TAUNTON'S

Fine WoodWorking

12 hand tools everyone needs, p. 22

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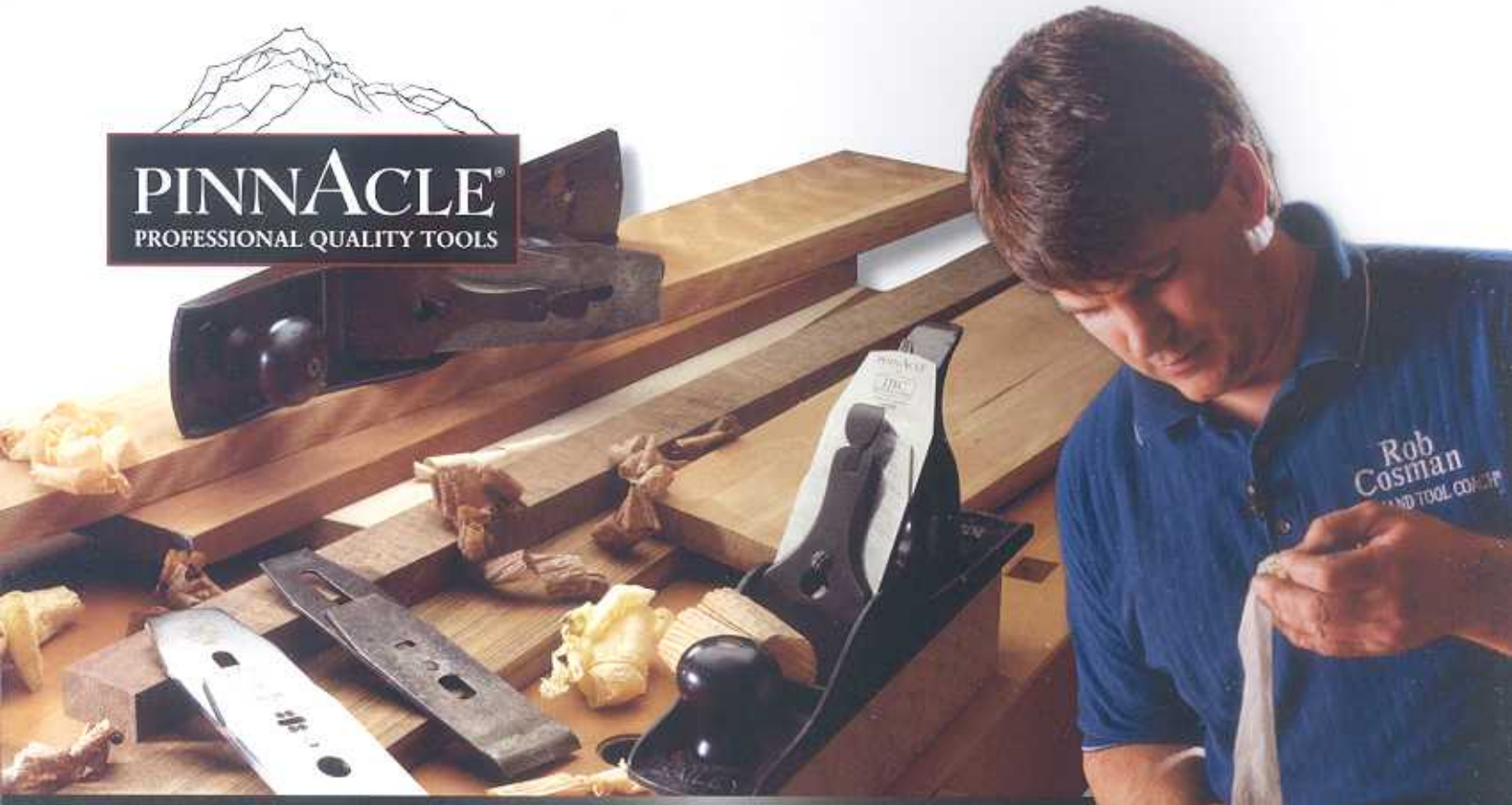

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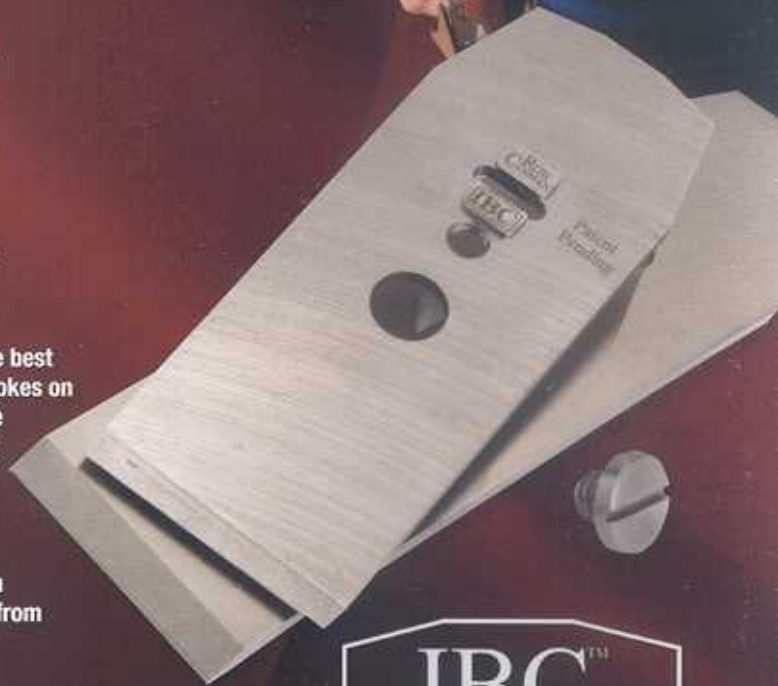
I have been tuning up old Stanley planes for over 30 years. We have even salvaged planes from before 1910. Tremendous satisfaction can be had from reviving and using an old heirloom."

— David Charlesworth, http://www.davidcharlesworth.co.uk/



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Fine WoodWorking

NOVEMBER/DECEMBER 2010 ■ ISSUE 215

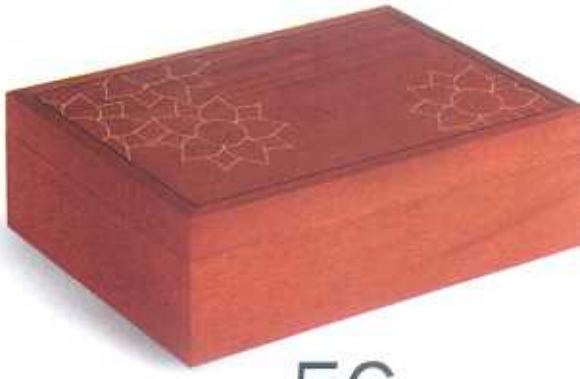
contents

up front

features

The Taunton Press
Inspiration for hands-on living®

Cover photo: Keith Wright



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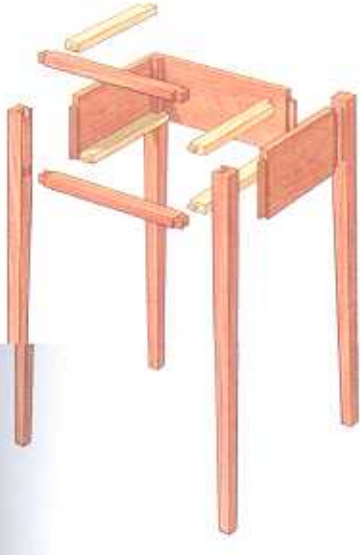

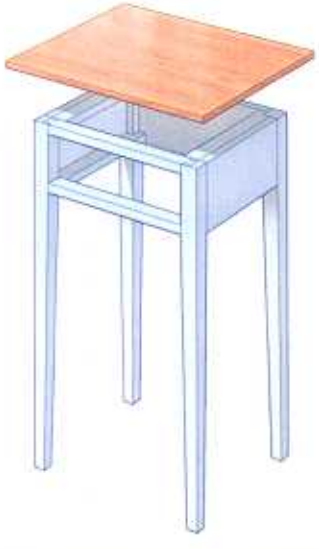

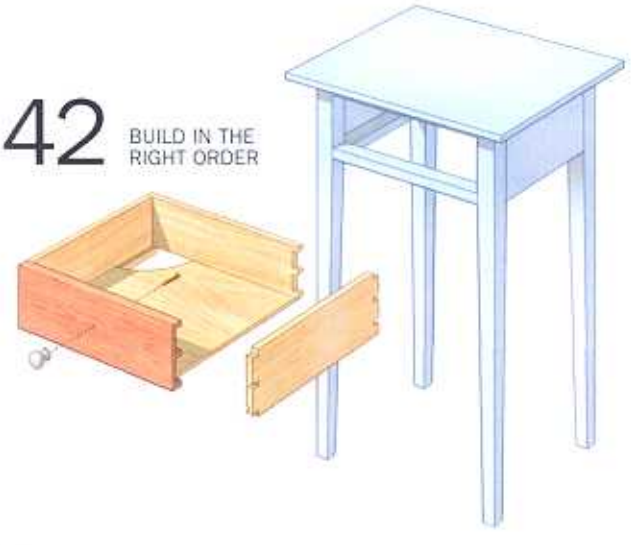

on the web

THIS MONTH ON FineWoodworking.com/extras

Visit our Web site to access free Web tie-ins, available September 30. While you're there, don't miss our collection of free content, including tool reviews, an extensive project gallery, and must-read blogs.

New Blog: Handwork

Get the latest on the hand-tool world with techniques, reviews, and more.

Free Woodworking Plans

Find your next project in our new online index of free and member-only plans. Click on the "Plans & Projects" tab at FineWoodworking.com.

Great Work Wins Prizes

Chad Hill of Fredericksburg, Va., won a complete spray system with this Baptismal Table. Isn't it time you entered one of our gallery challenges?

PHOTO: LARRY W. STONE

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Get free plans and more by signing up for our eLetter at FineWoodworking.com/newsletter.

Become an online member

Access more than 500 exclusive project and technique videos by subscribing to FineWoodworking.com. You'll also get more than 30 years of magazine archives at your fingertips, including 1,400-plus articles and project plans.

VIDEO WORKSHOP

Build a Hybrid Roubo Workbench

Coming Oct. 1: Follow along with *Fine Woodworking*'s John Tetreault as he builds this modern twist on a traditional design. It features tail and twin-screw vises from Lie-Nielsen, and a timber-frame base.

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- A flat and sturdy top
- A sliding deadman
- Custom benchdogs

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contributors

As the founder and president of the Society of American Period Furniture Makers, W. Mickey Callahan (*"Build a Classic Corner Chair"* and Master Class) aims to stimulate interest in American period furniture design and construction. The society now has 11 regional chapters, a glossy publication, and both a winter conference and a summer class. You can learn more and become a member at sapfm.org.

An interest in architecture and a love of art led **Judith Ames** *("Comfortable Bench for Two")* to a career making furniture. Her designs show her love of flowing curves, marquetry, and clever joinery: "Bodies move in curves and fit best into curved shapes," she says. Ames and her husband, Hank Holzer, work at Northwest Fine Woodworking, a Seattle gallery and woodworkers' cooperative. For more, visit holzerames.com and nwfinewoodworking.com.

Vijay Velji *("Shellac's Amazing Journey")* grew tired of buying slow-drying, stale shellac. So in 1996, he started Shellac Finishes (shellacfinishes.biz) by importing flakes from India. With encouragement from *Fine Woodworking*, Velji (center) traveled to India and took photographs of rural shellac production with the help of a guide (left) and a village headman (right). If you have questions, you can email him at sales@shellacfinishes.biz.

Steve Latta *("Dress Up Your Work With Creative Stringing")* has written more than two dozen articles for *FWW* since he first appeared in our magazine nearly 17 years ago. Now a contributing editor, he builds period reproduction and contemporary furniture on commission and teaches cabinetmaking at Thaddeus Stevens College of Technology in Lancaster, Pa.

Gregory Paolini *("Make a Limbert-Style Coffee Table")* lives in the mountains of western North Carolina, where he is a professional furniture and cabinet maker. He is a frequent contributor to *FWW* and also teaches woodworking classes. For more information and to see his portfolio, go to gregorypaolini.com.

For more information on our contributors, go to FineWoodworking.com/authors.

We are a reader-written magazine. To learn how to propose an article, go to FineWoodworking.com/submissions.

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Advertising Senior Vice President	Stephen Giannetti 203-304-3569 sgiannetti@taunton.com
Advertising Director	Peter Badeau 203-304-3572 pbadeau@taunton.com
Senior National Account Manager	Linda Abbett 203-304-3538 labbett@taunton.com
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letters

From the Editors

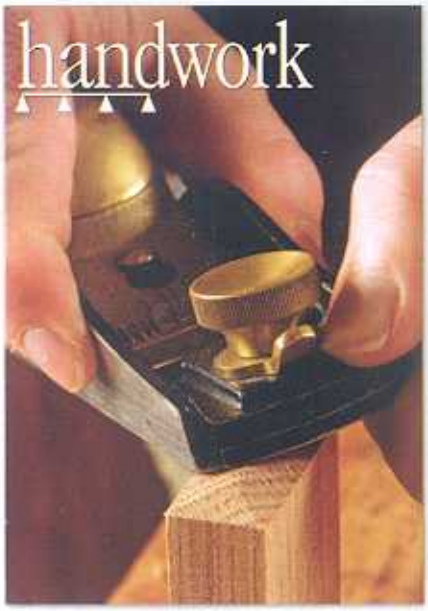
HAND TOOLS IN THE SPOTLIGHT

I understand why power tools are popular. They're efficient and accurate. But sometimes a hand tool is the smarter choice. Nothing preps a surface for finishing like a smoothing plane and no joint is as beautiful as a hand-cut dovetail. Simply put, to do your best work, hand tools should have a place in your shop.

I was lucky. I was exposed to hand tools early on. I learned how to sharpen them properly, and therefore I was able to use them to full effect. And my learning curve was shorter because companies like Lie-Nielsen were turning out top-notch tools that work right out of the box. That's probably why a lot of you have caught the hand-tool bug too.

I'm happy to announce that starting in this issue you'll find Handwork, a new section of *Fine Woodworking* devoted to hand-tool use. Don't worry, we'll still cover hand tools elsewhere in the magazine, but Handwork gives us a chance to cover techniques and tools that might not make it in otherwise. In keeping with our overall take on woodworking, we'll keep Handwork practical. We'll focus on helping you make better furniture by showing you the hand tools and techniques that make sense in a modern shop. And there is quite a bit to cover, even if we pass by pit saws, adzes, and other favorites of collectors and historical re-enactors.

Make sure to look for my new blog, also called Handwork (FineWoodworking.com/extras), where I'll bring you an even broader approach—looking at new tools, interviewing hand-tool users and makers, providing quick tips, and answering questions.



In this issue (p. 22), Michael Pekovich calls upon his years of experience making furniture to put together an overview of the 12 hand tools he considers necessary for fine woodworking. In future issues, Alf Sharp will use a pair of molding planes to make custom moldings, and Garrett Hack will turn an ordinary bench chisel into an indispensable skew chisel. And that's just some of what we have in store!

—Matt Kenney, associate editor

Modern glues are not repairable

The title of a recent Q&A, "Modern glues are strong enough for future antiques" (*FWW* #212), left out an important part of the story. Most antiques have survived by virtue of the reversible qualities of animal-based glue. Otherwise, broken furniture would have been junked and lost forever, or at best cannibalized by repair. By using today's non-reversible adhesives, we are creating a situation where fine pieces won't be able to be repaired.

It is reasonable to assume a chair will get damaged at some stage, either by racking the frame, the attentions of a new puppy, or some other circumstance or abuse.

Our cars don't have the engine welded to the gearbox or the whole assembly welded to the chassis; they are removable for reasonable repair, just as our furniture parts should be.

—KARL MADDEN,
Dunshaughlin, County Meath, Ireland

Melt wax sticks to fill defects

I would like to add a tip to Michael Miller's excellent article on finishing fixes (Finish Line, *FWW* #214). As a customer-service rep for a cabinetry company, I used the same Mohawk brand putty sticks as Miller. But for larger holes, instead of kneading the wax and pressing it in, I heated the stick with a small lighter and let the wax drip into the recess or crack. Then I just let it cool and harden and scraped away the excess. Last, I sprayed on little Deft lacquer (it sticks to the wax) and off I went.

—HAROLD STEWART, Oxnard, Calif.

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To contact us:
Fine Woodworking
The Taunton Press
63 South Main Street,
PO Box 5506, Newtown,
CT 06470-5506
Tel: 203-426-8171

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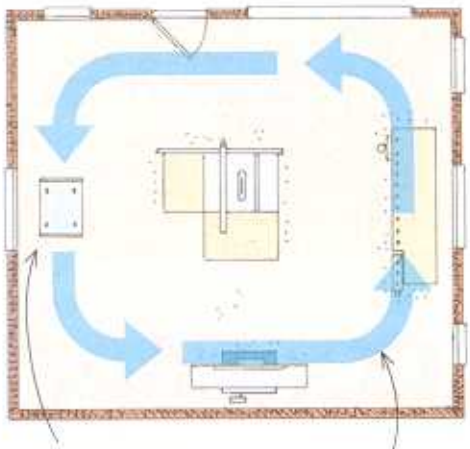
Get more from your air filter

I was happy to see that your recent test of air filters (*FWW* #213) was done with good protocol. The best part of the results was that all of the units remove the contaminants, especially those that can be inhaled deep into the lungs.

I would add that the placement of the air filter can influence the collection of particles. Correct placement of the unit is along a wall, near the middle, so that the air blows in a racetrack pattern around the room, collecting particles and carrying them back to the intake. Also, hang these units no higher than 8 feet, so the collected particles are removed from the breathing zone of the user.

—ALAN C. VEECK, certified air filter specialist, National Air Filtration Association, Virginia Beach, Va.

CREATE A RACETRACK



Place the air filter midway along a wall.

Airflow catches particles and returns them to the unit.

Kudos to North Bennet Street School

I was excited to see the article about the North Bennet Street School ("Stellar Training in Craftsmanship, Period," *FWW* #213). After attending an NBSS open house several years ago, I took the 10-week Fundamentals of Fine Woodworking workshop and haven't been the same since. The workshop was the best-organized class I've ever had in any subject. I've been a seat-of-the-pants woodworker since childhood, but this raised significantly my standards for my own work and gave me greater freedom in designing projects. And just learning the right way to sharpen tools was liberating. One should go to an NBSS open house cautiously: It could change your life!

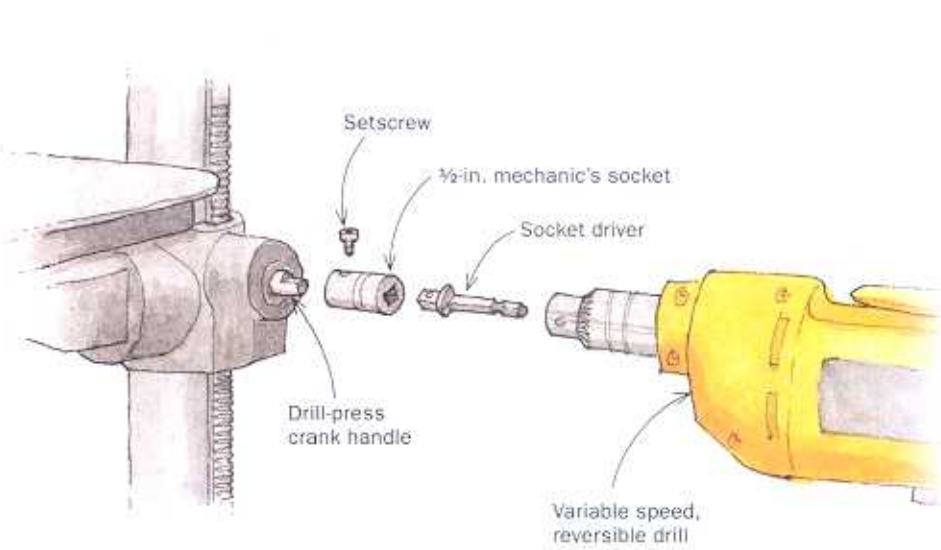
—ELLEN CHASE, Alstead, N.H.

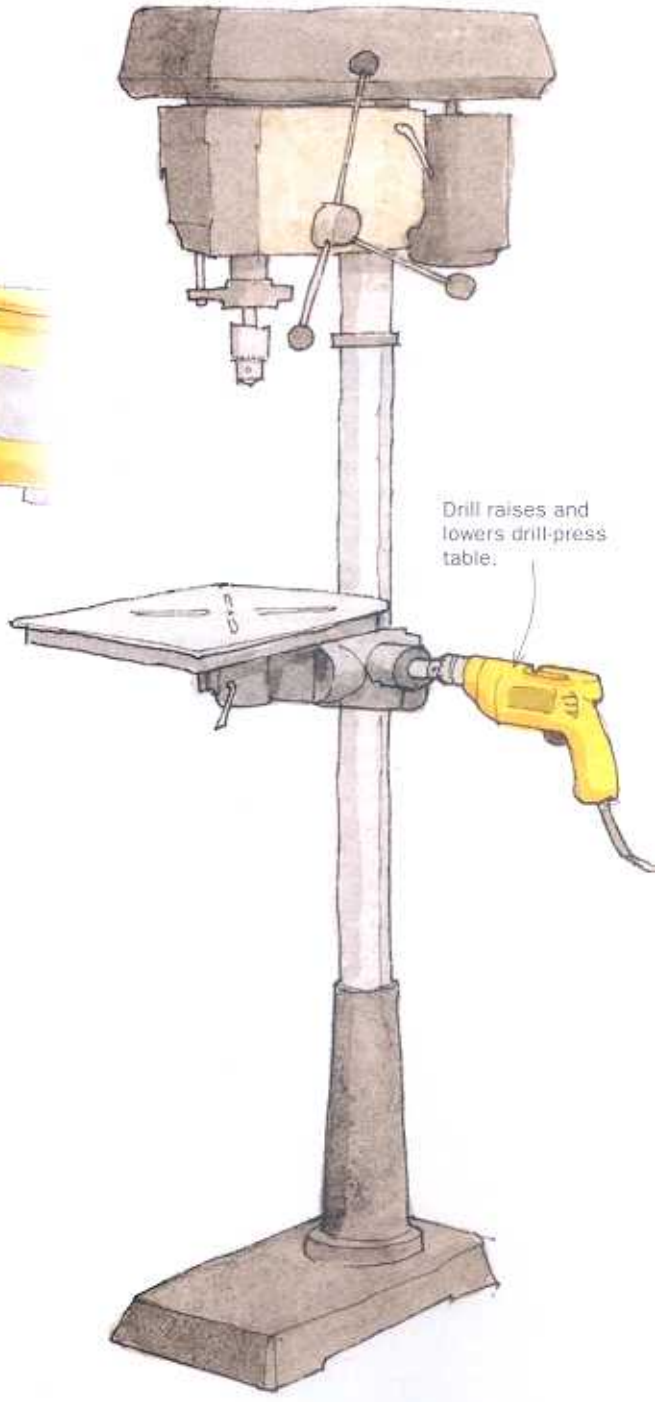
About your safety

Working wood is inherently dangerous. Using hand or power tools improperly or ignoring standard safety practices can lead to permanent injury or even death. Don't perform operations you learn about here (or elsewhere) until you're certain they are safe for you. If something about an operation doesn't feel right, find another way. We want you to enjoy the craft, so please keep safety foremost in your mind.

methods of work

EDITED AND DRAWN BY JIM RICHEY





Best Tip

Power lift for drill-press table

Micheal Jones, a self-taught woodworker, has been building furniture and cabinetry for more than 30 years. Always in search of a way to make a job easier, Jones says he has been known to spend more time building a nifty jig for a project than he's spent making the project itself.

I am getting on in years and I need to find ways to make woodworking less physical. Here is the way I make adjusting the height of my drill press table much easier.

My drill press employs a crank handle to raise and lower the table. But I found the handle to be awkward and hard to turn. So I rigged up a method that does the job using an old hand drill. The drill I use has variable speed, is reversible, and has plenty of torque.

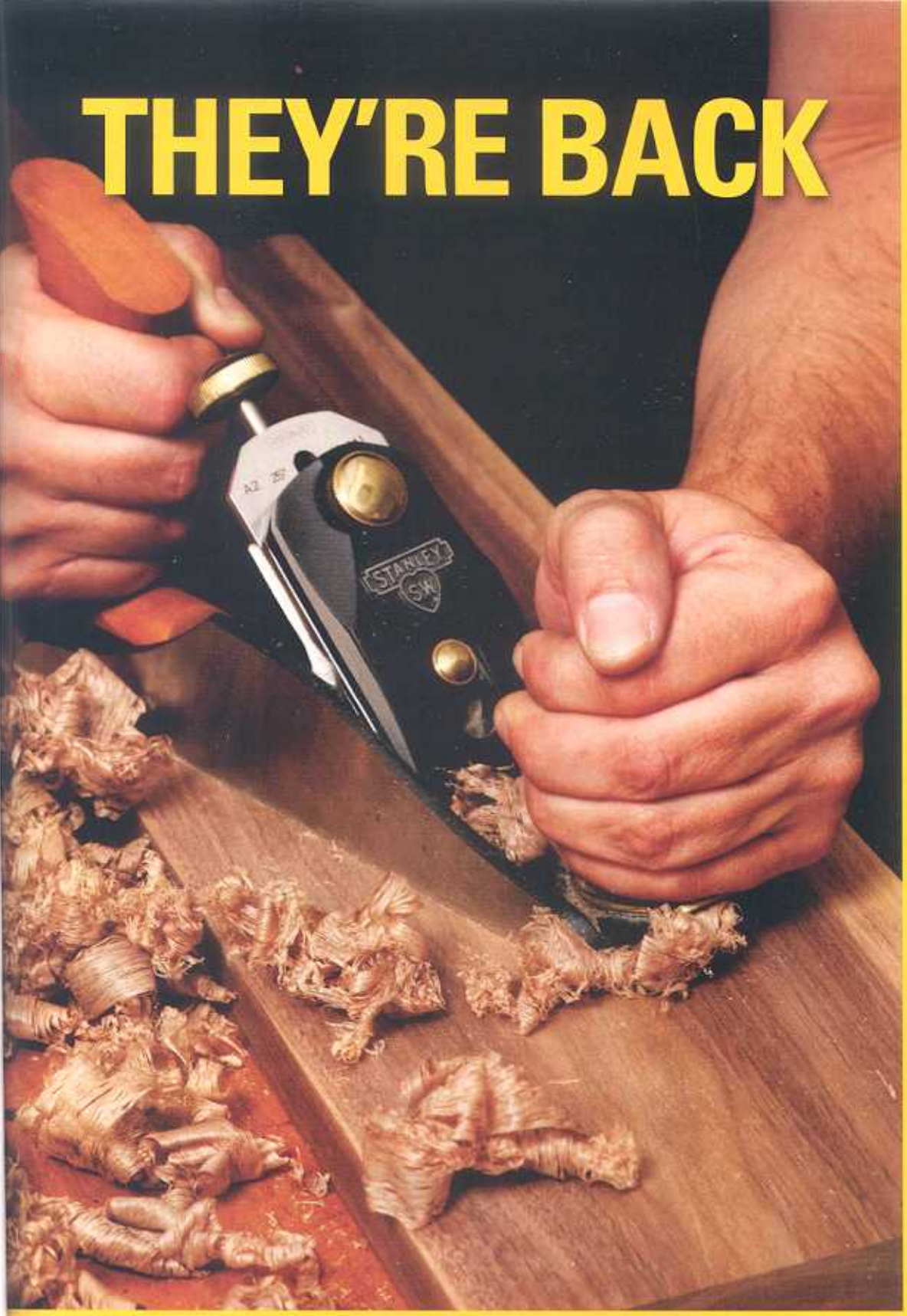
I removed the factory hand crank from the drill press. The shaft was 7/16-in. dia. with a flat side for the setscrew. I found that a ½-in. mechanic's socket would fit over the shaft. I drilled and tapped the socket near the end for a setscrew to hold it on the shaft with no sloppy movement, and then I chucked a ½-in. socket driver into my drill, which fits the square drive hole in the socket. Now I can run the drill slowly forward or reverse it to raise or lower the table. To save time, I just leave the drill set up nearby.

—MICHEAL L. JONES, Lee's Summit, Mo.

A Reward for the Best Tip

Send your original tips to Methods of Work, *Fine Woodworking*, PO Box 5506, Newtown, CT 06470, or email fwmow@taunton.com. We pay for every tip we publish; the best tip also wins a 12v driver kit from Bosch (model No. CLPK21-120).

THEY'RE BACK



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NO. 9 -1/2
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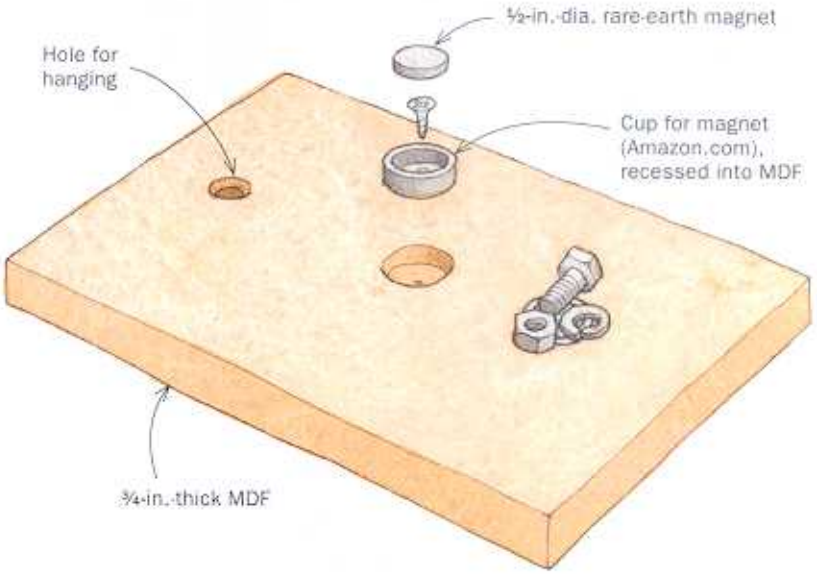
Magnetic parts keeper

To keep from losing small parts when I'm working on a project or disassembling a tool, I built this inexpensive parts keeper from a scrap piece of MDF and several ½-in.-dia. rare-earth magnets. I used a Forstner bit to counterbore for the magnet cups. Simply place your nuts, bolts, and small parts on the keeper and they will stay there until you need them again. To hold more parts, add more magnets. A chamfered hole lets me store my keeper on a nail.

—SERGE DUCLOS, Delson, Que., Canada



Center finder for chair stretchers

Finding the perfect center to drill mortises for stretchers between two round chair legs can be quite a juggling act and a time consumer if you make a lot of chairs like I do. I came up with a simple solution using two center-finding heads and two grooved metal rules from combination squares. The rules are held together with a homemade clamp box, which allows the rules to slide between the legs and be locked precisely in place.

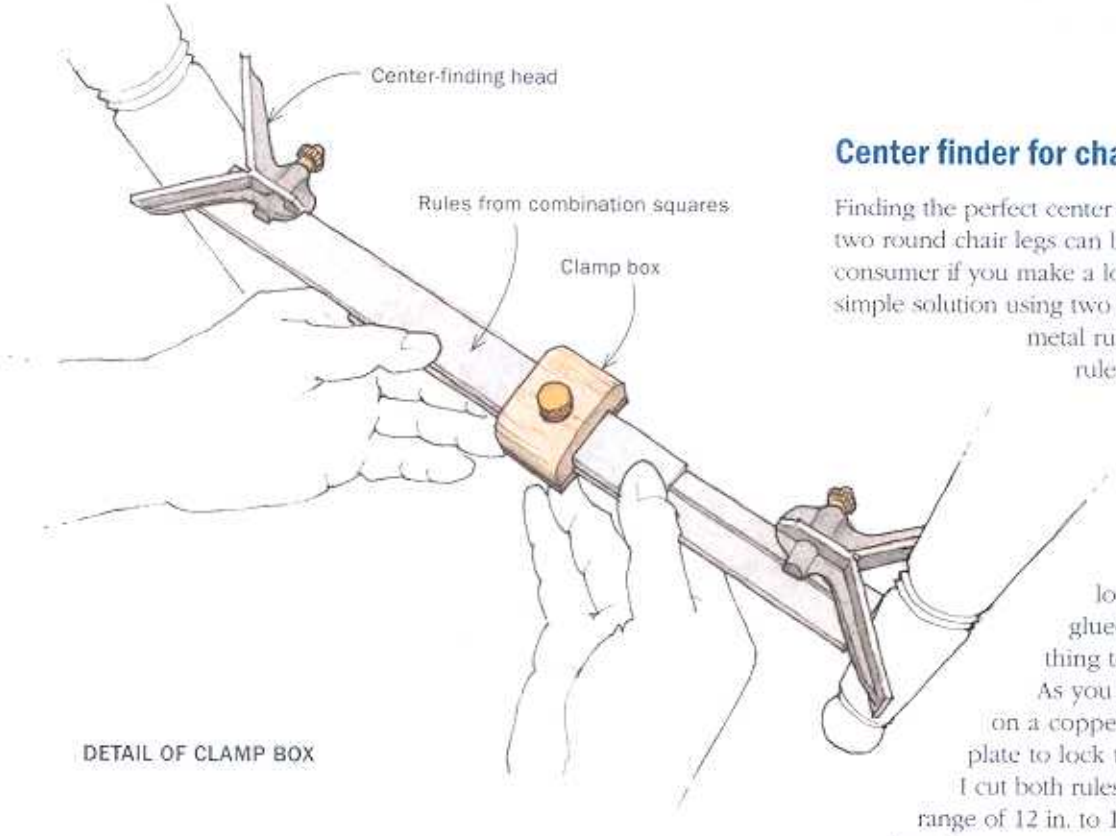
The top piece of the clamp box has a dado for the rules, a recessed T-nut, and a ¼-in. brass screw for locking the rules. A piece of hardwood glued at the bottom holds the whole thing together.

