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OCTOBER 2011 ■ #192

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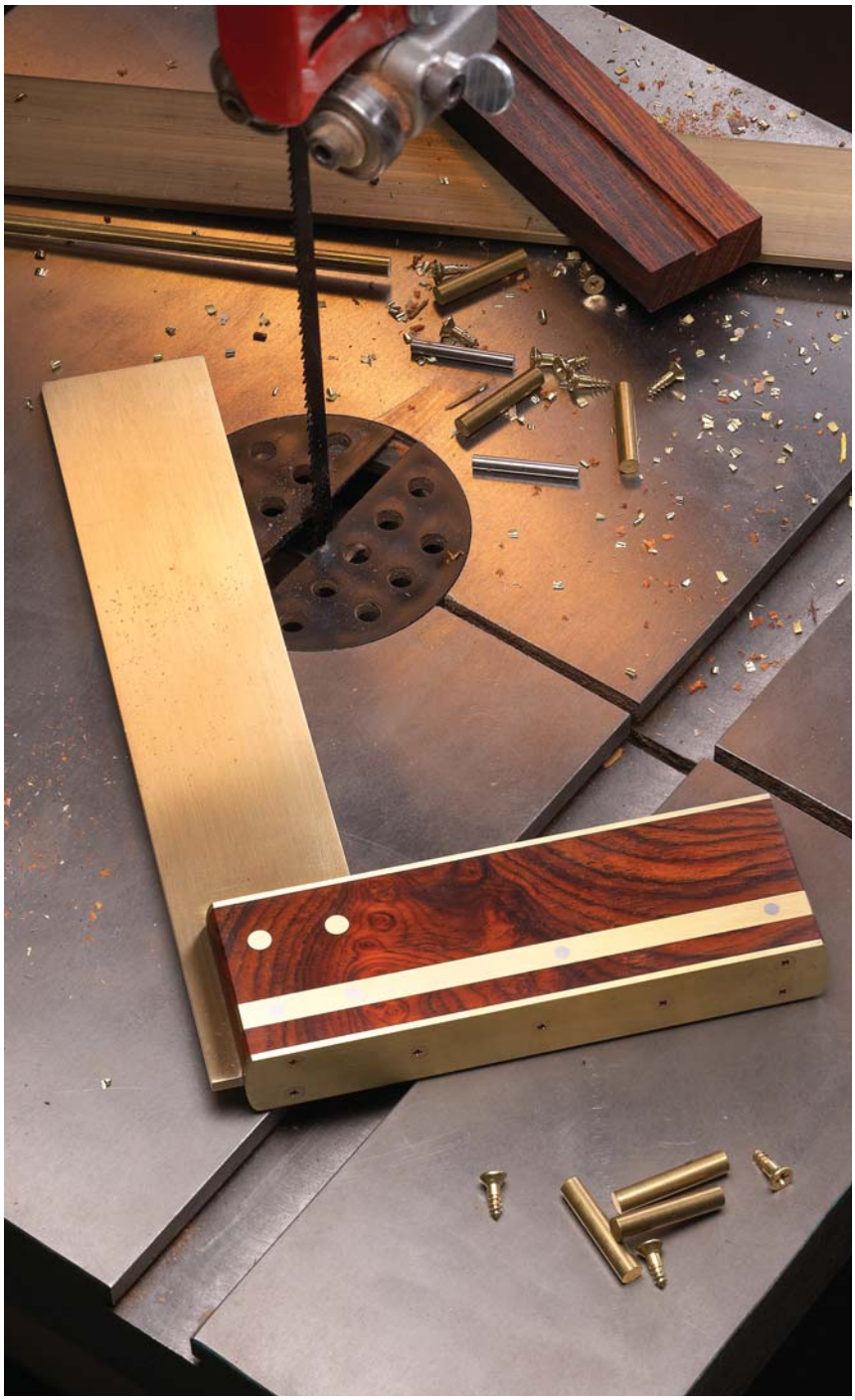

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- Cutting capacity/throat: 16 1/4"
- Max. cutting height: 12 1/8"
- Blade size: 131 1/2" L (1/8" - 1" W)
- Blade speeds: 1700 & 3500 FPM
- Quick release blade tension lever
- Approx. shipping weight: 342 lbs.

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- Motor: 1 3/4 HP, 110V/220V, single-phase
- Precision ground cast iron table w/wings
- Table size: 27" x 44" • Arbor: 5/8"
- Arbor speed: 4200 RPM
- Capacity: 3 1/8" @ 90°, 2 1/4" @ 45°
- Rip capacity: 36" R, 12" L • Approx. shipping weight: 342 lbs.

