cor-

rect an error. After I had tacked that scroll into place with a brad in either top corner, I checked the frame for square by measuring the diagonals, and found that one diagonal was $\frac{3}{8}$ " longer than the other. I pushed the long diagonal against a V-block clamped to the deck on one end of that diagonal. Then, while pressing against that V-block until the lengths of the diagonals matched (making the frame square), I nailed the wide scroll into place.

I finished up the frame by nailing the safety bars into their notches.

Installing Mouldings

The first moulding I installed was the bottom portion of the crown moulding. I cut the parts

on a miter box – leaving each a bit long – then brought them to the final length with a miter plane and a shooting board. (The plate rack's mouldings required two different shooting boards – one for the flat miters and one for the box miters.)

I then screwed these pieces into place from the back side. I next added the $1\frac{3}{4}" \times 1\frac{3}{4}"$ pieces of the crown moulding, again cutting each piece slightly long and bringing them to length on a shooting board. I screwed the long central piece in place from the back side. The two end pieces of this moulding I press-fit with glue by holding each piece in position for 60 seconds while the glue grabbed.

I then cut and fit the $\frac{1}{2}" \times \frac{7}{8}"$ mouldings for the front edges of the ends and the bottom. I nailed (and glued) the two end pieces into position but I left the bottom loose because I had to fit the joints where the partition mouldings would meet this bottom section.

These meetings of end and partition mouldings require a double miter. I first cut the 45° ears on the male section, roughing in the cuts by sawing a bit outside a mark made on the bottom side by a bevel square. I then finished up these angles with a miter plane on a shooting board.

I laid out the female halves of each joint on the bottom side of the bottom moulding, then roughed in that joint on my band saw and finished up with a paring chisel. When those joints were finished, I nailed the bottom into place. But I couldn't, at that time, nail the partition mouldings because those first had to be fit for the long middle shelf mouldings. These joints were double miters just like the joints connecting the partition and bottom mouldings.

Hanging the Rack

Lester Margon said that original plate rack has "Standard hangers . . . fastened to the rear edge of the top and bottom members so that the rack may be secured to the wall." I wasn't sure what "standard hangers" meant so I chose to hang my version from a 1×2 walnut cleat that is screwed to the wall and to the underside of the plate rack's top. Because this meant that the whole rack – and whatever was displayed upon it – would be hung from the top, I reinforced the top with several hidden glue blocks and a pair of metal corner brackets. **PW**

Kerry is a furniture maker in Lancaster, Ohio, and the author of many books on woodworking, including the new "Chairmaking Simplified" (Popular Woodworking Books). You can see more of his work and his books at kerrypiercefurniture.com.



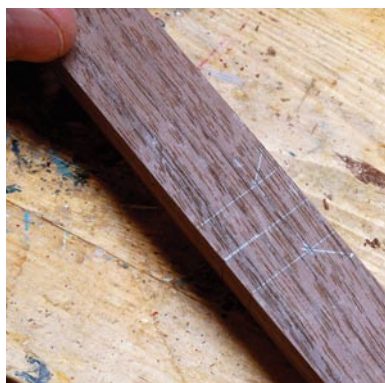
Where glue helps. Glue adds little strength to a dado joint so I assembled them unglued, but whenever I had a chance to glue side grain to side grain, I used glue as I'm doing here with this moulding.



Double your precision. The partition mouldings enter the bottom moulding with the double-miter joint shown here. The same joint is used when the middle shelf mouldings enter the partition mouldings.



Shooting to size. I rough cut the miters on the male part with a saw, then finalized the miter with several strokes of a miter plane on a shooting board. The miter is finished when it just meets the central raised portion of the moulding.



The miter's mate. This photo shows the layout of the joint's female part. The marks on the right edge of the moulding indicate the full width of the male moulding while the marks at the left-hand side of each diagonal indicate the width of the central raised portion of the male moulding. Staying clear of the layout lines, I cut the joint on my band saw.



Pare to fit. I then fine-tuned the female part of the joint with a paring chisel, giving the part several test fittings.

Online EXTRAS

For more on nails, go to:

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First *Fan Carving*

BY GLEN D. HUEY

Study the furniture built prior to the Queen Anne period and you'll find surface ornamentation is primarily accomplished with mouldings and/or paint. While there are a few examples of carvings on earlier work, it wasn't until the first third of the 18th century that furniture makers included decorative features on their work such as shells and fans.

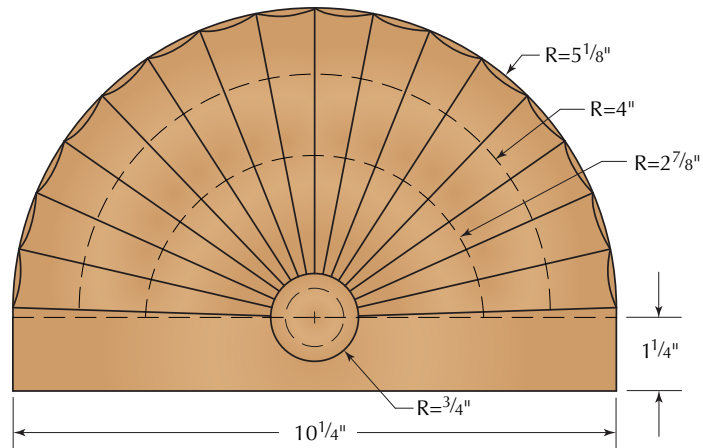
Wallace Nutting, in "Furniture Treasury Vol. III" (Macmillan Publishing Co.), separates shells from fans by calling them, "those cheaper modifications which more properly are denominated fans." From a carving perspective, he was correct – shells are more difficult to produce. But from a purely aesthetic point of view, I think fans, when carved well, rival any shell design in beauty.

As the popularity of fan carvings grew during the 1700s, each region of furniture manufacture developed its own style. Today, we evaluate the carved fan to help identify in which region a piece of furniture was built.

This design was developed from a number of New England pieces, and I have infused my own ideas as well.

As an introduction to fan carving, you might expect a flat design. However, creating an undulating design, a serpentine or an S-shaped surface, involves only a couple additional steps during the carving process. And the results are worth the extra effort.

It takes five tools to enhance the design of any project with a carved fan. We show you the tools and tricks to get it right the first time.



FAN CARVING



No difference.
As with any woodworking project, the path to a great carved fan begins with good, accurate layout work.

Accurate Layout, Better Results

I imagine there are woodworkers who carve exceptionally well who could position themselves in front of a blank of wood and freehand carve a masterpiece fan. I cannot.

The first step in fan layout is placement. This fan is carved into a drawer front. The carving is placed 1 1/4" above the bottom edge of the drawer front to gain additional shadow lines as the design rolls into the drawer divider below. Mark this distance up from the bottom edge, then use a straightedge and pencil to draw the baseline.

Most fans on period furniture are symmetrical designs. Mark the middle of the drawer front on the previously marked baseline. Use a square to extend a vertical line up the face of the front. The intersection of the two lines is important; a circle and a half circle are drawn from this point. The circle, from which the rays travel outward to the fan's edge, has a 1 1/2" diameter, which is a 3/4" radius. Use a compass to complete the full circle.

The size of the circle influences the width of the rays at their smallest or narrowest section. If the circle shrinks in size, the width of the rays at the circle becomes too narrow to carve or distinguish. Your first instinct might be to increase the size of the inner circle, but I must caution you that you need to keep the ratio of the circle and the fan size in mind. Proportions are easy to lose if you're not careful, and then the carving won't look pleasing to the eye.

The radius of the outer edge of the fan, the half circle, is determined by the height of the drawer front. If you have no boundaries the sky's the limit as to size, but for this drawer front, set the compass so the top edge of the fan is 1" below the top edge. That's a radius of 5 1/8" and the fan is 10 1/4" across at the baseline. Draw the outer edge of the fan with a compass, then continue the layout lines from the end of the half circle (where the half circle intersects the baseline) to the bottom edge of the drawer front using a square.

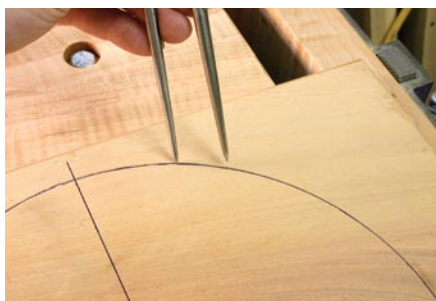
Step Off the Rays

With the overall dimensions of the fan set, the next step is to lay out the individual rays. This task is completed with a pair of dividers, a pencil and a straightedge.

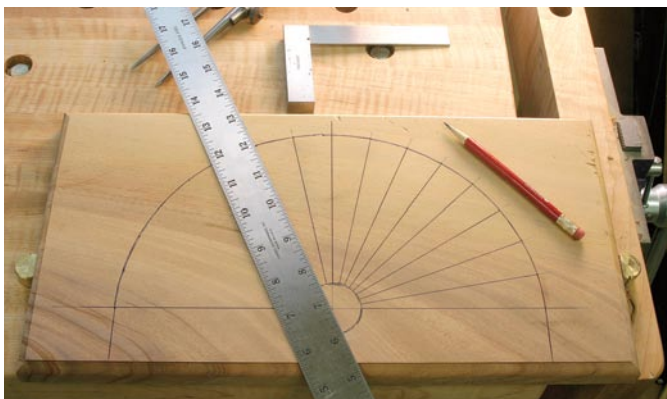
Set the dividers at 1" (this is the figure I used) and begin to step off the points at the intersection of the vertical line and the fan's outer edge. Working from the centerline out maintains the symmetry of the fan. Make very light pinpoints as you lay out one side of the fan by making impressions along the fan's outer edge. The last point, the one made nearest the fan's baseline, should be very close to that baseline. If your layout falls short, increase the spread of the dividers then repeat this step again.

It's OK to be slightly past the baseline, but if you go too far past you begin to close the fan's circumference and, in my opinion, that changes the look. Small deviations are fine and you should always please your eye.

Once the dividers are set and the width of the rays is determined, step off the points adding pressure as you work. Move to the second half of the fan and repeat the steps to lay out the ray points, again starting from the centerline.



Stepping out. Symmetry is important, so it's best to lay out the ray sizes with a set of dividers.



Connect the dots. Draw the ray lines onto the carving using the stepped-off points along the fan's outer edge and the point at the intersection of the baseline and vertical line.

Now connect the points made with the dividers with the point at the intersection of the vertical line and the fan's baseline. Carry the lines past the fan's edge. You'll need to draw those lines in a second time after dishing out the serpentine area.

Evaluate the layout at this time. If you think the inner layout lines are too tight, increase the diameter of the inner circle or reduce the number of rays in the fan. Do the opposite if the rays are too wide.

To establish the depth of the serpentine or sculpted area, I turn to a trick adapted from watching Windsor chairmakers sculpt seats: Drill a hole to the required depth, then sculpt to the bottom of the hole. For the fan, adjust a compass to 4", use the vertical/baseline point for one leg, then draw a short line across every other ray line. Next, install a 1/8" drill bit into the drill press, set the press to drill to a depth of 3/16", then drill at each intersection along that 4" radius.

Required Carving Tools

As far as carving goes, this fan requires a minimal number of carving tools: three gouges and two V-parting tools. The numbers given on my carving tools indicate the amount of curvature and the width of the blade, in that order. So, the higher the first number of the gouge the tighter the curve, and the higher the second number the wider the cutting end.

Of the gouges, one is a 7/25 straight-shaft gouge and the two others are back-bent gouges, a 25/6 and a 25/13. The straight gouge is the tool used to hog out the serpentine-shaped valley of the fan while the back-bent tools are used for carving the convex surfaces of each ray. The smaller back-bent tool is used along the first third of each ray moving from

the inner circle outward. The remaining ray edges are worked with the wider back-bent gouge.