As you tighten the knurled screw, it pushes on a copper penny, which acts as a pressure plate to lock the two rules in place.

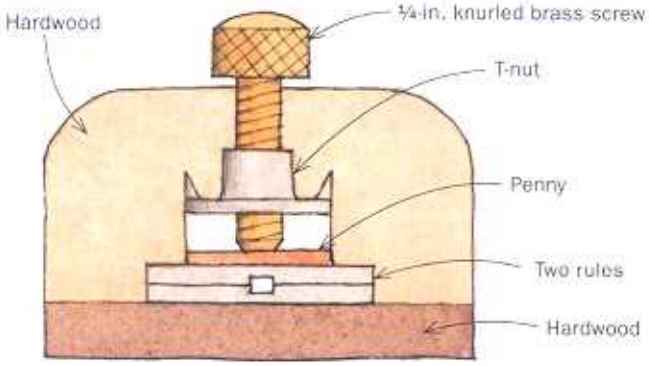
I cut both rules short (about 9 in.) to give a measuring range of 12 in. to 16 in.—the distance between most chair legs. You can customize the length of the rules to suit your needs.

The device is easy to use. First I locate the height of the stretchers on the legs. Then I align the device with those marks and extend it until both legs of the center finders are rubbing the perimeter of each leg. Finally, I advance the rule tips to touch the legs, lock down the clamp, and mark the center point of the legs. The jig ensures that I drill aligning mortises, and it also helps me determine the length of the stretcher with precision.

—RICHARD CIUPKA, Montreal, Que., Canada



DETAIL OF CLAMP BOX



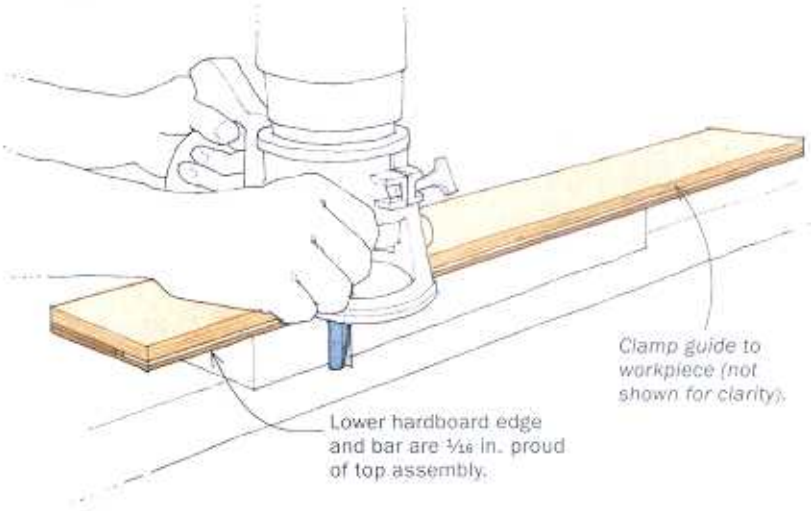
Straight-line guide for the router

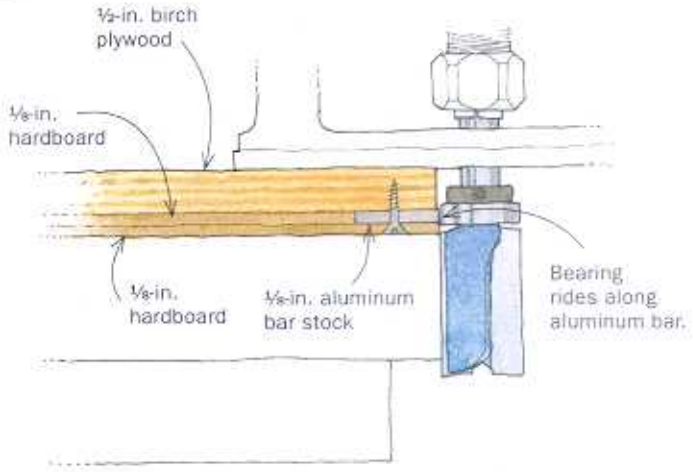
This router guide, when used with a top-bearing-guided pattern-maker's bit, turns your router into a jointer and a precise trimmer. An embedded aluminum bar makes this jig more accurate and durable than others like it.

To make it, cut a piece of ½-in. birch plywood about 4 in. wide (half the diameter of the router's base plus 1 in.) by 4 ft. long. Rip a piece of ⅛-in. hardboard ⅛ in. wider than the plywood for the guide's base. Now cut a 4-ft.-long piece of 1-in.-wide, ⅛-in.-thick aluminum bar (grainger.com). Clamp the bar about 1/16 in. proud of the plywood's edge and then rip a piece of ⅛-in. hardboard to fill the space behind the aluminum. Glue this filler to the plywood. Now assemble the guide with ¾-in. screws. Finally, with the router bit's bearing on the aluminum, make one full pass to establish the reference edge on the exposed hardboard. Your guide is complete.

To use, just clamp the guide to the workpiece with the lower edge aligned with your layout marks. Set the router depth so the bit's bearing is on the aluminum edge and trim away. Be sure the guide is clamped securely at two points at all times. Also, don't let the router tip.

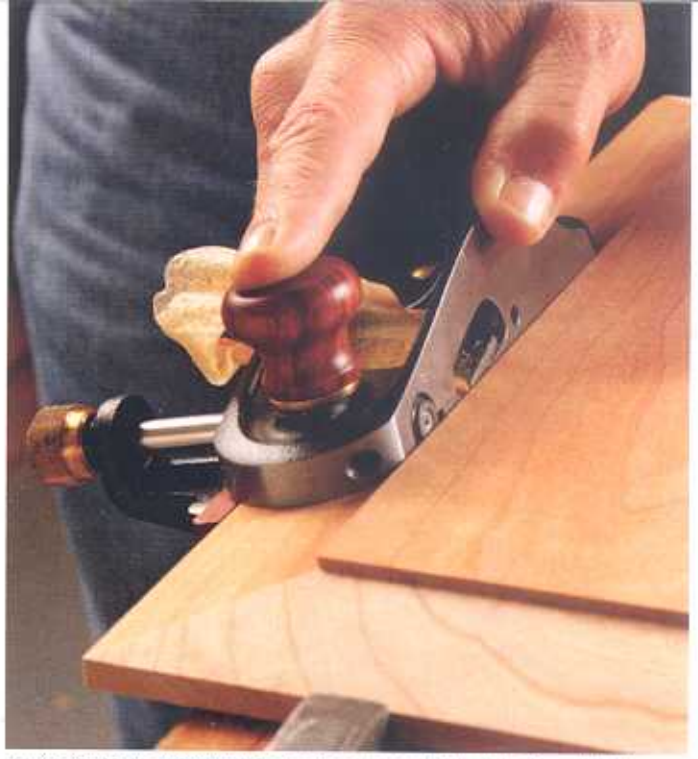
—BOB WEY, Westford, Mass.





■ HAND TOOLS

Skew block plane is hard to beat



Zero tearout. *The skew block plane is available in left- and right-handed models. Although it matters less with joinery where any tearout will be hidden, owning both versions means you'll always be able to plane with the grain.*

Best tool for tenons. *With a wide, low-angle blade that stretches to one side of the body, the skew block plane excels at fitting tenons. The angled blade minimizes tearout and produces superfine shavings across the grain.*

A nicker for clean cuts. *The scoring blade (nicker) severs the wood fibers for clean cross-grain cuts. Adjust the cutting depth by loosening a setscrew and rotating the cam-shaped mounting post.*

A SKEW BLOCK PLANE is the latest addition to the high-quality line of Veritas handplanes. Because its blade is angled 15°, it planes with less resistance and produces cleaner cuts than regular block planes, especially across the grain. Better yet, the blade reaches all the way to one side of the body, and it has a fence and a nicker blade, making it extremely versatile. It comes in left- and right-handed versions, and if you opt for both, you'll always be able to plane with the grain. But since these planes are commonly used for joinery where tearout is hidden, you can get by with one that matches your dominant hand (left-handed plane for lefties).

The quality of these planes is outstanding, and they were ready to go right out of the box. For starters, the blades were lapped dead flat and their bevels were sharp and perfectly formed. The Norris-style adjuster, which controls both vertical and lateral blade movement with surprising precision, had almost no backlash. I also really like the setscrews in the side of the body that allow perfect and repeatable alignment of the blade, which is critical on this type of plane. Also, the mouth is adjustable for light and heavy cuts.

The plane arrived for review at an opportune time. I was working on a commissioned dresser with curved drawer fronts. In order to prep the front for dovetails, I needed to cut cross-grain rabbets. The plane worked perfectly for this task, as its low profile gave excellent control. Its fence referenced off the board ends, yielding accurate and nearly effortless right-angle rabbets on the curved fronts.

For fitting joints and light to medium rabbets, this pair of planes is hard to beat. In fact, I give them a hearty thumbs-up. The Veritas Skew Block Planes are available from Lee Valley Tools for $209 each, or you can buy the pair for $389 (leevalley.com).

—Chris Gochnour is a woodworker in Murray, Utah.

Photos: staff

Up-front bevel controls. *Rather than a knob or lever at the back of the saw, Bosch puts its bevel lock at the front of the saw for convenience. The saw tilts 47° in both directions and miters 60° right and 52° left.*

■ MACHINES

Innovative sliding miter saw saves space, adds accuracy

SLIDING MITER SAWS are a mainstay of many home woodshops. The reason: their 12- to 14-in. crosscut capacity. This is most commonly achieved by one or more sliding tubes that provide the travel for the blade, transmission, and motor assembly. It's a time-tested design, but there are a couple of problems. One is that the tubes stick out about 12 in. beyond the rear of the saw, requiring that the saw be positioned that distance from the wall. As a result, you end up with 2 or 3 sq. ft. of wasted space behind the saw—and most woodworkers would rather put that space to better use. The other is that the sliding mechanism introduces some flex and inaccuracy.

Bosch has solved these problems with its newest 12-in. slider. The saw uses a pair of hinged arms, each with three knuckles, to provide the travel for its 13½-in. crosscut capacity. The big benefit is that you can put the saw right up to the wall. In addition, it's very accurate because of the tight tolerances in the hinged arms. And you can adjust the tightness of the mechanism to your personal preference.

The saw bevels to 47° in both directions and miters to 60° right and 52° left. There are nine detents for common miter settings. Although we've seen it on past Bosch miter saws, I really like the up-front bevel control that eliminates reaching around the back of the saw for bevel adjustments. After replacing the stock 60-tooth blade with a 90-tooth version from CMT because it had less runout, I tested the saw with a number of cuts and materials and it performed exceptionally well right out of the box. The cuts were furniture-quality.

Bosch's new saw (No. GCM12SD; boschtools.com) is accurate, the controls are precise and intuitive, and the space-saving design is icing on the cake.

At $800, the only downside is the price.

—Patrick McCombe is an associate editor.

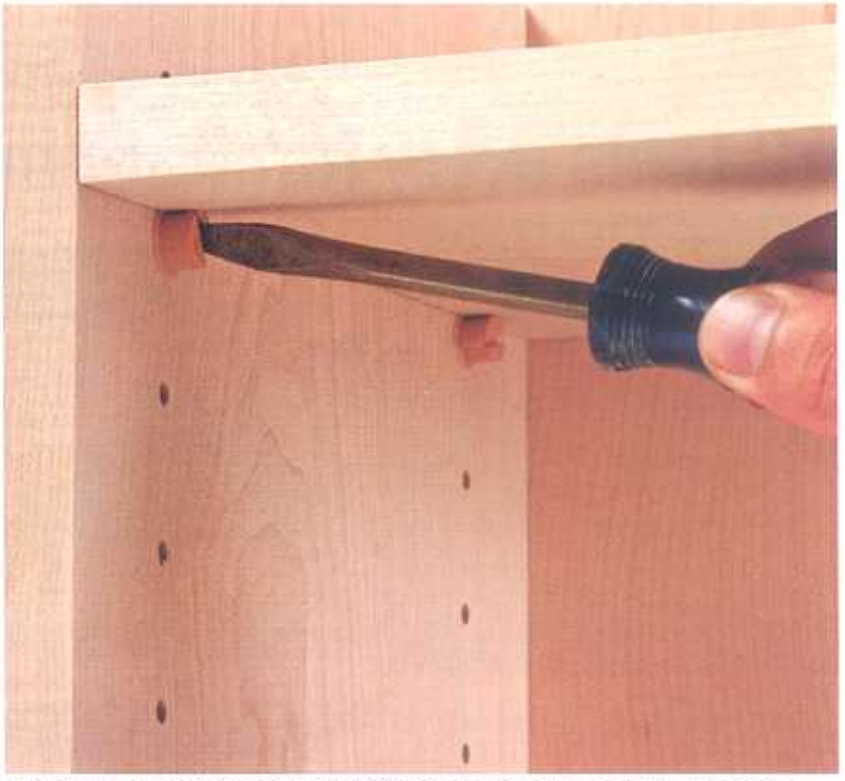
HARDWARE

A new spin on shelf pins

SHELF PINS ARE AN EASY and inexpensive way to support adjustable shelving for books, cabinets, and case pieces. You can easily move the shelves and the pins to different heights when your storage needs change.

Unfortunately, if your pin drilling is off (even a little) or if your stock warps, you'll end up with rocking shelves and rattling objects. But there is an easy fix. Spiral Supports (spiralsupports.com) are 5-mm, cam-shaped shelf pins that can accommodate up to 5/32 in. of warp or out-of-level. You simply turn them with a straight screwdriver. They're available in black, white, brown, tan, and clear; a pack of 12 sells for about $4.

—*P.M.*



Quick cure for rattling shelves. *A screwdriver and cam-shaped Spiral Supports make it easy to stabilize a wonky shelf. The 5-mm shelf pins are available in black, white, brown, tan, and clear and provide up to 5/32 in. of adjustment.*

READER SERVICE NO. 4

READER SERVICE NO. 19

READER SERVICE NO. 59

12 tools every furniture maker needs

BY MICHAEL PEKOVICH

THE BIG 12

- Coping saw
- Smoothing plane
- Combination square
- Bevel gauge
- Marking knife
- Dovetail saw
- Card scraper
- Marking gauge
- Spokeshave
- Shoulder plane
- Block plane
- Chisel set

I started out as a power-tool guy, but I've learned that even if you have every conceivable machine, you still need hand tools to produce your best work.

So now I use machines for the heavy lifting of milling and dimensioning lumber, and for joints that are never seen, like rabbets, dadoes, mortises, and tenons. I save my hand tools for where they really make a difference: layout, cutting dovetails and fitting joints, and surface prep. As a result, I don't need every hand tool ever made. In fact, there are only about a dozen essential ones. You probably already have some of them, and the rest you can pick up over time. And it's well worth the effort, because using them will help you to make better furniture, period.

In addition to these tools, you'll also need a sturdy workbench, but you don't need to spend a fortune on a massive bench or spend months making one. Go to FineWoodworking.com/extras for an easy-to-make bench that will get you up and running in no time and give you a chance to put your hand tools to work.

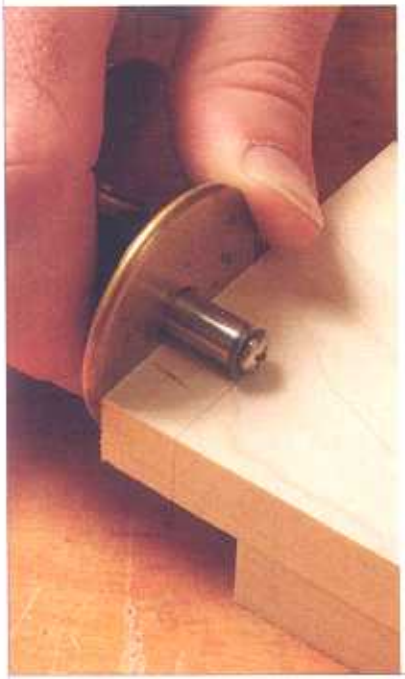
Online Extra

For more hand-tool news and tips, visit the Handwork blog at **FineWoodworking.com/extras.**

Michael Pekovich is Fine Woodworking's *art director.*

Tools for layout

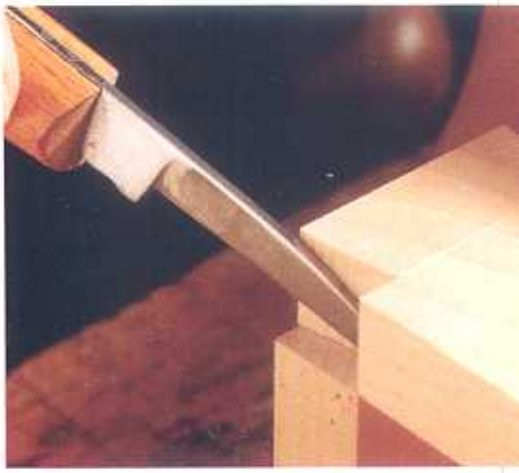
Accurate layout is an essential part of making fine furniture, and it's just as important for power-tool work as it is for handwork. That's because regardless of the tools you're using, you need precisely located and square joints. If you're just starting out in woodworking, these should be the first hand tools you buy.



MARKING GAUGE

Marking gauges excel at cutting a line parallel to the edge of a board, which is vital for laying out accurate tenons, mortises, and the baseline for dovetails. A cut line is better than a pencil line because it provides a precise location and line for starting a chisel or handsaw. Gauges with a knife or cutting wheel cut cleaner lines than pin gauges, but wheel gauges are easier to find. I recommend one like the Veritas standard wheel gauge for your first.

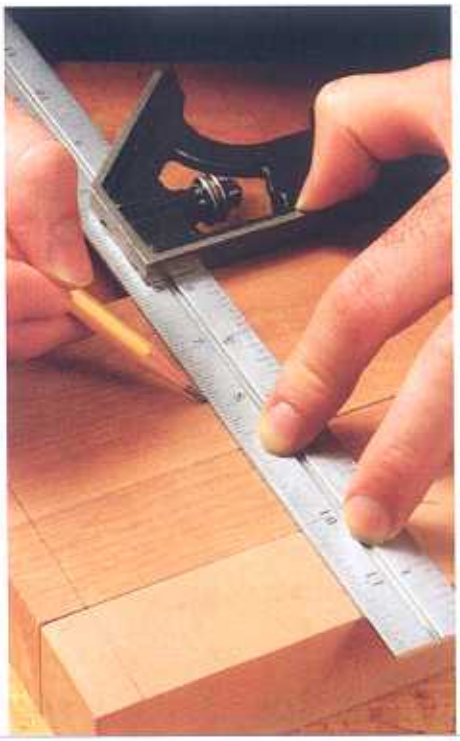
MARKING KNIFE



You also need a sharp marking knife. I've owned and used many different types, but the one I reach for time and again is a chip-carving knife. I like the blade's double bevel, which lets me mark on either side of the blade. And the bevels extend the entire height of the blade (the cross-section is triangular) so I can rest the blade against the side of the workpiece and strike a line exactly adjacent to it. The blade also is long, thin, and stiff, so it fits in tight places without flexing.

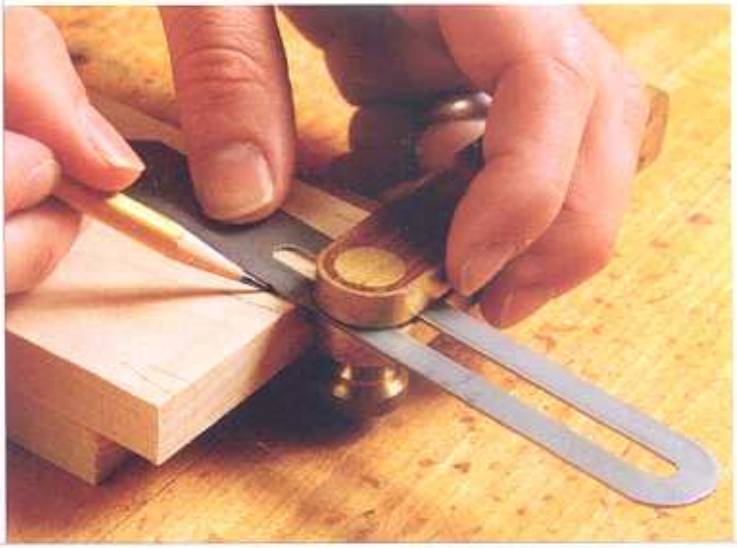
COMBINATION SQUARE

A combination square is indispensable for penciling or knifing a line at 45° and 90°. It's important to get a good one, like those made by Starrett, because it will be accurate out of the box and it will stay that way. The 12-in. model is a workhorse, long enough to mark wide boards or across multiple pieces at once. It's a good one to get first, but I've found a second, 6-in. version is just as handy. Because of its small size, it fits better in your hand and is easier to use when laying out joints in tight places and across end grain.



BEVEL GAUGE

Because it has a pivoting blade that can be locked into any angle, a bevel gauge is useful for transferring angles from plans to workpieces and setting tablesaw blade angles. However, you'll probably use it first to lay out dovetails, a task it is perfect for. When buying a bevel gauge, look for two things: First, the blade should lock down tightly, so it doesn't move accidentally. Second, the nut used to lock it down shouldn't get in the way of using the gauge (a frequent problem with the wing nut used on some gauges).



Tools for joinery

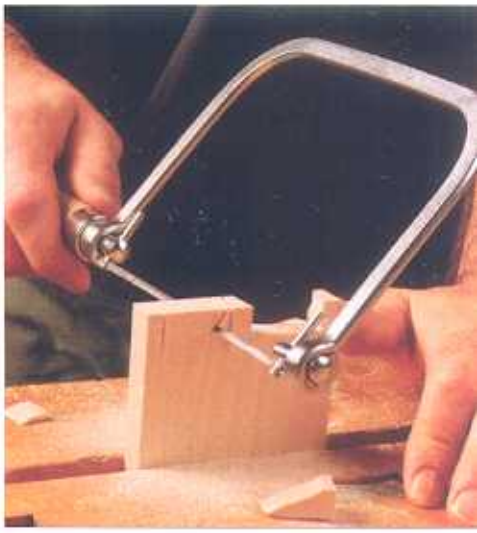
Dovetails are the hallmark of craftsmanship, and the effort to cut them by hand is well worth it. However, even if you use power tools to cut all of your joinery, hand tools are still the best way to fine-tune the fit. For hand-cut dovetails and tight-fitting tenons, I recommend a dovetail saw, a coping saw, a set of chisels, and a shoulder plane.

DOVETAIL SAW

You have two options for a dovetail saw: a Western backsaw or a Japanese pullsaw (dozuki). Japanese saws are a good place to start, because even the inexpensive ones are very sharp straight from the box. However, after 25 years of making furniture and using both types of saw, I can tell you that the pistol grip of Western backsaws positions your hand and arm for straighter cuts, so you will get more consistent and accurate results than from a dozuki. But don't feel bad about buying the dozuki first. You'll find plenty of uses for it, like cutting small parts and flush-trimming pegs.

COPING SAW

There is no need to be precious about getting rid of the waste between pins and tails, so I use a coping saw to do it before paring to the baseline with a chisel. You will save a huge amount of time compared to chopping away all of the waste with a chisel. In addition to cutting fast, coping saws also turn on a dime—perfect for maneuvering between pins or tails—and the cheap, replaceable blades mean you can always have a sharp one ready.



CHISELS

Start with at least four: ¼ in., ⅜ in., ½ in. and ¾ in. The six-chisel Irwin Blue Chip set is a great value, with a ⅝-in. and a 1-in. chisel in addition to the other four. Steer away from chisels sized in millimeters; the first set I bought was metric and that was a mistake. Although their widths approximated their U.S. equivalents, they were far enough off to prove frustrating when squaring up mortises or cleaning out grooves made with fractional bits. After you have the basic set, add a wide chisel (1½ in. to 2 in.) for paring and chamfering in tight spots.

SHOULDER PLANE

Regardless of how you cut joinery, you should have a shoulder plane, because nothing is better for fine-tuning joints for a perfect fit. What makes this plane unique is that the blade extends the full width of the sole, so you can plane right into a corner. If you try to plane a tenon cheek with a block plane, you'll end up with a tapered tenon. Shoulder planes come in a range of widths from ½ in. to 1¼ in. wide, but I find a wider plane is more versatile, handling broad tenon cheeks as well as narrow shoulders. It also has a ton of mass, which helps it stay flat on its sole and move with force when making cross-grain cuts.

Tools for shaping and smoothing

A good finish starts with good surface preparation, and hand tools are the fastest way to remove machine marks and tearout. The flat surfaces and crisp chamfers that handplanes create are impossible to replicate with a sander. A smoother and a block plane are the two planes to have. Add a card scraper to work really difficult grain, and a spokeshave for cleaning up curved surfaces.

BLOCK PLANE

For chamfering edges, leveling joints, and smoothing end grain, the block plane is indispensable. It also is perfect for paring the end grain on dovetails. Block planes are available in standard and low-angle models. I recommend a low-angle plane with an adjustable throat. This allows you to take a fine cut with a small mouth, which helps to prevent tearout.

CARD SCRAPER

On woods with tricky grain, like tiger maple, or when you've got a small bit of tearout on an otherwise clean board, there's no tool like a card scraper. Unlike a handplane, a scraper has no risk of tearout. Even when I handplane a surface, I'll often follow up with a card scraper to remove any imperfections.

SPOKESHAVE

The spokeshave is probably the most overlooked tool in the shop. This odd-looking tool is actually a short-soled handplane with handles on the side, rather than in front of and behind the blade. Nothing is faster at smoothing bandsawn curves. The tool is available with a flat or curved sole, but I recommend the flat sole, as it works well even on concave surfaces.

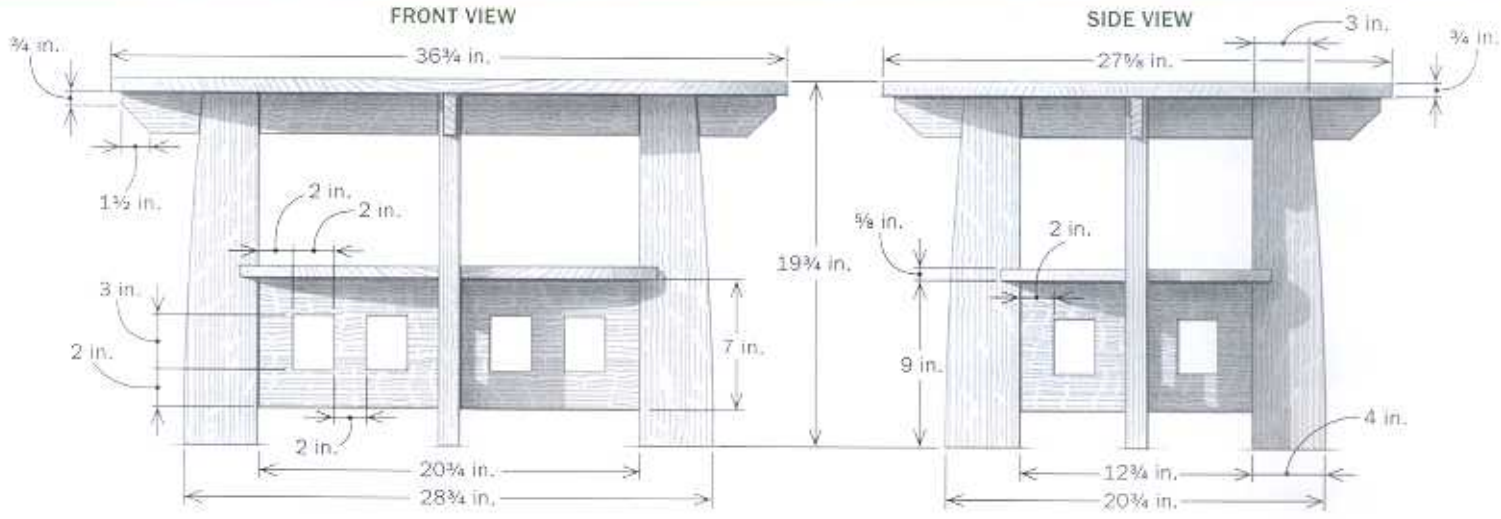
SMOOTHING PLANE

At last we come to that most iconic hand tool, the bench plane. I fared well for many years using only sanders to smooth surfaces, though today I couldn't imagine being without a plane. You can go from machine marks to a glass-smooth surface in just a few swipes. It's that rare instance in woodworking where the most enjoyable path is also the most efficient, and the results are superior to sanding. The size to start with is a No. 4. If you mill all your lumber with machines, you don't really need the flattening ability of a longer plane. The easiest path to making shavings is to buy a good-quality new plane—Lie-Nielsen and Veritas are proven products. An old plane, like a venerable Stanley Bailey, offers good quality at an initial savings, but requires some tune-up work and probably a new replacement blade. Regardless of the plane you buy, it has to be razor sharp. Even the most expensive plane is nothing but a paperweight if it's dull.

Photos: Michael Pekovich

Make a Limbert-Style Coffee

Learn to cut perfect ellipses and tight bridle joints



Photos, except where noted: Matt Kenney; this page: Keith Wright

Table

BY GREGORY PAOLINI

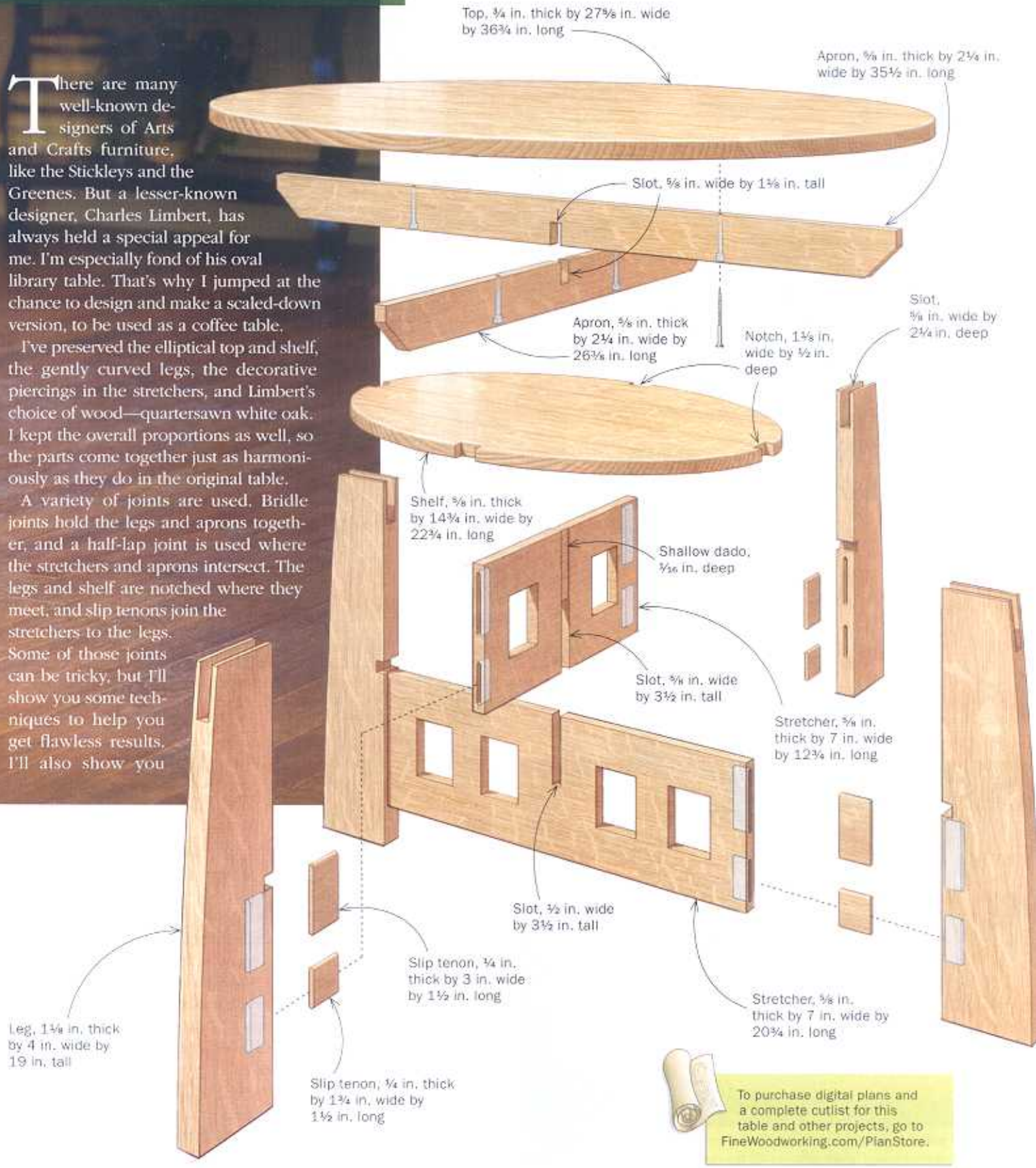
There are many well-known designers of Arts and Crafts furniture, like the Stickleys and the Greenes. But a lesser-known designer, Charles Limbert, has always held a special appeal for me. I'm especially fond of his oval library table. That's why I jumped at the chance to design and make a scaled-down version, to be used as a coffee table.