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- Cutting capacity: 25 5/8" R, 8" L
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- Motor: 3/4 HP, 110V/220V, single-phase, TEFC
- Precision ground cast iron table size: 14" sq.
- Table tilt: 15° L, 45° R
- Cutting capacity/throat: 13 1/2"
  - Max. cutting height: 6"
  - Blade size: 92 1/2" - 93 1/2" L (1/8" - 3/4" W)
- Blade speed: 3000 FPM
- Cast iron frame
- Steel open frame stand
- Approx. shipping weight: 165 lbs.

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- Motor: 1 HP, 110V/220V, single-phase, TEFC
- Precision ground cast iron table size: 14" sq.
- Table tilt: 10° L, 45° R
- Cutting capacity/throat: 13 1/2"
- Max. cutting height: 6"
- Blade size: 92 1/2" - 93 1/2" L (1/8" - 3/4" W)
- Blade speeds: 1500 & 3200 FPM
- Approx. shipping weight: 196 lbs.

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- Table tilt: 5° L, 45° R
- Cutting capacity/throat: 18 1/4"
- Max. cutting height: 12"
- Blade size: 143" L (1/8" - 1 1/4" W)
- Blade speeds: 1700 & 3500 FPM
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- Motor: 5 HP, 220V, single-phase
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- Cutterhead speed: 5034 RPM
- Max. jointer depth of cut: ⅛"
- Max. width of cut: 12"
- Planer feed rate: 22 FPM
- Max. planer depth of cut: ⅛"
- Max. planer cutting height: 8"
- Planer table size: 12¼" x 23⅜"
- Approx. shipping weight: 734 lbs.

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- Static pressure at rated CFM: 1.08"
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- Impeller: 13½"
- Height: 68½"
- Built-in remote control switch
- Approx. shipping weight: 210 lbs.

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- Precision ground cast iron table size: 9" x 72½"
- Max. depth of cut: ⅛"
- Max. rabbeting depth: ½"
- Cutterhead dia.: 3"
- Cutterhead speed: 5000 RPM
- Cuts per minute: 20,000
- Approx. shipping weight: 500 lbs.

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- Precision ground cast iron table size: 13" x 60"
- Fence: 5⅜" x 31¼"
- Cutterhead dia.: 3¾"
- Cutterhead speed: 4,950 RPM
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- Max. depth of cut: ⅜"
- Approx. shipping weight: 832 lbs.

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- Precision ground cast iron table size: 15" x 20"
- Min. stock thickness: 3/16"
- Min. stock length: 8"
- Max. cutting depth: ⅛"
- Feed rate: 16 FPM & 30 FPM
- Cutterhead speed: 5000 RPM
- Approx. shipping weight: 660 lbs.

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G0453P INTRODUCTORY PRICE **$995.00**

WITH SPIRAL CUTTERHEAD
G0453PX INTRODUCTORY PRICE **$1475.00**

10" DRUM SANDER

New!

- Motor: 1½ HP, 110V, single-phase
- Conveyor motor: 1/10 HP
- Drum speed: 2300 FPM
- Drum size: 5⅛" x 10"
- Max. sanding width: 10"
- Max. workpiece height: 2 15/16"
- Min. workpiece height: 3/16"
- Variable feed speeds: 1-10 FPM
- 4" dust port
- Approx. shipping weight: 220 lbs.

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- Cast iron table size: 12" x 20"
- Table tilt: 0 - 45°
- Floor to table height: 37⅝"
- Dust port: 2½"
- Approx. shipping weight: 232 lbs.

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- Amps: 14/7
- Intake size: 4"
- Bag size (dia. x depth): 13½" x 24"
- Balanced steel, radial fin impeller
- Air suction cpacity: 450 CFM
- Max. static pressure: 7.2"
- Approx. shipping weight: 51 lbs.