V-parting tools work pretty much the same. Use the 15/6 tool to score each ray line along its entire length and complete the first third of each line. The wider 12/8 V-parting tool is used to part the remaining ray lines as well as to define the outer edge of the fan.

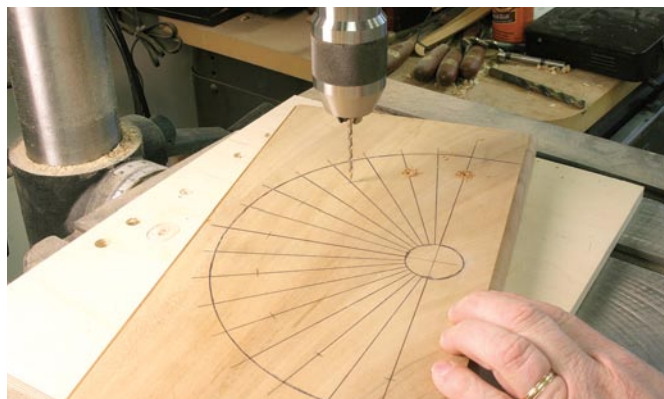
So how do you hold a carving tool? My answer is, "as comfortably as you can." I like to wrap one hand around the tool's steel as one would their lower hand while holding a baseball bat. Then, I position the end of the handle into the palm of the other hand with the index finger extended down the wooden shaft. I cannot say which hand should be the right or left because you'll find that being ambidextrous while carving is a fine asset. Learn to switch back and forth.

The hand lowest on the tool guides the tool's direction and acts as a pivot when necessary. The top hand is my drive hand, pushing the tool through the wood. My two hands work in unison.

Finally Time to Carve

Clamp the drawer front securely to your bench. Use the 12/8 V-parting tool to define the outer edge of the fan. As you work with a parting tool you'll find it's a lot like steering a car. If you turn your wrist to the right, the cut moves to the right – twist your wrist left and the tool cuts to the left. Keep the carving tool as straight as possible while cutting the edge. Work the line to a uniform depth.

The inner circle has to be cut, but not with a V-tool. Use the straight gouge, held vertically, to stab and define the inner circle. A light tap on the end will do the trick. Due to the shal-



Excavation guide. The key to cutting the serpentine shape both level and consistent is to drill accurate holes and work to their depth.



A short list. You don't need a tool chest full of carving tools to make this fan. Three gouges and two parting tools are all that's required.



It's like driving a car. Steer your V-parting tool along the outer edge of the fan. How you turn your wrist determines the cut's path.



Work between the lines. The addition of the inside layout line, along with the depth-setting holes, allows you to create a level and symmetrical trough.



I do it my way. Hold the carving tools however you want, but if you're ambidextrous, you're ahead of the game.

low depth of the rays as they meet the inner circle, the cut need not be too deep.

Next, use the straight gouge to hog away waste material from the S-shaped area. Removing this material is not a complex task because most of the wood being removed is cut across the grain. It's only at the middle of the fan that you're cutting with the grain. At that point, you'll need to move slowly and diligently to remove only the waste material. It's easy to dig a bit too deep. Work to the bottom of the drill-press holes.

In order to make a true symmetrical trough I add another compass line with the tool set to $2\frac{7}{8}$ ". My trough or serpentine shape is $2\frac{1}{4}$ " wide. When the majority of the waste is cleared and you've reached the bottom of the drilled holes, use the straight gouge to smooth and level the surface.

The idea is to get the surface as smooth as you can before moving on. Sanding the surface would surely accomplish this, but seasoned woodcarvers pooh-pooh using sandpaper in areas requiring more carving because the grit dulls the tools faster. As a beginner, I found

sanding the serpentine area to be best. The smooth surface allows the remaining steps to be accomplished more quickly and the tool cuts show better. And, I can always strop the edge of my carving tools.

Choose whether you want to sand or not, then lay the ray lines back onto the fan. Here is where having the lines extend over the fan's edge pay dividends.

Pull Rays from a Flat Surface

To make the rays stand out and be noticed, start with the narrow V-parting tool. Push the tool along the layout line with a light hand. All you're trying to do is define the ray, not dig it deep. Keep your wrist straight – no steering the tool – as you work from the inner circle outward. As you reach the downward slope of the serpentine area, you'll need to increase the pitch of the tool, or maintain the relationship of the tool to the surface as you descend. Work just to the bottom of the shaped area.

To complete cutting the ray line you'll need to work from the outer edge back to the bottom of the shaped area. Trying to cut uphill

is not advised – although it can be done. This is where you'll find being ambidextrous useful. It's easier to switch hands than turn the drawer front.

Once the ray lines are defined and you've deepened the first part of the ray, turn to the wider V-parting tool to increase the depth of the lines over the last two-thirds of each ray. The wider tool begins to roll the edge of each ray. Just remember to change directions and work into the middle of the trough.

Theory says you should increase the depth of the ray lines as you move farther from the inner circle. If this were flat work I would heed that advice. But due to the serpentine shape, I don't find it necessary to follow that "rule."

The same process is repeated on each ray. You can complete your V-tool work all at once if you choose. I, however, like to work a few rays at a time and switch to the gouges to watch the fan develop.

Rolling the Rays

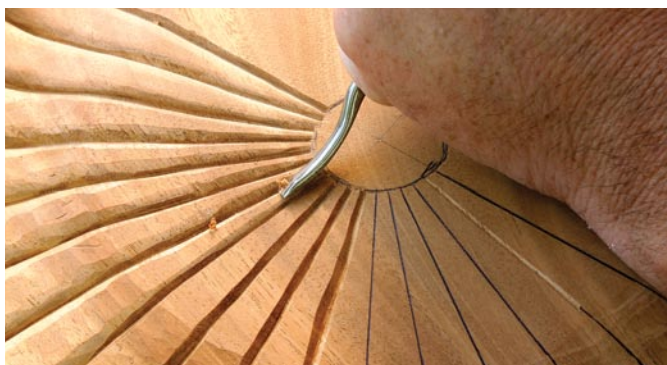
While the V-parting tools begin the process of shaping the rays, it's the back-bent gouges that



It's all in the tool. Grain direction is not such an issue when using a V-parting tool. Use the narrow cutting tool for the finer lines of the rays and the wider tool as you near the outer edge.



Which direction do you carve? The cutting action of a gouge near the middle rays is mostly cross grain, but as you move to the outer rays you have to read the grain.



No big deal. It's only with the small back-bent gouge that you're able to round the edge of the rays near the inner circle.



Big impact. Even though there's a little touch-up work left on this fan, you can tell now it adds impact to the design of the overall project.

roll the ray's edges to form. This is where you need to pay attention to the wood grain. The grain changes throughout the fan, depending on where you're carving. Watch carefully. If you cut against the grain, you're more likely to tear the fibers instead of cut. And due to the shallowness of the work, a small area of tear-out can be irreparable damage.

If you're working with particularly difficult wood – which I don't suggest if this is a first attempt, but I also know how, as woodworkers, we hate to practice – you can wipe the area with a dampened cloth and gain better results from your carving tools. It's the old "how-to-trim-end-grain" trick – it works on flat grain as well.

Begin rolling the edges with the 25/13 gouge. Work from the outer edge inward. Shaving small amounts of wood while you traverse into the valley from the outer edge is easily accomplished. The idea is to carve the ray into a semicircle at the outer edge, but I must admit that my rays are a bit flattened. To produce the full half circle requires deeper V-grooves and more work.

It should take a couple passes to finish the rounding of each ray. As you move

inward you'll reach a point where you need to change to the smaller-width back-bent tool. The smaller tool allows access to the narrow ends near the inner circle. Repeat these steps with each ray while trying to keep the surface smooth.

After you complete the rounding of the ray's edges, make another pass using the 15/6 V-parting tool. This pass cuts a bit deeper due to the edges of the rays being cut away. No longer is the shoulder of the carving tool rubbing against the wood. Then use the back-bent tool to round any edge as needed.

Homestretch: Straighten and Sand

Because I'm carving a drawer front that rolls into a drawer divider, I need to remove the material below the fan's baseline. The bottom edge of the inner circle is trimmed with the straight gouge leaving the edge at 90° to the drawer front. The squared edges, the continuation of the outer edge, are rolled down one side and left flat toward the center.

If your work is anything like mine, I know you'll have a few line wiggles here and there. Because the majority of the carving is complete, you get the feel and look of the fan in its

finished stage. Take a few minutes to go back and straighten any misaligned ray lines.

A great tip for this step is to use a low-angle or raking light. Let the light shine across your fan. As much as it might scare you, any imperfections will jump right out. But, please don't get caught up in trying to attain perfection. I view fan carvings as I do building 18th-century reproduction furniture and dovetails: If they're perfect in every way, how am I going to know they are handmade?

When you've smoothed the fan as much as you can with your tools, that's the time to turn to sandpaper. Don't start with anything more coarse than #150 grit. And if your carving is anywhere close to smooth, you're better off starting at #180-grit sandpaper. Please don't be tempted to use a flap-sanding wheel to finish your fan. That apparatus hurts more than it helps. Be patient. Sand by hand, then add the completed fan carving to any of your projects. **PW**

Glen is a senior editor of this magazine, a published author and the host of the Woodworker's Edge DVD series. Contact him at 513-531-2690 x11293 or glen.huey@fwpubs.com.



Kickback

BY MARC ADAMS

The fundamental rules (and devices) to keep you clear of danger at your saw.

I once heard that 90 percent (or more) of all table saw accidents involve some type of kickback, where the work flies back at the operator. Imagine what would happen to table saw accident statistics if we could eliminate kickback altogether. The table saw would go from being one of the most dangerous machines to one of the safest.

I often ask for a show of hands during my safety demonstrations of how many people have ever experienced kickback. Nearly everyone sheepishly raises their hand. I then ask how many people have experienced kickback more than once, and it's almost the same response.

Why is that?

It's clear that accidents occur to both the novice and experienced woodworker, but why would something as potentially dangerous as a piece of stock being kicked back at more than 100 miles per hour be an experience anyone would ever want to have more than once?

Kickback can be a product of both through and non-through cuts. Once it starts you can't stop it, and only Superman can react faster. The kickback zone can actually be anywhere in the shop. That's right—anywhere! The main (and most dangerous) line is toward the operator and directly in front of the blade. However a “kicked” item can ricochet

***Danger ahead.** Without the proper safety gear and procedures you are vulnerable to kickback at your table saw.*

off something and head in any direction, and boards with some significant width that kick back can pivot sideways as well.

I believe that most woodworkers don't understand the cause and cure of kickback, so let's take a look at both.

The Mechanics of Kickback

Kickback occurs when a piece of wood is unexpectedly thrown back toward the operator. The lifting and throwing force of kickback starts at the back of the blade, not the front.

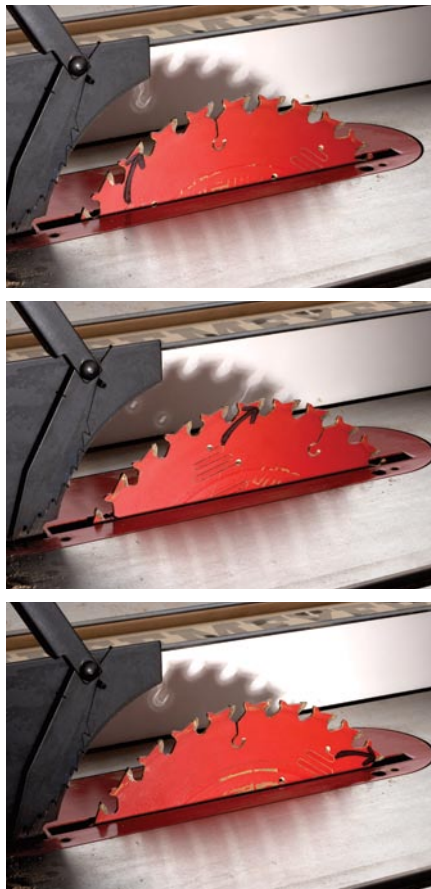
To get a better understanding of how this force is created, unplug your saw and mark any tooth with a felt-tip marker. Now rotate that tooth to where it just starts to rise above the table at the back of your saw's throat plate.