I've preserved the elliptical top and shelf, the gently curved legs, the decorative piercings in the stretchers, and Limbert's choice of wood—quartersawn white oak. I kept the overall proportions as well, so the parts come together just as harmoniously as they do in the original table.

A variety of joints are used. Bridle joints hold the legs and aprons together, and a half-lap joint is used where the stretchers and aprons intersect. The legs and shelf are notched where they meet, and slip tenons join the stretchers to the legs. Some of those joints can be tricky, but I'll show you some techniques to help you get flawless results. I'll also show you

STRENGTH AND BEAUTY

An elliptical top, arched legs, and decorative piercings add grace and beauty. Slip tenons and bridle joints ensure decades of service.



To purchase digital plans and a complete cutlist for this table and other projects, go to FineWoodworking.com/PlanStore.

Drawings: John Hartman

TOP AND SHELF

HOW TO MAKE A PERFECT ELLIPSE

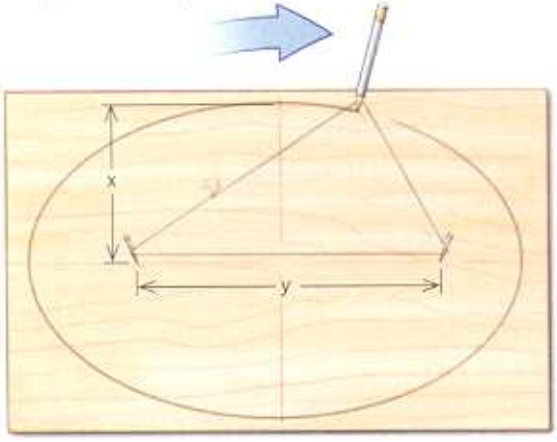
Both the top and shelf are elliptical. You can use a simple nail-and-string technique to make patterns for these. Each pattern does double duty. First, it lays out a line to follow at the bandsaw. And after the shape has been roughed out, the pattern serves as a template for a bushing-guided router.

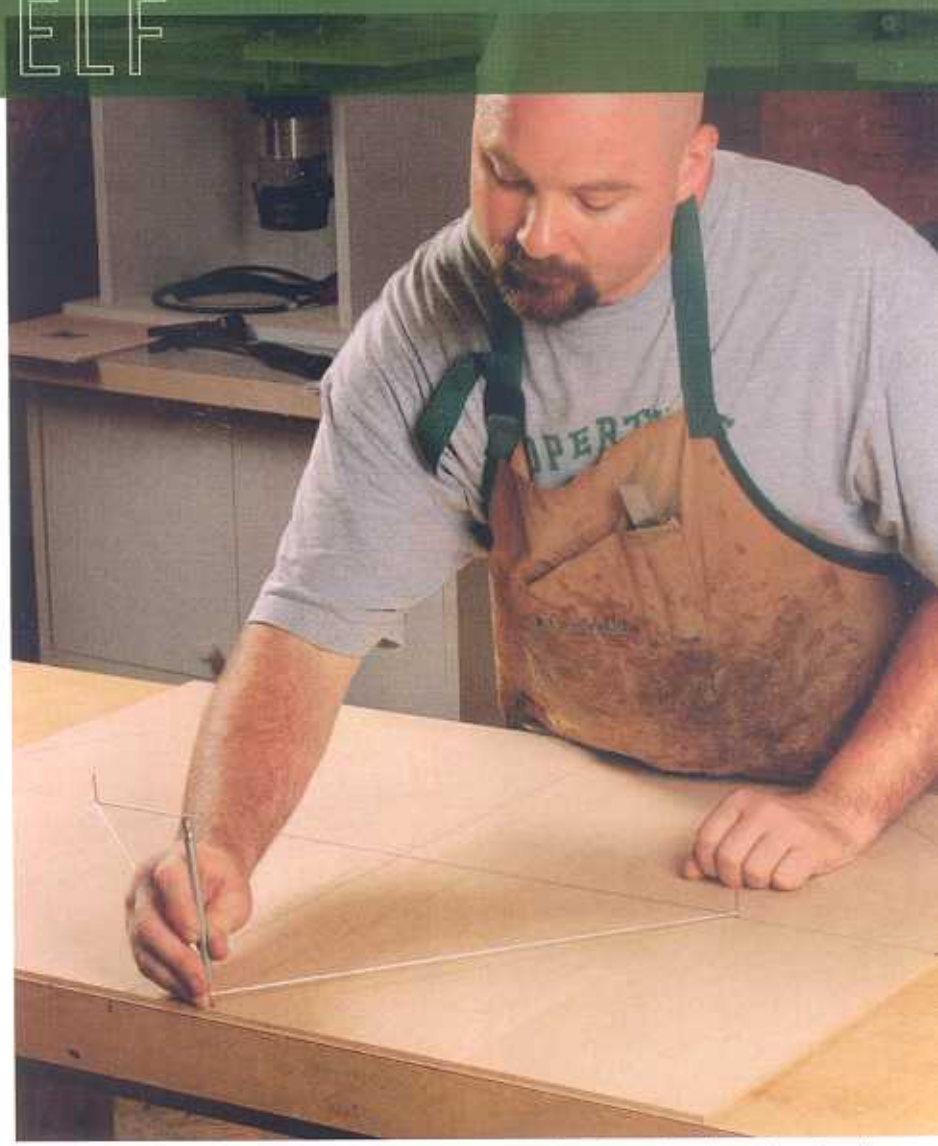
Nails and string. *Driven into the focal points, nails guide the string loop, which in turn guides the pencil along the perimeter of an ellipse.*

KEY DIMENSIONS

Here's how to lay out the nails and size the string for each ellipse:

Top: x = 13 13/16, y = 24 1/4 Shelf: x = 7 3/8, y = 17 5/16





Simple, accurate ellipses. *Size the string so the pencil reaches the x dimension (see diagram at left). Then keep the string taut as you trace an ellipse.*

Cut the pattern at the bandsaw. *Cut just outside the line, so there is less waste to remove when smoothing the curves.*

how to draw an accurate ellipse to take the mystery out of the top and shelf.

Pattern-rout the top and shelf

Begin by gluing up panels for the top and shelf and milling all of the parts. Then make full-size patterns for them. You'll need to draw two ellipses, which is easy to do with string, a pencil, and two small nails. To begin, draw the ellipse's axes on a piece of plywood 1 in. longer and wider than the ellipse and mark its length and width. Next, locate the foci, drive a nail into both foci, and tie a loop of string around them. When you stretch out the loop, it should just reach the side of the ellipse (see drawing, above left). Put a pencil inside the loop and draw, keeping the string taut.

With both ellipses drawn, cut them out at the bandsaw. Use 100-grit (CAMI) sandpaper, glued to a thin strip of wood, to remove the saw marks and fair the curves. Then trace the patterns on the panels for the top and shelf. Before cutting out the top and shelf, cut the notches in the shelf that join it to the legs. This is far easier to do now, when the sides and ends are square, than after cutting

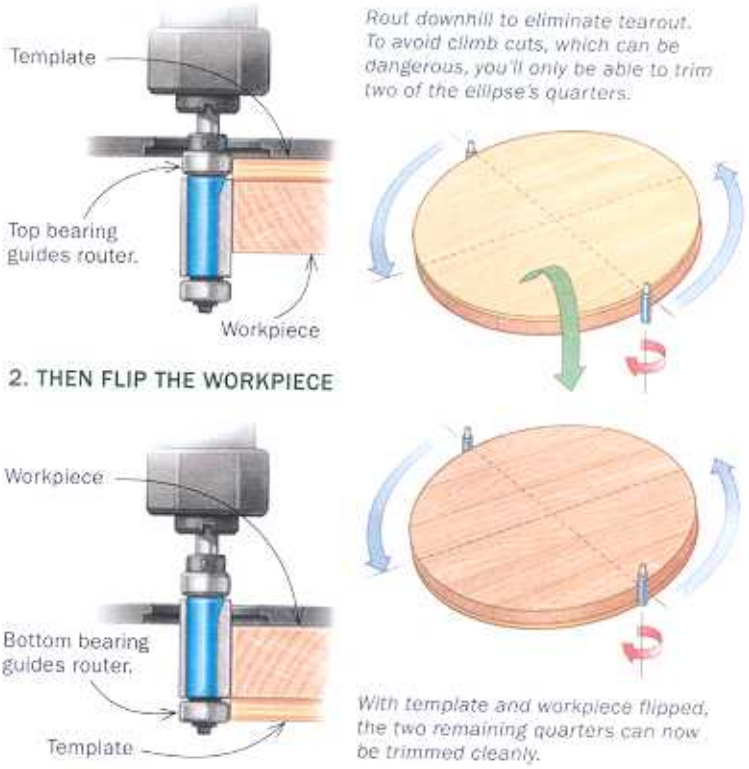
Notch the shelf before cutting the ellipse. *Because its width is critical, cut each side of the notch first and then remove the middle. Use stop blocks on your crosscut sled to ensure that notches on opposite sides will line up.*

Cut the top and shelf at the bandsaw. *Use the patterns to trace the shapes. When bandsawing, leave about ⅛ in. of waste for the next step: routing the edges flush to your template.*

the shelf into an ellipse. Lay out the notches by placing the legs on the shelf and transferring their thickness onto it. Then cut them at the tablesaw, using a crosscut sled. The width of the notches is critical, so cut the notch sides first and then nibble away the inside. Cut the notches a bit tight and fit them with a chisel later.

After all four notches have been cut, head to the bandsaw and cut out the elliptical top and shelf. The top is heavy and unwieldy, so cut away the bulk of each corner first. Then make a second pass close to the line. I use a flush-trimming bit to rout the top and shelf flush to their patterns (right).

Always rout downhill. *If you try to rout the whole circle in one pass, you'll tear out the grain in some areas. So you'll need to flip the workpiece. Use a double-bearing, flush-trimming bit so there's no need to change bits or re-attach the template on the other side. Just adjust the bit height to use the other bearing.*



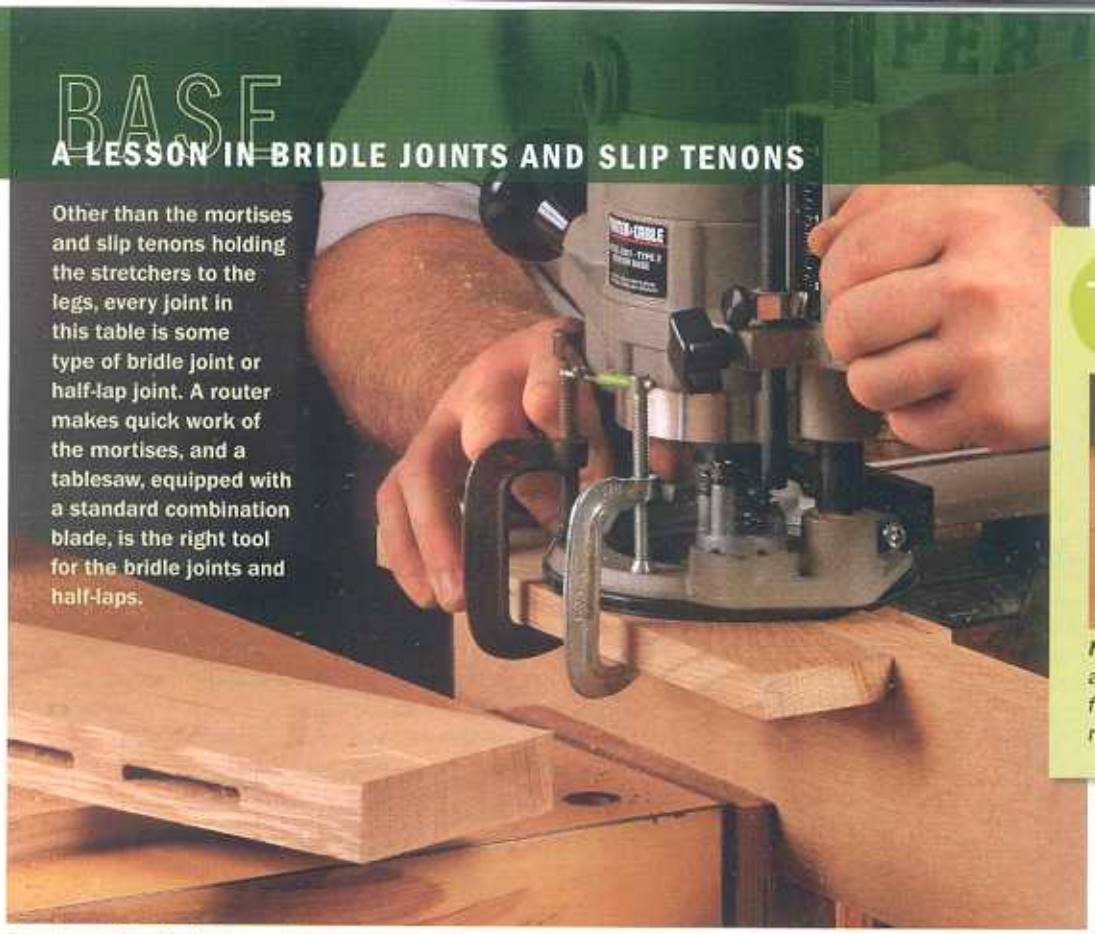
Join legs and aprons

With the top and shelf done, you can get started on the joinery. The stretchers are joined to the legs with slip tenons. Because the stretchers are 7 in. wide and could expand as much as 1/16 in., break the mortise into two. The tenon will fit tight in the upper mortise but loose in the lower one, forcing the stretcher's movement downward and away from the shelf. I make the slip tenons by milling some white oak to the correct thickness and width, rounding over the edges at the router table, and then crosscutting the tenons to length. Now cut a notch in each leg. Paired with the notches in the shelf, they form a strong joint that holds the shelf in place and prevents the base from twisting or racking. Cut them just as you did the notches in the shelf. While you're at the tablesaw, go ahead and cut the slot for the bridle joint into the top of each leg. I use a tenoning jig, starting at the center of the slot and working outward. As you get close to the sides of the slot, use the apron to test the fit.

A half-lap joint is used to connect the aprons where they intersect. For this joint, I cut a slot halfway through each apron. Unlike

BASE
A LESSON IN BRIDLE JOINTS AND SLIP TENONS

Other than the mortises and slip tenons holding the stretchers to the legs, every joint in this table is some type of bridle joint or half-lap joint. A router makes quick work of the mortises, and a tablesaw, equipped with a standard combination blade, is the right tool for the bridle joints and half-laps.



Rout mortises in the legs. *Use a spiral bit that matches the mortise's width, and use a fence on both sides of the router: Set up the router's edge guide and then clamp on a simple shopmade fence. The mating mortises in the stretchers are done the same way.*

TIP FENCE AND GUIDE BLOCK KEEP THE MORTISE ON LINE

No wiggle room. *It will be straight and parallel to the sides because the fence and guide block prevent the router from wandering.*

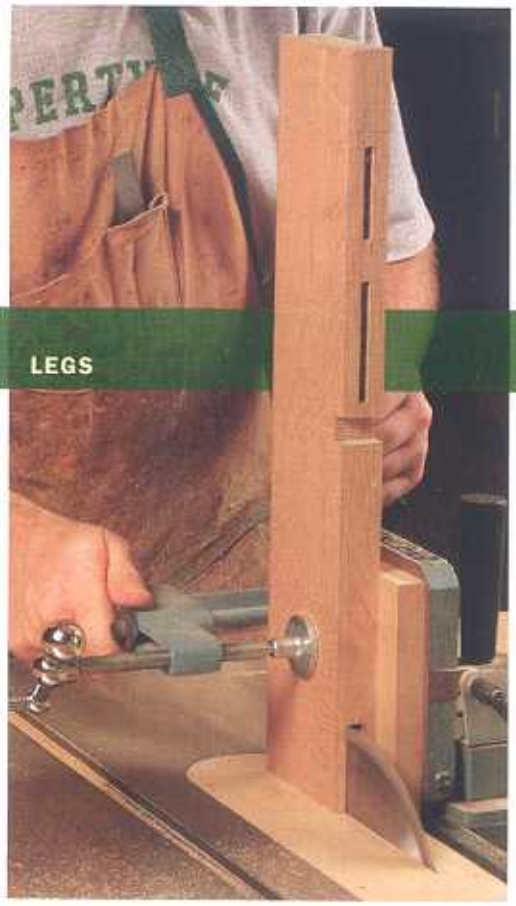
the notches in the legs and shelf, which were cut from the sides in, cut this joint from the center out. That will keep the joint centered on the aprons.

To complete the legs, cut the curve on the outside edge. I made a pattern out of ¼-in.-thick plywood and traced it on the legs. Save the offcuts to use as cauls during glue-up.

Slot and rout the stretchers

As with the aprons, a half-lap joint is used where the stretchers intersect. However, cut a shallow dado on both sides of the shorter stretcher to conceal the joint and reinforce it against racking.

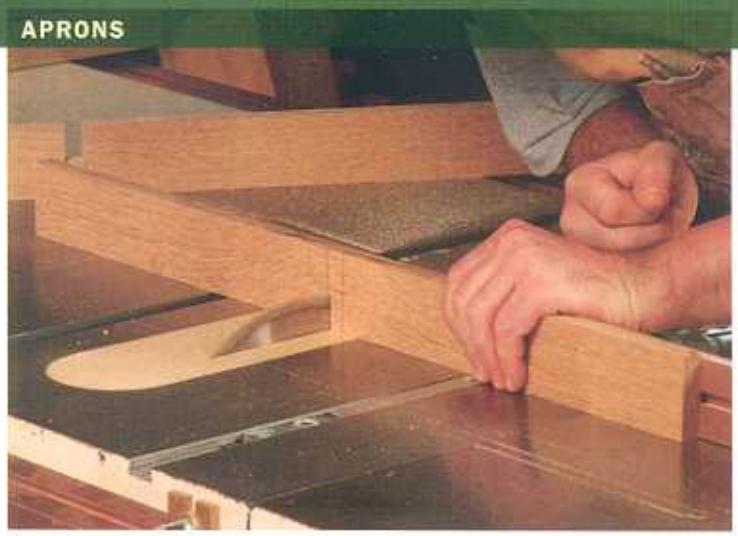
LEGS

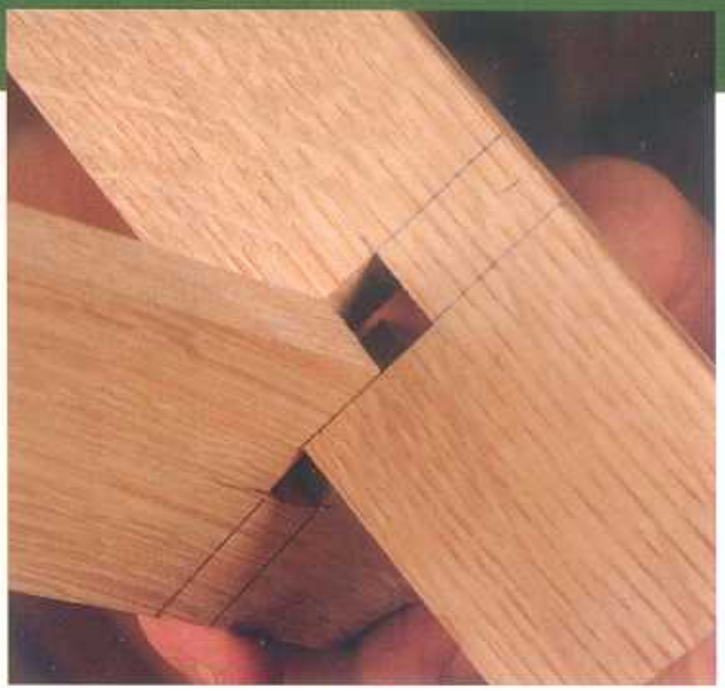


Bridle joints must be centered. *Using a tenoning jig for the slot, cut in the middle of the leg first. Then flip the leg side to side to make the subsequent cuts. As you work out to the sides of the joint, it remains centered on the leg.*

Cut the curve last. *After tracing the shape onto the leg, cut away the waste on the bandsaw, and then clean up the saw marks with a hand-plane or sander.*

APRONS





Slot the aprons and test the fit. *After marking the joint, cut each side first and then nibble away the waste one pass at a time (above). Cut the slots a bit tight at first, and then sneak up on a tight joint, checking the fit (right) after each trimming cut.*

After cutting the dadoes, raise the blade and cut a slot on the bottom edge of the stretcher. You won't be able to get the full depth with a 10-in. sawblade, so cut as deep as you can and finish up the slot with a handsaw and chisel. With the short stretcher done, cut the slot in the longer stretcher.

Now it's time to rout mortises in the ends of the stretchers to accept the slip tenons that join them to the legs. Do this the same way you routed the mortises in the legs, with a router and spiral bit.

After routing the mortises, use a template, plunge router, guide bushing, and spiral bit to rout the decorative piercings in the stretchers. Make the template from a piece of plywood and lay out the piercing on it, taking the bushing's offset into account. Head to the router table and cut out the opening. Attach a fence to the bottom side, lay out the location of the piercings on the stretchers, and you're ready to rout the openings (see "A Guide to Guide Bushings," *FWW* #207, p. 67).

Hog out most of the waste with a Forstner bit at the drill press. With most of the waste removed, clamp the template to the stretcher and the stretcher to the bench. Make a clockwise pass around the opening, increase the bit's depth, and make a second pass. Make a third pass to complete the piercing.

Dry-fit, stain, and glue up

This little table is kind of like a puzzle, in that there are pieces that interlock and must be

STRETCHERS

Cut the dado with a standard-kerf blade. *That way you can sneak up on the final width, testing now well the long stretcher fits into it as you go.*

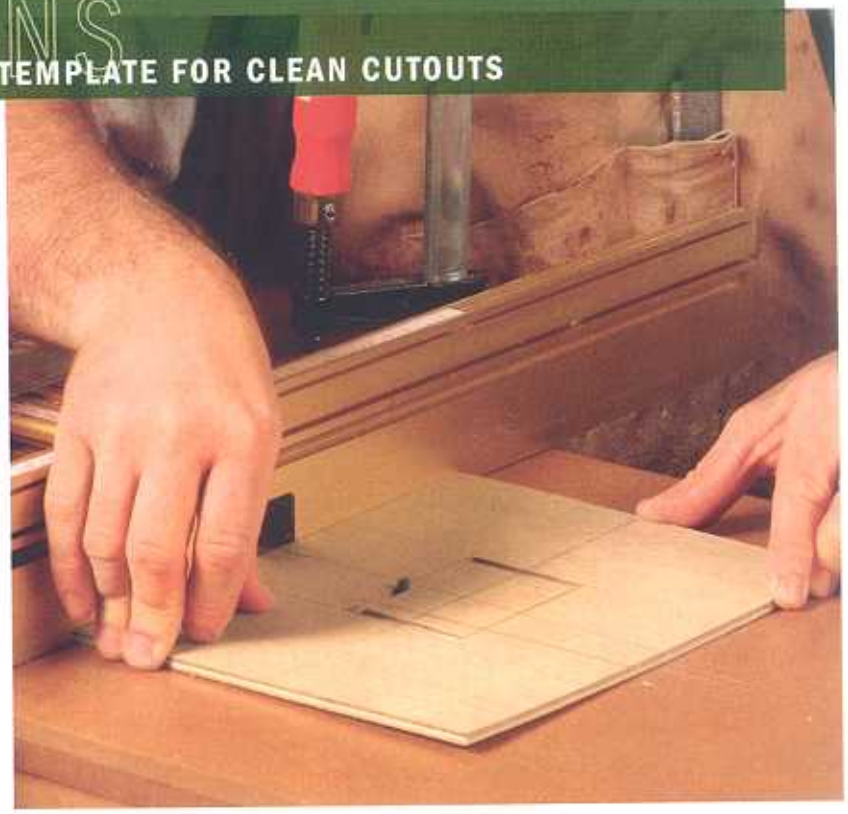
Start the slot at the tablesaw. *With the blade as high as possible, cut the sides to line up with the dado, and nibble away the waste in between.*

Go deeper with a handsaw. *Follow the sides of the slot with the saw and then remove the rest of the waste with a chisel.*

APRONS

USE A ROUTER TEMPLATE FOR CLEAN CUTOUTS

There are six rectangular piercings. Use a router and template to make them all the same. A spiral bit is best because its shearing action will cut the end grain areas smoothly.



Make the template at the router table. *Paolini routs one side of the opening at a time, lowering the template onto a ¼-in.-dia. spiral bit. He stops the last cut about ½ in. before the end and finishes it with a handsaw and sandpaper.*

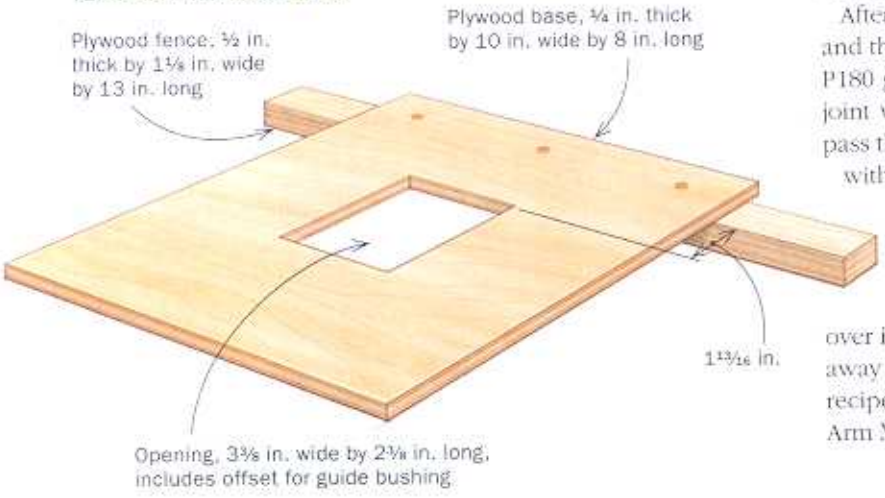
assembled in a particular order for the table to come together. Dry-fitting the table will help you not only learn and get comfortable with that puzzle, but also find any joints that need to be tweaked.

Begin by putting the stretchers together and adding one leg. Fit the shelf into that leg and add the opposite leg. Then add the last two legs. Now add the aprons and put the top in place. Before you take the table apart, use a pencil to mark the joint where the aprons intersect and where they pass through the legs. The marks will remind you not to sand those areas which would cause the joints to become loose. Also, as you take off the legs, number the inside of the notches—I use a felt-tipped marker—and number the corresponding legs to match. Numbering the apron on the top edge also is a good idea.

After disassembling the table, break the edges with a block plane and then use a random-orbit sander to sand all of the parts up to P180 grit. Do not sand the areas you marked earlier: the half-lap joint where the aprons intersect and the area where the apron pass through the bridle joint in the legs. Next, wipe all of the part with a damp rag to raise the grain, then use a sanding block and P220-grit paper to remove the raised grain.

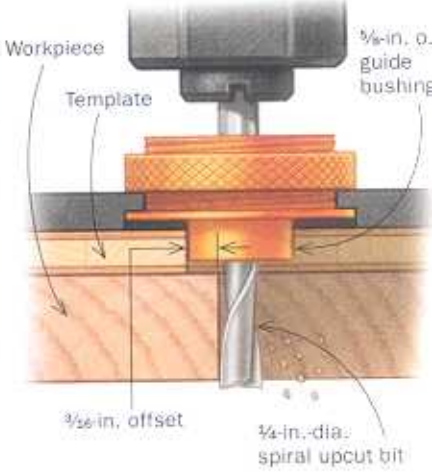
I finish the table before the glue-up. The advantage of finishing first is that any glue squeeze-out will not soak into the grain and become a problem when you try to finish over it. And squeeze-out doesn't stick to the finish, so it just peels away without fuss. To stain the table, I used the same finishing recipe that I used on my bow-arm Morris chair ("Build a Bow Arm Morris Chair," *FWW* #205). Tape off any area where glue will

TEMPLATE FOR CUTOUTS



Clamp the template in place. *Remove most of the waste in the cutout using a Forstner bit. Then clamp the template to the stretcher. Place scrap beneath the stretcher to protect your bench.*

Trim flush in three passes. *Set the bit depth to ¼ in. for the first pass, ½ in. for the second, and ⅝ in. on the last one.*



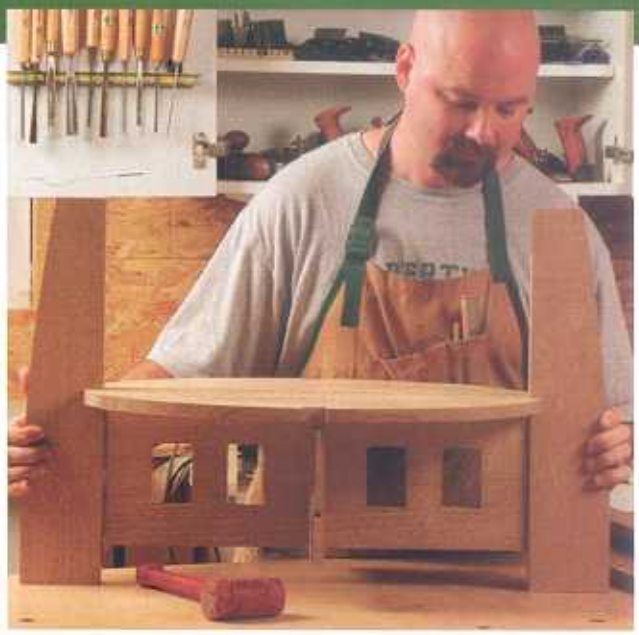
ASSEMBLY

A DRY RUN SORTS OUT SURPRISES

The table's base is a three-dimensional puzzle, and you don't want to be figuring it out with glue on the joints. So do a dry run to get comfortable with the steps.

Start with the stretchers. *As the core of the table, these should fit snugly and squarely.*

Fit the slip tenons. *The top should be a close fit, but leave the bottom tenon a bit narrow to allow for wood movement.*



The shelf is next. *Lock it in place with opposing legs, then add the last two. If you assemble the legs first, you won't be able to get the shelf in place.*

be applied, like the bridle and half-lap joints on the aprons, and use caution when staining around them and the slots.

Now you're ready for the glue. You can do it in stages or, if you're feeling lucky, all at once. Repeat the assembly order from the dry-fitting and use the leg cutoffs as cauls for the clamps. After the glue is dry, peel away any squeeze-out. Then rub out the finish with 0000 steel wool and paste wax, and buff the wax with a shoe-shine cloth or brush. Finally, attach the top with four screws, driving through the aprons and into the top. Slot the holes on the short apron to allow for wood movement. □

Gregory Paolini makes Arts-and-Crafts-style furniture in Waynesville, N.C.

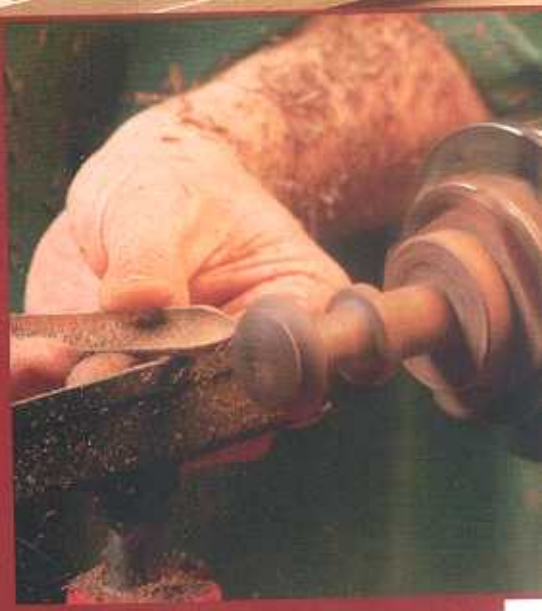
Aprons are the last piece to the puzzle. *They hold the legs in place and make the base rigid.*

TOOL TEST

Heavy-Duty

These lathes can do it all

With bolt-on bed extensions increasing the center-to-center distance, these benchtop machines can turn out long chair legs and table posts (above). They also have the swing, mass, torque, and variable speed to handle big blanks (near right). Small turnings are easy, too, such as custom knobs and pulls (far right).