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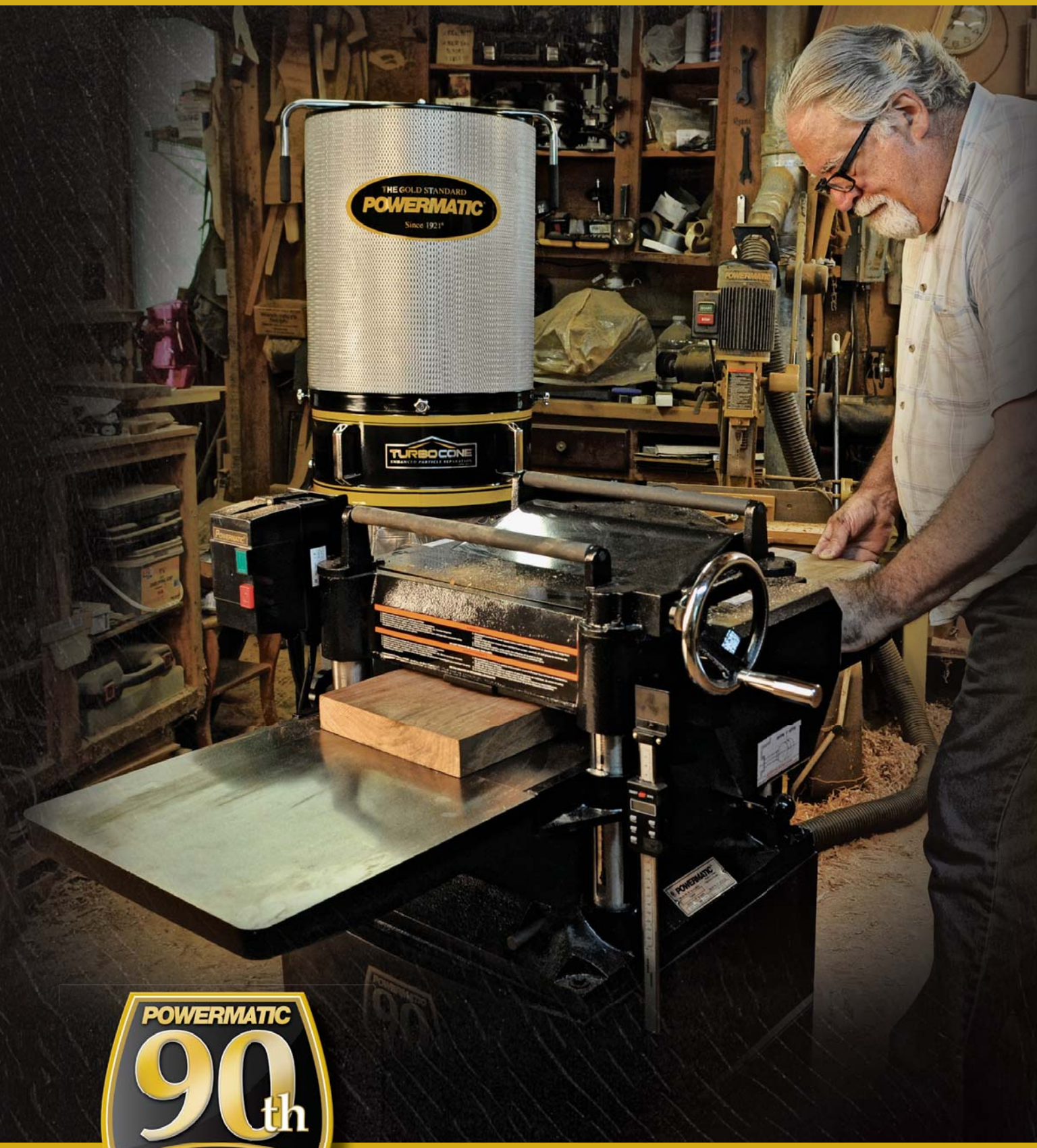
INLAY PHOTO BY ROB MILLARD; BEST OAK PHOTO BY PETER FOLLANSBEE; ROCKING CHAIR PHOTO BY JEFF MILLER; TABLE & COVER PHOTO BY AL PARRISH

POWERMATIC SPECIAL



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I Can Do That **26**

POPULAR WOODWORKING MAGAZINE

Number 192, October 2011. *Popular Woodworking Magazine* (ISSN 0884-8823,USPS 752-250) is published 7 times a year, February, April, June, August, October, November and December, which may include an occasional special, combined or expanded issue that may count as two issues, by F+W Media, Inc. Editorial and advertising offices are located at 4700 E. Galbraith Road, Cincinnati, Ohio 45236. Unsolicited manuscripts, photographs and artwork should include ample postage on a self-addressed, stamped envelope (SASE); otherwise they will not be returned. Subscription rates: A year's subscription (7 issues) is $24.95; outside of the U.S. add $7/year ▪ Canada Publications Mail Agreement No. 40025316. Canadian return address: 2835 Kew Drive, Windsor, ON N8T 3B7 ▪

Periodicals postage paid at Cincinnati, Ohio, and additional mailing offices. Postmaster: Send all address changes to *Popular Woodworking Magazine*, P.O. Box 420235, Palm Coast, FL 32142-0235 Canada GST Reg. #R122594716 ▪ Produced and printed in the U.S.A.