If you follow this one tooth as it rotates it will give you a better idea how a piece of wood is lifted and thrown forward. When the blade rises through the table at the back of the saw it has an initial vertical lift. As the blade continues to rotate and reaches the top of its arc, the vertical lift begins to transform into a horizontal thrust. By the time the blade moves from the top of the arc back down toward the saw's table, the horizontal thrust transitions back to vertical. By now all the force is moving down towards the table on its way to doing it all over again.

To help students understand how much lift a rotating blade has, I move them over to the 20" disc sander (unplugged, of course). As the sandpaper disc rotates, you can safely sand wood on the side that is rotating down toward the table. But move the wood to the lifting side and the piece is immediately lifted up. A table saw blade works in a similar fashion.

The Causes of Kickback

OK, so we know that kickback occurs at the back of the blade, but what are the series of events that can cause the stock to contact the back of the blade?



Up, forward and down again. If you follow the marked tooth in the series of photos above, you can see how initially the tooth lifts the work up. Then it pushes it forward. And finally it pushes it down.

By far the most common cause is binding or pinching. This happens when a piece of wood becomes trapped between the rotating blade and a stationary object, such as the fence or the guard. The following is a list of reasons that stock can kick back:

1. Crosscutting a piece of wood with the miter gauge on the left side of the blade while the fence is being used as a stop on the right-hand side of the blade – blam-o!
2. In some cases kickback is created if the saw kerf closes around the blade.
3. Make sure the fence is parallel to the blade. If the fence is toed inward toward the blade, it can cause the wood to come in contact with the back edge of the blade.

4. Cutting twisted, distorted, knotty, crooked or springy wood.

5. Freehand cutting or cutting wood that is not flat on the table, such as round stock.

6. Losing control of the work or letting go of the wood at the same time it's in contact with the saw blade.

7. Not following through when ripping, or stopping before the cut is complete.

8. Intentionally or unintentionally allowing the wood to "drop" on top or to the side of the back of the blade.

9. Backing out of a cut.

10. Improper setup of the machine's guards, fixtures or hold-downs.

11. Applying the entire pushing force toward the off-fall or free section of the work instead of pushing toward the fence.

The Cures for Kickback

Use the guard. The best cure for kickback is to deny the wood access to the back of the blade. A splitter, especially a riving knife, is by far the best protection you can give yourself.

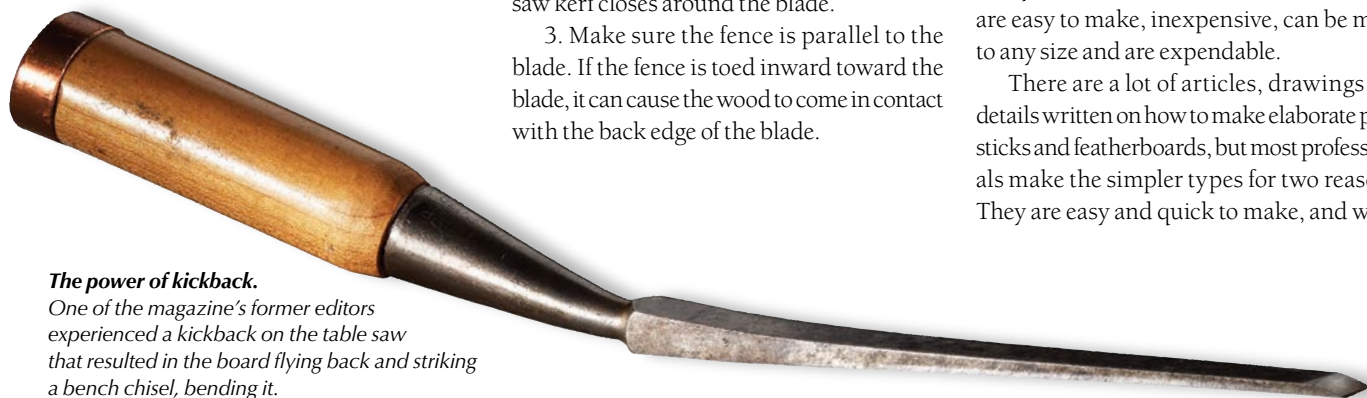
Double-check all your setups and plan your cuts carefully. Be aware of all the pinch points or bindings that could be created during any cut and plan your work first. And although this isn't a cure for kickback, there are blades that have anti-kickback fingers behind the teeth that limit the chip or depth of cut. These blades are sometimes sold as anti-kickback blades, but they do not eliminate kickback.

Now let's look at two important devices that can help you avoid injury, but only if you use them properly.

Featherboards and Push Sticks

Dr. Jeffery Greenburg, a brilliant hand surgeon and pretty fair woodworker, told me that he has never treated a patient whose injury occurred because of a push stick or any other safety device. As a matter of fact, a common reason accidents occur is from not using a safety device. Push sticks and featherboards are easy to make, inexpensive, can be made to any size and are expendable.

There are a lot of articles, drawings and details written on how to make elaborate push sticks and featherboards, but most professionals make the simpler types for two reasons: They are easy and quick to make, and when



The power of kickback.

One of the magazine's former editors experienced a kickback on the table saw that resulted in the board flying back and striking a bench chisel, bending it.



A proper featherboard. The fingers of a featherboard are consistent in size and springy, as shown. You can clamp them to the table or to the fence to help improve the safety of many operations.



Better together. Here a push stick is used with a featherboard. The push stick keeps the work flat on the table and moving forward. The featherboard, located in front of the blade, presses the work against the fence.

they get cut and nicked you don't feel so bad. They are the ultimate sacrificial tool.

Featherboards Not a Cure-all

Featherboards, spring boards, combs, anti-kickback fingers, spreaders and magnetic hold-downs all hold the work down or against an edge, and they act like a spring. A featherboard is a piece of solid stock with multiple kerfs that are equally spaced along the grain. The end of the piece is cut at a 30° to 45° angle. Featherboards can help minimize kickback, but they do not eliminate it, as some commercial featherboard manufacturers suggest.

Featherboards are designed, for the most part, to be clamped to the table or fence. Clamping them to the fence is usually not a problem. But clamping to the table can be a challenge. To get around this, some commercial featherboards have either built-in expansion bars that fit in the miter gauge's slot or heavy-duty magnets. If you use shop clamps to secure your featherboards, use two clamps to prevent the device from pivoting.

If a simple clamping solution is not readily available, try placing high-strength, fiberwoven carpet tape on the down side of the featherboard. This will hold it to the table but will not quite give the "stay-put" holding power that you can get with a clamp.

Featherboards that are clamped to the fence help keep the wood flat against the table and provide some kicking resistance. They can be placed anywhere along the fence where a downward force is needed. Be aware that fence-mounted featherboards can sometimes be restrictive. Table-mounted featherboards provide force toward the fence and offer some kicking resistance. It is vital that a table-mounted featherboard never be placed

beyond the front edge of the blade. If mounted behind the blade, the force will push the wood into the back of the blade.

The Proper Use of Push Sticks

Push sticks are used to help push the stock through the cut while keeping your fingers clear of the blade. A good push stick can help hold the work against the table while pushing forward at the same time.

They are an absolute must when cutting narrow or thin stock. Push sticks come in all shapes and sizes, and it's a good idea to have several different types and thicknesses ready to go. In most cases the width of the push stick should be less than the distance between the saw and the fence.

I prefer to use a push stick that both hooks on the back edge and sits on the top of the board. This type of push stick gives me more control and helps keep the stock from tipping up while moving past the blade.

It is important to understand when, and when not, to use a push stick. As long as you have your hands on a board when making a cut, you will always have a great degree of control. As soon as you use a push stick, you lose a portion of that control.

I always recommend that you use your hands for pushing your work when you have more than a 3" clearance from the guard—you simply have more control. If your hands will be within 3" of the guard, however, then a push stick is definitely necessary.

Be aware that you will lose some control. As a matter of fact, if you use a push stick with a downward force on a board that is off the table, it could cause the board to tip upward. Push sticks just aren't effective or necessary at the beginning of a cut on a long board.

I keep my push stick handy and when my push hand gets to that 3" limit, with my left hand holding the board firm, I use my right hand to pick up the push stick and finish the cut. I also keep a second push stick to the left of the table so that my left hand has access to a push stick as well. Be aware that sometimes push sticks can slip off the stock and cause a very dangerous situation. Always keep your push stick hooked firmly over the edge or side of the board. **PW**

Marc is the founder of the Marc Adams School of Woodworking (marcadams.com), the largest woodworking school in North America. He also is the host of 11 DVDs, including one on workshop safety, which is available on his web site.



A good push stick. Here's one of my frequently used push sticks. It hooks over the back of the work and presses the work flat against the table.

Everyday Greene & Greene

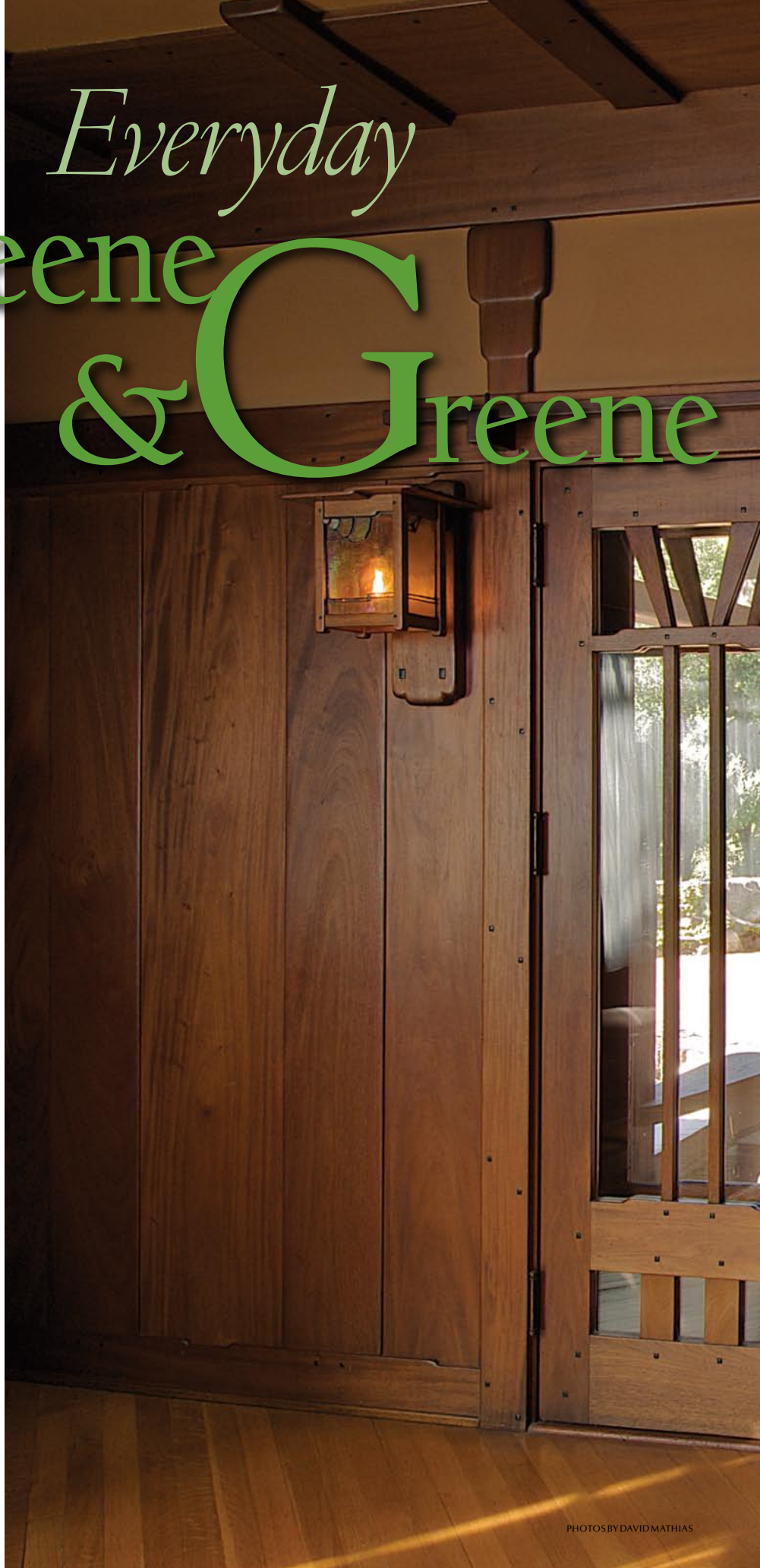
In the hands of genius,
ordinary items
become fine art.