Photos: Asa Christian

Benchtop Lathes

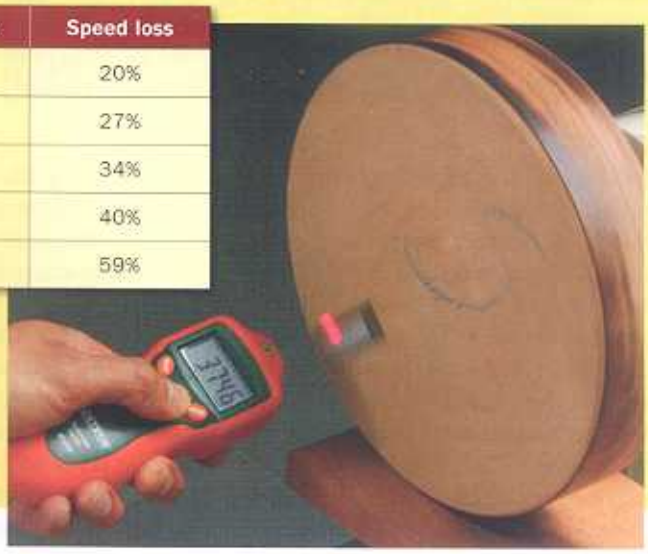
With more muscle and mass than ever, one of these midsize models could be the first and last lathe you'll need

BY TIM ALBERS

Turning is a growing hobby, and newcomers need affordable lathes to get started on. So a few years back, manufacturers started stretching mini-lathes—originally designed for small projects like pens and salt shakers—in an effort to create an entry-level lathe for more ambitious turners. They added bed extensions for longer spindle work and increased the capacity over the bed for bigger bowls and platters. These souped-up minis (called "midis" by at least one manufacturer) sold by the tens of thousands, but user feedback was mixed: When furniture makers tried to turn big posts, or when turners threw a big, chunky blank onto a faceplate, these lightweight lathes didn't have the mass or torque to handle the job. So manufacturers responded with a new breed of midsize

LOW-END TORQUE IS WHAT MATTERS

Model	Starting RPM	RPM w/resistance	Speed loss
Delta 46-460	510	409	20%
Penn State Turncrafter	502	366	27%
General 25-200M1	502	332	34%
General 25-114M1	509	303	40%
Jet JWL-1220	501	205	59%



Tough test. *Albers screwed a big wooden disk to each lathe's faceplate, and used a simple lever to put roughly 12 lb. of pressure on the disk. With the belt set on the lowest speed range, Albers set each lathe as close to 500 rpm as he could get it and put weight on the lever. Then he used a laser photo tachometer to measure how much speed each lathe lost. The Delta proved to be the most powerful.*

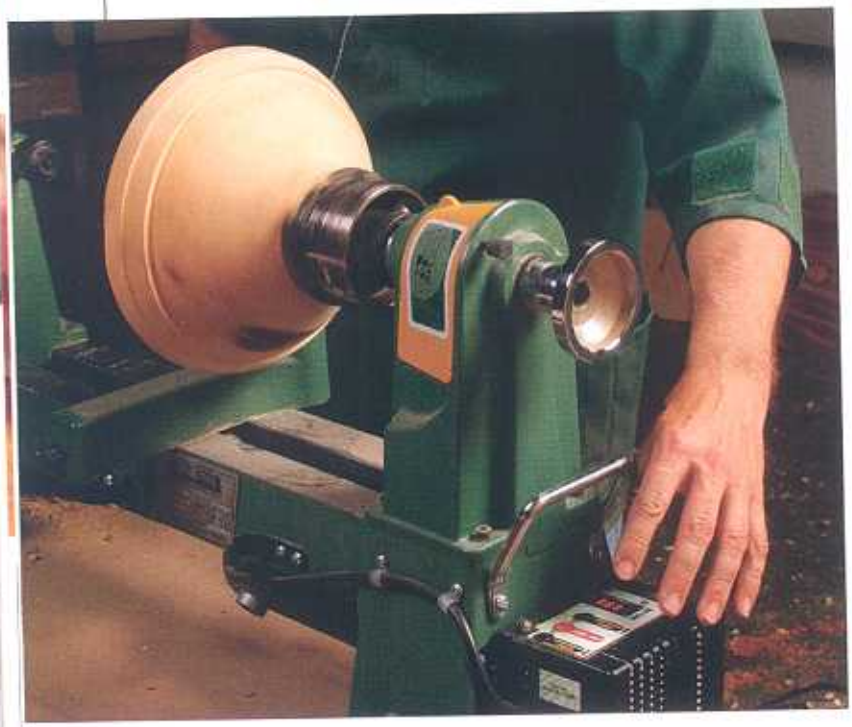
The little things add up quickly

CONTROLS

Good controls are a big plus. *With top-mounted electronics and a large off switch, the Delta (right) makes it easy to stop the lathe quickly or change speeds without having to hunt. The small buttons on the General 25-114's side-mounted control box (below) are hard to find in a pinch.*

BELT CHANGES

Belt changes should be easy, too. *Although these lathes are touted as variable speed, they still require belt changes to access the highest and lowest speed ranges. Delta (left) makes it easy, with up-front access to the belts and a one-handed motor release. Speed changes are fussier on the Jet (below).*



benchtop lathes, and that's good news for woodworkers of all stripes.

These new models offer beefed-up castings, larger motors, and even more swing over the bed than the old midis. What's more, at $500 to $1,000 including a bed extension, their prices have not increased as much as their versatility has.

For furniture makers, whose needs range from bed posts to drawer pulls, one of these lathes will be a friend for life. Better yet for people like me, who enjoy turning for turning's sake, they have the low-end torque and vibration-dampening mass to turn odd-shaped burls and heavy logs into beautiful bowls, platters, and hollow vessels. And most come with the variable speed, reverse rotation, and precise indexing found on lathes that cost twice as much.

I couldn't wait to compare these new models head to head. I limited my test to benchtop lathes with bed extensions, at least 12 in. of swing over the bed, and motors of ¾ hp or more. Where possible, I ordered the variable-speed model. Each lathe has a 1-in. by 8-tpi spindle and a No. 2 Morse taper headstock and tailstock. Also, each comes standard with a drive center, live tail center, knockout bar, and faceplate. You might need to buy an additional tail center, as the standard ones are a bit large for thin spindles, such as the end of a table leg.

Each lathe got a real-world workout

Lathes are simple machines, but the primary parts must all work well. The headstock

TOOL RESTS

You want a wide, solid tool rest. *Penn State leads the way with a 12-in. rest (right), meaning you can do more turning before unlocking and shifting it. The Jet's rest (below) pivoted under moderate use, no matter how tightly Albers locked it down.*

GENERAL OFFERS A UNIQUE HEADSTOCK

Limited benefit. *The sliding, pivoting headstock on the General 25-200M1 does allow outboard turning, but that doesn't mean vessels much bigger than 12 in. dia. are possible: The small outboard bed limits the effective reach of the tool rest (left). The sliding headstock does come in handy when you move it to the far end of the lathe (below), where a long tool handle won't bump the bed.*

must be solid and vibration-free, the tailstock and banjo (which supports the tool rest) must slide on the bed easily but lock firmly, the tailstock quill must be solid, and the lathe should have power and speed options in keeping with its capacity.

To put each lathe on the same footing, I built a universal stand from MDF. Then, to test their high- and low-end capabilities, I spent a fair amount of time on each lathe turning real-world projects. I turned small spindles that you might use as a chair rung or leg; larger spindles such as table legs and newel posts; small intricate items like knobs, finials, and handles; and finally, big, heavy green-wood bowl blanks. All of the lathes performed reasonably well, and I was able to create high-quality work from each one. Still, a few stood out from the rest.

Fit and finish varied

None of the lathes took more than 10 minutes to assemble, but once I began bolting on the bed extensions, differences began to appear. The Delta, Penn State, and General 25-200M1 bolted together with minimal work, but the Jet and the General 14-in. model required me to file the beds so the tailstock would slide freely. The Jet also had rough castings, sharp enough to cut my finger when I picked it up. The Delta had the smoothest machining, and the best fit between the beds and access doors.

By the way, the Delta and the General 25-200M1 can accept multiple bed extensions. Want to turn 60-in. spindles? Buy

Head to head

PENN STATE TURNCRAFTER COMMANDER

DELTA 46-460

MODEL	STREET PRICE*	MOTOR	WEIGHT**	SWING	BETWEEN CENTERS***	SPEED (RANGES)	REVERSIBLE?
Delta 46-460 deltaportercable.com	$750	1 hp	97 lb.	12 in.	41½ in.	Variable (250–750, 600–1,800, 1,350–4,000)	Yes
General 25-114M1 general.ca	$760	¾ hp	93 lb.	14 in.	40 in.	Variable (250–800, 550–1,700, 1,200–3,600)	Yes
General 25-200M1 general.ca	$930	¾ hp	146 lb.	12 in.	49 in.	Variable (300–900, 600–1,800, 1,200–3,600)	No
Penn State Turncrafter Commander pennstateind.com	$480	1 hp	106 lb.	12 in.	42 in.	Variable (150–1,900, 300–4,100)	No
Jet JWL-1220 jettools.com	$570	¾ hp	98 lb.	12 in.	48 in.	6 speeds (500–3,900)	No

* including one bed extension ** without bed extension *** with one bed extension installed

another extension and bolt it on. And the General 25-200M1 offers another unique feature: a sliding and pivoting headstock. This doesn't deliver the big outboard turning capacity you might expect (see photos, p. 39), but it does have its advantages.

Torque test was tough for some

All of these midi-lathes offer more power than yesterday's minis and midis, but I wanted to see if they could produce the low-speed torque required for serious faceplate turning. I used a variation of the power test Andy Barnum developed for big floor models in *FWW* #191 ("Tool Test: Heavy-Duty Lathes"). The Delta and the Penn State, with larger motors, were the big winners (see chart, p. 37), and had plenty of power when I turned full-size bowl blanks. That's not to say that I couldn't purposely stall these lathes with an aggressive cut, but with a sharp tool and a moderate cut they had no problems. The lower-powered lathes performed well enough on spindles, but were frustrating when I turned the largest bowl blanks.

Ease of use matters most

While these lathes seem similar at first glance, ergonomics varies quite a bit, and

GENERAL 25-114M1

GENERAL 25-200M1

JET JWL-1220

details that seem small at first can turn into big frustrations as you use a lathe more and more.

For example, you'll use the controls constantly, and the large on-off switch and variable-speed dial on the Delta are easy to reach and manipulate. The dials and switches on the Penn State and General 25-200M1 also worked well. But the small buttons and poor location of the General 25-114M1's controls forced me to actually look and concentrate as opposed to just reaching.

Although all but one of the lathes offers variable speed, the dials only work in a given range. To get to a higher or lower range, you'll need to move a belt. The Delta has a large access door up front, with a one-handed motor tension lever, a real plus. The Penn State, which has only two speed ranges (for fewer belt changes), offers a large, removable plastic cover on the outboard side that allows good access to the belts and pulleys. The other models offer the same two-handed belt-tensioning and small, hard-to-access doors I've seen on mini-lathes for years.

You'll need to lock the spindle when you change chucks or faceplates, or use the indexing function. The Penn State's locking pin, mounted directly on top of the headstock, is the easiest to use. The Delta's pin works well but gets in the way when you crank the headstock by hand. All of the lathes offer 24 indexing positions, except the General 25-200M1, which has 36. However, when not in use, the pin is kept in a threaded storage position, and must be unscrewed and screwed into one of several holes for indexing, which is a hassle.

The digital speed readouts on the Penn State and both General models are neat features, but I'm not sure how much value they add. Most woodworkers will quickly get a sense of the appropriate speed for the task at hand. Basically, I've learned to turn as fast as the lathe will allow without vibrating or shuddering.

Tool rests are not all created equal— The Delta, Jet, and Penn State each come standard with a 6-in. tool rest and a longer 10-in. (Delta and Jet) or 12-in. rest (Penn State). The General models include only the shorter size, which must be relocated constantly when turning long spindles. More importantly, not all of the tool rests stayed put. The one on the Jet moved under moderate use no matter how hard I tightened the handle, while the rest on the General 25-200M1 moved occasionally under heavy use.

Two standouts

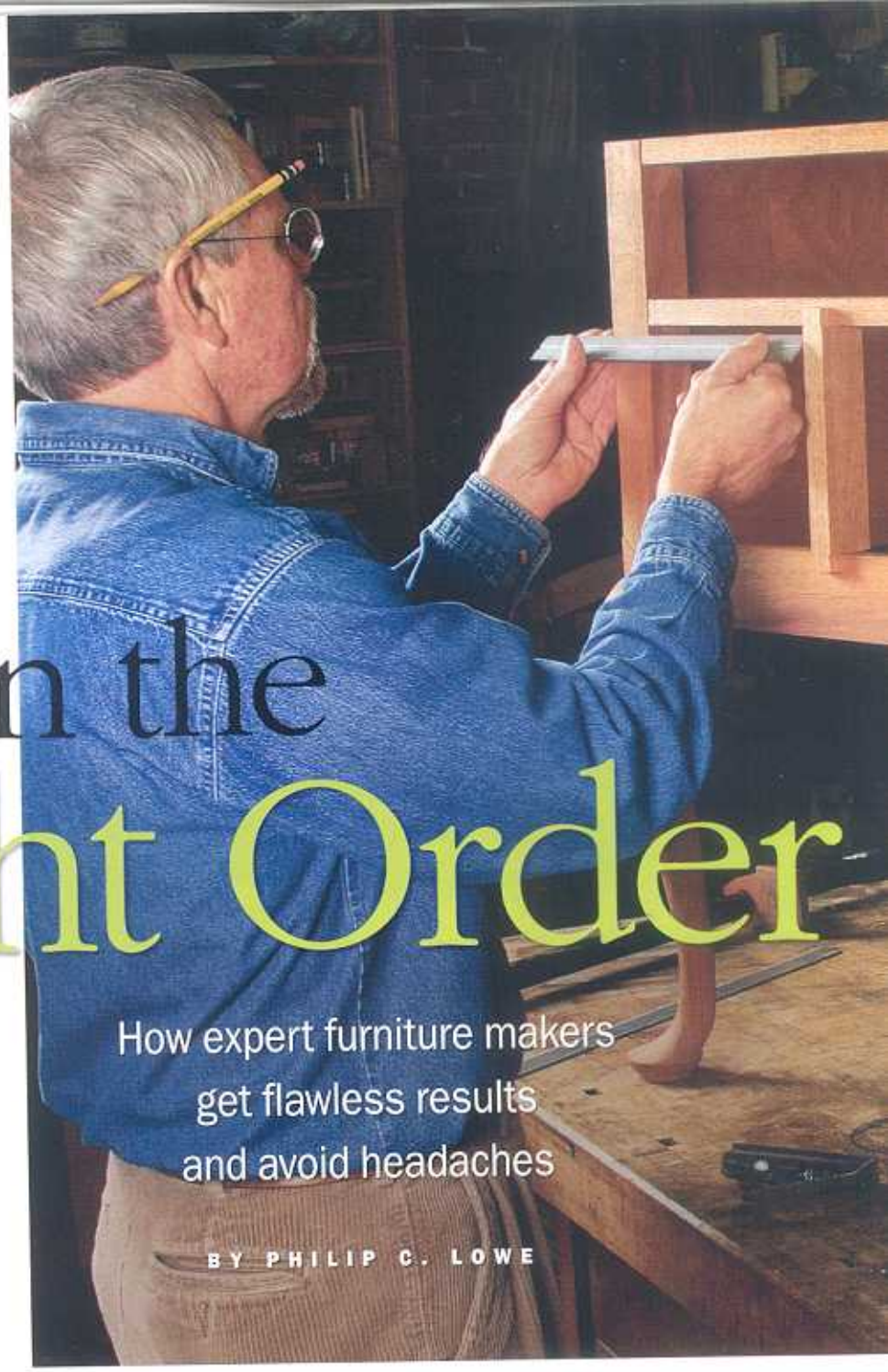
In the end, the Best Overall and Best Value awards were easy decisions. The Delta's power and features stand out from the crowd. And the Penn State is a real bargain at $480 including the bed extension. Either of these models is plenty of lathe for a furniture maker, and will satisfy many turners, too. □

Tim Albers is a woodworker and wood turner, and a frequent tool tester for Fine Woodworking. *He lives in Ventura, Calif.*

Build in the Right Order

How expert furniture makers get flawless results and avoid headaches

BY PHILIP C. LOWE



Drawings are important in any furniture project, but they don't tell you where to start building.

The choice is an important one. Building in the right order helps ensure that parts fit properly, and it gives you the flexibility to work around the small variations that are bound to occur. Choose poorly and the project can get a lot more complicated.

This approach goes hand in hand with another important idea, which is to avoid precutting all of your parts to final dimension. Instead, leave them slightly oversize. That way, you can cut them to fit the piece perfectly as it comes together.

So how do you choose where to start? The clearest general rule is to build the case first. Doing so lets you start with a single assembly that will control the dimensions of just about every other part in the project. Even in pieces that aren't case pieces, this underlying idea still applies: Look for the assembly with the most control over other parts, and start there.

Practice this and you'll find that for any piece of furniture, there's a sequence that will make the task simpler.

Here are four basic furniture types, with time-tested advice on what to build first, next, and last. If you understand these, you should be able to handle almost everything else.

Philip C. Lowe owns and operates The Furniture Institute of Massachusetts (furnituremakingclasses.com) in Beverly, Mass.

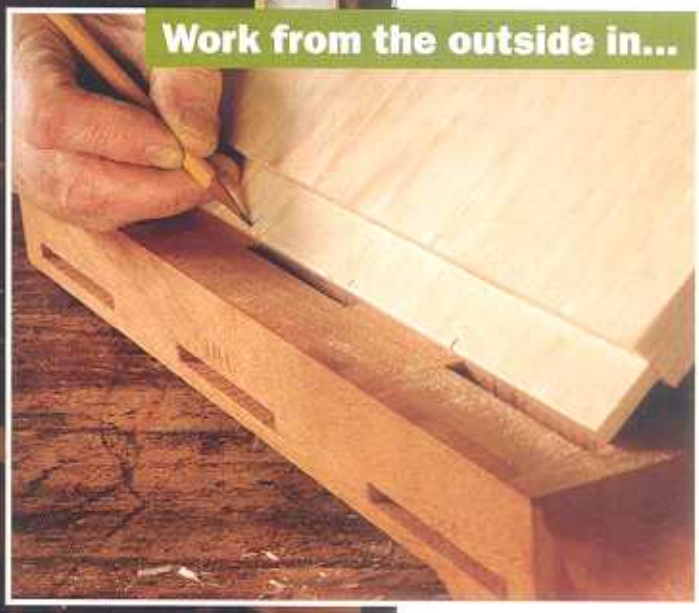
4 GAME PLANS COVER MOST PIECES

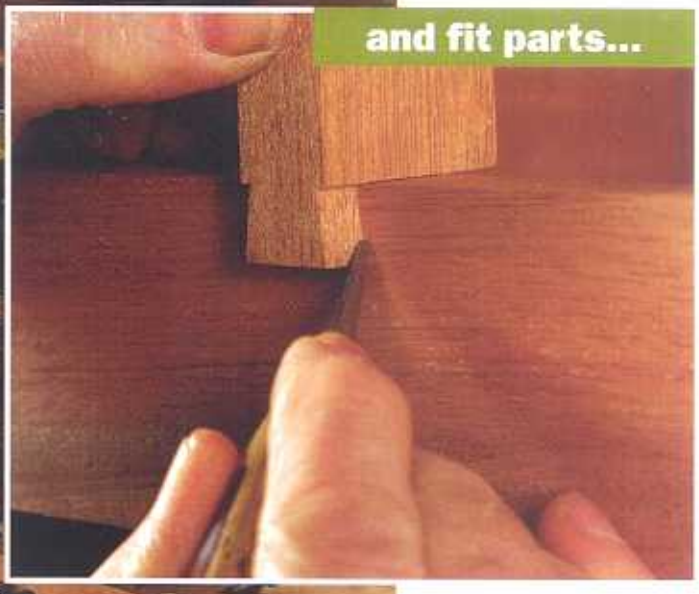
Read on for illustrated guides to four of the most common pieces.

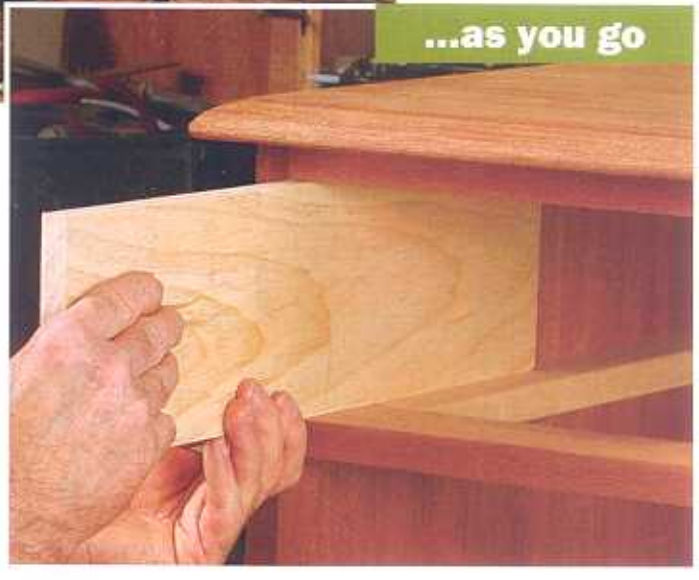
1 CABINETS

2 TABLES

Photos, except where noted: Steve Scott; drawings: John Hir







3 CASE PIECES

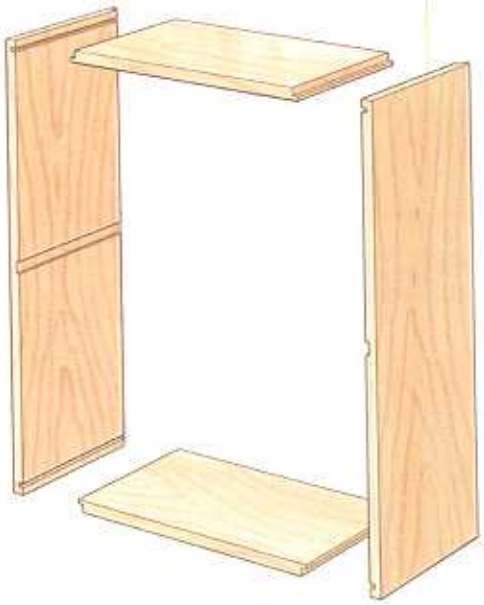
4 CHAIRS

GAME PLAN Cabinet with face frame and door

This small wall cabinet is a good example of a piece with a solid-wood face frame. The rest of the piece is solid wood, too, but it could just as easily be plywood or have more complex joinery.

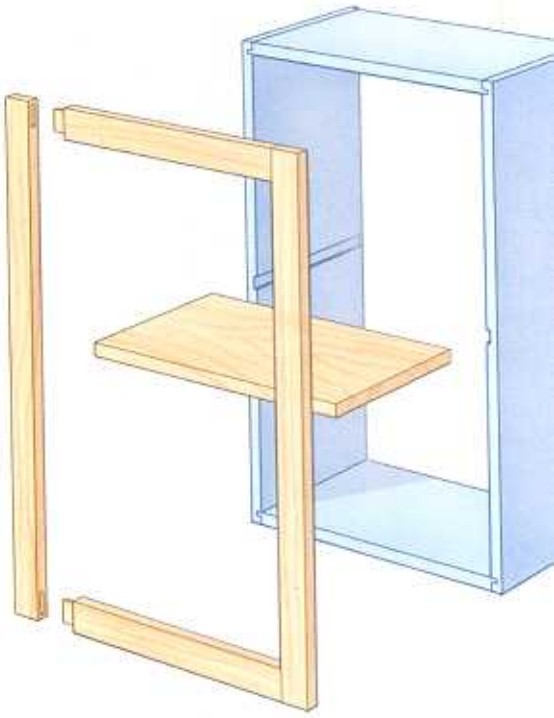
STEP 1 BUILD THE BOX

As with any case piece, the basic box comes first. You need to see the exact size of the case before you can measure for the shelf and size the face frame. Don't forget to cut the shelf dadoes and rabbet the case parts for the back, if need be, before gluing up the case.



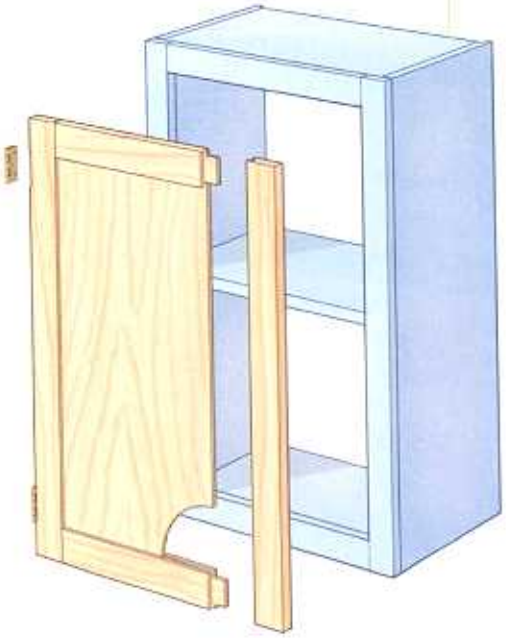
STEP 2 ADD THE SHELF AND SIZE THE FACE FRAME

With the case glued up, measure the inside width just below the top and add the dado depths for a perfect-fitting shelf. Build the face frame slightly oversize—3/32 in. on each side—so it can be planed flush. The frame should be attached before any other work is done, as it will define the opening for the door and could even pull the case slightly out of square when it is attached.



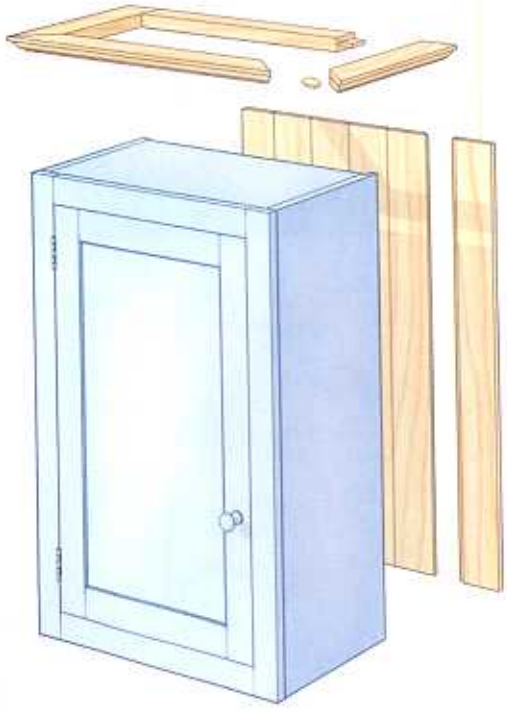
STEP 3 FIT THE DOOR

Size the door to fit the opening in the face frame. Dry-fit the door frame and measure from groove bottom to groove bottom to size the panel. Then glue up the door. Fit the door by planing the top, bottom, and one edge to fit with the correct clearance. Now install the hinges and mark the door's overlap. Remove the door, cut and plane it to size, and re-install.



STEP 4 ADD THE BACK AND THE TOP

The back and the top go on last. Leaving the back off until the end makes it easier to fit the door because you can see the gaps when the door is backlit. Rip and crosscut the boards or back panel to size, cut the rabbets for shiplaps if called for, and install the back. An exception to this approach would be a larger piece, where it's a good idea to install the back after the face frame but before the door, to add rigidity. Finally, fit and attach the top moldings.



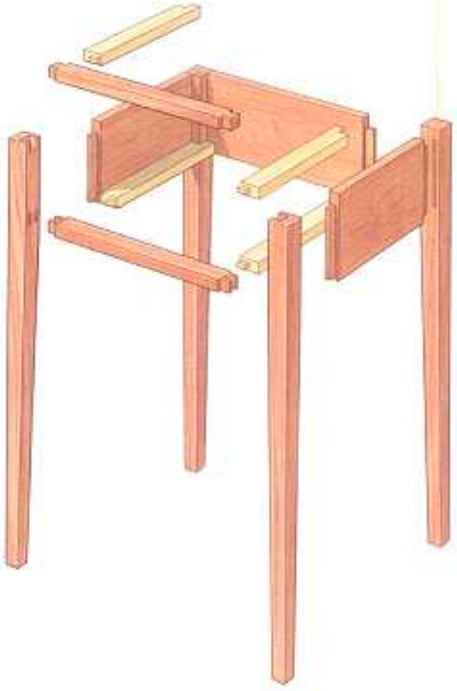
GAME PLAN

Table with drawer

This project has legs and aprons joined with mortises and tenons, but the same basic rules apply.

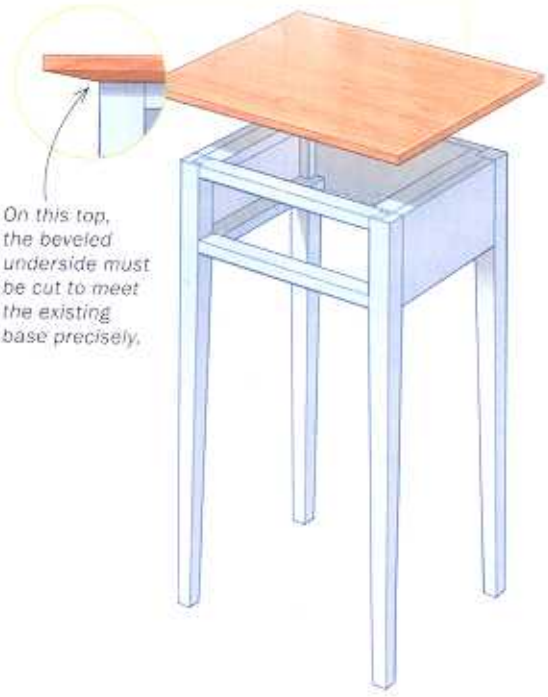
STEP 1 BUILD THE BASE

Start with the base because it controls the size of the drawer opening and the top. Mill the legs and aprons to finished dimension and mark out for the mortise-and-tenon joinery. Mortise and taper the legs, then tenon the aprons and the lower front rail. Dovetail the top rail and (with the base dry-fitted) mark out its sockets in the front legs. Cut the sockets, then glue up the front and back assemblies separately before joining them with the side aprons. The drawer kickers and runners go in last.



STEP 2 SIZE THE TOP

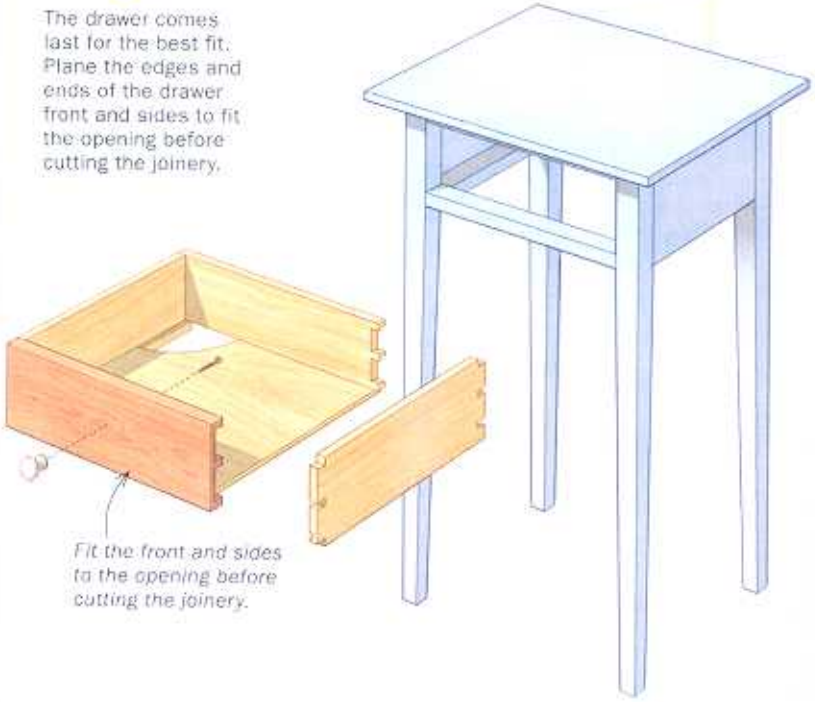
First, check the finished dimensions of the base. After gluing up and flattening the panel for the top, cut it to size and shape the edge. Then, go ahead and fasten it to the base. If any bow exists in the top front rail, attaching the top will change the shape of the drawer opening. That's why this needs to be done before fitting the drawer.



On this top, the beveled underside must be cut to meet the existing base precisely.

STEP 3 FIT THE DRAWER

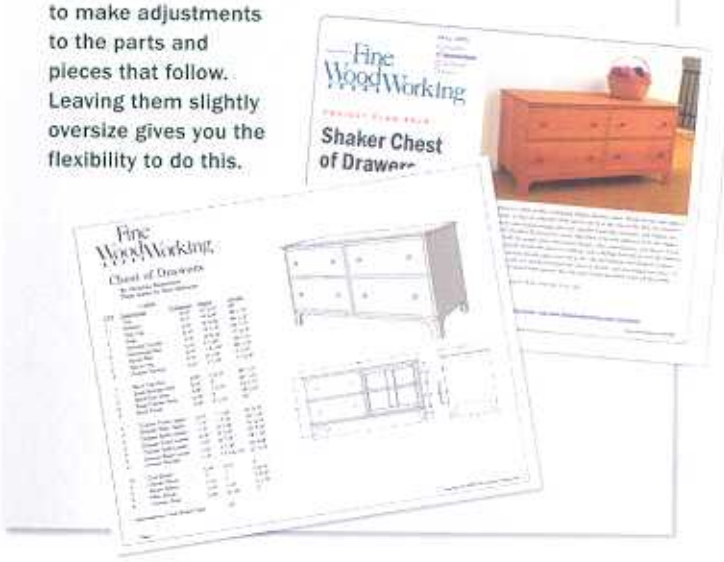
The drawer comes last for the best fit. Plane the edges and ends of the drawer front and sides to fit the opening before cutting the joinery.