MORTISER & BENCH PHOTOS BY AL PARRISH; CURVED TABLE FRONT PHOTO COURTESY OF LIE-NIELSEN TOOLWORKS; FINISHING PHOTO BY BOB FLEXNER

CONTRIBUTORS

John Economaki

"Try for Your Best Work," page 28.

John Economaki got into making tools after years of using them. His woodworking career as a professional furniture designer/maker began in the mid-1970s but in 1982, he developed a hyper-allergic reaction to wood dust. So in 1983, he founded Bridge City Tool Works to make the tools he wished he'd been able to buy when he was a furniture maker.

"I couldn't get a try square that was square, so I made my own," John says. "Short, stubby scratch awls are worthless as a layout tool so I made my own."

John's work is focused primarily on using tools as a canvas to explore both functionality and creative aesthetic possibilities. In this issue, he shows you how to make the square that helped to make his company.

To read more about John and his company, and to read his blog, visit bridgecitytools.com.

Jeff Miller

"Make a Chair That Rocks," page 48.

Jeff Miller trained as a classical musician and his first foray into woodworking was making musical instruments. But his empty apartment needed furniture, and Jeff quickly found designing and building furniture to be far more satisfying than his attempts to build Renaissance cornettos, recorders and flutes.

He's been crafting award-winning furniture in his Chicago studio for 27 years now, and has participated in juried shows in galleries and museums across the country. Although he makes a wide variety of furniture, Jeff's main interest is chairs; he has developed more than 30 different chair designs over the years. In this issue, he shares his methods for getting the geometry right in a rocking chair build.

To read more about Jeff and the woodworking classes he teaches in his Chicago studio, visit furnituremaking.com.

Toshio Odate

"A Teacup & 8 Dinner Plates," page 52.

Toshio Odate completed a traditional woodworking apprenticeship in Japan (where he also studied arc welding and sand casting) before moving to the United States in 1958.

As an author, lecturer and teacher, Toshio has been pivotal in spreading knowledge about Japanese woodworking tools and techniques throughout the Western world. He is a sculptor, woodworker, former professor at the Pratt Institute in New York, and the author of "Japanese Woodworking Tools: Their Tradition, Spirit and Use" (Linden) and "Making Shoji" (Linden). His work has appeared in many woodworking magazines and other publications, and he's been a guest on "Martha Stewart Living," "The Woodwright's Shop" and other television shows.

Toshio Odate's books are available through online retailers, including Amazon.com.

POPULAR Woodworking MAGAZINE

OCTOBER 2011, VOL. 31, NO. 5
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BY CHRISTOPHER SCHWARZ, EDITOR

Stepping Down, Stepping Out

When I interviewed in 1996 to work at *Popular Woodworking Magazine*, it took me about 30 seconds to realize that I had finally found my life's work.

Ever since I can recall, I have loved both building things and writing. But until 1996 it never occurred to me to put the two together.

Somehow I talked my way into a low-level job here, and for the last 14 years I've had the best job in the world: Working in the shop and writing about it.

So why am I bidding you "farewell" in this column?

Most of you know that I've spent the last decade promoting handwork, both in this magazine and in DVDs, woodworking classes and on my blogs.

In fact, I started a small company called Lost Art Press to help promote handwork, revive forgotten texts and publish new writings on traditional furniture work.

After four years of doing that part-time, it became obvious that handwork needs a full-time advocate. I decided that I wanted that job.

So I hired myself to do it.

Why now? This might be my last chance to take a huge gamble. I just turned 43. I've paid off my mortgage. I have no debt. My spouse has a good job. My kids are out of diapers.

If I don't do this now, I might just run out of time – or nerve.

But even though I'm stepping down as editor of *Popular Woodworking Magazine*, I don't think you are done with me yet. I love this magazine almost as much as I love my wife and kids. So I hope to write for this magazine and its web site as a contributor for as long as they'll have me.

And I wouldn't worry about any large-scale changes here at the magazine – there are no plans to make it all about glue-gun crafts.

Despite the demise of many magazines, *Popular Woodworking Magazine* is in better financial and editorial shape than at any point in its history. Part of the reason is the hard work of the staff of editors, designers and builders.

But mostly we all sleep easily at night because of the support from all of you, our readers.

You supported us as we rebalanced the handwork vs. machine-work equation in the world. You pushed us to offer DVDs, CDs of our back issues, streaming video and – our latest venture – pure digital subscriptions.