BY DAVID MATHIAS &
ROBERT W. LANG

One of the best-known quotations to arise from the Arts & Crafts movement is from William Morris. A founding father of the movement in England, Morris was part designer, part philosopher and part social activist. He famously said, “Have nothing in your house that you do not know to be useful or believe to be beautiful.”

Brothers Charles and Henry Greene were luminaries of the Arts & Crafts period in the United States. While not involved in social aspects of the movement they did practice many of the design tenets. Charles Greene wrote of their principles for domestic architecture, that they strove, “... to make these necessary and useful things pleasurable.” The Greenes turned Morris’ “or” into an “and.” They saw no reason that objects couldn’t be both useful and beautiful. This simple idea is at the heart of their best work.

One of the Greenes’ talents was an ability to make common things uncommonly beautiful. Here we will focus on





No less important. The doors from the Gamble house dining room to the patio share the attention to detail and craftsmanship of the rest of the room and house.

very common objects indeed: doors and cabinets for the kitchen and bath. With photographs from 10 Greene & Greene houses, from modest to majestic, we'll get a grand tour of the Greenes' gift for elevating mundane elements to high art.

In a Greene & Greene home, there are no unimportant details. Everyday items are crafted with the same degree of skill and care

as showpiece items, and designed with the same thoughtful blending of form and function. A cabinet in a servant's area would be simple and of less expensive material, but as well constructed as dining room built-ins.

Then and Now

In a modern home the kitchen is a gathering place, perhaps the only room in which the

entire family spends time together. This is a relatively new phenomenon in urban/suburban America where, historically, kitchens were often small and the domain of hired help. Large kitchens that are well-integrated with the rest of the home have facilitated the change. Central air conditioning has also played a role – kitchens are no longer sauna-like.

Bathrooms have undergone a similar transformation. One hundred years ago, few would have considered the bathroom a sanctuary. For many contemporary people, that's exactly what a bathroom is. Today's marble-clad, whirlpool-equipped baths bear only a passing resemblance to their forebears.

In the world in which Charles and Henry Greene lived, kitchens and baths were almost entirely utilitarian. For their wealthier clients, the kitchen was rarely seen; it was a room in which only the staff spent time. Thus, attention to detail in these rooms provided limited return to the architect. Yet, even in their modest commissions, the Greenes attended to the details in kitchens and baths just as they did in every other aspect of their work.

In the Kitchen

Intact 100-year-old kitchens and baths are rare. The Gamble house, of course, is largely unchanged from that time. Restored rooms in other Greene & Greene homes retain some of the original elements (or reproductions of them). The Caroline DeForest house, however, still has its original kitchen right down to the wooden countertops.

The DeForest house is a wonderful example of the Greenes' work prior to the ultimate bungalows. Built in 1906, this 2,700 square-foot home has many interesting features. The main entrance to the house is on one side rather than facing the street. The walkway brings visitors to a wonderful covered porch. The double-door entry leads to a living area with a wall of windows above an inviting window seat.

The kitchen is quite small and simple. The cabinets are a straightforward but attractive board-and-batten design decorated with hundreds of roundhead brass screws. The slots in the screws align with the grain direction of the wood; it's a subtle, obsessive touch.

The Gamble house kitchen is large by comparison – though not by today's standard for a house of that size. Its center island layout would seem familiar to many homeowners today. The lack of a kitchen table is one clue that this isn't a typical, modern kitchen design.

Both Useful and Beautiful



A place for everything. In the Bolton house, the then-new telephone was given a built-in home.



Out of sight, not out of mind. Located in the Gamble garage, this medicine cabinet is gracefully designed, nicely detailed and well constructed.



Custom closet. The closet doors in the Jenny Reeve house provide an important design element for the room, along with serving a practical need.

The maple cabinets are very pleasing. The adjacent butler's pantry leads to the stunning dining room.

Beginning in 1906, many Greene & Greene cabinets, particularly in butler's pantries, were constructed with sliding rather than swinging doors, a response to the 1906 San Francisco earthquake, to prevent dishes from falling to the floor when the shaking started.

The Smallest Room

White. White walls. White floors. White fixtures. White, everywhere white. That is a reasonable description of most bathrooms 100 years ago. The Greenes didn't do a lot to change that situation. Clients expected white, the color of clean. What the Greenes were able to do, however, was to unify the bathroom with the rest of the house.

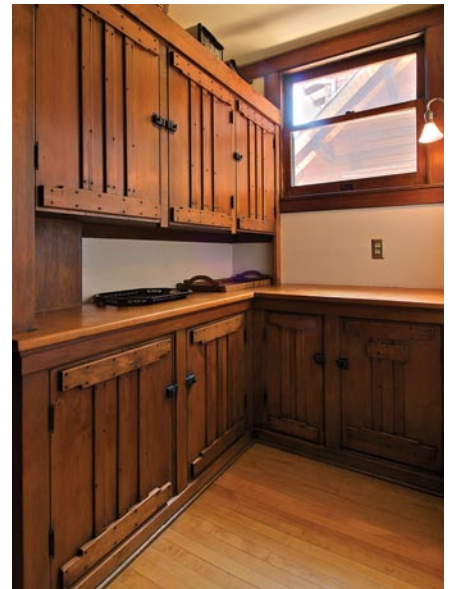
Modern vanities weren't yet common but every bath had a medicine cabinet. Rather than sterile, featureless models, Charles and Henry incorporated custom-made cabinets that were clearly integrated with the houses' architectural trim.

The truly grand Robert Blacker house has a medicine cabinet and two stained glass windows integrated to become a work of art. It is a

In the Kitchen



As it was in 1906. Built before the ultimate bungalows, the DeForest house was modest, yet the small kitchen contained elegant details.



All in a row. The DeForest pantry cabinets featured stylized board-and-batten doors, and the numerous exposed screw heads are all aligned in the direction of the wood grain.



Maple masterpiece. The story is told that Mary Gamble never set foot in her kitchen, yet the cabinets are as nice as any in the house.



On the way to the dining room. The Gamble house butler's pantry, between the kitchen and dining room, features floor-to-ceiling and wall-to-wall cabinets.

fantastic detail that transforms an otherwise plain room into a place of marvelous beauty. It's a detail that would be suitable in many settings in the home.

Making an Entrance

Anyone with more than a casual familiarity with the work of Greene & Greene has seen examples of their magnificent entry doors. The California live oak motif on the Gamble house doors is probably the best-known example, but several other homes—including the Ford and Blacker houses—have similarly striking

entrances with impressive details.

While the main entrances are most impressive, many other common doors within these homes are quite beautiful. As with numerous elements in a Greene & Greene house, the design vocabulary ties doors into the whole.

In the Gamble house, sunbursts (long elements angled at the top to model the sun's rays) appear in doors and windows. In the Blacker house, "Blacker brackets" grace the corners of many exterior doors as well as windows. In the Freeman Ford house, several interior doors include art glass simi-

lar in design to that in the impressive main entry door. Recurring themes are a Greene & Greene hallmark.

The Halstead house (1906) was a very modest commission for the Greenes. Originally quite small, it was built with a single bedroom. Yet even in this humble home there is considerable attention to detail. Many interior doors are a four-panel design, one over three. The center bottom panel is shorter than those flanking it. The rails above and below the bottom panels are angled to meet the shorter panel rather than stepped. This is a subtle,

The Bath



Sign of the times. In the early 1900s, white was the preferred color for bathrooms because it was considered sanitary. The Gamble master bathroom followed this dictum, but in a style keeping with the rest of the house.



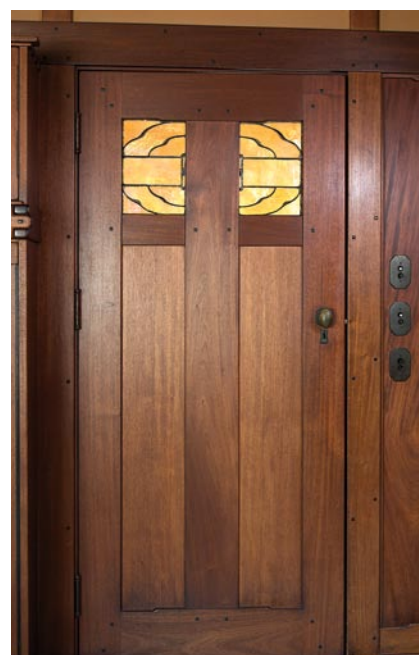
An accurate reflection. In Charles Greene's Pasadena home, the medicine cabinet contains elements that appear in the woodwork in other parts of the home.

One for the Blackers.

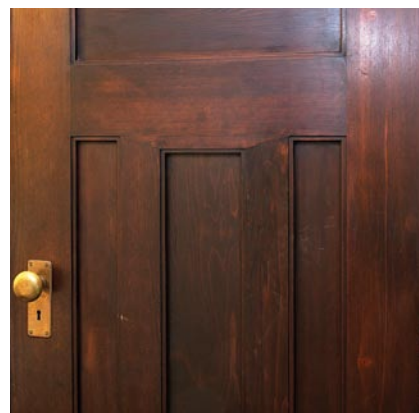
In the Blacker house, the bathroom cabinet was enhanced with art-glass doors, and the bracket detail is also present.



Entrances



Subtle details. Interior doors in the Freeman Ford house are rich in detail. Art glass lights and cloudlifts add elegance in an understated way.



Not an ordinary door. This door from the Halstead house reveals variations in door components that require extra effort in construction.

wonderful detail that inspires awe at the idea that someone thought to do it.

In some cases even garage doors got the full treatment. Today, most garage doors are generic. One look at the Gamble house's garage, with lifts and pegs creatively arranged, and there's no question as to its heritage – it is clearly Greene & Greene.

In 1916 Charles Greene moved his family north to Carmel, Calif., to pursue architecture at a reduced pace as well as other artistic endeavors. His years there resulted in some outstanding designs, very different from the

Greene & Greene norm. Most notable is the D.L. James house, a magnificent testament to the natural beauty of the Northern California coast and to Charles Greene's genius.

For the last 30 years of his life, Charles' primary canvas was his Carmel studio. The hand of the master is, to this day, seen everywhere. His carving work on the doors is magnificent. Some carvings remain unfinished, with Charles' chalk and pencil sketches still visible on them. As for all of us, Charles' list of projects was longer than his years on earth.

Now that building components are mere

commodities, it is important to recall a time when homes, large or small, were built with attention to even minor details. Unfortunately, today such quality is available only to the very wealthy. Perhaps one day the pendulum will again swing in the other direction.

Until then, we can look to the work of the past and hope. **PW**

David lives and works with wood in Columbus, Ohio. He has written several articles on Greene & Greene for Popular Woodworking. Robert is senior editor of this magazine, and the author of "Shop Drawings for Greene & Greene Furniture."