Fit the front and sides to the opening before cutting the joinery.

Building from plans

Avoid the temptation to mill all your pieces to the dimensions specified in the cutlist before you start the project. On a case piece, for example, the box you build will vary slightly from your plan. It may be a little larger or smaller; it may even be slightly out of square. When that happens, you'll have to make adjustments to the parts and pieces that follow. Leaving them slightly oversize gives you the flexibility to do this.



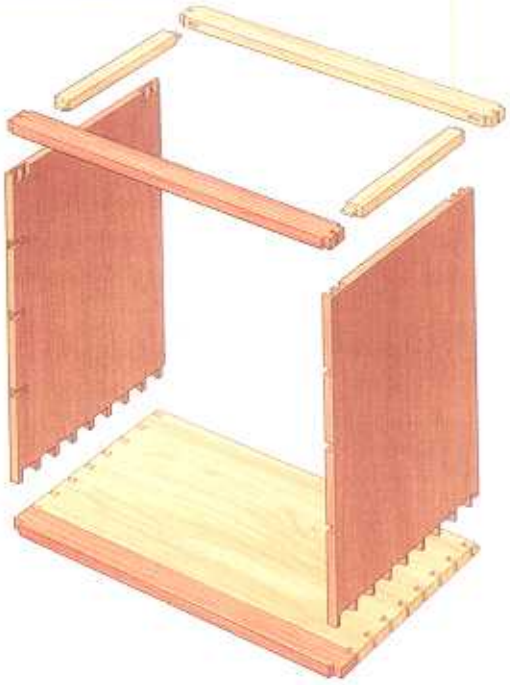
GAME PLAN

Chest of drawers

You'll often hear woodworkers say that it's much easier to build a drawer to fit an opening than it is to build an opening to fit a drawer. This is even more true when multiple drawers are involved.

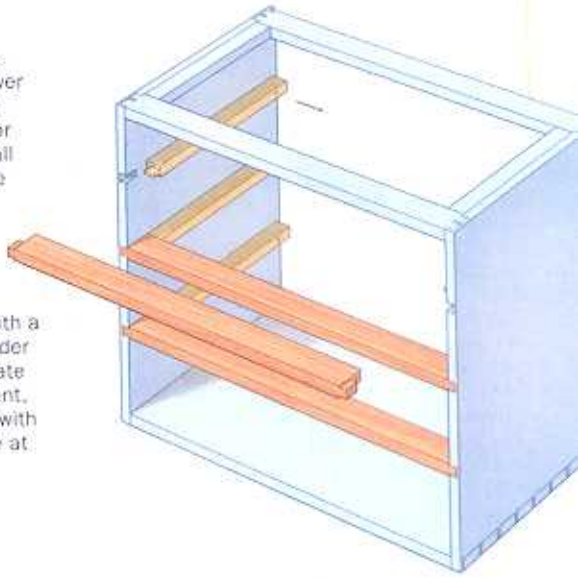
STEP 1 BUILD THE CASE

The case is first, because its final size and shape will determine the dimensions of just about every other component in the piece, and you can tailor the rest of the components for a precise fit. In this piece, the case is solid wood, with dovetail joinery. But the concept would be the same for post-and-panel construction.



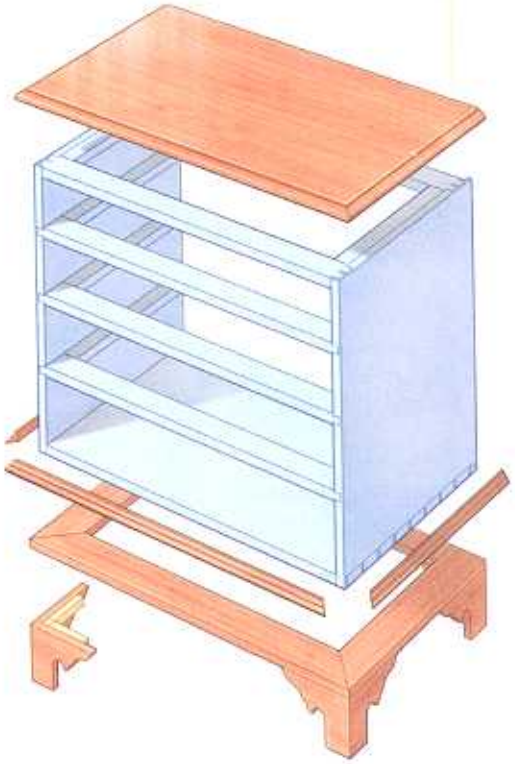
STEP 2 ADD THE DIVIDERS

After gluing up the basic box, install the horizontal drawer dividers, along with the interior components, all of which define the opening for each drawer. The runners are tenoned into the dividers with a relieved shoulder to accommodate wood movement, and held fast with a single screw at the back.



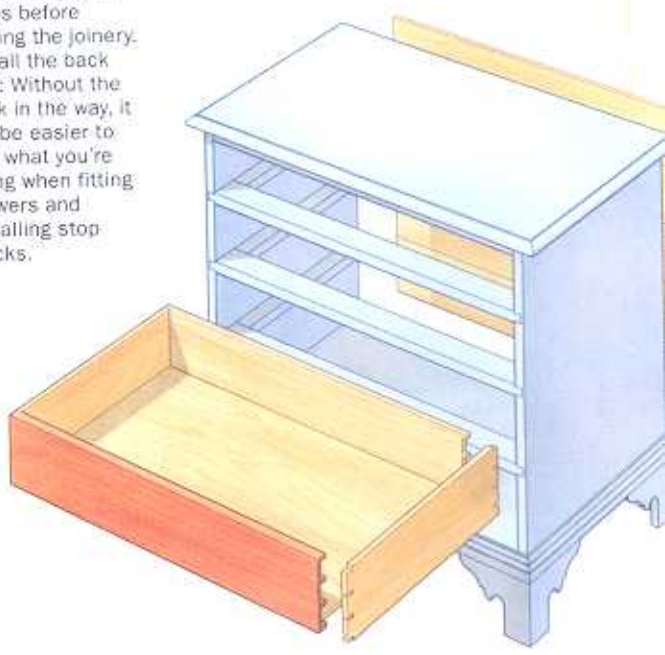
STEP 3 ATTACH THE TOP, BASE, AND MOLDINGS

Wait until the case is assembled so you can measure its bottom for the base. This lets you fit the base accurately and accommodate any imperfections, like corners that might not be precisely 90°. This will affect the fit of the base molding as well. Install the top and attach the base before fitting the drawers. As with a table, if there's any bow in the top stretchers, or twist in the base frame, attaching the base will alter the shape of the drawer openings.



STEP 4 FIT THE DRAWERS AND ADD THE BACK

Again, fit the drawer front and sides before cutting the joinery. Install the back last: Without the back in the way, it will be easier to see what you're doing when fitting drawers and installing stop blocks.



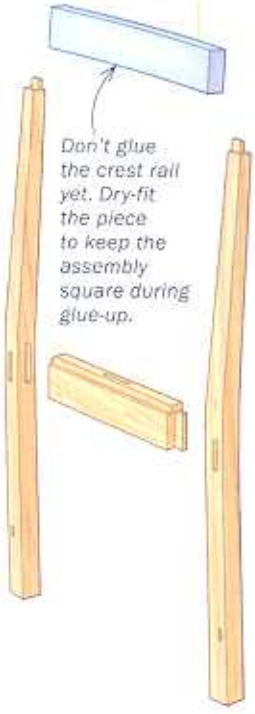
GAME PLAN

Side chair

With compound angles in all directions, chairs strike fear in the hearts of many woodworkers. But if you realize that the back is the foundation and start there, you'll find you can use the fit-as-you-go principle to divide and conquer almost any chair.

STEP 1 THE BACK ASSEMBLY

Start with the posts: Shape them, cut the seat-rail and stretcher mortises, and form the tenons at the tops. Then size the rear seat rail and cut its tenons as well as the rabbet for the seat frame and mortise for the splat. Dry-fit the assembly, mark the crest rail for an exact fit, and lay out the crest-rail mortises against the tops of the posts. To help keep the assembly straight and parallel while you glue it up, dry-fit the crest rail during the process.

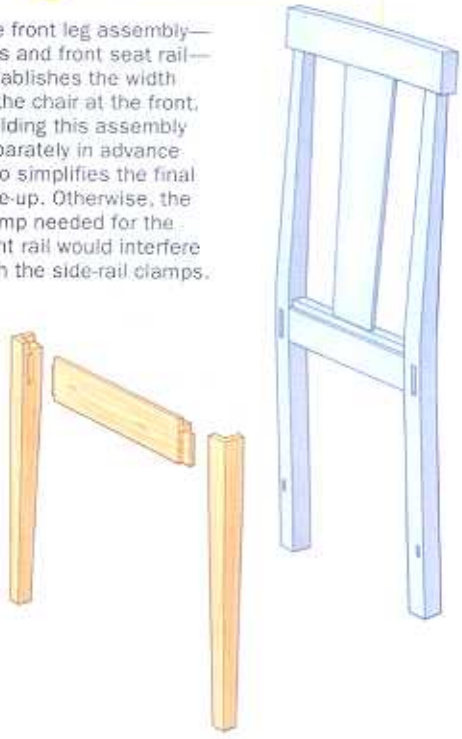


STEP 2 THE SPLAT

Together, the back assembly and the crest rail create the opening for the back splat. Install the splat now because you don't want other parts in the way when clamping it. Mortise the bottom of the crest rail for the splat. Then, fit the splat's bottom tenon into its mortise and, with the crest rail removed, use a straightedge across the tops of the posts to mark out for the top tenon. When the joinery is fitted, glue the splat and crest rail in place.

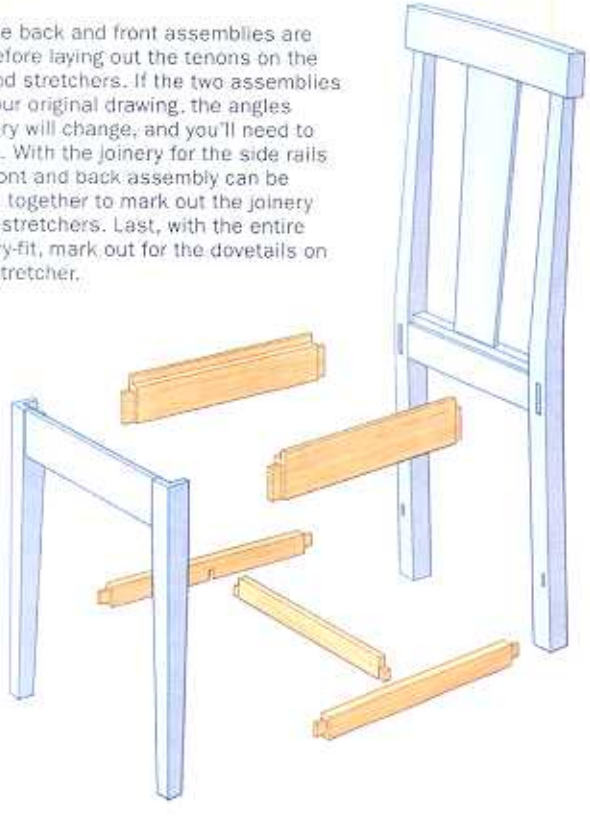
STEP 3 THE FRONT LEG ASSEMBLY

The front leg assembly—legs and front seat rail—establishes the width of the chair at the front. Building this assembly separately in advance also simplifies the final glue-up. Otherwise, the clamp needed for the front rail would interfere with the side-rail clamps.



STEP 4 SIDE RAILS FIRST AND STRETCHERS LAST

Wait until the back and front assemblies are complete before laying out the tenons on the side rails and stretchers. If the two assemblies vary from your original drawing, the angles for the joinery will change, and you'll need to adjust them. With the joinery for the side rails done, the front and back assembly can be dry-clamped together to mark out the joinery for the side stretchers. Last, with the entire assembly dry-fit, mark out for the dovetails on the center stretcher.



Styles vary, but the approach is the same

The concept of building in a particular order and fitting parts as you go isn't confined to one particular style of furniture making. The logic illustrated in these game plans can be applied to any piece, whether it's a Queen Anne lowboy, a Shaker chest of drawers, or a contemporary chest on stand.

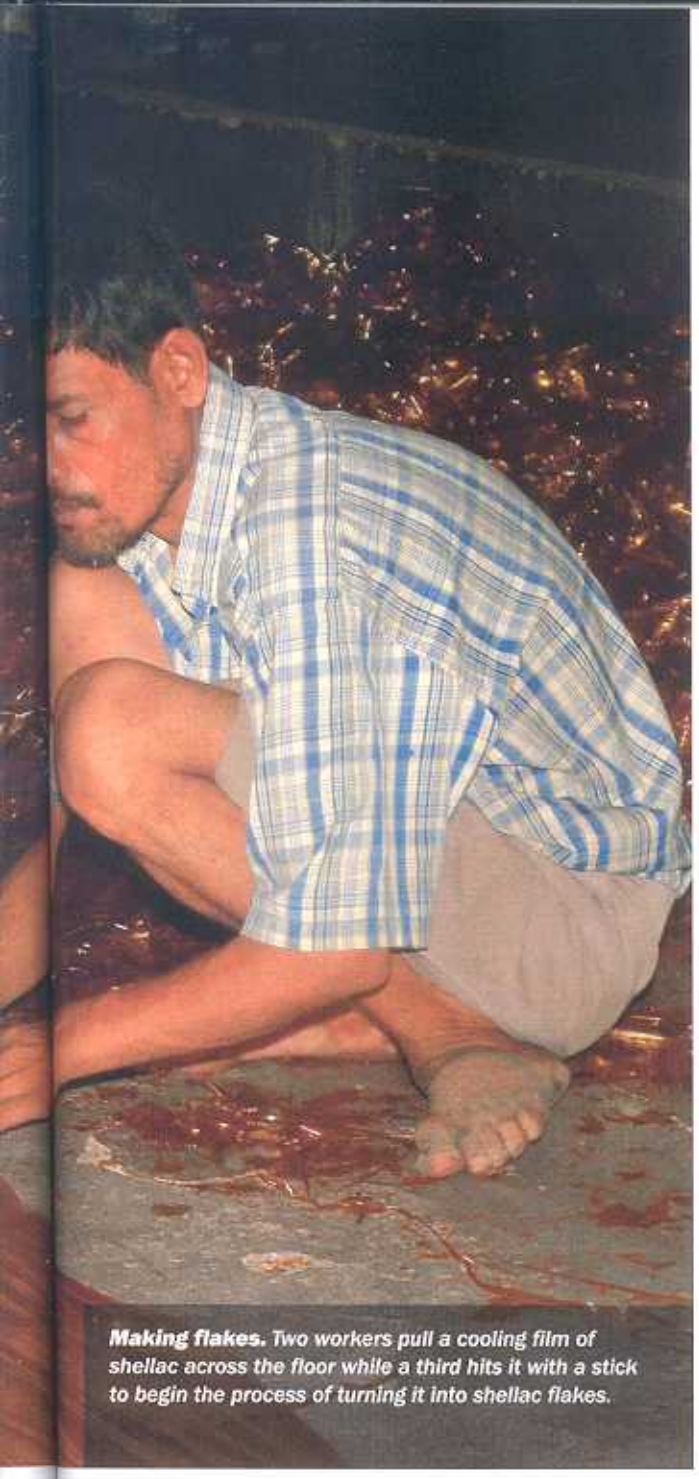
Photos, this page: Michael Pekovich (Shaker chest); Seth Janofsky (chest on stand)

Shellac's Amazing Journey

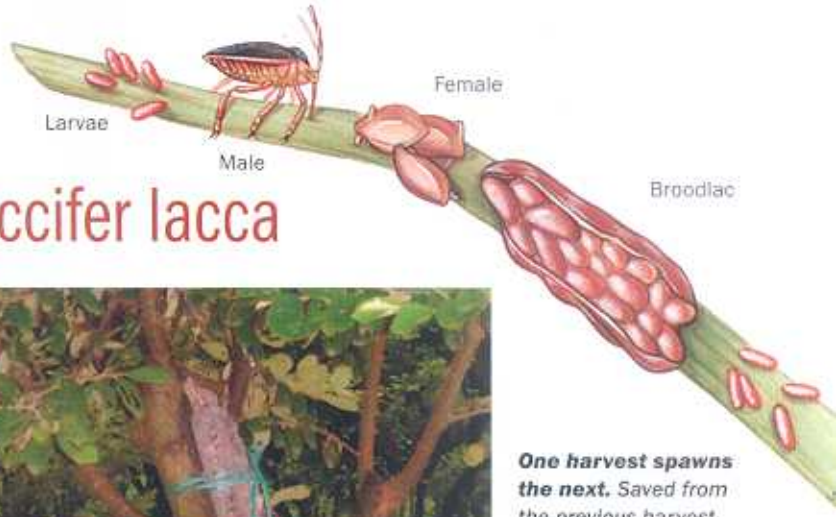
Follow this finish from the tree to your shop, and learn why it is still unmatched

BY VIJAY VELJI

Photos taken in India. Vijay Velji, remaining photos, staff.



Making flakes. *Two workers pull a cooling film of shellac across the floor while a third hits it with a stick to begin the process of turning it into shellac flakes.*



Laccifer lacca

One harvest spawns the next. *Saved from the previous harvest, short sections of branch encrusted with shellac-producing insects and their eggs, known as broodlac, are tied to suitable host trees showing new growth.*

Shellac on a stick. *The larvae emerge from the broodlac and settle on the new growth. They form a hard, protective shell around the twigs. This is known as sticklac, which is the basis of shellac. The fuzzy white substance on the outside is wax.*

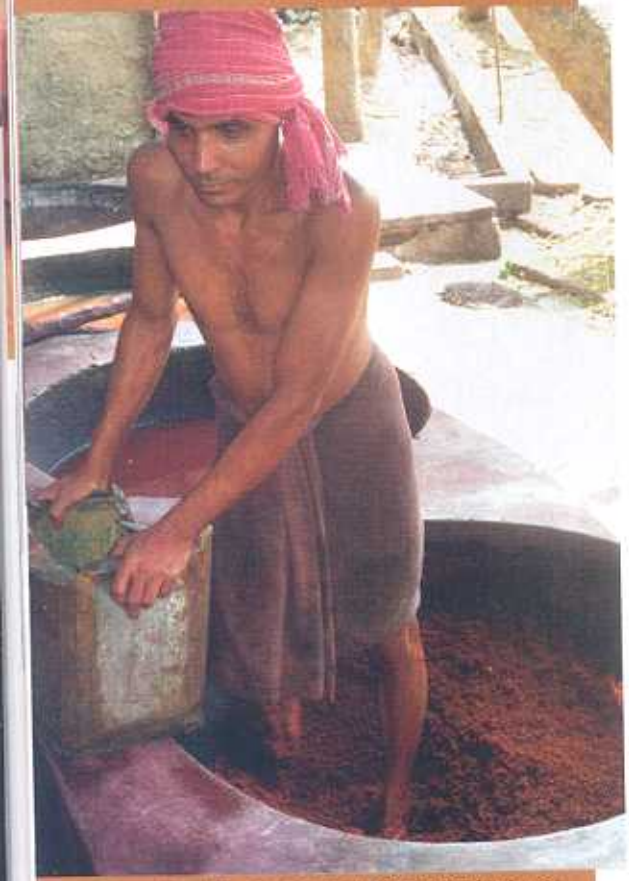
For over two centuries, Western woodworkers have appreciated shellac's unique qualities. It can be used as a sealer on bare wood, as a tinted finish to warm up or age wood's appearance, or as a topcoat—including the incomparable French polish.

However, shellac's story goes back much further than 200 years and is not confined to wood: In its native India, medicinal uses for shellac were described several thousand years ago, while a book published there in 1590 mentions polishing with shellac. Since then, it has also been used for everything from phonograph records to the coating for time-release pills. Having recently returned from India, I'll show you the

Drawings: Sara Krause

Raw material needs refining

Crushed and sieved. *After the sticklac is harvested and crushed, it is sieved to remove pieces of the host tree.*



Seedlac is the result. *Sticklac is placed in a container with water and trodden on to break open the insect bodies and remove the red dye. The result is called seedlac.*

BUTTONLAC

One at a time. *Workers pass a canvas tube filled with dry seedlac in front of an oven. As the seedlac melts, they twist the tube, forcing molten shellac through the canvas, where it is scraped off and deposited onto a galvanized sheet of metal to form buttonlac. While the buttons are still soft, they are stamped with the manufacturer's seal (left).*

fascinating way shellac is grown, harvested, and refined. Then I'll describe the grades of shellac and how to get the most from each one. The best part of the story is that despite man's efforts, no other finish can match shellac's versatility, beauty, or environmental friendliness.

Shellac really does grow on trees

Shellac is derived from the resinous secretion of a tiny insect—tinier than the period at the end of this sentence—known as *Laccifer lacca*. Twice a year, in India and Thailand, millions of red larvae about 1/64 in. long hatch and settle on the tender, fresh twigs of certain trees. Each larva inserts its proboscis into the tree and then secretes a protective coating consisting of a dark red scale and a yellow-to-reddish substance called lac resin. The larvae mature inside their protective shells and become sexually mature insects in about eight weeks. The males crawl out of their shells to fertilize several females and then die. Their direct contribution to shellac is insignificant.

However, the females, growing in size to accommodate their many eggs, increase production of lac resin and wax. In 14 weeks, the new larvae hatch and emerge to begin a new life cycle. Thus the insect completes two life cycles in a year, yielding two lac crops; the primary one in April-June and the secondary one in October-November, which generally has lower quality. It takes about 300,000 insects to produce 1 kilogram or 2.2 lb. of shellac.

How it is harvested—Shellac is often described with the terms baisacky, kusumi, or rangini. Baisacky is the spring harvest season. Kusumi is the lac obtained from the Kusum tree. It is the most expensive since it contains very little red dye, giving it a golden yellow color. The rangini ("colorful") strain comes from the two other

FLAKES BY HAND

Spread and stretched. *Instead of creating individual buttons, a worker places the molten shellac on the outside of a ceramic cylinder filled with hot water (above). The worker then spreads it into a thin layer using the stem of a palm frond. The worker removes the shellac from the cylinder, then uses his hands, feet, and mouth to stretch the shellac into a thin sheet (right). Once it has cooled, he lays it down on the ground to be broken into shellac flakes.*

FLAKES BY MACHINE

Still labor-intensive. *To make shellac flakes by machine, molten seedlac is poured across a steel drum heated by steam. A weighted bar spreads the shellac into a thin sheet and two workers further stretch the material after it comes out of the machine.*

More handwork follows. *After the film of shellac has cooled, it is beaten with a stick to form the flakes familiar to woodworkers.*

The finished products, and how to use them

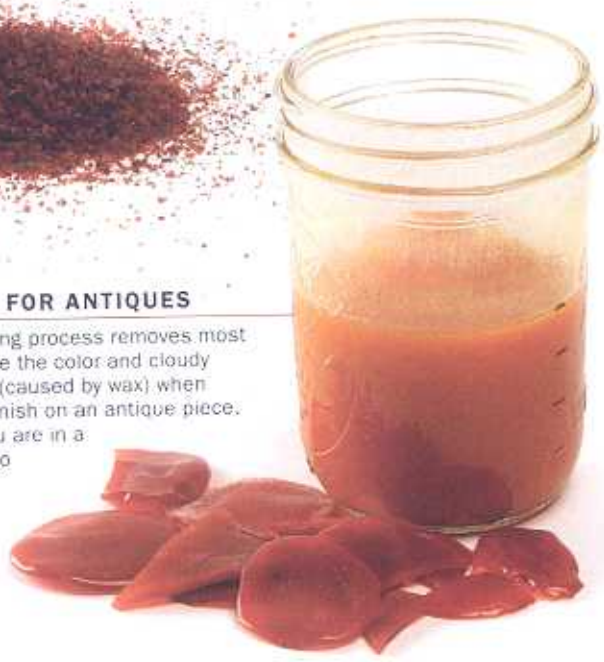
Shellac is available in cans, where it is already dissolved in alcohol (see opposite page), or in dry forms that you dissolve yourself when needed. Shellac in dry form must generally be mail-ordered but comes in a much wider variety of types. The main grades are seedlac, buttonlac, handmade waxy flakes, and machine-made dewaxed flakes, which are the most useful by far. When dry, all shellac is non-toxic, so it's safe for children's toys and also is widely used in the food and drug industries as a coating.

SEEDLAC: A UNIQUE COLOR

Despite the large amount of wax and residue that have to be removed by filtering or decanting after seedlac has been dissolved in alcohol, many makers and restorers of period furniture swear by the color seedlac gives to cherry and mahogany in particular. As with all waxy shellacs, seedlac can't be applied directly before or after another type of finish because of adhesion problems.

BUTTONLAC: GOOD FOR ANTIQUES

Although the manufacturing process removes most impurities, restorers value the color and cloudy appearance of buttonlac (caused by wax) when matching the color and finish on an antique piece. Don't use buttonlac if you are in a hurry, as it takes longer to dissolve than flakes.



DEWAXED FLAKES: FOR ALL FINE FINISHES

Dewaxed shellac is by far the best for finishing. It contains no impurities and has negligible amounts of residual wax. While French polishing can be done with any shellac, dewaxed varieties give the best results. It makes an excellent sealer on bare wood (controlling blotches and preventing sap bleed-through) as well as a barrier coat between finishes that are either incompatible (waterborne finish over oil) or have a common solvent and might blotch (waterborne clear finish over a waterborne dye). It is also less susceptible to water damage than waxy shellac. The colors include garnet, orange, beige, and super blonde. These can be used to add color to the wood, or super blonde shellac can be tinted with concentrated dyes or alcohol-soluble dye powders already dissolved in alcohol.

popular host trees, the palas and the plum. It contains more red dye, and also more wax, making it cheaper than kusumi.

The cultivation of lac is fairly simple: The host trees are pruned and when the new shoots emerge, two or three branches containing female insects and their eggs, known as broodlac, are tied near the new shoots. The larvae emerge, settle on the shoots, and start producing lac. At harvest time the twigs are cut, and after a portion is set aside to serve as broodlac, the rest is scraped off and sold as sticklac. This consists of chunks of lac, often with a hole through the middle where the twig was.

The color of this raw material varies from year to year as climate variations alter the tree's sap, on which the insects feed.

Turning raw sticklac into seedlac—In a mainly cottage industry carried out by hand, sticklac is crushed and then sieved to remove tree debris and other contaminants. It is then washed several times in large vats and at the same time rubbed against the sides of the vat to break open the insect bodies. This dissolves a red dye that can be used as a substitute for cochineal.

After repeated cleaning, the lac is left to dry and then sieved once more to produce seedlac. Apart from lac resin, sticklac contains wax, lac dye, and other impurities.

Shellac is made by hand or machine

The rest of the process also was once done entirely by hand. These days, machine production predominates, but a niche market in handmade shellac survives.

To make solid shellac by hand, a worker fills a long, narrow canvas bag with seedlac. One end is held in front of an oven and the other is attached to a crank. Heat from the oven melts the seedlac and the crank forces the molten shellac through the bag while the impurities remain inside. The molten shellac is scraped off and dollops placed onto a galvanized iron sheet, forming small disks called buttonlac.

To make shellac flakes, the worker uses a palm frond to spread the molten shellac over a porcelain cylinder filled with hot water. Using considerable skill, he pulls the hot, pliable shellac off the cylinder and stretches it into a very thin sheet using his hands, feet, and even teeth. Once this translucent sheet is cool, it is broken into flakes.

CANS ARE CONVENIENT

If you want the benefits of shellac without the bother of flakes, premixed shellac, made by Zinsser, is available in hardware stores and home centers. The company sells dewaxed SealCoat and waxy Bulls Eye. The latter come in "amber" and "clear" but they have the same drawbacks that waxy flakes have, such as a cloudy appearance and incompatibility with some other finishes. A better all-round choice is SealCoat, which has the advantages of dewaxed flakes plus a longer shelf life than dissolved flakes. However, the preservatives make it less suitable than flakes for French polishing.

Machine-made shellac is produced in two different ways. One uses the same principle as in handmade shellac: Seedlac is melted, poured across a steam-heated metal drum, and then forced into a thin sheet using a weighted bar pressing against the drum. The thin, rapidly cooling sheet is further stretched by hand as workers pull it across the floor. Once it has stretched about 25 ft. from the machine, it is cool enough to be broken up with sticks into shellac flakes.

The second machine method uses solvent to extract pure shellac from seedlac. All dewaxed shellac, whether canned or flakes, is made using the solvent method.

What is the shelf life of shellac?

Shellac flakes have a shelf life. After about two years, dewaxed shellac that has been stored in a cool, dark, dry place will dissolve in alcohol more slowly, and some of it will not dissolve completely, forming a gelatinous mass at the bottom of the bottle. If this shellac is used for French polishing, it will require more than the usual amount of oil for lubrication and will take longer to dry. Because they are less processed, waxy grades last about three years.

Once dissolved in alcohol, shellac does not last more than about six months. Store the mixture in a dark, dry area, ideally between 65° and 70°F. However, canned shellac has a shelf life of three years from the date stamped on the can. □

Vijay Velji is the owner of Shellac Finishes (ShellacFinishes.biz) and lives in San Diego.

WHAT IS A SHELLAC CUT?

The cut is the ratio of dry shellac dissolved in 1 gal. of denatured alcohol. A 1-lb. cut means 1 lb. of shellac dissolved in 1 gallon of alcohol. A 2-lb. cut is used for most applications whether brushing, spraying, or padding, but for a final coat with no brush marks, a 1-lb. cut is better. For canned shellac, Zinsser's waxy grades come as a 3-lb. cut; SealCoat is a 2-lb. cut. To turn a 2-lb. cut into a 1-lb. cut, combine 3 parts shellac with 2 parts alcohol.

1 lb. dry shellac + 1 gallon of alcohol = A 1-lb. cut

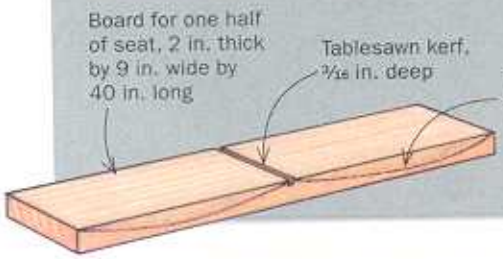
Just mix and wait. *Place the shellac flakes and alcohol in a clean glass jar with a tight-fitting lid. Give it an occasional shake and it should dissolve in a few hours.*

HOW TO MAKE SHELLAC FROM FLAKES

You probably won't need a gallon of shellac, so a useful ratio is as follows: 1 oz. of shellac by volume in a cup of alcohol yields a 1-lb. cut. If you need a 2-lb. cut, simply increase the shellac flakes to 2 oz.

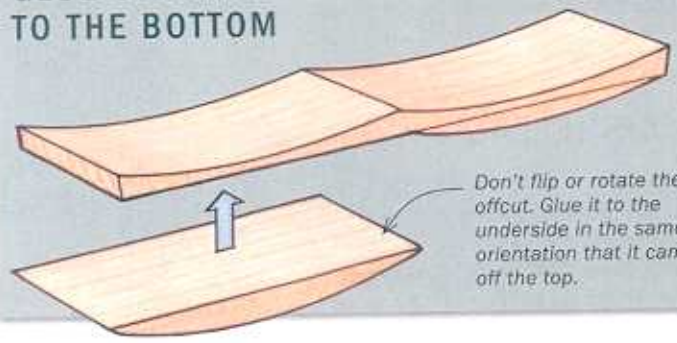
Comfortable Seat for Two

BANDSAW THE SEAT PROFILE



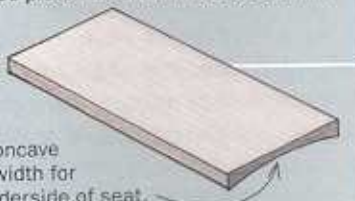
Tablesaw kerf simplifies resawing. *When the bandsaw blade enters the kerf, the offcut comes free. Without it, you'd either cut into—and ruin—the second offcut, or stop the blade and back out of the cut.*

GLUE OFFCUTS TO THE BOTTOM



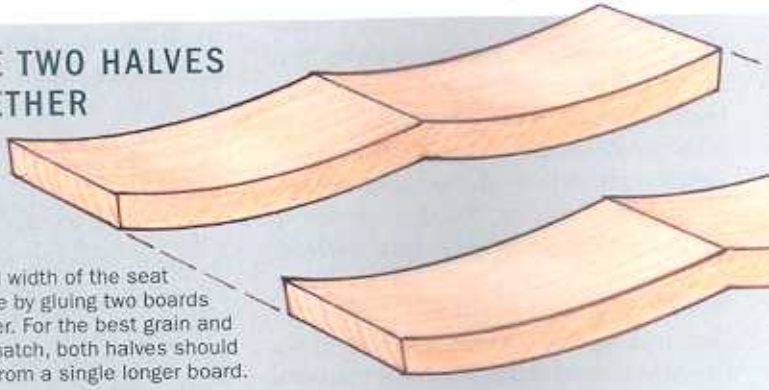
Don't flip or rotate the offcut. Glue it to the underside in the same orientation that it came off the top.