Without you, I'd likely be handing you an order of fries at the drive-thru by now (like many fellow journalists). And thanks to you, I have a shot at changing how we (and our kids) turn trees into furniture. PWM

PHOTO BY AL PARRISH

POPULAR WOODWORKING MAGAZINE

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Safety Note

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

Highly Recommended

Somebody needs to come up with a better name for this tool than "ruler stop." By clamping this puppy on almost any ruler (or story stick), it does about 90 percent of the work done by a combination square.

And though there are several brands, the best by far is the Czeck Edge (czeckedge.com, $31.95). Made in the United States, this tool clamps tightly, never slips and is amazingly precise.

I keep one in my shop apron and clamp it to whatever is at hand. It might not replace my combination square, but it saves me from having to walk to the bench to fetch it.

— Christopher Schwarz

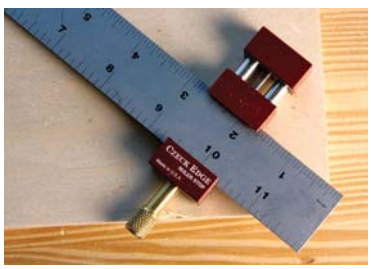


PHOTO BY CHRISTOPHER SCHWARZ

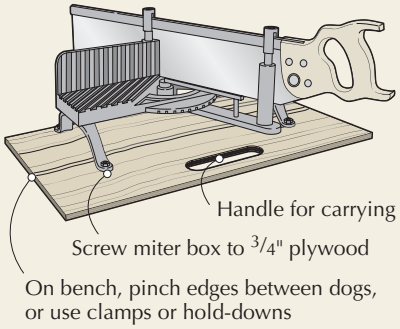
Securing a Miter Box

I recently acquired a nice Millers Falls miter box (finally!) and plan to attach it to a wood base. I've seen several photos of your miter boxes on your blog and wonder if you've attached dogs to the bottom of your base so that it fits in your benchdog holes.

If so, how did you attach the dogs? Did you countersink holes for the dogs then run a screw in through the top? That just doesn't seem like a very dignified method, but maybe the shear forces aren't that great and the dogs would hold. I'm interested in hearing how you solved this simple problem. I also thought about just adding a lip to the front of my base like a bench hook; I could then clamp it in my face vise.

With that figured out, all I'll have to do is search for a new backsaw.

Randy Rietcheck
Damascus, Maryland



Randy,

I use my miter boxes everywhere—not just on the bench. So I screw the saw's cast base to a slab of 3/4" scrap plywood then pinch the base between dogs when I work at the bench. I can also clamp it to my table saw outfeed table (that seems weird) or even to my kitchen countertop when working elsewhere in the house.

Adding a hook or dogs limits where you can work. But if you are going to work only on the bench, I would opt for the hook.

The saws for these boxes are fairly common. So if you strike out at a tool meet (it happens), keep your eyes fixed on eBay.

Christopher Schwarz, editor

Should Bevel-up Plane Blades Be Ground with a Camber?

Please comment on putting a camber on bevel-up plane blades. Is it necessary? I've been using a bevel-up jack plane and I do get blade tracks. I find that skewing my bevel-up smoother and going from one side of the workpiece to the other seems to do a pretty good job.

I read a bit online, and some people suggest grinding a significant camber but it seems a bit extreme. I considered adding a bit of a back bevel just to raise the corners, but would like your input before I write off a $40 blade.

Peter Boucher
Kingston, Ontario

Peter,

Whether or not you need a camber depends on your results.

Many woodworkers ease the corners of their irons and don't get plane tracks. That works great.

Other woodworkers introduce a camber, from a mild one to a strong one. The camber reduces or eliminates tracks, and it also allows you to correct edges and faces because you can use different parts of the mouth of the plane to remove material selectively.

How you get from point A to point B is up to you, as long as point B is a nice-looking finished surface.

As to the geometry of a camber in a bevel-up tool, here are the basics. If you want to produce the same cutting characteristics on a bevel-up plane that you have on a bevel-down plane, then you will need to camber the blade of the bevel-up tool more. There are formulas for calculating this, but I prefer to simply approach the problem through trial and error.

1. If I am getting plane tracks, I increase the camber.

2. If my plane is cutting only in the middle of the iron, I have too much camber and need to reduce it.

Christopher Schwarz, editor

'Dovetail a Day' Practice Stock

I'm about a week into cutting a "dovetail a day" (per Editor Christopher Schwarz's suggestion) and began working with Honduran mahogany (Ian Kirby's suggestion – but expensive) then switched to white pine.