Unity, not division. The living room doors in the Thorsen house articulate spaces while continuing the overall design scheme.



Outbuildings, not afterthoughts. The garage doors at the Gamble house contain cloudlift rails and panels, a feature that recurs throughout the main house.



Active retirement. Charles Greene spent the last years of his life working in and on his studio in Carmel, Calif.



View from the back. The back entrance of the Blacker house is as important as the front. Unifying elements and design features are prominent.

building a skateboard in a vacuum

BY HUNTER LANG

Bring a new generation to the shop and learn a new technique – the vacuum-press pump.

Over the years as a skateboarder, I've owned many different skateboards of varying quality, and I have always wondered what it would be like to build one myself.

The Roarokit skateboard kit offered the perfect opportunity to experience the skateboard-building process firsthand. While it was at times challenging, the results are very rewarding for someone who enjoys tinkering and learning how things are made.

Most skateboards are mass produced in steam presses. As this would be very expensive to do yourself, a valid alternative is to use a kit and a hand-powered vacuum-press pump.

The Roarokit kit consists of a foam mold, seven 1/16"-thick maple veneers that are precut to the shape of a skateboard, the necessary glue, a mesh sleeve to hold the veneers to the mold, and a vacuum-seal bag and pump that are used to press the veneers to the shape of the mold and hold them in place until the glue dries.

Ready for Round One

Thanks to the easy-to-follow instructions, the entire process is fairly straightforward:

After some sanding, you line up a few veneers using pre-drilled holes for the trucks (the axles of a skateboard) and glue them together; then you place them in the vacuum press with the mold until the glue dries. You repeat this process until all the veneers have been glued together. Then you paint the skateboard and add the hardware.

The first step is to lightly sand each veneer before gluing to remove any rough edges.

Each veneer has an arrow on it that indicates its stacking order and which way it should face. It is important to note that the grain of veneers number three and five runs perpendicular to the grain of the other veneers. This gives the skateboard its strength. If the grain in every layer ran the same way, the board would have strength only in one direction. With alternating grain patterns, the board has strength in any direction.

In the first glue-up, three veneers are glued together. After applying glue to two of the three pieces of wood, place the veneers on the foam mold, then place the workpiece in the mesh netting that comes with the kit. (The mesh helps keep the plastic press from bunching up when the air is sucked out.)

With the mold and veneers fit into the net, place everything into the plastic vacuum-press bag. Peel the paper backing off one side of the sealant strip (it's included with the kit) and stick the strip at the mouth of the bag. Peel off the paper strip on the exposed side and place it inside the bag so it doesn't get lost; you'll need it again. Now close the bag, securing it with the sealant strip.

Putting the Squeeze On

Make sure that nothing is obstructing the adhesive seal, or the press will leak air and the veneers will not glue together properly.

Now dampen the pump's connection point on the bag with some water; this will improve

the pump seal. Attach the pump, and pump by hand until there is no air left in the bag.

While pumping, have a helper push the veneers down so that they conform to the shape of the mold. Eventually the seal will be tight enough that your helper can let go while you continue pumping. As the bag empties of air, pumping will require a drastically larger amount of force.

When all the air has been sucked out, stop pumping and simply let the bag sit for 24 hours. Check periodically that the bag is holding its seal.

After 24 hours, break the seal at the mouth of the bag, but leave the adhesive strip in place and cover its sticky side with the paper strip you put in the bag. Be sure that no foreign debris comes into contact with the adhesive strip, which would ruin the seal for the next pressing. Now take the veneers and mold out of the vacuum and mesh netting.

Some glue may have leaked onto the mold and caused the board to stick to it. If this is



Sand first. Sand off any rough edges to prevent them from puncturing the vacuum bag and to guarantee the veneers glue together tightly.



Even coat. Roll glue onto the veneer with a 3" roller included in the kit, and make sure there is plenty of glue on the edges.



This sucks the air. Pumping the press produces a vacuum that forces the plies to the shape of the mold.



In shape. The bag should be tight around the board and mold without any air pockets. A rubber band and a nail keep the wood in place on the mold.



Rough around the edges. After taking the board out of the press, excess dried glue must be removed before the next layers are added.

the case, just pry the two apart but be careful not to remove foam from the mold. Use a Surform rasp to remove any excess glue from the edges of the board or anywhere else that the glue shouldn't be.

Layer by Layer

The next two layers to be glued will be slightly more difficult to line up because the substrate (which is the first three layers you glued) is curved. Be sure to push the veneers down to fit the already glued ones and put the veneers

and mold back into the press following the same process as before.

After another 24 hours, it's time to glue down the last two veneers. Glue this layer just like the others and put the skateboard back into the mold. After the glue dries, it's time to prepare the skateboard for finishing.

Before painting, some work still needs to be done. I had some rough and uneven edges, excess glue, and a few spots where the layers of wood didn't properly glue together on the edge. First, use a belt sander to sand down the

rough and uneven edges on the sides of the board. When sanding the curved front and back, be sure to pivot the board to maintain an even curve. After the edges are smooth, use a random-orbit sander to sand the top and bottom, and round the board's edges.

If you have any areas on the edge that didn't glue down properly, the board's integrity will be compromised. To fix this problem, glue and clamp down any problem areas and let them dry. Afterward, if any gaps remain, fill them with an epoxy. Now that the board is prepped, you're ready to customize the look of your board.

The Roarokit kit can be purchased with a design already printed on the final veneer, or with all veneers left blank. I used the blank version so I could design a custom paint job.

Manufactured skateboard images are silk screened onto boards; for this project I used spray paint. I began the process by spraying on a layer of shellac as a sealer. After it dried, I sprayed a light coat of green onto the board, which allowed the grain to show through.

I then masked off all the parts of the board that I didn't want painted black, cut a design



Scrape and rasp. After using a Surform to work the edges, remove excess glue from the top of the board with a scraper.

Smooth operator. Sand the end of the board with a belt sander to remove rough edges after the final gluing.



Straight edge. Sand the side edges of the board to even out the layers and remove rough or jagged edges.

into the masking tape, and painted the uncovered areas with black spray paint. I removed the masking tape and touched up any flaws in the painting. Then, after the paint dried, I applied a final layer of shellac to seal the paint and add shine to the board.

Putting it all Together

A skateboard consists of various different parts. The main part, which I created with the kit, is called the “deck.” A skateboard also needs trucks, which are axles that also provide a mechanism for turning; wheels, which come in an assortment of colors and sizes; grip tape, essentially sandpaper on top of the board to provide traction for your feet; riser pads that go between the trucks and the bottom of the board to prevent damage to the deck; and bearings that are placed into the wheels.

I bought these parts at a local skateboard shop, but they’re easy to find online. The supplies box below lists a couple sources.

The first step in assembling the skateboard is to put the grip tape on the top of the board. The tape keeps your feet from slipping when riding the skateboard. It comes in sheets and is applied like any type of tape. Be sure to cover the deck evenly with tape, and keep it flat, without any creases. After taping, cut off any excess with an X-Acto knife.

Next, you will need to re-drill the wheel holes in the deck to clean out any glue that may have seeped in during the gluing process, and to redefine and countersink the holes on the top of the board that have been covered up by the grip tape.

Be careful. Trucks are designed with specific measurements, and the slightest variance in distance between holes may cause the trucks to not fit into the deck correctly.

After the holes are re-drilled, put machine screws through the holes from the top. Then place the riser through the screws on the bot-



Get ready to paint. Sand the bottom of the board with a random-orbit sander and #120 grit to smooth the board out and remove excess glue.



First paint coat. I sprayed a light coat of green paint to let the wood grain show through.



Ease the edges. Use the sander to round over the edges to prevent splintering when riding.



Peel then paint. I covered the board with masking tape and cut the pattern before spraying the black paint.

tom of the board. After this, put the trucks on top of the riser pads, over the same screws as the riser pads.

Be sure that the cap of each truck is facing inward toward the other one; otherwise the board will turn in the opposite direction that you intend it to while riding. After both the riser pads and the trucks are on the screws, turn a nut onto the end of each screw and tighten from both sides. (Use a screwdriver on the top side and a wrench on the bottom side.) This will hold the trucks snugly onto the board.

The trucks have a nut on top of the cap that can be tightened or loosened to make the turning action tighter or looser depending on the preferences of the skater. But don’t tighten it too much or the rubber piece inside will break from stress and the trucks will be too loose to use.

Each skateboard wheel will require two bearings and a cylinder that goes in between. Stick all of these into the wheel. It will be a tight fit, but hand pressure alone should provide sufficient force. Don’t use a tool with a distinct point to do this job, or you might damage the bearings.

One method is to push the bearings in with your hands and tighten the wheel onto the truck axle until the bearings are firmly in place. Put one wheel on each axle of the board and tighten the nut on the end tight enough that the wheels won’t wobble out of control, but also loose enough that the wheels will spin freely.

It is also important to note that the bearings will require constant cleaning. It is suggested to wipe them clean after every time that you ride. Otherwise they can clog and slow down or eventually sustain permanent damage.

The Roarokit Kit provides an opportunity for the tinkerer to experience building a skateboard firsthand. Although this may not be the easiest way to get a skateboard, you will appreciate the work that went into building it yourself more than just purchasing one at a store.

Plus, this is a great way to tackle a new technique, while building something fun with your children or grandchildren. Just don’t forget to buy a helmet and pads to go with it! **PW**

Hunter lives and attends high school in Cincinnati. When he isn’t making stuff, he plays guitar, runs cross-country and pole vaults.

Supplies

Roarokit Skateboard Company
416-938-4588 or www.roarokit.com

1 ■ Blank Street Board Deck
#01111, \$114.99

Skate Warehouse
800-467-5283 or skatewarehouse.com

Skate America
800-595-5311 or skateamerica.com

Prices correct at time of publication.

Imitation COULD BE ILLEGAL

BY JON SHACKELFORD



It has often been said that imitation is the sincerest form of flattery. Perhaps nowhere is imitation more commonplace than in furniture making. Attractive pieces from antiquity as well as the avant-garde are studied, scaled and reproduced by industrious woodworkers everywhere. But not all furniture creators and designers consider imitation a compliment – especially when it leads to lost income or damaged reputation.

In increasing numbers, furniture creators and designers are turning to intellectual property law as a means of preventing unauthorized replication of their work. Take for example

Eames. This Eames lounge chair and ottoman feature santos palisander veneer. Herman Miller was the original collaborative partner in 1956 for these and other Charles and Ray Eames pieces, and still holds exclusive license to produce these designs, which are registered with the U.S. Patent & Trademark Office.

Many iconic designs are legally protected;
research before you copy.

the famous Eames lounge chair and ottoman, pictured above. Herman Miller, who acquired exclusive rights from Charles and Ray Eames nearly 60 years ago, has sought to stop others from reproducing the “EAMES” trademark and also the lounge’s distinctive shape (its “trade dress”), and has registered these traits with the U.S. Patent & Trademark Office.

United States commerce laws encourage competition in the marketplace, and toward this end favor a competitive landscape in which many sellers can offer the same popular products. This aim, however, is in tension with two other societal objectives: 1) encour-

aging innovation, and 2) preventing consumer confusion at the point of purchase.

How does a government like the United States, dedicated to free-market principles, balance equally compelling desires to foster creativity and protect consumers from fraud or mistake in their purchases? The answer, at least in part, is to limit the commercial copying of products (such as furniture) with a few carefully crafted “intellectual property” laws.

Under what circumstances is it illegal for a woodworker to reproduce someone else’s furniture design? As a practical matter, there is a difference between building furniture for

sale and building for personal use. Although personal-use builders may be equally guilty of infringing someone's intellectual property, they are far less likely than those who sell to be noticed or pursued.