Sand the offcuts before glue-up. *They come together at too steep an angle to sand afterward. Ames sands across the grain with a shop-made, curved platen inserted in a belt sander.*



Platen is concave across its width for sanding underside of seat.

GLUE TWO HALVES TOGETHER



The full width of the seat is made by gluing two boards together. For the best grain and color match, both halves should come from a single longer board.

Smart bandsawing creates beautiful curves and saves wood

BY JUDITH AMES

The design for this bench kicked around in my head for several years as I worked out the details. The wait was worth it. Clients love the curvaceous seat and legs, with their subtle but noticeable Asian influence. And being a native of New England, where frugality is prized, I take pleasure in knowing that very little wood is wasted when I make the seat. The offcuts from shaping the top are glued to the underside so that the top and bottom curves run parallel, a technique I first developed when making rocking-chair seats.

The curves of the seat aren't just for show. Each one scoops out a comfortable place to sit. And I add a gentle curve to the edges—I call them "pillowed" edges—to further soften the look of the bench.

I also am pleased that the simple elegance of the bench is the result of a refreshingly simple technique. The seat is made from two planks of wood. All it takes is two cuts at the bandsaw to rough out the scoops. I then move the offcuts to the underside and glue them in the same orientation. After the two halves are glued together, I shape the legs at the bandsaw, and join them to the seat with mortise-and-tenon joints.

In all, I find this a satisfying piece to make. Not only do my clients find the design pleasing, but they find comfort in it, too. And it pleases my frugal Yankee soul that I'm helping to conserve a precious resource by getting the most out of the wood I use to make the bench. □

Judith Ames designs and makes furniture in Seattle.

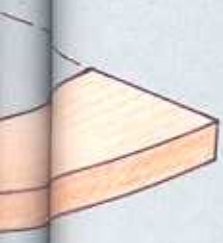
ATTACH THE LEGS

Each leg is cut from a single plank. The tenon is cut while the blank is square, and fitted into an angled mortise (8°). Next, Ames bandsaws the inside and outside faces, then the edges. The edges are also rounded slightly.

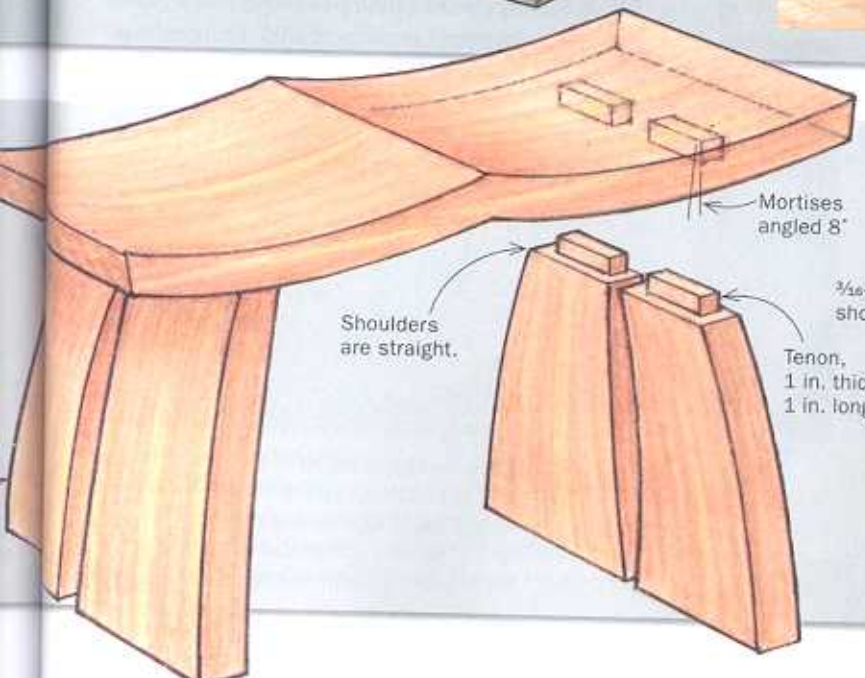
Photos: Matt Kenney; drawings: Vince Babak

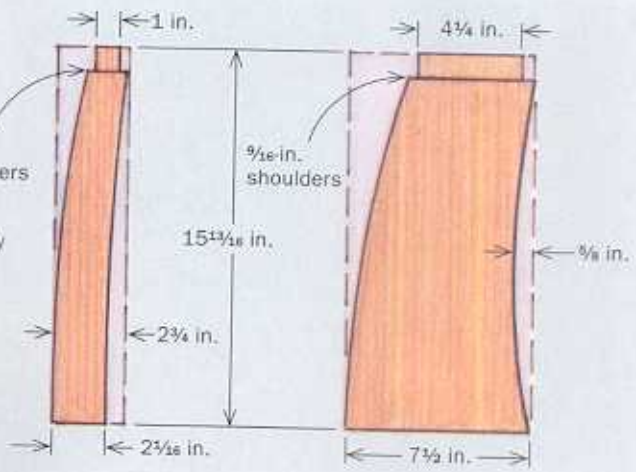
Get help to hold the board upright. *Ames clamps the board to an L-shaped plywood support to keep it parallel to the blade, which minimizes the amount of sanding needed afterward.*

Got clamps? *You'll need them now. Ames spaces them 3 in. apart and uses shaped cauls to get pressure into the valley where the offcuts meet.*



And smooth the seat. *When gluing, Ames aligns the two halves simply by sight and feel. Afterward, she again sands across the grain (right). The platen for the top side needs only a slight curve. After sanding, Ames uses a card scraper.*





Dress Up Your Work With Creative Stringing

If you can imagine a shape, you can inlay it

BY STEVE LATTA

PLAY WITH GEOMETRY

Two simple shapes—a circle and a curve—cut into a single piece of MDF are all that's needed to cut the grooves for this lotus flower.

OR DRAW A PICTURE

Pattern routing makes it simple to cut grooves for pictorial inlays of all kinds, such as this stylized songbird.

There's no better way to personalize a piece of woodworking than with inlay. It's a decorative technique that's highly flexible and uses common woodworking tools.

One of the most basic challenges in inlay work involves cutting the narrow grooves in which the inlay is set. If the line is straight and near the edge of the panel, you can use a router with an edge guide, or other inlay tools. But things get more complicated when you're working away from a reference edge or cutting grooves with complex curves or irregular shapes.

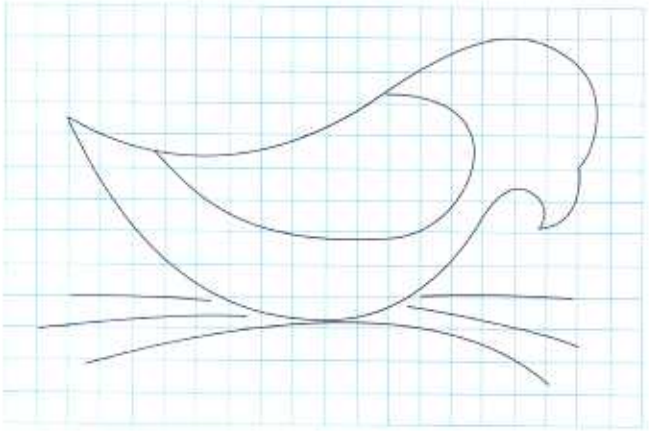
The solution is to use a pattern. This approach works very much like larger-scale pattern routing for shaping furniture parts. First, you create a pattern by cutting the design into a piece of MDF. Then you position the pattern on the workpiece and use it as a guide for the router. It's possible to use a trim router for this work, with a collet adapter for small-shank bits, but I strongly recommend a high-speed rotary tool (such as a Dremel), equipped with a router base from stewmac.com. The bits I use are two-flute, spiral upcutting end mills (1/32 in. from drilltechnology.com).

As for the stringing, you'll need to cut your own (see "Line and berry inlay," *FWW* #196) using 0.9-mm or 1/28-in. veneer in holly, sycamore, or dyed black anigre (try wood-veneers.com, rosebudveneer.com, or berkshireveneer.com). To show the possibilities, I'll demonstrate two of my favorite designs.

Steve Latta is a contributing editor.

Photos, this page, and drawings: John Tetreault

A pictorial design: The songbird



This design was adapted from a decoration on early Pennsylvania German furniture. It can be sized for a variety of uses including blanket chests, door panels, and box lids.

The pattern is made in two parts—the body and the wing. Start with a piece of ½-in. MDF that is large enough to allow plenty of room to accommodate clamps in areas that won't obstruct the router's path. The stringing is dyed black anigre.

If you want the inlaid design to exactly match the size of the drawing, be sure to enlarge the drawing slightly on a photocopier before using it to cut out the pattern. This step accounts for the offset between the bit's shank, which rides the pattern, and its cutting edge. For my ⅛-in. bit, that offset is about 3/64 in.

I make inlay patterns from ½-in. MDF because it wears well. The spinning shank can burn a recess into the pattern and put a ripple or wide spot in your groove. But as long as you keep the bit moving while you are routing the grooves, the pattern should last a long time. Keep the tool moving—even after you've cut power—until the bit stops.

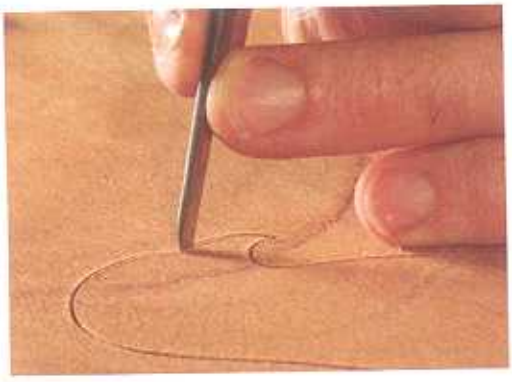
The grooves for the bird design can essentially be cut all at once, without stopping to insert any inlay until the entire design is cut. The pattern has a couple of tight inside corners, which can be prone to burning. To avoid this, be sure to rout all the way in and then quickly come out. The outside corners need special care as well, as shown in the photos.

A TEMPLATE GUIDES THE WAY

Make a pattern to guide the router. *Glue the drawing to a piece of MDF and cut out the interior and wing with a scrollsaw (above). Smooth the curves with sandpaper or small files, keeping the edges square to the face. When routing the grooves (right), angle the router and pivot down to start the cut, keeping the bit shank against the template.*

TIP FOR OUTSIDE CORNERS

Stop short and finish by hand. *Routing all the way around an outside corner yields a rounded arc instead of a sharp apex. To avoid this, run the router close to the point, cut the power, and back up (top). Repeat from the other direction. To join the two grooves, Latta uses a narrow #2 or #3 gouge (bottom). An X-Acto knife with a blunted tip helps remove the chips.*

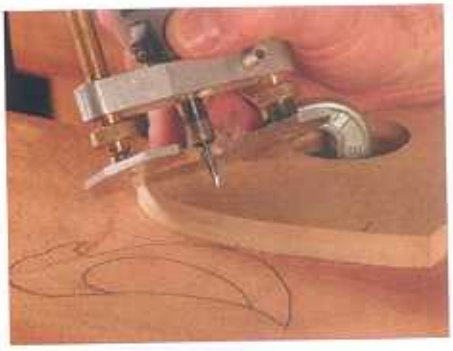


Rout the wing. *With the perimeter of the body cut, put the wing back in, hold it in place with tape, and rout around it. Avoid thick tape—you don't want the router base hanging up on it. Transparent household tape is fine.*

INSERT THE INLAY AND TRIM IT FLUSH

Shape the stringing. *Latta coaxes a curve into the stringing by bending the pieces over a heated burn-in knife. He uses an automotive feeler gauge as a bending strap to stop the stringing from catching.*

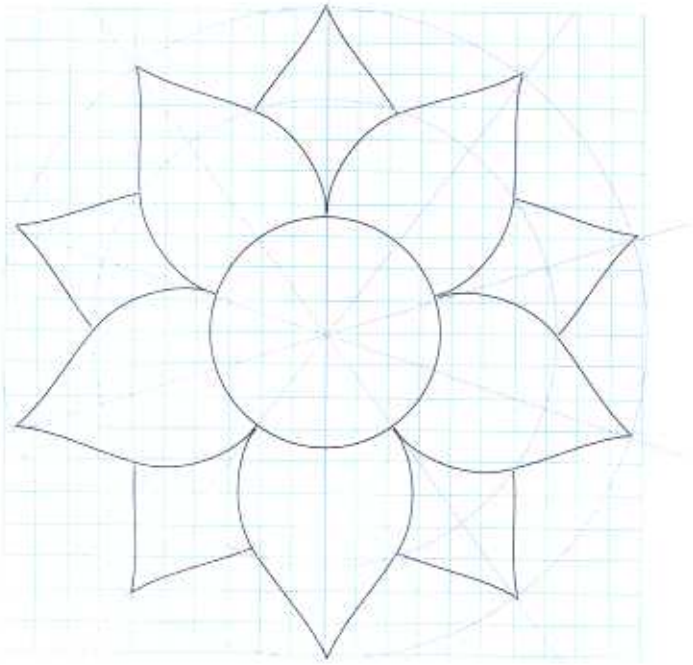
Apply glue like a surgeon. *Latta uses a syringe with a narrow, curved tip ($2.60 at leevalley.com) to lay a fine bead of yellow glue into the groove (top). Press the inlay into the groove with your fingers, leaving it just proud of the surface. Trim each end at an angle (above) so the pieces mate cleanly.*



Give the bird a perch. *Latta uses a separate pattern (top) to rout the simple arcs that anchor the bird design. Leaving the stringing above the surface lets you level it with a smoothing plane iron, used bevel down (above).*

Photos, except where noted: Steve Scott

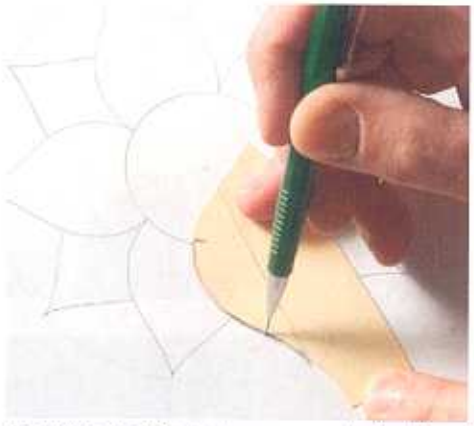
A geometric design: The lotus

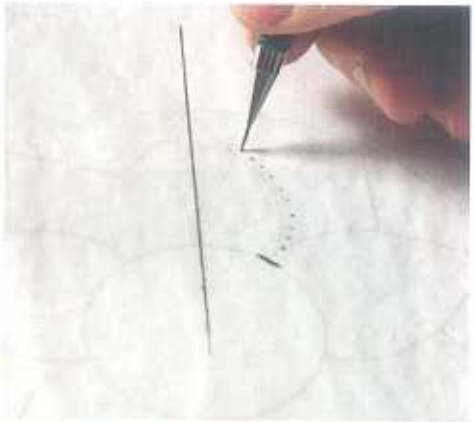


The lotus design, with its repeating complex curves, is tailor-made for pattern-routed grooves. The pattern that creates the flower's center is simply a hole drilled with a Forstner bit. The leaf pattern, which creates one half of a single leaf, is sawn into the edge of the same MDF template. To make the pattern, it helps to have a full-scale drawing of the design from which to trace. You can either copy the one shown here or draw your own.

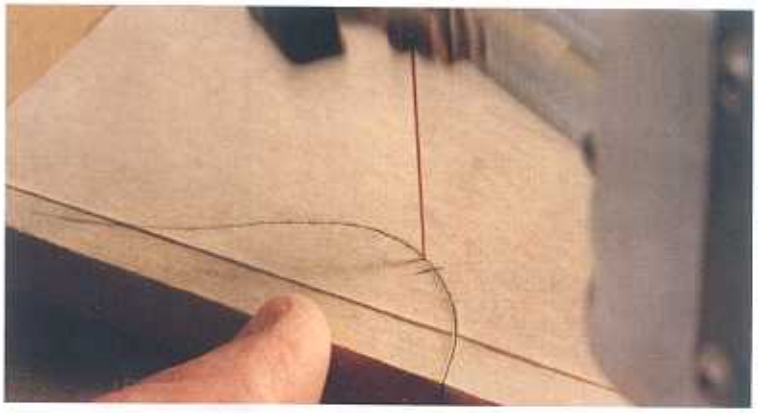
To draw, start with two concentric circles for the flower's inner and outer diameters. Experiment with their relative sizes to find a proportion that pleases your eye, then divide the circles into 10 equal segments. Use the circles and rays to guide your drawing of the leaves—leaf tips at the outer circle, bases at the inner circle. I use a French curve to refine the leaf shape, then cut it out and use it to create a card-stock template for drawing the final design. Finally, a third concentric circle marks the intersection of background and foreground leaves.

Cut a practice flower or two in MDF or scrap before taking the router to your workpiece. Doing so lets you refine your layout while getting used to the tool.





Draw the design. *Latta uses a card-stock template to create a finished drawing of the full design (left). He then creates a tracing from which the MDF pattern will be cut (right). To account for the offset between the bit's shank and cutter, the tracing must be 3/64 in. larger than the original drawing. Latta marks the offset with a series of dots, then connects them to create the traced line. He also draws the arcs beyond the centerline to allow minor adjustments when aligning the pattern on the work. Finally, he marks the tracing to indicate where the leaf's base meets the central circle.*

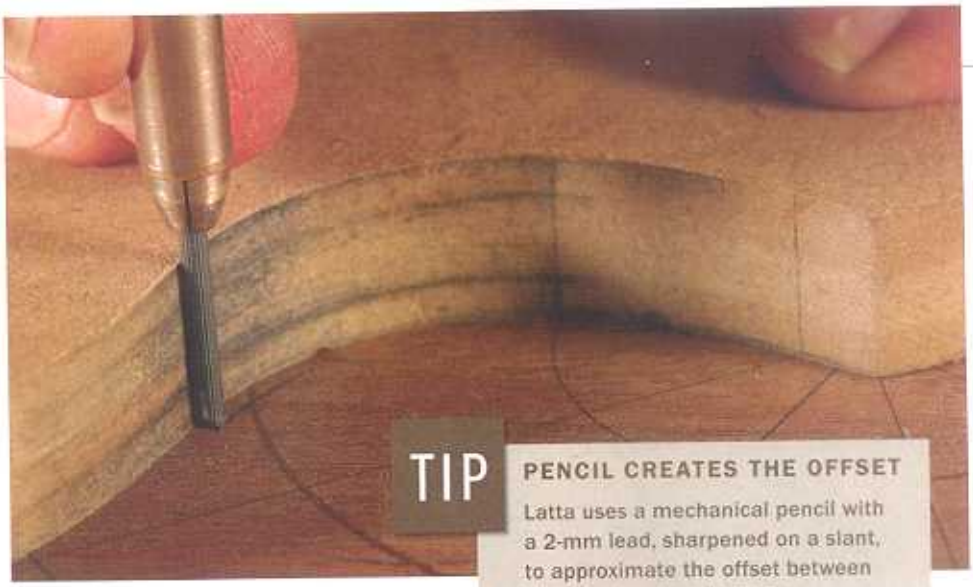


Cut the pattern on the scrollsaw. *Glue the tracing to the MDF and score the centerline with a knife. After cutting the pattern and smoothing it with files and sandpaper, carry the layout lines down the edges to the bottom of the pattern.*

Lotus (continued)

LAY OUT THE WORKPIECE

Key landmarks. *To guide placement of the MDF pattern, draw the circles and rays on the workpiece (above). To complete the layout for each background leaf, position the pattern for the adjacent full leaf and draw an arc where the pattern crosses the middle circle. The resulting X (right) indicates where the two leaves meet.*



TIP

PENCIL CREATES THE OFFSET

Latta uses a mechanical pencil with a 2-mm lead, sharpened on a slant, to approximate the offset between the bit's shank and cutter.

A SEAMLESS INLAY, STEP BY STEP

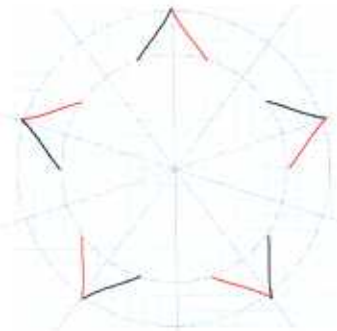
To join the many lines of stringing cleanly, it's important to cut and fill each set of corresponding grooves in a specific order, filling and leveling them before cutting the next ones. Start in the background and work forward. This way, you can trim the ends of the first pieces as you cut subsequent grooves. This leaves nearly invisible joints.

1 BACKGROUND FIRST

Start with the background leaves, cutting the left-hand edge of each leaf. Lay the leaf pattern down on the workpiece and align its centerline with one of the rays. Place the point of the leaf at the outermost reference circle and clamp the pattern in place.

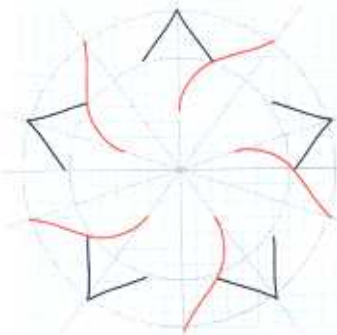
2 FILL AS YOU GO

Once the left-hand edges are done, fill the grooves with stringing and then cut the right-hand edges, filling them as well. Keep an eye on the bit. You don't want to run too far into the adjoining line; you don't want to stop short of it, either.



3 START THE LONG LEAVES

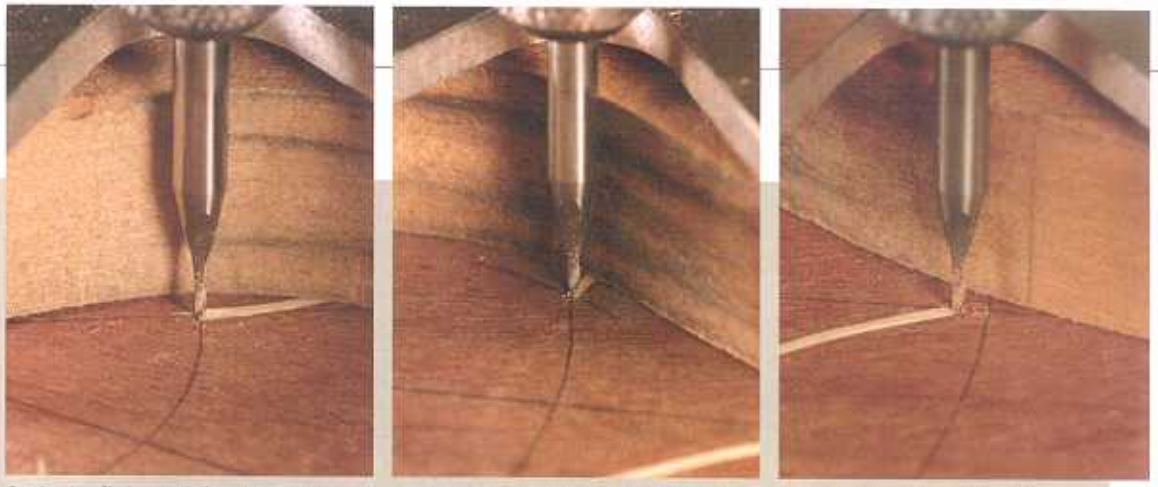
Position the pattern to rout the first half of the long leaves, being sure to just clip the end of the background leaves as shown.



TIP

MAKE A TEST RUN

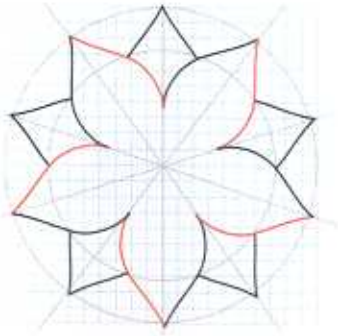
To rout the grooves in Step 4, the pattern must be positioned to cut three intersections cleanly.

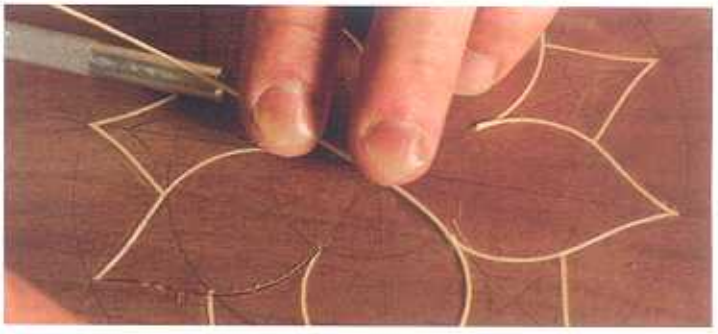


At the leaf's base (left), check to see that the bit starts on the central circle and completely overlaps the existing line of stringing. Where it meets the background leaf (center), the bit should rest on the reference arc and clip the end of the existing stringing. At the petal's tip (right), it should clip the existing line but not go beyond it.

4 COMPLETE THE LEAVES

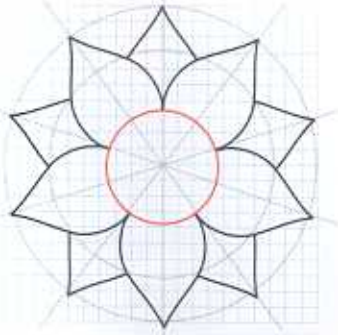
After cutting the last leaf grooves, use an X-Acto knife to clean them up and to refine the point on the leaf tips if necessary. Then set the stringing, trimming the ends with a chisel.

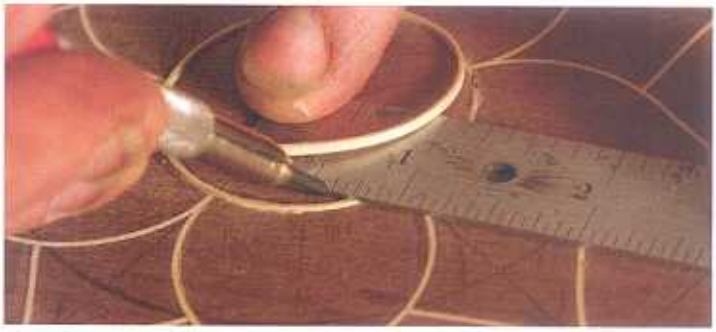


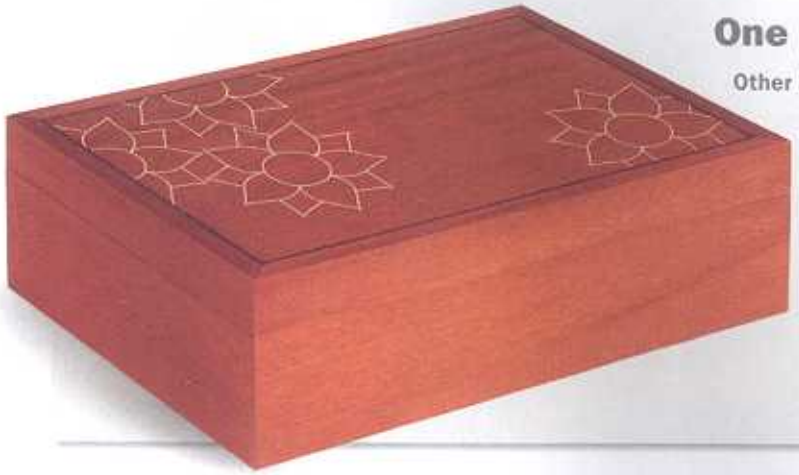


5 FULL CIRCLE

The groove for the central circle should evenly clip the stringing at the base of each petal. Close the circle with a scarf joint, marking the angle on the workpiece for reference when cutting the mating ends.

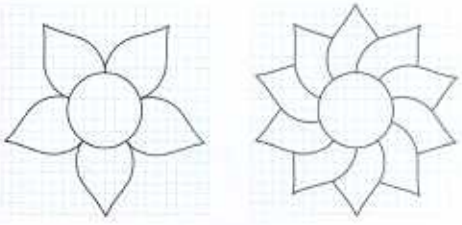






One pattern, many designs

Other lotus variations (below) can be cut with the same template. Creative placement (left) is part of the fun.



Build a Classic Corner

This 18th-century beauty is all curves, but the joinery is straightforward

BY W. MICKEY CALLAHAN

The corner chair, sometimes called a roundabout chair, became fashionable in England and America in the late 17th and early 18th centuries. Supposedly created for a gentleman to sit on while wearing his broad coat and sword, it may owe its name simply to the fact that it sits nicely in the corner of a room. Regardless, it provides today's sitter with an optimal amount of back and arm support, especially when writing at a table or a desk.

Though the chair has lots of curves, the construction is simple mortise-and-tenon joinery without the compound angles found on many chairs. If you aren't a confident carver, eliminate the shell, replace the ball-and-claw foot with a pad foot, and you'll still have a very handsome chair.

Shapely legs for a shapely chair

The two side legs and the back leg transition into the arm supports, while the front leg terminates at the seat. Pay close attention to the end-grain orientation when you lay out the stock: The front leg should be oriented for a bull's-eye grain pattern on the exposed knee. The other legs should have straight, vertical grain.

Transfer your patterns onto 16/4 stock machined to 3 in. square, but leave enough length for two knee blocks per leg. The knee blocks serve primarily as a transition between the legs and the seat rails.

Photos: Mark Schofield

Chair

While the leg blanks are square, lay out and cut all the mortises, then create the tenons that enter the arm rail. All the tenon shoulders must be at the same elevation for the arm to fit flush. Cut around the perimeter of the blank using a dado blade. The tenon is not centered, so set the elevation of the blade carefully for each cut. Drill a ⅞-in.-dia. hole in a piece of scrap to use as a gauge when rounding the tenons.

Cut away the knee-block stock and then rough out the cabriole legs on the bandsaw. Cut the square sections housing the mortises proud of the pattern, as you will flush them to the fronts of the glued-in seat rails later. This is particularly important for the front leg because you will remove a large amount of stock, and leaving it square also aids clamping the leg to the rails.

Shape the legs and carve ball-and-claw feet (see Master Class, *FWW* #186), but hold off on the knee shell until the post of the front leg is rounded into the adjoining seat rails.

Curved rails, square joinery

Try to get all the rails from one board for grain and color consistency. This is particularly important for the two front rails, which should be laid out end to end or book-matched for a pleasing pattern on the curved faces.

Starting with the front rails, lay out and cut the tenons, and then trace the front and back profiles on the top of each rail. Bandsaw close to the lines, then clean up the surfaces with a curved-sole spokeshave and cabinet scrapers. Leave extra material on the front at each end so you can fair the rail-to-leg joints after they are glued.

The slip-seat frame is supported in the back by cleats, but it rests on a

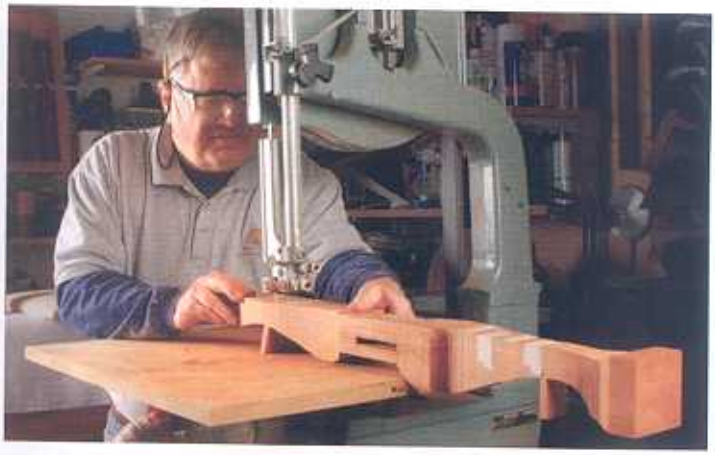
Legs first

MACHINES AND HAND TOOLS WORK AS A TEAM

Chair construction begins with the legs. Lay out the pattern, cut the joinery, and then shape the curvaceous legs starting at the bandsaw and moving on to a variety of hand tools.