I switched to white pine because my first dovetail project was in white pine. I have noticed that cutting dovetails in pine is a completely different experience than doing so in mahogany. The wood compresses wonderfully to give you super tight joints, but you can also dent the base of pins and tails with the side of your chisel when paring.

Yesterday, I finished up the last bits of my last two practice boards and need to prep some more stock for practice. What wood do you recommend?

Colin Hayward
Newton, Massachusetts

Colin,

When I teach dovetailing, I usually use poplar. It's not too soft, like white pine. It's not too difficult, like white oak. It is not as prone to splitting like some other species.

And it's cheap. So mistakes aren't as costly.

Christopher Schwarz, editor

Sector Secrets Clarification

In Jim Tolpin's "Secrets of the Sector" from the June 2011 issue (#190), on page 41 in Drawing A, the note reads: "Span between back of hinge pin and

CONTINUED ON PAGE 14

ILLUSTRATIONS BY MARY JANE FAVORITE

CONTINUED FROM PAGE 12

first division line should equal all division spacing."

Would "Span between axis center of hinge pin and first division line should equal all division spacing" be more accurate?

Edmond Devroey
via e-mail

Edmond,
The spacing of the division lines must start at the back of the hinge pin, not at its centerline, because that is where the hinge action actually originates.

If the division lines were stepped off from the centerline, the first division would come out slightly shorter than the rest, throwing off subsequent transverse spacings, because they wouldn't be equal divisions.

Jim Tolpin, contributor

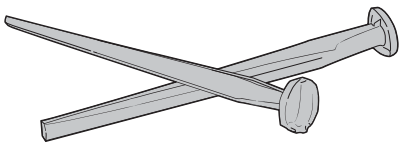
Correct Use of Clout Nails

I have a question regarding cut nails. I'm in the final stages of building my latest project (a smallish cabinet).

The back will be shiplapped or tongue-and-groove boards that I'd like to attach with cut nails with wrought heads.

What is the proper method to use cut nails when joining two pieces to each other with grain that runs perpendicular? Should I drill a pilot hole through my backboard and rely on the wrought head to hold it in place?

Matt Wilson
Stittsville, Ontario



Matt,
Clout nails, also sometimes called rosehead or wrought head nails, use the head to do most of the holding. You should drill a pilot through the backboard and into the cabinet's rabbet. The size of the hole is something you need to experiment with – it depends on the wood and its tendency to split. I'll try 3/32" with most nails for backboards and adjust from there.

But the key things are:

1. The pilot needs to be in both the backboard and the cabinet. Some old sources state that the pilot should be three-fourths the length of the nail. I haven't found this to work well in hardwoods. My pilot is the full length of the nail.

2. The nail's wedge shape should be in line with the grain of the backboard, not the cabinet part below. It is the backboard that is in danger of splitting.

And don't worry too much about wood movement. Nails bend. That is one of their virtues. Just leave a little room for the boards to expand and contract.

Christopher Schwarz, editor

Refurbish a Benchtop

I've been planning to build a quality workbench but recently was given a solid beech 24" x 6 1/2' European-style workbench with a 2 5/8"-thick top.

Unfortunately, the top has seen better days; it has 50-100 (maybe more) random holes in it (probably of varying depths) and a big circle routed out of it – not to mention the many obligatory saw cuts on the edges. How do you recommend I refurbish the top?

Kurt Berger
via e-mail

Kurt
I would simply plane the top until it is flat then use it as-is. Workbenches see some serious use (and in the picture you sent, yours doesn't look all that bad to my eye).

If you are not proficient with a handplane, find a cabinetshop in your area that has a wide-belt sander. Five minutes in the sander will flatten it and clean up a lot of the mess.

None of the problems you describe really affect the usability of the bench, so I wouldn't worry about the holes or routed channel.

Christopher Schwarz, editor

Tool Roll Chisel Storage

Christopher Schwarz wrote in his review that the new Stanley tool roll pockets were a tad tight to easily accept chisel handles (June 2011, Issue # 190).

"The right word may be effective, but no word was ever as effective as a rightly timed pause."
— Samuel Clemens (1835 - 1910)
American humorist

But Lie-Nielsen recommends loading tool roll pockets blades first.

Do you have any thoughts that would sway me one way or the other?

Ike Weatherholtz
Falling Waters, West Virginia

Ike,
Either way works.

I put my handles in the pockets of my tool rolls so I can see the blades' shapes and sizes. I hate rooting around in a tool roll to find the one tool I want – it's always the last one in the roll.