Four Types of Protection

Illegal imitation of furniture is a form of trespassing – although instead of trouncing on another person's land, the trespass is to their “intellectual” property. In the context of furniture reproduction, the most germane (but by no means the only) forms of intellectual property are: 1) design patents, 2) utility patents, 3) copyrights and 4) trademarks. For woodworkers who sell their handiwork, it may be helpful to envision these forms of intellectual property like menacing bear traps set between the workshop and the buyer. Avoiding infringement is a matter of carefully evading each trap, or seeking permission from (and often paying) the trap's owner for the privilege of crossing over. To be caught in a trap is an expensive and exhausting process whether one is found guilty or innocent.

Design Patents

Design patents, common in the furniture trades, are a first variety of traps to be dodged by the reproduction furniture maker. They protect the unique (and unobvious) ornamental designs of things manufactured, and as such are ideally suited for all types of furniture. Once granted by the U.S. Patent Office, a design patent lasts 14 years and cannot be

renewed or extended. Many successful furniture designers protect their creations with design patents.

Infringement of a design patent occurs when, in the eyes of an ordinary observer, giving attention as a purchaser usually gives, the reproduction piece substantially resembles the drawings in the design patent. If adjudged guilty, the infringer can be ordered to stop the infringement and pay money damages ranging from a reasonable royalty to compensation for lost profits or worse.

How can a reproduction furniture maker safely pass through the field of design patent traps? First, consider the age of the inspirational furniture design. If the piece to be copied has been known to the public for more than 18 years, then it is reasonably safe to assume any once-relevant design patents have expired. (Adding four years to the normal design patent lifespan accounts for possible delays in patent filing and examination.) For inspirational furniture designs less than 18 years old, the most reliable way to reduce the risk of design patent infringement is to conduct patent research. Patent infringement is serious business, and therefore clearance research is no job for an amateur; seek assistance from a qualified intellectual property lawyer.

Utility Patents

Utility patents are another gang of traps standing between a woodworker and his or her customers. These legal devices provide protection for unique (and unobvious) products, as well



Thos. Moser. This iconic chair is trademarked as the Thos. Moser Continuous Arm Chair. It is further protected by a design patent.

as the machines and processes used to make things, and the materials from which things are made. Utility patents are so common in the furniture trades that the U.S. Patent Office has dedicated specific classifications to chairs, beds and other types of furniture. A utility patent lasts (typically) for 20 years from the date it is filed in the Patent Office and in this context cannot be renewed or extended.



Frank Lloyd Wright. These chairs and the extension table were designed for Susan Lawrence Dana in 1902. Pictured above are reproductions from Copeland Furniture, which holds exclusive license to build these and other Frank Lloyd Wright designs.

Like their design counterparts, utility patents can be infringed even if the reproduction maker does not slavishly copy the original. Utility patent infringement occurs when the reproduction piece incorporates the combination of features claimed in one of the numbered paragraphs at the end of a utility patent. In addition to spending hundreds of thousands of dollars in a lawsuit, infringers will be ordered to compensate the patent holder. The utility patent shown on the next page is for the Balans Variable Chair, memorable for supporting the occupant in a semi-kneeling posture. In the mid-1980s, the patent owners sued a competitor alleging infringement.

To trek safely around all possible utility patent traps, the reproduction furniture maker should again consider the age of the inspirational furniture. Utility patents have a slightly longer lifespan than design patents – 20 years. Furniture commercialized more than 20 years earlier, therefore, is not likely to remain fettered by utility patents. If the furniture piece to be copied is less than 20 years old and has unique attributes that could possibly be protected with a utility patent, a qualified patent lawyer should be engaged to search and evaluate the patent records.

Copyrights

Copyrights are a third form of intellectual property threat to the reproduction furniture maker. Copyright can be used to protect purely stylistic elements found in furniture

design, including original works of applied decorative carvings or emblems, custom finials, original paint schemes, fabric patterns and such.

Copyrights have somewhat limited application to furniture design. The law has developed so that copyright protection should not overlap the domains reserved for patents. As a consequence, there are many boundaries placed on copyrights. For example, the overall shape of the furniture piece cannot be copyrighted – that is reserved to design patents. Nor can any functional features be copyrighted, in deference to utility patents. Even truly artistic features that are inseparably integrated into the structure of furniture cannot be copyrighted, for fear of encroaching into the patent domain.

To illustrate this last point, think of a shield-back chair with particularly artistic fretwork. If the fretwork is an integral portion of the backrest, the chair may not function properly without it. Therefore, the fretwork pattern is deemed inseparable from the structure and probably not copyrightable.

Many furniture companies routinely register copyrights covering distinctive artistic elements in their furniture designs, and do not seem reluctant to enforce those copyrights.

Under current U.S. law, a copyright automatically attaches the moment the “work” is created, and endures for the author’s life plus

an additional 70 years. In the case of copyrightable works made by a company employee, the duration of copyright will be 95 years from its first publication or 120 years from creation, whichever is shorter. Therefore, due to the longevity of copyright protection, the reproduction furniture maker/seller should be careful when drawing inspiration from any artistic sculptures, carvings or pictorial representations that are less than 120 years old.

However, the risk of copyright infringement diminishes considerably if the artistic element at issue is a common feature found in pieces by various woodworkers, or if it is so integrated into the functionality of the piece (like the shield-back chair example) that it is hard to imagine the feature as a stand-alone work of art.

Copyright law, like all other forms of intellectual property law, is infested with terminology, interpretations and exceptions crafted by courts and lawmakers over many years. There is therefore no substitute for consulting a qualified lawyer if you suspect your commercial activity will lead anywhere near another’s copyright.

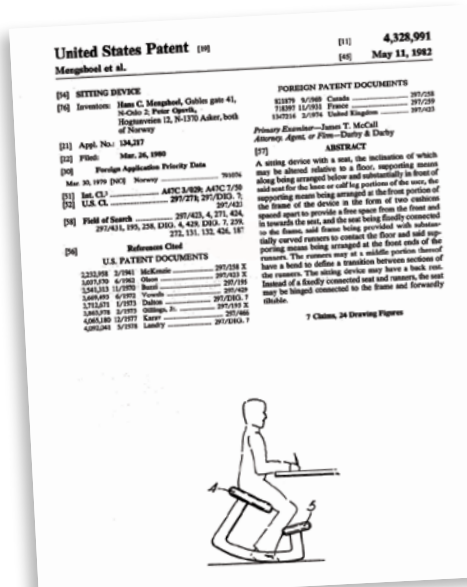
Trademarks

Trademarks are a fourth category of intellectual property traps for the furniture maker. A wise maker/seller of reproduction furniture will give wide berth to other people’s trademark rights, just as they would when crossing the areas laden with patent and copyright traps. Trademarks protect consumers from mistaking the source of a product they intend to buy. Consumers rely on trademarks (sometimes subconsciously) to indicate that a product was made or sponsored by a trustworthy source. Gustav Stickley, like many fine craftsmen and women, authenticated his pieces with various forms of trademark, from a red decal with joiners compass and “Als Ik Kan,” to paper labels, and eventually a stamped maker’s mark.

Trademarks can take a wide variety of forms – from words and logos, to colors, shapes, and even sounds and smells. The woodworker reproducing someone else’s furniture design should be especially mindful not to copy any maker marks, names, logos or distinctive product shapes (when the furniture shape is protectable as trade dress). Misappropriation of names, logos and maker marks should be rather obvious – refrain from using either the same or a confusingly similar branding technique as the original. For example, if someone



Landscape Forms. This Michigan-based company holds design patent protection on a number of their products that are seen across the world in parks, airports, on college campuses and other public spaces. The company recently defended its rights to the Austin bench, pictured above.



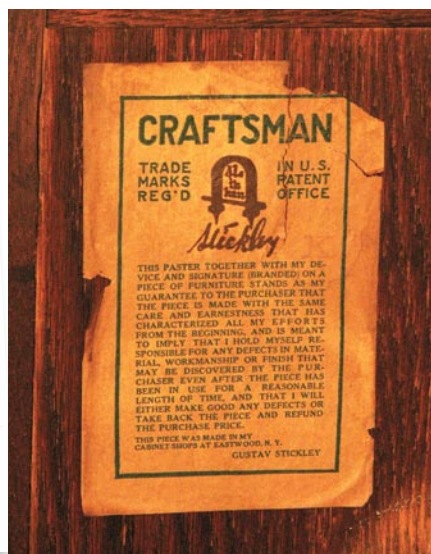
Utility patent. Above is the utility patent for the *Balans Variable Chair*, a popular seating form in the 1980s.

selling their reproduction of a Craftsman-era chair applies to it (or their advertising) any of the protected words or logos associated with Frank Lloyd Wright, the reproducer may receive a nasty letter from the Frank Lloyd Wright Foundation, which currently holds a great many trademarks associated with the late architect.

Trade Dress

Trade dress on the other hand, or as it is formally known “product configuration trade dress,” recognizes that the shape of a product can operate similar to a brand name or logo (as asserted by Herman Miller for the Eames lounge chair). Fortunately for the reproduction woodworker, the shape of a furniture piece must satisfy a high standard in order to acquire trade dress protection; not many furniture designs will qualify. Unless a business has been aggressive over a period of years policing its furniture designs, trade dress protection is not likely to be recognized.

In 1997, the U.S. Court of Appeals, 2nd Circuit, issued a decision stemming from a trade dress infringement suit filed by Michigan-based Landscape Forms, Inc., a designer/manufacturer of furniture used in airports, parks and shopping malls. The court reasoned that elements in the shape of furniture are sometimes fairly equated by consumers as the “stamp of their maker.” Despite the opportunity for trade dress protection to exist in any non-functional design feature, it will only arise



Stickley. This trademark from Gustav Stickley’s *Craftsman Workshops* is found on pieces manufactured from 1912 to 1916. The designs were out of production for a number of years, and thus are now in the public domain.

once the shape of a product has developed substantial recognition with consumers as a reliable symbol that they associate with a single producer or source.

Under the right conditions, any trademark – be it a maker’s mark, name, logo or distinctive product shape – may continue indefinitely. (Examples of long-lived trademarks include beer brands Lowenbrau, which claims rights back to 1383, and Stella Artois dating to 1366.) Unlike patents, trademarks do not have to be registered with any government agency to be enforceable. As a consequence, it is sometimes difficult to assess when a particular furniture piece embodies protectable trade dress, and all the more reason why the prudent seller of reproduction furniture relies on professional legal support to assess infringement risks.

Assess the Situation

Countless intellectual property traps have been set by furniture designers and creators to stop unauthorized copying of their work. Reproduction woodworkers aspiring to sell their handiwork are at risk of stepping in one or more traps if they are not careful.

An honest, self-administered inquiry may help the reproduction woodworker recognize when trademark infringement could be an issue. If the answer to any of the following questions is “yes,” then you may be venturing dangerously close to trademark infringement:

- Am I intentionally playing off the good name

and reputation of someone else by adopting (or straying too close to) their name, logo or product design?

- Is it possible that buyers might mistakenly assume my product is sponsored or approved by the originator of the furniture piece I am replicating?

- Is the furniture piece I intend to reproduce currently available from only one particular source?

To avoid patent and copyright traps, consider the age of the piece to be copied. If it first appeared more than 120 years ago and has since been knocked off by others without apparent backlash, then it is unlikely any threatening intellectual property traps remain. If the inspirational design is somewhere between 20-120 years old, then any patent will have expired and only copyright and trademark dimensions need be considered. Here too, multiple precedents of other people copying the same furniture design suggest the coast is clear. Any inspiring furniture design that is less than 20 years old should be reviewed for patents, in addition to trademarks and copyrights, before attempting a commercial knock-off. As a general caution, the first person to knock-off a particular furniture design, even one that is greater than 120 years old, should be wary. In all cases, consult a qualified intellectual property lawyer before exposing yourself to unnecessary risk and liability.