Cut the leg tenons using a dado set. *While the leg blanks are still square, cut the tenons on the tops of the side and back legs that connect them to the arm rails.*

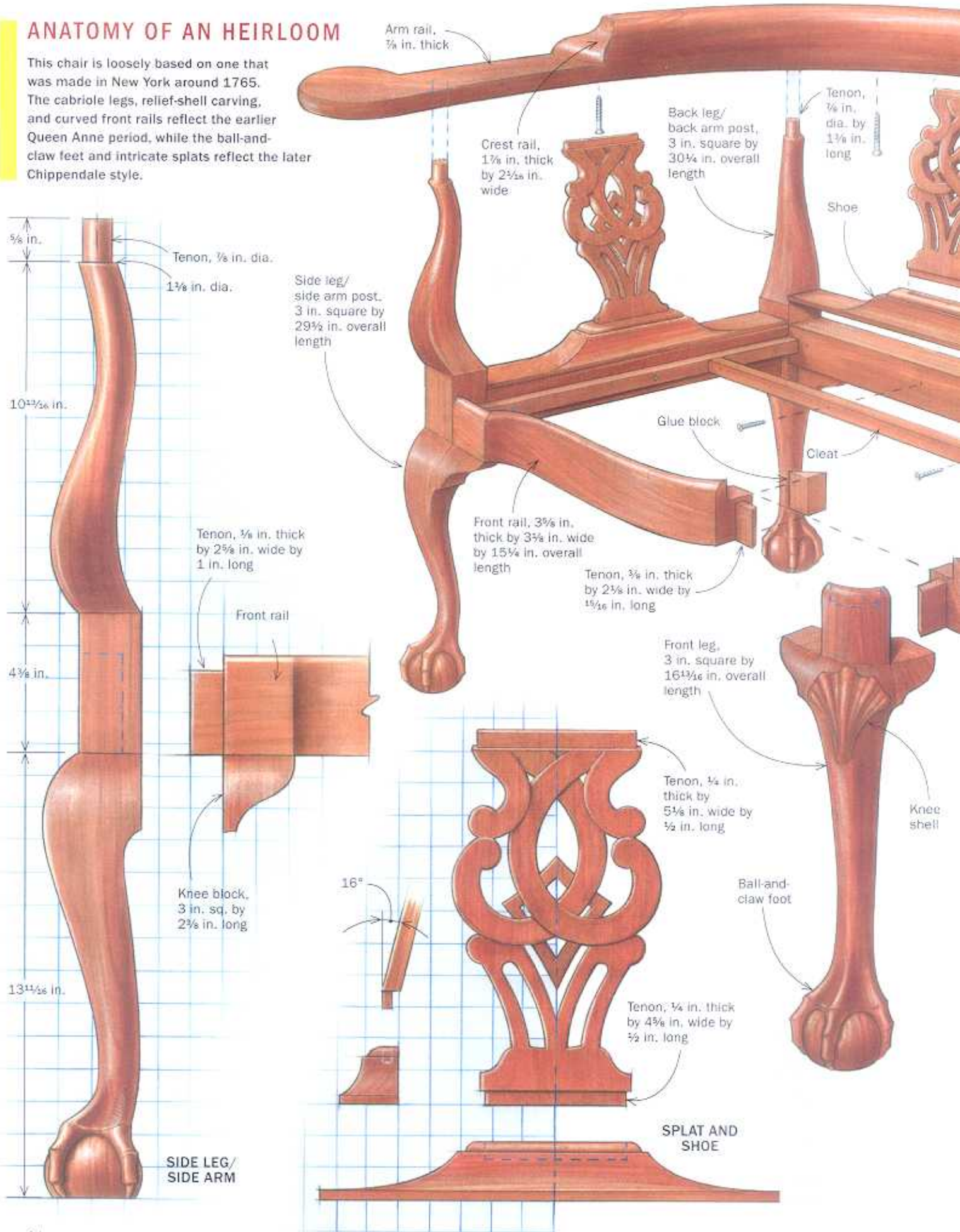
Round the tenons. *Guided by a drilled template, round the square tenons using chisels and carving gouges.*



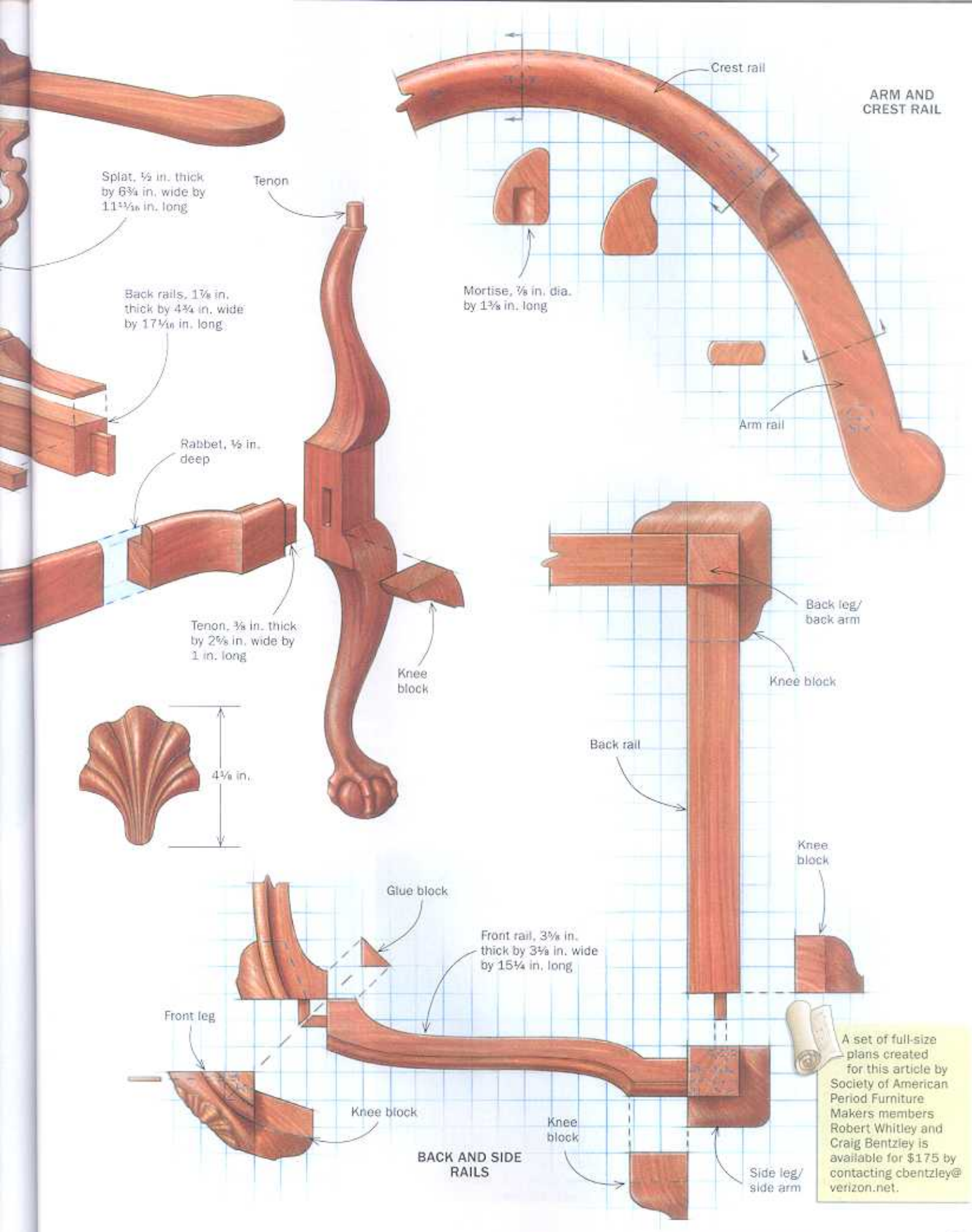
Cabrioles, back to back. *The back and side legs are really two cabriole legs in one separated by a square post in the middle. Careful bandsawing now (left) will reduce hand shaping later (below). Chisels, rasps, files, and spokeshaves can all be employed to bring the cabriole legs to their final shape.*

ANATOMY OF AN HEIRLOOM

This chair is loosely based on one that was made in New York around 1765. The cabriole legs, relief-shell carving, and curved front rails reflect the earlier Queen Anne period, while the ball-and-claw feet and intricate splats reflect the later Chippendale style.



Drawings: Bob La Pointe



A set of full-size plans created for this article by Society of American Period Furniture Makers members Robert Whitley and Craig Bentzley is available for $175 by contacting cbentzley@verizon.net.

Shapely rails BUT STRAIGHTFORWARD JOINERY

The chair's front rails are S-shaped and include a rabbet to support the upholstered seat. Each back rail begins life attached to a shoe that receives the carved back splats.

FRONT RAILS

Rough-cut the rabbet. *Remove the bulk of the waste using a dado blade. Cut to the lowest point of the rabbet with one pass, then clamp a stop block to the tablesaw and raise the blade into the stationary front rail as shown to make the deeper cuts.*

rabbet cut into the inside top faces of the front rails. To cut the rabbet, first lightly scribe a parallel line ½ in. from the front of each rail to establish its edge. Remove most of the waste with a dado blade, then trim to the scribe line using a gouge and chisel. Again, leave a little extra to be removed adjacent to the front leg after glue-up.

The two rear rails also incorporate a shoe that will house the bottom of the back splat. The shoe starts out as part of the back rail but is cut away. This ensures a perfect grain match and provides a bigger section to handle when shaping the shoe.

Before cutting the tenons, use a router table to shape the cove and the quarter-round bead on the front face and top edge of each shoe. Now cut the tenons on each end and cut the shoes' side profiles on the bandsaw. Finish shaping them with a chisel and scraper. Excavate the mortise in the top of each shoe and then carefully carve the bead returns at each end of the mortise. When both shoes are profiled, saw them from the rear rails.

Dry-fit the four legs to the seat rails to ensure that all joinery is correct and that all four legs land firmly on the floor.

One long arm made from three parts

The construction of the arm rail is simplicity itself. The bottom two parts are butt-joined and held together by the crest rail. The arc of the arm is not a constant radius, so use care when laying out the parts.

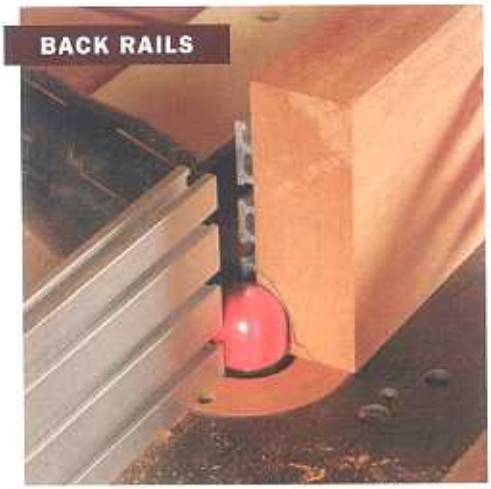
To ensure matching profiles, nest the two arm blanks together using double-stick tape and rough-cut them on the bandsaw. Clean them up on the router table using a template and a bearing-guided bit. Bandsaw the crest rail to rough shape. Using the arms as a template, clean up the crest rail on the router table, using a flush-trimming bit. Now cut the ogee-shaped ends on the bandsaw. Glue and screw the three parts together but leave any further shaping until later.

Once the glue dries, locate the mortises in the arm rail for the leg tenons. First, use the drawing to locate the mortise for the back-leg tenon and drill it on the drill press. Place the tenon gauge you used earlier over the end of each side-leg tenon, and then use a Forstner bit to mark the center of each tenon. Use a clipped nail to drill a small hole in the center of each tenon. Inserting another clipped nail in each hole, place the dry-assembled chair base upside down on the arm rail. Align the two sections, push the nails into the rail, and drill mortises centered on the nail holes. You can now finish shaping the arm rail.

The back splats complete the chair

To make the back splats, first dry-fit the arm rail to the base to establish the distance between the top of the shoe and the arm rail. On a piece of scrap the same thickness as the back splats but an inch or two longer, cut an angled tenon that fits into the shoe. Rip off a ¼-in.-thick piece

BACK RAILS



Shape the shoes. *Use a bullnose bit in a router table to cut the shoe's cove. Cut the bead with a corner round bit.*

Bandsaw the ends. *With the front profile cut, draw the side profiles on the back of the shoe and cut them on the bandsaw.*

Take off your shoes. *When you've finished shaping the shoes, cut them away from the back rails. Remove the small tab at each end.*

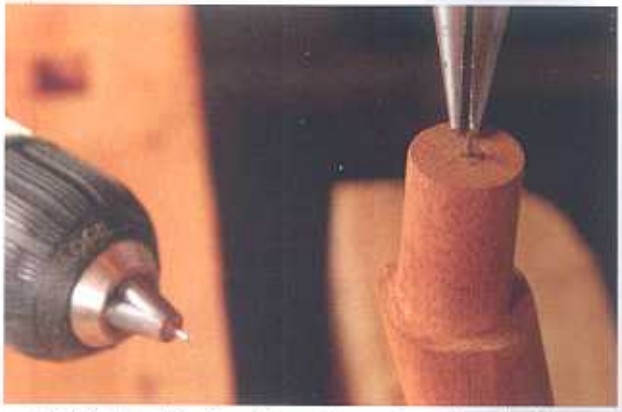
Arm rail

CURVE IT AND CARVE IT

The armrest flows around the back and sides of the chair. You need to locate the mortises accurately for the arm posts and the splats.

Two parts shape the third. *After shaping the two sections of the arm, screw them to the crest rail to act as a template for shaping it to match. Use a flush-trimming bit in the router table.*

A tricky cut made easy. *A hand screw provides a stable platform for bandsawing the ogee-shaped ends of the crest rail.*



Trick for marking mortises. *Use a clipped brad nail to drill a hole in the center of the side-leg tenons. Then place another clipped nail in the hole (above). Place the back leg tenon into its mortise in the arm rail. Set the side leg tenons an equal distance from the inside edge of the arm rail (right). Push down on the legs so that the nails mark the arm rail.*

and crosscut it in two. Clamp these two parts so they overlap and use them as a measuring stick to determine the distance. Crosscut the scrap piece to this size and use it to mark the location of the mortises for the splats on the underside of the crest rail, including the center points.

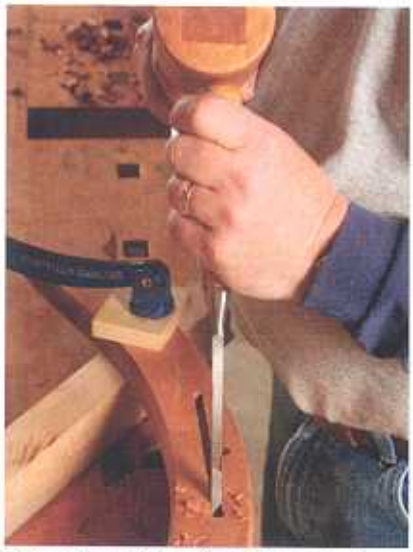
Resaw the splats from one board, but leave them about 1 in. extralong. Because the mortises for both ends of the splats are perpendicular to the floor but the splats lean outward from the seat, you must angle the tenons accordingly.

With the same measuring stick used earlier, determine the total length of each splat, locate the tenon shoulders, and tweak the tenon angles. Transfer this information to the side of the splats and cut them to final

Finish shaping the crest rail. *Use a flat chisel to rough out the front curve and then refine it using a spokeshave and scrapers (left). On the back side at both ends of the crest rail, use carving gouges to create the small, tapering recesses that are purely for ornamentation (above).*

Back splats HOW TO GET A PERFECT FIT

Scraps help. *Use a scrap of wood to find the height of the splat and the angle and location of the joinery.*



Chop the mortise. *Carefully clamp the arm rail so that you can chop the splat mortises.*

Angle the tenons with accuracy. *Use a tenon jig and narrow dado set to form the tenons at each end of the back splats.*

Carving tips. *To give a three-dimensional look to the back splat, carve away material where the pattern intersects. After making the initial chop cuts at each intersection (above), remove the paper pattern and complete the carving (right).*

length with the ends at an angle of approximately 16°. Use an angled tenon jig to cut the tenons. Trim them to width with a handsaw and a bench chisel.

Once you are satisfied with the joints, spray-mount the pattern to the front of each splat. Bandsaw the outer profile and use a scrollsaw or fretsaw to cut the inner pattern. This design has an interlaced effect created by carving away material at the points of intersection. Make the initial cuts with the pattern attached, but remove it to complete the carving to get a better feel for the final look. Complete the splats by smoothing all the saw cuts and lightly chamfering all the exposed edges on the rear faces with curved and flat files.

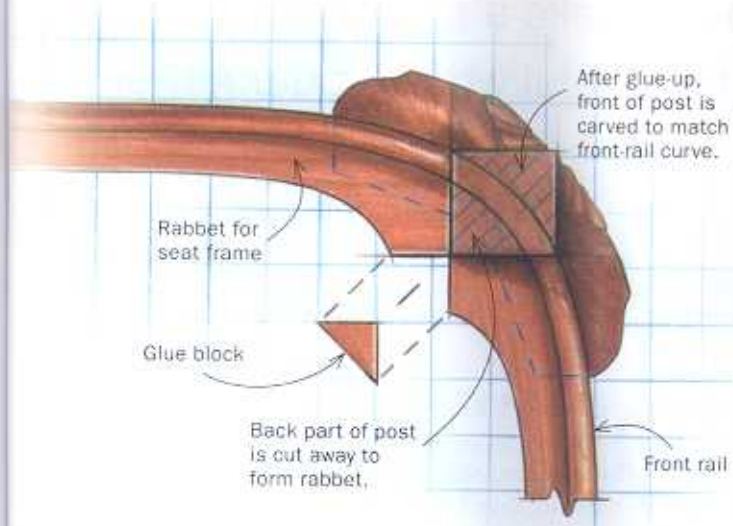
Carve and shape as you assemble

Add the front knee blocks, which should fit flush to the bottom of the rail and the face of the adjacent leg post. Once fitted, simply rub-glue them into position. Sometimes a bed-spring clamp helps hold them in place until the glue sets up. Now glue the front rails to the front post, and then shape the front post to form a continuous curve. Then you can carve the knee shell (see Master Class, *FWW* #210) and then cut away the rabbet in the back of the front leg post for the seat frame.

I prefer to glue up the remainder of the base in two stages, as it is less frantic and there is enough flex in the base to allow this. Because you can't use the front leg post for clamping when gluing on the side legs, you'll need to attach clamping blocks to the front rails. These are simply sandpaper-backed blocks attached with a

Assembly CLAMP, THEN SHAPE

Keep the front leg post square to provide a flat surface for clamping the front rails to it. After glue-up, you can also extend the seat-frame rabbet onto the back of the front post.



Finish shaping the front post. *After you have clamped on the front rails, you can extend their curve and rabbet onto the post.*

separate clamp. Once this assembly is dry, add the back leg and the back rails.

Now assemble the top half of the chair. Dry-fit all the parts. If necessary, plane off some of the base of the shoes to get the shoes and splats to fit. Glue the shoes to the back rails, glue the splats into the shoes, and then glue the arm rail to the leg tenons and the top of the splats. You may require several bar clamps to ensure that the arm rail is firmly attached and flush to the shoulders of the two side and rear legs as well as the top shoulder of each splat.

Once the glue is dry, you can finish shaping the base starting with the leg-to-rail joints. Now that you no longer need the flat surface for clamping, you can attach the knee blocks to the back and side legs. Last, create the thumbnail edge on the front rails and intersecting front leg using a chisel and rasp, but be careful not to go beyond the pattern lines.

Glue and screw the seat-frame supports inside the back rails, and add a small angled glue block inside the front leg and front rail intersection for added strength.

Make the slip-seat frame for upholstering the chair (see Master Class, p. 90). Give the chair a final hand-sanding and then apply your choice of finish. I brushed on several washcoats of garnet shellac and then several coats of an oil/varnish mixture. □

Mickey Callahan is a period furniture maker in Bellingham, Mass.

Final assembly. *Clamping the arm/crest rail to the rest of the chair can be tricky given the chair's numerous curves. Do a dry-fit first. The easiest way to fine-tune the fit is to plane a bit off the shoes at the base of each back splat.*

Get a Handle on Your Pulls

Drawer pulls make a strong statement, so be careful where you put them

BY MATT KENNEY

Drawers are made to be opened and closed, and that means every drawer needs a pull. And although attaching pulls is one of the last things you do when making a drawer, you can't wait until then to think about the style of pull you'll use and where on the drawer it will go. Because they are attached to the drawer fronts, pulls are highly visible and can have a dramatic effect on the beauty of a piece of furniture.

There's plenty to say about which types of pulls go with which pieces, but this article will focus on where to put them. Placing a pull on a drawer front is not as simple as "put it in the center." After all, it's not exactly clear how you center something like a pendant pull. And of course some drawers need two pulls, which should be spaced so that they are comfortable to use. Then there is the visual pattern created by the overall array of pulls, and that is determined mostly by how you size and orient the drawers themselves.

When I started to think about everything it takes to place pulls just right, I was overwhelmed. That's why I asked several successful furniture designers and makers for help. I not only learned some great basic guidelines, but also that there are situations you'll have to take one at a time.

Matt Kenney is an associate editor. Christian Becksvoort, Gerald Curry, Garrett Hack, and Michael Fortune contributed to this article.

DON'T ALWAYS CENTER THE SCREWS

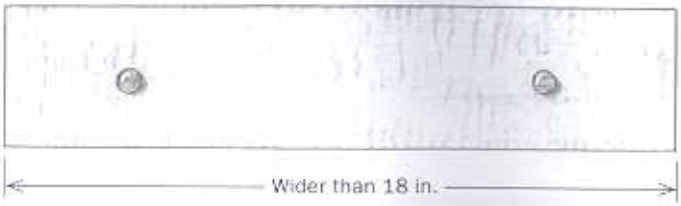
Typically, pulls are centered vertically. How that is done depends on the pull's style. Because their height is balanced above and below the point of attachment, place knobs and handles by centering their screw holes or tenons. However, a pendant or bail pull would appear low on the drawer if centered this way. Instead, balance its overall outline above and below the drawer's centerline. It's the same for every other pull type: Think about the overall height, not just where the screw or tenon goes in.

Photo (left): Jeff Wolfram

ONE PULL, OR TWO?

SIMPLE ANSWER: DRAWER WIDTH DECIDES

Drawers less than 14 in. wide need only one pull because they are small enough to open and close by pulling or pushing on the center.



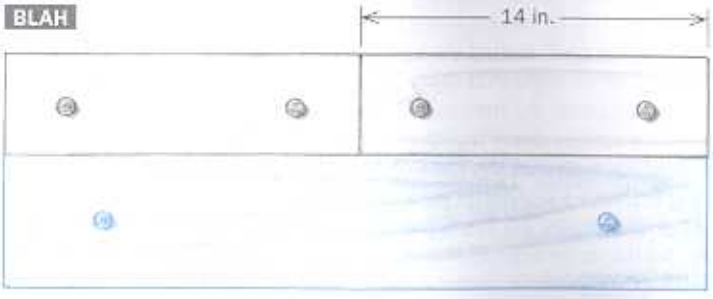
Drawers wider than 18 in. definitely need two pulls. A single, centered pull would be stressed by the weight of the drawer, eventually causing it to break or break free of the drawer front.

MAKE TWO PULLS COMFORTABLE TO USE

Space pulls between 18 in. and 22 in. apart, roughly the distance between a pair of outstretched hands. If the drawer is too narrow to space the pulls 18 in. apart, they should be separated by at least one-half of the drawer's width.

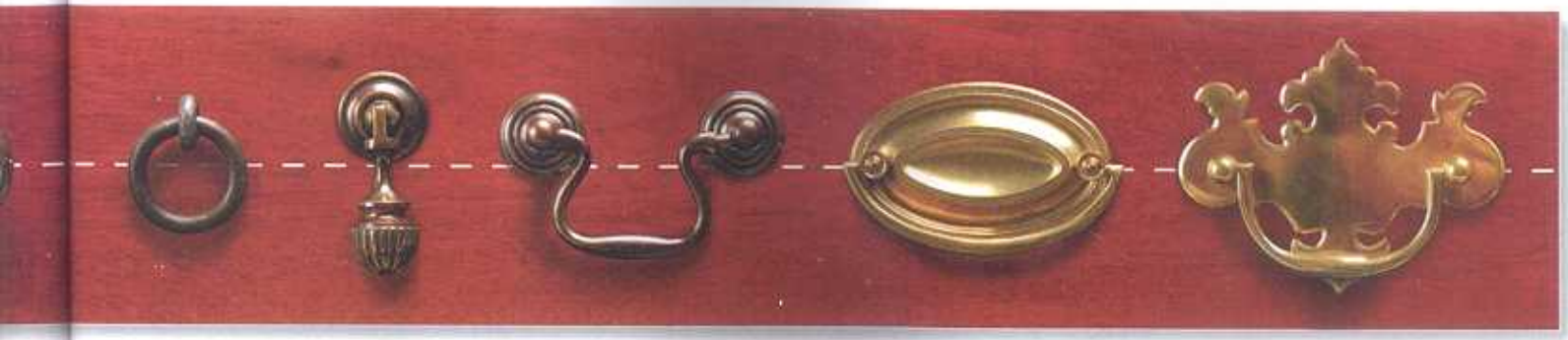
ON MEDIUM-SIZE DRAWERS, CONSIDER THE WHOLE ARRAY

Between 14 in. and 18 in. is a gray area. The choice between one pull or two comes down to aesthetics.



1. With two knobs on each of the small top drawers, this array looks top-heavy. Centering a single knob on each small drawer balances the pattern. It also brings the knobs on the top drawers closer together, creating two inward slanting diagonals, which suggests a solid base and upward movement.

2. A single, centered knob on the bottom drawer creates an inverted triangle and a top-heavy pattern. However, placing two knobs on the bottom drawer—and aligning them under the knobs on the top drawers—gives the array a more solid feel.



NOW CONSIDER THE WHOLE PIECE

On a piece with multiple drawers, the number, size, and arrangement of the drawers affects how the pulls are arrayed. You'll have a better chance of integrating the array into the overall design if you begin to think about drawers and pulls as soon as you start to sketch out a piece.

LEARN FROM THE CLASSICS

Gerald Curry's reproduction of a Chippendale block-front chest of drawers is a perfect example of how the arrangement of drawers affects the array formed by their pulls. The brasses on each drawer form an arc. Because the drawers are graduated, the most dramatic arc is at the bottom and the most gentle at the top. The tighter arc on the bottom drawer complements the arc suggested by the bracket base, and the more relaxed arc on the top drawer transitions nicely to the straight line of the top. Moreover, the series of arcs reinforces the strong, stable stance while drawing the eye upward at the same time.

WHAT WORKS ON ONE HIGHBOY DOESN'T ON ANOTHER

On Jeffrey Greene's bonnet-top highboy (left), the pulls on the lower drawers are farther apart than the pulls on the two drawers in the top row. The pattern they create mirrors the lines of the piece created by the sides and the bonnet top. The same drawer arrangement doesn't work on a flat-top highboy (below). Adding a third drawer to the top row makes for a more successful pull array. The outer pulls on the top row are moved out, pulling the eye up and out toward the cornice, and the top two rows create an angle that mirrors the angled corner joint of the cornice. The top row also emphasizes the thinness of the piece's waist, making the pulls on the lower drawers appear closer together and balancing the three pulls on the bottom row of drawers. Note that the pulls on the lower half are directly in line with the knees, giving the base a wonderful grounded stance while drawing the eye up and into the waist. From there the eye is pulled up to the cornice.

Photo: Jeffrey Greene

STEPPED DRAWERS CREATE CONVERGING LINES

The stepped drawers on Hank Gilpin's sideboard (above)—narrower at the bottom than at the top—mirror the arc of the middle legs. By centering a single pull on the drawers in the two lower rows and placing two pulls on the center drawer in the top row, Gilpin uses the pulls to echo the arc as well. Garrett Hack used centered knobs to emphasize the stepped rise of the two outer columns of drawers on his sideboard (right).

RULES ARE MADE TO BE BROKEN

Michael Fortune knew the usual rules wouldn't work on this seven-drawer cabinet. If he had centered the pulls vertically (see drawing below), the lowest one would be too close to the floor and awkward to use. Also, while the pulls are nicely proportioned, on the large drawers they would appear lonely if centered vertically. So he positioned all of the pulls the same distance from the top of the drawer.

Centered, but off-target. *When centered vertically on the lower three drawer fronts, the delicate pulls get lost. Also, the column of pulls no longer enhances the graduation of the drawer fronts.*

TWO WAYS TO SPICE UP SHAKER

Christian Becksvoort and Gerald Curry used drawer design and pull arrangement to put a spin on Shaker design. By alternating rows of one and two drawers (above), Becksvoort created a pattern of diamonds. Curry's take (left) is more aggressive. The small second drawers on the third and fifth rows create an asymmetric diamond pattern.

Photos, clockwise from top left: Jon Binzen; Dennis Griggs; Dean Powell; Michael Fortune; center photo: Jeff Wolfram

readers gallery

JEFFREY TEEPLE
Amherst, N.H.

Teeple designed this cupboard over chest (19 in. deep by 34 in. wide by 74 in. tall) to reflect Shaker influence but not to be a straight reproduction. He included his favorite Shaker design features, such as a turned swell taper for the legs, frame-and-panel construction, recessed-panel doors, a large cove for the cornice, and small bead details. The tiger maple is finished with aniline dye, shellac, gel stain, and wax. PHOTO: ABBY LOGAN

JOE DOHERTY
New Orleans, La.

This coffee table (18 in. wide by 60 in. long by 24 in. tall) was designed and built for the New Orleans-based Green Project, a not-for-profit organization that resells high-quality, salvaged building materials at low cost. Its annual fund-raiser, Salvations, is a furniture competition of work built from 90% reclaimed materials. Doherty made his cypress table from an old painted door. He finished it with lacquer and won Best in Show in 2010.

Submissions

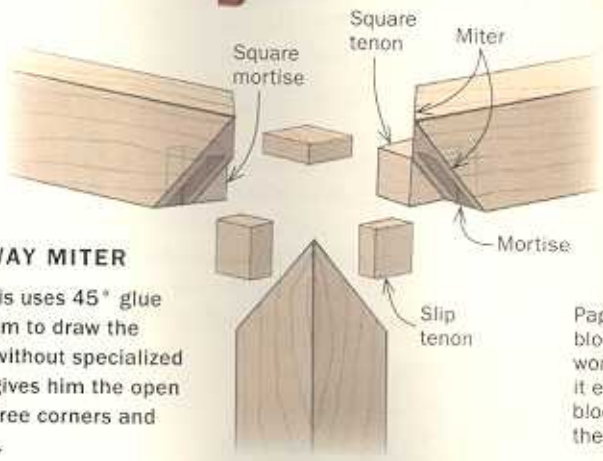
Readers Gallery provides design inspiration by showcasing the work of our readers. For submission instructions and an entry form, go to FineWoodworking.com.

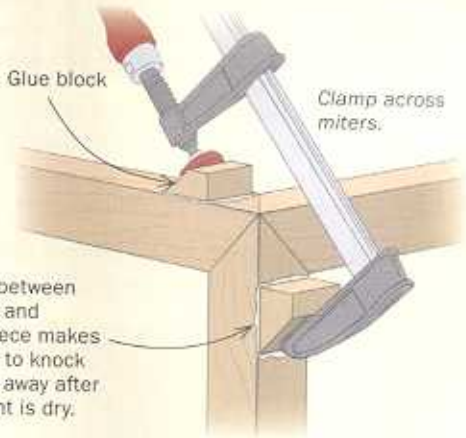
DESIGN SPOTLIGHT

SAM NORRIS
Burlington, Vt.

Norris built this desk for the annual New Hampshire Furniture Masters auction. He set out to build a contemporary piece that reflected ancient Chinese design, also borrowing from contemporary furniture maker Greg Smith. However, a lot of the construction methods were dictated by his design choices. The table looks simple enough at first glance, but the three-way miter, curved stretchers, and curved legs weren't easy to execute.

PHOTO: JEFF CLARKE



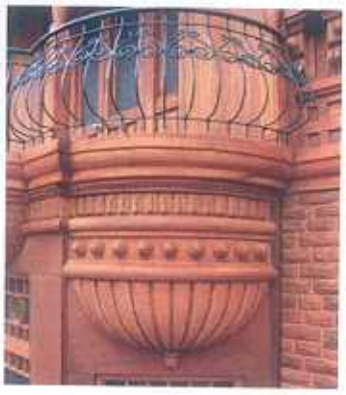


SPARE DESIGN CALLS FOR A 3-WAY MITER

To glue the joint, Norris uses 45° glue blocks, which allow him to draw the joint together tightly without specialized clamps. Gorilla Glue gives him the open time to manage all three corners and tenons in one glue-up.

BENOIT CHASSÉ
Quebec, Canada

Inspired by an old Victorian building in Montreal, Chassé originally built this piece (9¾ in. deep by 52⅜ in. wide by 43 in. tall) to store 450 cassette tapes. The accordian-style doors opened just under the balconies and exposed sliding storage. When technology made the tape storage unnecessary, Chassé cut the depth in half (not an easy feat) and turned the piece into sculpture. The woods are mahogany, white pine, and cherry, and the finish is stain and acrylic paint.



Drawings: Kelly J. Dunton

CHARLES MAXWELL
Pittsford, N.Y.

On Maxwell's Cape Cod honeymoon 27 years ago, he and his wife saw a skeleton clock, and he vowed to make her one. In 2007 after retiring from the U.S. Navy, Maxwell made good on that promise and hasn't stopped making clocks since. His building process is as unique as the clocks. After drawing the design, he starts building with scrapwood and only switches to the final wood when all the dimensions and shapes are perfect. This maple, ebony, poplar, and holly clock (16 in. deep by 20 in. wide by 70 in. tall) was a commission, and the finish is black lacquer or tung oil and wax.