As to which way results in a longer-lasting tool roll, it's a complete non-issue in my book. The blades have to contact the tool roll somewhere – either in the pocket or in the flap.

And, as always, there is a third option: Put the tools in the tool roll with the blades in the pocket, then write the size and shape on the pocket with a fine marker. PWM

Christopher Schwarz, editor

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EDITED BY KARI HULTMAN

THE WINNER:

A Simple Toothing Plane

For 35 years I've used toothing planes on veneers, especially ones with swirling grain. With sawn veneers, the toother is the fastest way to make them flat (but not smooth). The pattern made by the plane increases the gluing surface by almost double.

A toothing plane can also be used on solid wood and it works very well on crotch lumber.

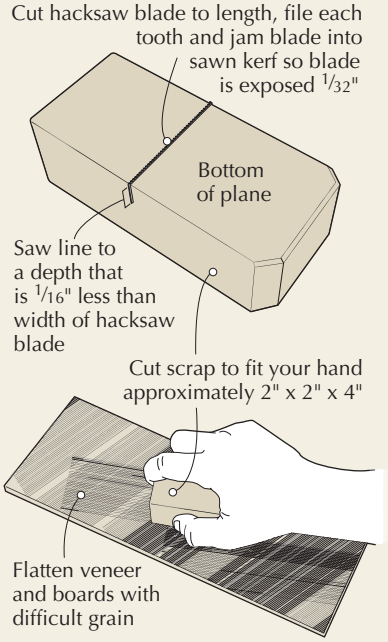
I was preparing for a presentation on veneer repair and trying to find my toothing plane when I had a revelation. Palm, meet forehead. Hard.

Here is a simple recipe for a high-performance, donkey-dumb, practically free toothing plane.

The material and tools that are needed to construct it include a scrap of wood, a fine-tooth hacksaw blade, a backsaw, a layout square, a pencil and sheet metal snips.

Find a scrap block of wood that fits your hand nicely. I used a piece measuring 2" x 2" x 4". Shape and smooth it to your preferences; embellish as necessary. (I'm thinking about using ivory and mother-of-pearl inlays for the next one.)

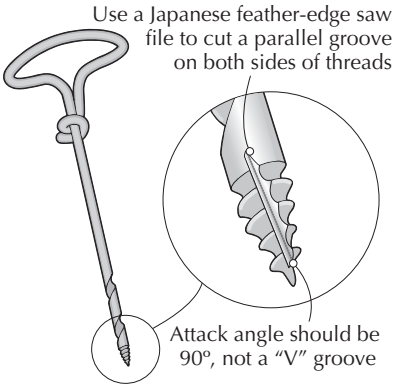
On the sole of the scrap, use your square to draw a line about midway along its length. Saw the line to a depth that is 1/16" less than the width of the hacksaw blade.



With the metal snips, cut the hacksaw blade to the length of the sawn kerf. With a small triangular file, take a stroke or two on each tooth to make the spacing uniform. Jam the blade into the kerf so that the teeth protrude about 1/32". Start planing.

It works so well that my vintage wooden toother and my Lie-Nielsen may be gathering a fair amount of dust.

Don Williams
Clinton, Maryland



Gimlet Improvement

Gimlets can be handy when you need to bore a small hole in a tight space.

However, the inexpensive gimlets that are available at woodworking supply stores do not work very well and tend to split the wood. The screw threads feed aggressively into the workpiece, squeezing past the wood fibers rather than severing them.

What if the screw point was altered to mimic an auger screw point so it could cut fibers? I made this alteration to the points on my gimlets and found that the edge of a Japanese feather-edge saw file did the job quickly and better than a diamond paddle or triangular file.

I cut two parallel slots on opposite sides of each gimlet with an aggressive 90° attack angle; a V-groove is less effective at cutting fibers. The modified screw point binds less and requires less force. Splitting is virtually eliminated. To clear the chips, I periodically pull the gimlet out of the hole.

This simple modification can turn a frustrating tool into a life-saver.

Rob Porcaro
Medfield, Massachusetts

Scratch Awl Hits the Mark

I discovered that an old dart with a steel point can be used as the basis for a really good homemade scratch awl. You only need to remove the shaft and flight assembly from the barrel (mine simply unscrewed), then make a custom handle.

The hardest part of the process is matching a drill bit to the diameter of the dart's barrel. Measure the length of the barrel, then drill a hole in a wood blank that will allow about two-thirds of it to be inserted. At that length, it's well supported.

After drilling the blank, it's a simple job to turn it on a lathe or shape a comfortable handle with your tools of choice. Secure the dart into the handle with epoxy or cyanoacrylate glue.