On the flip side of this discussion, if you happen to be a furniture designer and want to protect your latest masterpiece, consider all these forms of intellectual property. Patent strategies tend to be the stronger and more easily enforced forms of intellectual property protection. However, patent protection can be expensive and the decision to file for a patent must be carried out early, at most within one year of first making the furniture design known to the public. For non-functional artistic features of furniture design, copyrights provide a lot of “bang for the buck.” They are easily registered and enjoy a long lifespan, although they are only effective against direct copiers. Trademarks are a valuable tool for any business, but require consistency in use and vigilant policing and marketing in order to maintain. **PW**

Jon is an attorney specializing in intellectual property law, and is registered with the U.S. Patent & Trademark Office. He has been counseling inventors and avidly working wood in his spare time for more than 20 years. Jon lives in Chelsea, Mich.

Flush-cutting Jig

An end to the troublesome task of trimming solid-wood edging.

Adding a solid-wood edge to plywood is a necessary but evil task for most woodworkers. And while clamps and cleverness go a long way toward getting the edging stuck to the plywood, the real trouble begins when you trim the edging flush to the plywood.

Thanks to the ever-shrinking thickness of plywood's exterior skin, it seems to get harder every year to work the stuff without cutting through the face veneer and exposing the ugly plies below. So you have to be careful any time you deal with the stuff.

There are lots of ways to trim the edging, and I've tried just about every one of them. Here's what I've found:

■ **Scraping or sanding.** If you can get your edging on just right so that it's only about $\frac{1}{64}$ " proud of the plywood, then it's a simple thing to sand or scrape it flush as you prepare your parts for finishing.

Unfortunately, to work to this tolerance generally requires great skill or special router bits that create an interlocking joint between the edging and the plywood. You also can add splines to the edging and the plywood to create this interlock – which is an extra step.

■ **Planing.** If you don't have the special router bits or don't want to cut splines, you can make your edging just a little wider and simply use glue and clamps to apply the edging. The edging will slip around a bit, but that's why you give yourself a little extra meat on the edging – usually $\frac{1}{32}$ " to $\frac{1}{16}$ " on each face. This is too much to easily sand or scrape, and so one solution is to plane it, then scrape or sand it. Planing it (I use a block plane) is OK if you have only a few shelves to do. When you are building an entire run of shelves, it's more work than necessary.

■ **Routing or sawing off the waste.** Other solutions include removing the waste with a router with a flush-trim bit, or sawing off



Just a little off the bottom. When you add solid-wood edging to plywood, trimming the solid wood flush to the plywood can be tricky or tedious. This simple jig (two bits of wood that are nailed and glued together) makes it simple and quick.

the waste with the cut being limited by some sort of accessory fence. Every one of these solutions involves balancing the work on its skinny edge and pushing it past the cutter. This can be a tippy situation – one false move and your plywood or edging is toast. Plus, it can be difficult to keep the workpiece against your fence with enough force to get the edging truly flush to the plywood.

Solution: Work Flat

My solution came to me a few years ago when trimming all the edging for the built-ins in a home addition. I needed something that

could run hundreds of feet of plywood with little chance of spoiling the work. And I didn't want to buy some fancy tooling.

So here's how it works: You need a couple scraps of plywood (their size will vary depending on your work), a stack dado set and your table saw. The two pieces of scrap are screwed together to form an "L" shape: One part sits flat on the top of the saw, the other hooks over the rail of your saw's fence (don't forget to clamp it there). Then you install the dado stack. Put enough chippers on the arbor so that it will make a cut that is slightly wider than your edging. Then raise

CONTINUED ON PAGE 82



An overgrown bench hook. This jig works on the same principle as a bench hook, but it's essential to clamp the hook to your table saw's rail to be safe. You don't want it to move.



Safe and accurate. One of the things I really like about this jig is that you can push the work flat over the blades, plus you can use your basket guard for added safety.



A brush with flushness. To set the dado stack so it is exactly as high as the top of the jig, rub a piece of your work over the knives. The knives should just brush the work.



Results. Here you can see how the jig cut this edging flush (the small ridge is actually the glue squeeze-out left behind). Above it is an example of the shelf's finished and profiled edge.

the saw's arbor so the dado stack is exactly as high as the scrap plywood piece on your saw's table. (One note on dado stacks: This jig won't work well if you have a cheap dado stack where the chippers are shorter than the outside blades.)

Now set your table saw's rip fence. Lock down the fence so that when you push your workpiece over the jig and against the fence, the edging will pass over the dado stack.

This jig and technique have a number of advantages:

- The work remains stable during the cut. The more you press the work against

the jig, the cleaner the resulting cut. Plus, it works fine even if the plywood has a little waviness to it.

- You don't have to balance the work on edge, so you won't gouge the plywood or the edging by accident.

- You can easily use a basket-style table saw guard with this jig.

- Feeding the stock is a natural and easy motion – like ripping a board.

- The jig is so simple you can just recycle it at the end of the project.

As you get more confident with the technique, you will be able to easily set the fence

so that the outside teeth of your dado stack are positioned exactly where the seam is between your plywood and the attached edging. When you hit this sweet spot, it's almost impossible to cut through the plywood skin.

And while this jig removes a major source of anxiety with a project, it's still not enough to make me enjoy working with these plywoods with paper-thin veneers. **PW**

Christopher is the editor of this magazine and the author of "Workbenches: From Design & Theory to Construction & Use" (Popular Woodworking Books). You can visit his personal blog at LostArtPress.com.

Corner Shelf

This handsome hanging storage unit is a snap to build with screwed butt joints.

This simple and casual storage unit offers a choice when it comes to stock selection. In the November 2007 “I Can Do That” column, we discussed an easy way to glue up panels using pocket screws (“Shaker Step Stool,” issue #165). So you might wish to follow the steps outlined there to make panels for the backs, top and shelf.

But, you can also buy already glued-up panels of pine at the home center for just a little more cash outlay, so that’s what I did for this project. My shopping trip for this corner shelf was quick and easy. I picked up two 24" x 48" pine panels, one pine 1" x 8" x 3' for the sides, one pine 1" x 2" x 2' for the rail, and two double hooks with a rubbed-nickel finish.

Start by cutting your top to the proper-sized square; the rest of the pieces simply need to fit under it, as shown below. While the top in my version is 23½" square, you can easily make yours smaller (or larger), and base the size of your other pieces off the top, calculating in a ¾" overhang.

To cut all the panels to size, I clamped a straightedge with a beefy edge to the piece,



Corner storage. Simple to build, this shelf unit with hooks adds casual elegance to an often-overlooked storage opportunity – a corner.

1½" to the left of my cutline, and used that as a rail along which to guide the jigsaw. (Note that one back piece is 21¼" wide, the other is 22" wide because they overlap.) Depending on the width of your jigsaw (or circular saw) base, your setup may vary. To set your straightedge location, simply measure from the edge of the blade to the outside of your baseplate. That’s the offset for your guide.

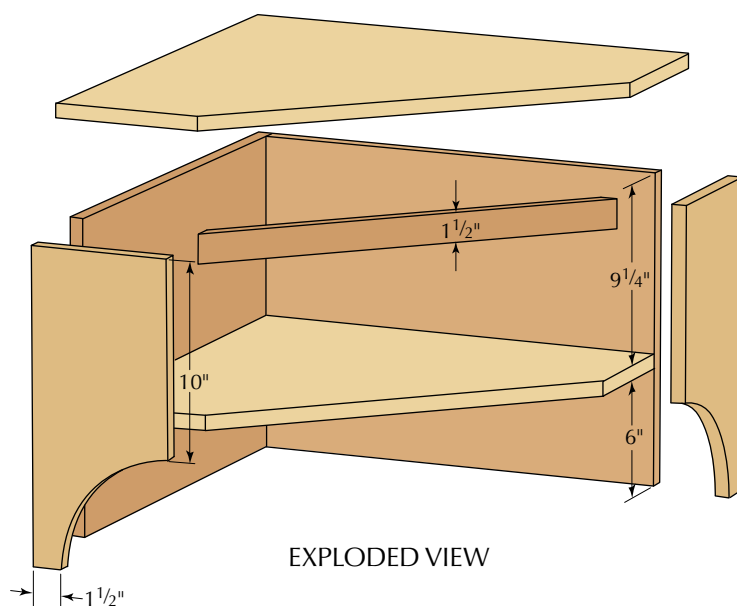
To join the two back pieces, lay the narrow back piece face down on a table, line up a thick caul (a piece of 2x4 works well) across the edge, and clamp it in place. This allows you a flat reference surface against which to



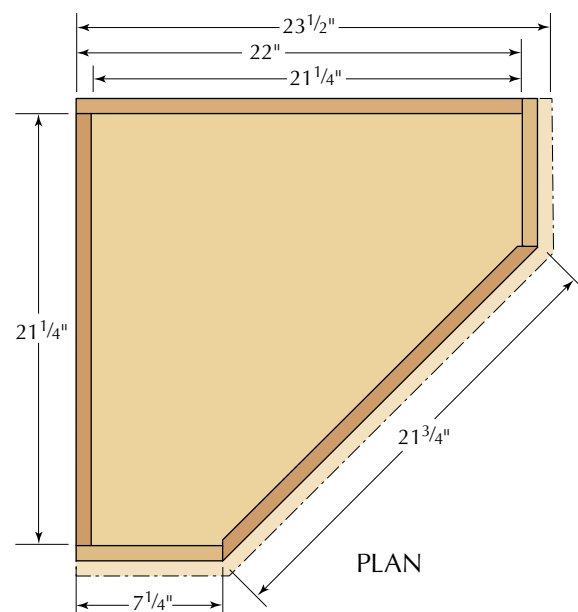
Cut to size. Cutting your top to size first allows you to easily fit everything that goes under it, even if you change the dimensions to suit your specifications.



Straightedge jig. A straightedge with a beefy edge makes a good guide for making straight cuts with a jigsaw or circular saw.



EXPLODED VIEW



PLAN

balance the wide back piece as you drill holes and screw the pieces together (I used 1 1/2" x #8 screws). Set the back pieces aside, and move on to the top and shelf.

To make the 45° cuts across the top and shelf, use the same jig setup as for the panels. On the top, the angle begins 8" from the back corners; on the shelf, it's at 6 1/2".

The sides were simply chopped to 7 1/4" length from the dimensional stock to 16" at the miter saw.

Then, I measured in 1 1/2" from the bottom edge, grabbed a handy bucket off our shop shelves, and used that to draw my arcs. The arc ended at 6" from the side's bottom edge, so that's where I installed the shelf later in the process. The position of your shelf can vary based on your radius—or based on what you think looks most attractive. There's no structural reason that the shelf be aligned with the curve.



What's on hand. You don't need a compass to draw an arc. Just grab whatever's handy around the house. I used a bucket with an 11" diameter to its outer rim.

Corner Shelf

NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL	COMMENTS
		T	W	L		
❑ 1	Narrow back	3/4	21 1/4	16	Pine	
❑ 1	Wide back	3/4	22	16	Pine	
❑ 2	Sides	3/4	7 1/4	16	Pine	
❑ 1	Top	3/4	23 1/2	23 1/2	Pine	
❑ 1	Shelf	3/4	21 1/4	21 1/4	Pine	
❑ 1	Top rail	3/4	1 1/2	21 3/4	Pine	45° on both ends

After marking and cutting one side with a jigsaw, I used that cut to mark the second side. I then cut it, clamped the two together, and did the final shaping and smoothing with a rasp and #120-grit sandpaper. I also sanded to clean up saw cuts and break the edges.

Now it's time to put it all together. First, position your shelf and mark on the back of both back pieces the location for your screw holes (I used five screws across each back piece). Drill pilot holes at the marked locations into the positioned shelf, then sink your screws.

Position your side pieces with the top edge aligned with the top of the back pieces, and drill pilot holes and countersinks to attach the sides to both the backs and shelf (I used four screws along the side, and two to hold the sides tight to the shelf).