MARK GOWER
Arcata, Calif.

Gower, a recipient of the annual John D. Mineck Furniture Fellowship, built this English brown oak bowl for the Mineck foundation's fund-raising auction. He roughed out the shape on the bandsaw and refined it with hand tools. This bowl, 4½ in. wide by 12 in. long by 2½ in. tall, is designed around irregular arcs. The finish is tung oil.

MICHAEL SEWARD
New Park, Pa.

Inspired by the work of Sam Maloof and George Nakashima, Seward designed and built this walnut table with bird's-eye maple butterfly joints to reflect both influences yet remain distinctly his own. The table, finished with hand-rubbed oil, is 50 in. wide by 96½ in. long by 30½ in. tall.

OLD WOOD, NEW WOODWORK

A recent exhibition in New York City paired prominent contemporary woodworkers with historical wood. "National Treasures: History in the Making," which was on view at the Architectural Digest Home Show, featured new work by 20 makers. All the pieces were made from wood with a past—horse chestnut from Mount Vernon, elm from Monticello, osage orange from Patrick Henry's Red Hill Plantation. The show was curated by Jacques Vesery, a carver and turner, and William Jewell, whose company, Historical Woods of America, specializes in lumber with a pedigree.

JANEL JACOBSON
Sunrise, Minn.

Jacobson, who specializes in small carvings of natural objects, carved seed pods and leaves from trees native to Virginia. The horse chestnut seed pod with the tiny frog perched on it is carved in boxwood from Patrick Henry's property. The dogwood blossom is boxwood from James Madison's estate. The container she carved out for them, which is 2⅞ in. deep by 14⅝ in. wide by 5¼ in. tall, is from horse chestnut that grew at Mount Vernon.

MICHAEL CULLEN
Petaluma, Calif.

Cullen's chest on stand, made with walnut from two trees at Mount Vernon, is carved with stylized stripes—reminiscent of a flag flapping in the wind—and circles to represent the circle of stars on the nation's first flag. The lid is embellished with 13 stars and the bottom of the chest is composed of 13 planks. The chest is 11 in. deep by 27 in. wide by 30 in. tall. PHOTO: DON RUSSEL

THOMAS HUCKER
Hoboken, N.J.

Hucker's training as a furniture maker included stints with period furniture maker Leonard Hilgner and contemporary master Jere Osgood. For his end tables, Hucker took inspiration from the traditional pie-crust tea tables that were in vogue at the time the nation was founded and gave them a decidedly modern twist. These end tables, built with wood from a walnut tree that grew on the site of George Washington's whiskey distillery, are 16 in. deep by 24 in. wide by 24 in. tall. PHOTO: VIRGINIA KAMENITZER

SILAS KOPF
Easthampton, Mass.

Marquetry master Silas Kopf built a contemporary writing table with legs and aprons made with walnut from a tree that grew at Mt. Vernon. The tromp l'oeil 18th-century scene on the top surface, which includes a quill pen and a just-started first draft of the Declaration of Independence complete with cross-outs, includes 15 species of veneer, including horse chestnut planted by George Washington and tulip poplar from Thomas Jefferson's Monticello. The desk is 22 in. deep by 52 in. wide by 30 in. tall. PHOTO: DAVID RYAN

Why finish wood?

IT MAY BE A CHORE, BUT THERE ARE GOOD REASONS TO APPLY A FINISH

BY MARK SCHOFIELD

Finishing experts tell you how to apply a finish but they never explain *why* you should finish wood. Why not leave a piece in its just-planed state showing the wood's natural beauty? Is it really necessary to go to all that trouble coating your piece with some combination of oil, resin, or plastic?

In fact, there are many important reasons for applying a finish—some aesthetic and some practical. A finish can reduce seasonal movement and the resulting stresses on joinery. It also makes a surface more impact-resistant and protects wood from everyday use, whether the piece is a rarely handled picture frame, a kitchen table, or an outside chair. Also, the right combination of dyes, stains, and clear finishes can turn humdrum wood into an eye-catching piece.

And finally, there *are* some occasions when no finish really is a valid option.

Some finishes slow wood movement

When it comes to protecting a piece of furniture from the damage that can be caused by wood movement, applying a finish is no substitute for careful construction.

Still, certain finishes will reduce wood's tendency to absorb and release moisture. This in turn will slow seasonal expansion and contraction, reducing stresses that can eventually damage joinery and helping to minimize problems like door panels that rattle in winter or drawers that stick in summer.

Some finishes are better at this than others (see chart, p. 80). No clear finish can match paint at controlling moisture, even over a couple of weeks. Pure oil

Photo, this page: Kelly J. Dunton

Protect the surface

An oil finish is easily renewed. *Penetrating finishes like linseed oil or tung oil don't protect as well as film finishes, but they can be sanded away to repair damage, and then renewed.*

finishes in particular are ineffective. Spar varnish gives some protection, but the standouts among clear finishes are shellac and polyurethane.

If you do apply an effective moisture-excluding finish, be sure to treat all surfaces equally. Otherwise, each side of the surface will absorb and release moisture at a different rate, causing the boards to cup.

Finished wood stays cleaner

No piece stays looking like the day it was made. The surface gets a slightly rough feeling, sunlight oxidizes the surface cells, and hands leave oil and dirt. A clear finish can give wood varying degrees of protection against environmental damage as well as everyday wear and tear.

The need for protection varies by the intended location and use of the piece. If you want the look of natural wood, a rarely handled piece such as a picture frame or an ornamental turning probably only needs a single coat of finish followed by a coat of wax. That's enough to allow dust to be wiped off and not into the grain.

Tabletops likely to come into contact with food and drink need a finish that can protect the wood. Unfinished, scrubbed-pine tables were fine for the nobles who employed scullery maids, but if you're cleaning up after yourself, you'll find that traces of red wine and ketchup are removed far more easily from a durable film finish such as varnish or polyurethane.

Penetrating finishes offer less protection, but minor damage can be repaired more easily by sanding and then wiping on

No finish is waterproof

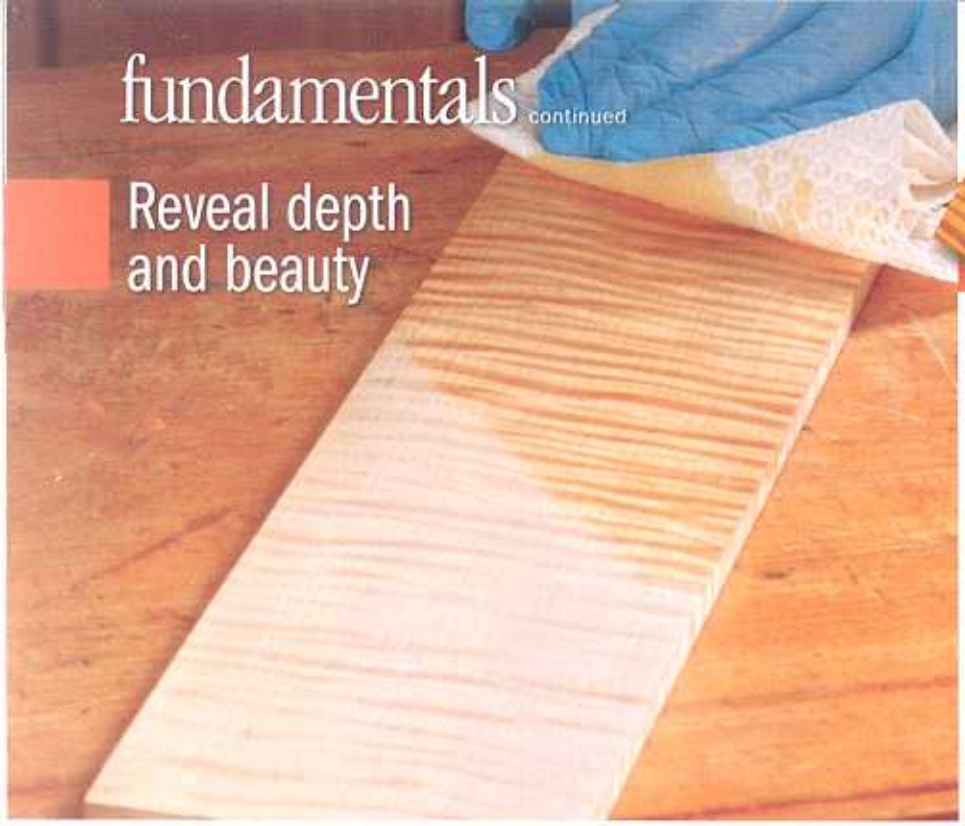
If you live where there are wide humidity swings between winter and summer, you should weigh moisture control more heavily in choosing a finish. Use this chart to compare the moisture-repelling properties of common finishes. Each finish was applied in three coats on samples of clear Ponderosa pine. The test pieces—along with unfinished control samples—were then kept in a controlled environment of 80°F and 90% humidity to simulate real-world humidity changes. Afterward, each was weighed and compared against its unfinished control piece to gauge relative water gain.

	PERCENTAGE OF MOISTURE REPELLED		
FINISH	**1 DAY**	**7 DAYS**	**14 DAYS**
Paste wax	17	0	0
Linseed oil	18	2	0
Tung oil	52	6	2
Nitrocellulose lacquer	79	37	19
Spar varnish	87	53	30
Shellac	91	64	42
Oil-based polyurethane	90	64	44
Oil-based paint	97	86	80

Source: Forest Products Laboratory, U.S. Forest Service
Excerpted from *Understanding Wood* by R. Bruce Hoadley (The Taunton Press, 2000)

Photos, except where noted: Steve Scott

Reveal depth and beauty



What they mean by "the finishing touch." *A clear finish transforms the wood by enhancing contrast in the figure and emphasizing the surface luster.*

Tiger maple, in living color. *Dyes can give your work a full color palette while also enhancing figure.*

another coat of finish. This easily repairable finish is suitable for surfaces that won't be subject to frequent damage by liquids. The "easily" is relative when compared to repairing a film finish: It is still quite a lot of work to sand out the damage and apply new finish to the damaged area and possibly the whole immediate surface, so you don't want to do this once a month to a kitchen table. Almost any other piece, including the tops of occasional tables (especially in an adults-only house), will be fine with a penetrating finish.

Enhance wood's beauty

Yes, beauty is in the eye of the beholder, but even those who hate finishing must have had that moment of pleasure when the first coat of finish lights up the wood. The impact is greatest with highly figured wood—burls, crotches, blister, and ribbon stripe. Finish increases the light/dark contrast and exaggerates the shimmer, or chatoyance.

Applying a finish also increases the contrast between light and dark woods, whether it is walnut drawer pulls, wenge trim, or the mahogany background to holly stringing.

Don't confine yourself to clear coats: Dyes can really put the tiger in tiger maple, while bright dyes help blister and quilt-figured maple to jump out.

Finishing outdoor furniture

Whether to finish an outside piece is rather like deciding whether to dye your hair. You can either accept going gray, or you can apply dye/finish on a regular basis. In both cases, make the

Outdoors: To finish or not?

Two ways to survive the great outdoors. *To finish his outdoor furniture, Sean Clarke applies multiple layers of epoxy sealer and marine varnish. Or you could take Hank Gilpin's approach and apply no finish at all.*

Photos, this page (top and bottom left): Mark Schofield

Some woods finish themselves

Easy option for tropical woods. *Dense, oily woods like cocobolo absorb less moisture and can be sanded and buffed to a high polish.*

choice and then stick with it; neither gray roots nor an outdoor piece with peeling finish are attractive.

A finished outdoor piece is much easier to keep clean and dry. After a day of rain, you can wipe it with a cloth or a towel and you have a surface ready for those white trousers or dresses. An unfinished piece will stay damp for hours or even days after a good soaking and will grow lichen, moss, etc.

Outdoor finishes not only need to withstand the elements but also must allow for far more wood movement than interior finishes. The answer is to use a durable yet flexible finish. Apply many layers of a marine varnish, particularly on end grain. Immediately repair any damage before water can get under the finish, and when the surface loses its shine, apply another coat. If you wait until the finish has begun to crack and peel, the only solution is to go back to bare wood and begin again.

For those determined not to apply a finish, a durable outdoor wood such as teak, white oak, or cedar will give you years of good service before weathering starts to weaken it. You can also avoid finishing some dense, oily tropical hardwoods such as cocobolo or rosewood. Sand them to a high grit and then buff them (on a buffing wheel for small objects) and they'll retain a medium luster. □

Mark Schofield is the managing editor (and has accepted going gray).

Q&A

Dos and don'ts of fence alignment

Q: Should a tablesaw fence be set parallel to the blade or angled slightly away from the back of the blade?

—BRAD ANDREWS, Independence, Mo.

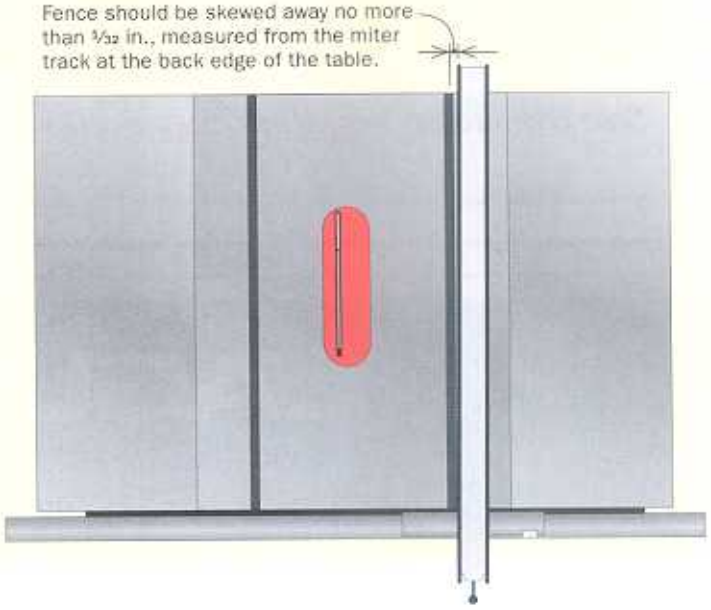
A: I DON'T THINK IT MATTERS; just don't toe it in toward the blade. I recently checked the four saws in our shop, and found that two had fences parallel and two had fences toed out. All four work just fine. However, the fence should not be skewed more than 1/32 in. away from the blade. If it's skewed more than that, the blade, rather than the fence, will guide the workpiece, pulling it away from the fence, and that's a dangerous situation you want to avoid. Also, to prevent the blade from throwing up chips, burning the stock, and lifting the workpiece off the table or jamming dangerously against the splitter, the fence should never be angled toward the blade.

—Contributing editor Steve Latta teaches woodworking at Thaddeus Stevens College in Lancaster, Pa.

Align the fence to the blade. *It should be parallel to prevent burning and to keep chips and dust from being thrown up toward you.*

STAY CLEAN AND GET BETTER CUTS

When the fence is parallel to the blade (or angled slightly outward), the back of the blade doesn't cut the workpiece, so chips won't be thrown up toward you and the board is less likely to burn.



Use wide boards best-side up

Q: I'd like to make a tabletop from some wide boards. I've heard that wider boards are more prone to cupping. Should I rip the wide boards down and reglue them, alternating the direction of their growth rings up and then down?

—JIM STASKAL, Waunakee, Wis.

A: THERE'S NO NEED TO RIP THE BOARDS narrower, and there's no need to alternate the direction of the growth rings. I've routinely glued up 12-in.-wide boards for tabletops for 40 years without any problems. And I always face the best side of every board out, where it will be seen, regardless of whether the growth rings turn up or down. However, a wide top definitely needs to be attached to aprons, cleats, or breadboard ends to help keep it flat.

—Christian Becksvoort is a contributing editor.

The beauty of big boards. *Put their best sides up, even if that means the directions of the growth rings don't alternate. Aprons, cleats, and breadboard ends provide enough stability to keep the top flat.*

Photos, except where noted: staff; this page (bottom): Dennis Griggs

Climb cut is challenging, but gives great results

Q: I'm routing rabbets for a cabinet that I'm building, but I keep getting severe tearout. What can I do to avoid it?

—JOHN McCOMBE, Pittsburgh, Pa.

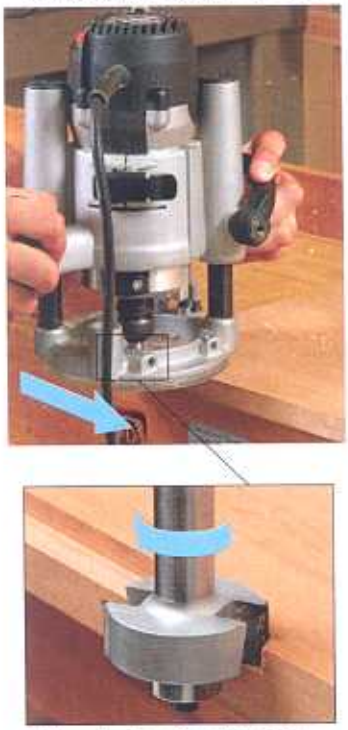
A: THE MOST LIKELY CAUSE OF THE TEAROUT is that the bit is cutting against the grain. To get around that problem, use a climb cut.

Standard practice is to rout against a bit's direction of rotation. A climb cut is the opposite, routing in the same direction as the rotation. The benefit of climb cuts is that they leave a very clean cut, even on woods prone to tearout. That's the only reason I use them.

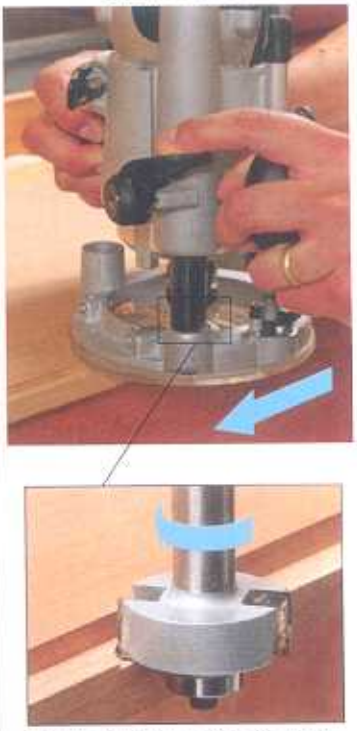
Because the bit's rotation can increase how quickly the router moves through the cut, climb cuts should be made only with a handheld router, small-diameter bits, and shallow cuts (the problem becomes more severe as the diameter of the bit and depth of cut increase). If the router isn't carefully controlled, you can lose control of it very quickly. Also, the workpiece should be clamped to a stable surface, like a workbench.

—Gregory Paolini is a professional furniture maker in Waynesville, N.C.

STANDARD ROUTER CUT



CLIMB CUT



A standard cut works best for waste removal. *For safety and speed, remove most of the waste when cutting a rabbet in woods prone to tearout. Feed the router in the opposite direction to the bit's rotation.*

Climb cut eliminates tearout. *Clamp the workpiece to a bench and feed the router carefully so it doesn't get away from you. Take a shallow pass, feeding the router in the direction of the bit's rotation.*

Tips for finding the best lumber

Q: I've noticed that the projects in *Fine Woodworking* are made from beautiful boards. What's the secret to finding them?

—CARL D. WILLIAMS, Centerville, Ohio

A: YOU WON'T ALWAYS FIND GREAT BOARDS in the regular stacks at a local lumberyard, so it pays to explain to a lumberyard employee the types of boards you're after. They might direct you to where wide boards are kept separately, or tell you when the next delivery is arriving so you'll get first pick of the boards.

If they don't have exactly what you want, there's a good chance they know where to get it. They may know of sawmills that sell locally harvested woods. Local mills are a great place to find unique lumber, like an entire tree sequentially cut into boards.

Finally, buy from lumberyards in a tree's native area. When I wanted some madrone, I called lumber dealers in the Pacific Northwest, because that's where it grows. It wasn't long until I found boards that made me happy.

—Matt Kenney is an associate editor.

Ask and ye shall receive. *The brown oak and cherry boards at left (top, middle) were found by asking for a second stack to scour. The madrone (bottom board) was bought from a dealer in Oregon, where it grows.*

Drawings: Kelly J. Dunton

Recipe for a homemade stain

Q: I can't find a ready-made stain the exact color I want, so I've decided to make one. Do you have any advice on how to do that?

—MAX GURNEMANZ, Kensington, Md.

A: ARTIST'S OIL PIGMENTS COME IN A HUGE RANGE of colors, but you also can customize your exact color by blending two or more. First, mix two parts Danish oil with one part pigment. Then add another two parts of Danish oil and mix. Test on a scrap board and adjust as needed until you get the color you're after. When you're satisfied, strain the mixture through a fine mesh paint filter to remove any leftover lumps of pigment. As with any stain, apply this one over a washcoat of shellac if the wood is prone to blotching, like cherry or pine.

—Finishing expert Peter Gedrys is a frequent contributor.

Add artist's oil pigments to half of the Danish oil. *Because the pigments are oil-based, they mix evenly with the Danish oil.*

Mix the oil and pigments. *Mash the pigments with a cheap brush to break them down and dissolve them in the oil.*

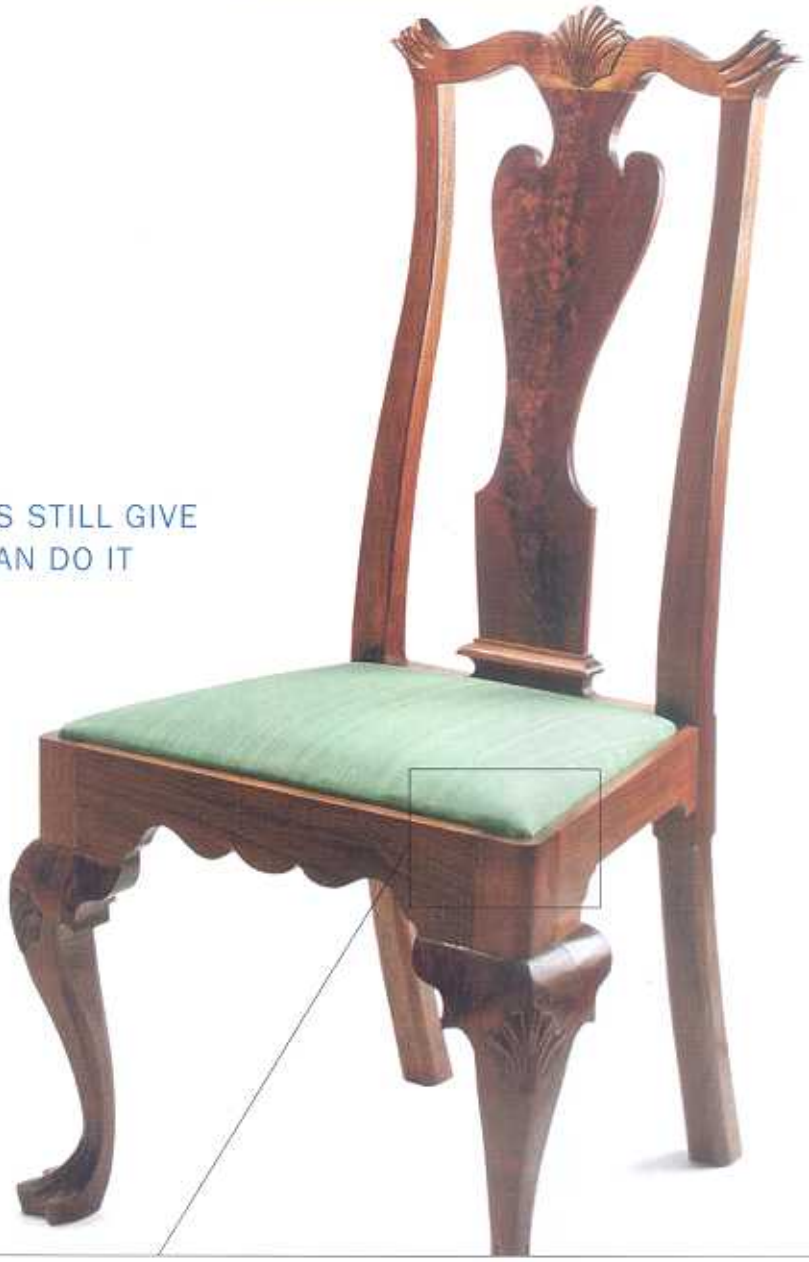
Test stain on a scrap. *After adding the remaining oil, wipe some of the stain on an offcut from the project to see how it looks. Filter to remove undissolved pigments and stray bristles.*

master class

Traditional upholstery

TIME-TESTED TOOLS AND MATERIALS STILL GIVE THE BEST RESULTS, AND ANYONE CAN DO IT

BY W. MICKEY CALLAHAN



Many woodworkers hesitate to build a chair, particularly a period version, because of the upholstered seat. They think the options are either shopmade with foam rubber, which won't look correct, or an expensive professional job. But you can do the job yourself using traditional materials in a time-tested way. Basic upholstery tools cost around $60, the materials can be bought online, and the techniques are easily learned. The result will look and feel authentic and last a lifetime.

The frame is the foundation

The seat frame anchors all the upholstery. While it can be constructed from any medium-density hardwood, ash works best because it is strong and holds upholstery tacks firmly. You can use mortise-and-tenon joinery or, as in this case, bridle joints. The frame is 2½ in. wide; the outer dimensions depend on the thickness of the outer fabric. A 3/32-in. clearance between the frame and the chair rails is fine for most fabrics, but leather will require a larger gap.

The frame should extend ¼ in. above the chair rail, but put an 8° to 10° bevel on the top outside edge. Starting even with the chair rail, the bevel creates a transition from the upholstered seat to the chair frame and helps reduce wear on the upholstery fabric, as does rounding over the frame's outside edges.

Mickey Callahan is a period furniture maker in Bellingham, Mass.

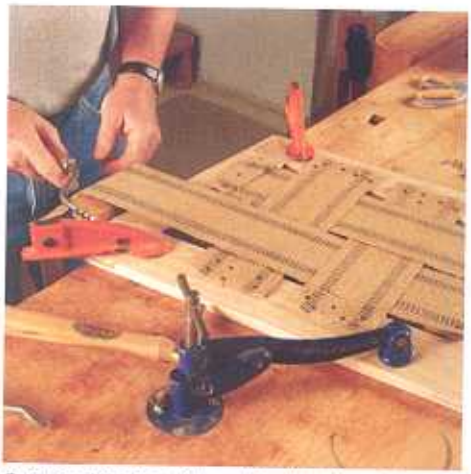
AN UPHOLSTERED SEAT, UNCOVERED

Photos: Mark Schofield

Step 1: Weave a web

Tack and fold. *Cut off a strip of webbing about 6 in. longer than the width of the frame. Tack down one end just inside the bevel using five #6 tacks, staggering the tacks slightly to avoid splitting the wood. Fold the webbing over the tacked end to create a double layer, and tack this down as well, interspacing the tacks with the first set.*

Stretch and tack. *Stretch the webbing across the frame using a webbing stretcher. The webbing should be tight but not enough to distort the frame. Anchor this end of the webbing in a similar way with another double row of tacks. The magnetic-tipped hammer allows you to pick up the tacks while one hand holds the stretcher.*



Over and under. *When attaching the side-to-side webbing, go over and under the front-to-back webbing to create a weave.*

Step 2: Add horsehair

Tack and trim. *Apply a layer of rubberized horsehair padding following the outline of the seat. Secure the horsehair with two #3 tacks per side and then use scissors to slightly round over the top edges.*

Step 3: Lay on the batting

Start in the middle. *Peel apart some 1-in.-thick cotton batting and place a ½-in.-thick piece in the center. Stop 2 in. from the edge.*

Move outward. *Add progressively larger squares of ½-in.-thick batting. Pull the edges to feather them down onto the rubberized horsehair.*

Cover the edging. *The third or fourth piece of batting should reach the contoured edges of the rubberized horsehair.*

Step 4: Stretch and fit the muslin

Tack lightly. *Cut the muslin so it extends 6 in. beyond the frame on all sides. Lightly stretch it over the padding and secure it with one #3 tack centered on the bottom of each frame piece.*

Check the fit and finish. *Look at the seat, and sit on it to determine if cotton batting needs to be added or removed.*

If it looks good, you can move on. *Once satisfied, place the seat facedown. With the muslin held tightly, remove one of the tacks using a tack lifter.*

Stretch and tack lightly. *Stretch the muslin, making sure there are no wrinkles along the edge of the frame. Apply three tacks, working out from the center. Don't drive them home. Go around the frame, working evenly out from the center of each side, keeping the muslin evenly stretched and wrinkle-free.*

Pound them in. *Drive the tacks home once you are satisfied that the muslin fits tight without wrinkles. Then place a tack on either side of an imaginary diagonal line from each corner.*

Finish with the corners. *Pull the flap of muslin out and away from a corner.*

Tack it. *Holding the flap tight, secure it with two or three more tacks.*

Then trim it. *Cut away the excess fabric inside the line of tacks.*

Step 5: Cover with the finish fabric

The top layer. *Don't stretch the finish fabric as tightly as the muslin. Use longer #4 tacks, and make sure the weave and any pattern are oriented correctly.*

Pull to remove wrinkles. *Ensure that wrinkles are eliminated, particularly at the corners.*

Trim the excess. *Cut away surplus fabric to leave the underside of the frame as flat as possible.*

SOURCES OF SUPPLY

The upholstery tools and materials can be found at **upholsterysupplies.com**

For one seat frame, you will need 2 to 3 yds. of 3½-in.-wide jute webbing, several feet of rubberized horsehair padding, 1 to 2 yds. of 1-in.-thick cotton batting, and 2 to 3 ft. of cotton muslin, black cambric, and your choice of finish fabric. Upholstery or blue tacks work better than staples because you can partially sink them and then remove them if the upholstery material needs moving. You'll need #3, #4, and #6 sizes.

Hide your work. *To finish, tack or staple down black fabric to hide and protect the webbing and padding.*

How to fit a seat frame to a curved chair

On a seat whose rails are not straight, such as the corner chair featured on pp. 62-69, you'll need to transfer the chair's shape to the seat frame. Place the frame on top of the front rails with the back sides about 3/32 in. away from the back rails. Trace the profile of the front rails onto the underside of the frame and cut this out on the bandsaw. Now use a marking gauge to draw a line ½ in. inside this curve and head back over to the bandsaw. Test the fit until there is an even gap between the frame and the chair rails. Ease all the edges and chamfer the top front edges.

Matching curves. *Transfer the curve of the chair rails to the underside of the slip-seat frame.*

Cut twice, scribe once. *After bandsawing the line you just drew, scribe a parallel line ½ in. to the inside and saw it, too.*

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Joinery for the ages

BY ANISSA KAPSALES

David Haig has been making his sinuous rocker (see the back cover) for 20 years. And just as he seamlessly blends the use of machines and hand tools, he also balances delicate, graceful lines with remarkable strength and durability. He sweeps one perfect curve into the next as he merges the design with joinery that has proven itself over decades.

GUSSETED
Rather than putting the back leg directly into the arm, Haig reinforces the joint by creating a gusset that sits in a mortise in the arm.

SCREWED AND PLUGGED
The back-leg-to-seat joint is reinforced with a #12 dome-head screw and then plugged. Haig does the final shaping with a Japanese whittling knife after the joint is cut and fit.

NOTCHED
Before the seat is shaped, a router with a ½-in. straight cutter and a simple jig are used to create the curved notches in the seat that accept the back legs.

MORTISED
The rocker-to-seat joint is like a cantilevered spring. An angled mortise houses the rocker part. Haig says he can put his full weight on just the seat and rockers when they are fitted and glued.

BISCUITED
The rocker and back legs meet in a point and are joined with a single biscuit. Haig uses a V-chisel to add a fine cross-hatching on the mating surfaces and epoxies it all in place.

LAMINATED
Where the rocker curls under the seat and sits in the housing, the curve is too tight to create from a single steam-bent piece. Instead, three pieces cut from the steam-bent rocker stock are laminated and epoxied to the rocker.

Online Extra

To see a video of David Haig bending the wood and cutting the joinery for this chair in his New Zealand shop, go to **FineWoodworking.com/extras.**

Drawings: John Tetreault, photo: Daniel Allen

Dream Rocker

David Haig had been restoring antiques and making furniture for abou a decade when he took a year off in 1990 to help a friend build a house Away from his furniture shop and tools, he felt a "creative itch" and begar sketching a new rocking chair full of swooping and coiling curves. But h couldn't resolve the design. "It kept eluding me like a half-remembere dream," he says. Then one day, with one quick stroke, he drew a lin that swept from the tail end of the rocker to the underside of the arm. H had found his signature chair. When he got back home, he spent thre months teaching himself to steam-bend wood and then began buildin the prototype.

Born in Malaysia, schooled in England, and now settled beside a ba near the city of Nelson, New Zealand, Haig has traced quite a path acros the globe. But he can hardly compete with his rockers: They've gone t 15 countries on four continents. Haig still relishes building the challeng ing chair. "After you make a few hundred," he says, "you get pretty goo at it." The rocker on this page is air-dried English sycamore, but Haig als makes them in English ash, English walnut, and European beech.

—Jonathan Binze

Photos: Daniel Aller

How They Did It Turn to p. 98 for details on how Haig shapes the parts of this chair and joins them together.

Pro Portfolio To see and hear more about Haig and his work, watch an audio slide show at FineWoodworking.com/extras.