Nail (or screw) the top in place after drilling pilot holes, making sure you have an even overhang on both sides.

The last step is to measure across the front edge just under the top, and cut your rail to length. So that it fits snugly into the angled opening, cut 45° angles on both ends. Now

run a bead of glue along the top edge, position it, drill pilot holes and nail it in place.

Now that everything is assembled, fill your screw and nail holes, then paint, add the hooks where you like them, and you're done. **PW**

Megan is the managing editor of this magazine. Contact her at 513-531-2690 x11348 or megan.fitzpatrick@fwpubs.com.

About This Column

Our "I Can Do That" column features projects that can be completed by any woodworker with a modest (but decent) kit of tools in less than two days of shop time, and using raw materials that are available at any home center. We offer a free online manual in PDF format that explains all the tools and shows you how to perform the basic operations in a step-by-step format. You'll learn to rip with a jigsaw, crosscut with a miter saw and drill straight with the help of our manual.



Visit ICanDoThatExtras.com to download the free manual.

Applying Wiping Varnish

Practice makes perfect.

I've written several times in these pages about wiping varnish being one of the best finishes for a woodworker not using a spray gun—most recently in November 2005 (you can find that article in the finishing section at popularwoodworking.com). Wiping varnish is simply alkyd or polyurethane varnish thinned about half with mineral spirits (paint thinner). The thinning makes the varnish easy to wipe on the wood.

If you remember, I pointed out that the big problem with wiping varnish is manufacturers concealing what's in the can. Instead of calling the product what it is—thinned varnish—they commonly use uninformative names such as “tung oil,” Seal-a-Cell, Waterlox, Profin or Salad Bowl Finish.

This user-unfriendly marketing practice has prevented the finish from being treated as a “category” in the manner of other finishes such as oil, shellac, lacquer and water-based finish.

The advantage of grouping all thinned varnishes as a category is that it allows us to discuss uniform application procedures that apply to every brand. For this article, we're going to avoid confusion by making our own wiping varnish.

I've designed this article as a step-by-step instruction using scrap wood, similar, for example, to an exercise in learning to cut dovetails. If you would like to follow along, you will need the following supplies, most of which are available at a home center.

- A quart of gloss, oil-based polyurethane varnish (approximately \$8).
- A quart of mineral spirits, also known as paint thinner (approximately \$5).
- A clean, wide-mouth jar with a lid (from your kitchen).
- Latex or other type of protective gloves (approximately \$2 for 10 pair).



A simple solution. Above is everything you need to make and apply wiping varnish, which is simply alkyd or polyurethane varnish thinned about in half with mineral spirits. By first practicing on scrap, you'll feel more comfortable when you tackle the real project.

- Lint-free rags such as old, clean T-shirts, cheesecloth or Scott Rags, which are paper rags in a box or on a roll (approximately \$2 for the roll).
- A sheet of #400-grit sandpaper (approximately \$4 for a packet of three).
- A 2' x 2' or larger, sheet of 1/2" or 3/4" veneered plywood or MDF. Any hardwood veneer is OK (from your scraps, a wood sup-

plier or one of many cabinet shops that often throw away pieces this size).

- A brown paper bag (from the supermarket).

The procedure is detailed in the following pictures.

Bob is author of “Understanding Wood Finishing” and a contributing editor to Popular Woodworking.



1 To make your own wiping varnish for this exercise, pour approximately equal amounts of oil-based polyurethane and mineral spirits into a wide-mouth jar.



2 Be sure to stir the thinned polyurethane or the two parts will remain separated.



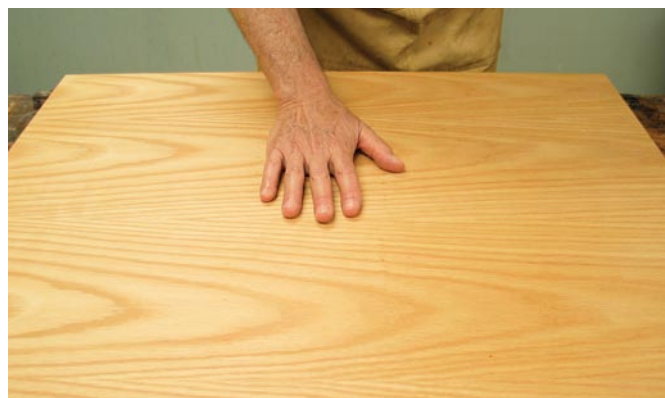
3 Before applying the finish, sand the surface of the panel to #150 grit or #180 grit, with the grain. (If you use a random-orbit sander, finish off by sanding in the direction of the grain with #180 grit to remove the sander swirls. Back the sandpaper with a flat sanding block.) Remove the dust with a vacuum if possible so you don't brush the dust into the air. You can also use a tack rag, but you will load it up pretty quickly. Then pour some of the wiping varnish onto the wood and wipe it all over the surface with one of the types of rags. You could also brush on the wiping varnish, but pouring and spreading is much faster.



4 After thoroughly wetting the surface, wipe off all the excess wiping varnish with a dry rag. (I seldom use cheesecloth, and I often use the Scott Rags. Here I'm using an old, clean T-shirt.) There's no need to scrub dry; simply wipe to remove the wetness. Let this first coat dry for four to six hours or overnight.



5 Sand the surface lightly using #400-grit sandpaper until the finish feels smooth. It shouldn't take much, usually not more than one or two passes everywhere. There's no reason to use a flat block to back the sandpaper. For the most efficient use of the sandpaper, tear off a third of a sheet crossways, and fold it into thirds lengthways. This gives you three faces for easy handling.



6 Remove the sanding dust with a vacuum or a tack rag. Finish by wiping over the surface with your hand. You'll feel if any dust remains and your hand will pick it up. You can wipe your hand on your pants to clean it.



7 *For the second coat*, we'll leave a little more finish on the surface, though you could apply all coats in the manner of the first. The downside of the first method is that the build will be slow, but each coat will be almost perfect. Instead of using a brush for the second coat, fold one of the rags to create a flat side. Here I'm using a Scott Rag.



8 *Just as with the first coat*, pour some of the wiping varnish onto the surface and wipe it around with the folded cloth.



9 *With the surface wet*, begin wiping in the direction of the wood grain to get an even thickness that is slightly more than damp but not as wet as when brushing. If you have poured too much finish onto the surface, remove some with a dry cloth and continue spreading with the folded cloth. Move your head to catch a reflected light on the surface to see what's happening so you can correct problems. This is critical for achieving good results. Let this coat dry for four to six hours or overnight (the finish dries faster in warmer conditions). Clearly, each coat has to be kept very thin on vertical surfaces to avoid runs and sags.



10 *When the finish is dry*, sand the surface lightly with #400-grit sandpaper to remove dust nibs and other problems. (There are always dust nibs when you apply the finish damp or wet.) Sand just enough so the surface feels smooth.



11 *If anything should go wrong* during application – for example, using a dirty cloth that leaves lots of dust in the finish – you can remove the uncured finish for quite some time by wiping over with a cloth wet with mineral spirits. You won't remove or damage the coat underneath.



12 *You can apply as many coats* as you want, until you get the look you want. You can experiment with how much finish you leave on the surface with each coat. Once you have built a noticeable thickness, the finish will be glossy. If you would rather have a satin sheen, apply a last coat or two using gel varnish (also sold as neutral gel stain) in the same manner as the first coat of wiping varnish. Wipe off all the excess. No matter how clean you get the air in your shop, there will always be some dust nibs. An easy way to remove them without changing the sheen is to rub lightly using a folded brown paper bag. Wait to do this until the finish has cured enough so you no longer smell the paint thinner with your nose pressed against the surface. You'll be amazed at how effective this is. **PW**

Pink Lemonade

An old piece of MDF brings back happy memories.

"Happiness isn't something you experience; it's something you remember."

— Oscar Levant

That quote knocked around in my head for days. You know the feeling. A little voice is screaming the answer to a question from the basement of your brain and it takes a good night's sleep or some distraction to hear it clearly. To a large extent woodworking serves this function. Concentrating on the repetitive strokes of a plane iron on a sharpening stone leaves a lot of brain power to do other things.

So what else is it about woodworking that makes us happy? One weekend the answer came to me toward the end of a month-long project. Several years ago my wife and I decided to take advantage of the housing-price bubble in California and build an addition to our home. She needed an office. Our teenagers needed a recreation room. Our aging parents might someday need an eldercare room that could double as a guest room for now. And I wanted a shop. We love our neighborhood and didn't want to move, so we built on.

At first, the shop became a combo faux-office and paint room. The garage continued to serve as a weekend woodshop. Everything on wheels and both cars back in by Sunday night was the promise. That worked well until a woodworking uncle got senile and I became the recipient of a 20" planer, an 18" band saw and a big dust collector. My car lost out for a year. Meanwhile, the hand-tool drumbeat of Christopher Schwarz, Adam Cherubini, Rob Cosman and others advocating safer, dust-reduced and less noisy shop practices finally got to me — it was time for a change.

The paint shop part of my faux-office was a 7' x 11' space. With a clever plan this space transformed during a month into a hand-tool shop. A newly cut-in window, tongue-and-groove knotty pine paneling made with 19th-century moulding planes purchased off the Internet, and my Brazilian hammock hanging between two hooks for the occasional nap, made the room finally habitable.

It also smells good.

Now we come to the happiness part. One of the last things was tackling the accumulation of wood left over from past projects. You know, the corner of the garage that has cut-off ends that are too big to just throw away. Over the

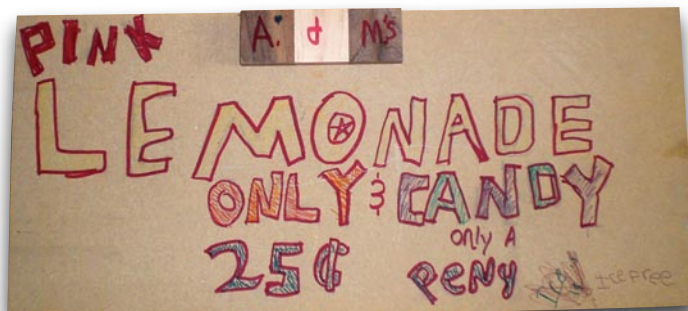
ter had made the sign when she was 8 years old. She had left it as a legacy for me to enjoy years later.

"A & M's Pink Lemonade" stand lasted only one summer's afternoon. Two little girls had the time of their lives using Dad's tools and materials to hammer, draw and imagine all of the money they were going to make. After all, Pink Lemonade at 25 cents, Candy only a "peny," and free ice would be a real deal for all of the thirsty commuters traveling past our front yard.

My daughter has always had an entrepreneurial bent. Her preschool resume includes collecting trash from around the house to sell to people who didn't have any; going around the neighborhood offering to draw pictures for people for cash; and finally her desire to be a country-western singer with the stage name Ginger Ale. You haven't lived until you have a daughter.

Her handmade sign became the finishing touch for my little faux-office shop. Someday, maybe I'll sell it for a million dollars on eBay. That is what those memories are worth to me.

And, now I know Oscar was right. Happiness is something you remember. And that is a reason to love woodworking. You can make something for others that really evokes happiness. Perhaps someday, my daughter will find some little thing her ol' Dad made that will fetch her as many happy memories as that "Lemonade" sign brings me. **PW**



years, this pile has taken on a life of its own. We call it Fred. It was time for Fred to lose some weight. So one Sunday, with strains of Bach and Handel playing in the background, I began to do something about Fred.

As I worked through a warm August afternoon, sorting Fred into useables and throw-aways, I came to a good-sized piece of MDF and reached down and pulled it out of the pile as a probable useable. Turning it over, however, my throat got a lump and I just stared at the piece. In large felt-pen letters was the word "Lemonade." Nailed across the top was a remnant of a chess board made long ago. In a flood of memories, I recalled that my daugh-

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