Josh Burroughs
Houston, Texas

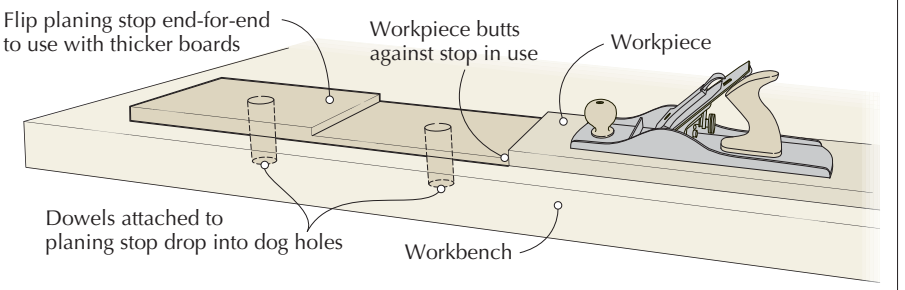
ILLUSTRATIONS BY MARY JANE FAVORITE

Split-level Planing Stop

When handplaning, I prefer to use a single planing stop to avoid having to clamp the workpiece. The round holes in my bench enable the workpiece to rotate away from me while planing against a bench dog. To prevent this, I added two dowels to the bottom of a split-level board to make what I call a bench curb.

The device can be moved to any pair of evenly spaced holes on my benchtop. One end of the curb is 3/16" thick for planing thin stock. And when I'm planing thicker boards, I simply turn the bench curb around to use the 9/16"-thick end.

The stop can be used along the length or across the width of your bench. Drill pairs of holes wherever you would like to use it. Two curbs and wedges can be used to trap panels that require more support.



Steve Sampietro
Reseda, California

Hairspray 'Glue'

I was all set to epoxy loose chisel handles when I remembered an idea from my motorcycle days. We used to glue our handlebar grips on with hairspray!

I cleaned the handles and chisel sockets with mineral spirits, sprayed the sockets with a short burst of cheap hairspray, inserted the handle and gave the chisel a good whack into a piece of poplar. When I want to remove a handle, I give it a sideways rap on the bench and it pops loose.

Hairspray is also handy for other uses.

The tote on my old handplane always came loose even though I'd tighten the bolt. The threads were slightly worn after 90 years of use. So, I sprayed the male threads and assembled the tote. It has remained tight ever since.

If you have a stripped screw hole, a little drop of hairspray in the hole or on the screw will fix it.

When I use chalk to mark boards, I spray the marks lightly with hairspray to prevent smudging. It's easily removed by scraping, planing, sanding or wiping with mineral spirits.

To transfer an inlay pattern onto a workpiece, I print the design on thin transfer paper, spray the wood with hairspray and lay the paper on top. While the hairspray is wet I can move the design around. When it dries in a couple minutes, the design is permanently attached. Then, I cut right through the paper and into the wood. When I'm done, I scrape away the paper and wipe the wood with mineral spirits to remove any hairspray residue.

The can of hairspray in my shop has provoked a plethora of snide comments because I'm bald. Oh well …. PWM

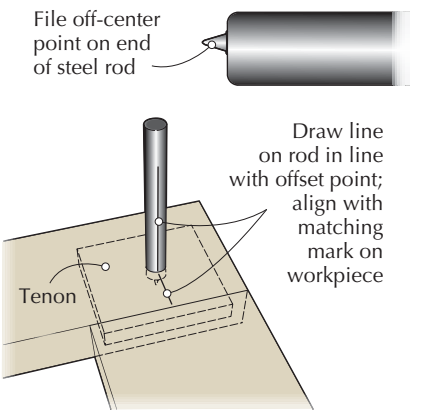
Scott Stafford
Great Falls, Montana

Offset Punch for Drawboring

Here is an idea for marking the offset hole for drawboring. Take a piece of steel rod that matches the diameter of your peg holes and file an off-center point on one end.

Draw a line along the length of the rod in line with the point. Drop the offset punch into the peg hole and align the mark with a matching line on the workpiece. The point should be closest to the shoulder of the tenon. Tap it with a hammer to make the offset mark on the tenon, drill the hole in the tenon and drive the peg home.

Joe Massey
Ft. Myers, Florida



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BY THE EDITORS

General's Beefed-up Mortiser

A hefty machine doesn't dance around a bench.

If your woodworking involves a lot of mortise-and-tenon joinery, you need a dedicated mortise machine. The new 5/8" hollow chisel benchtop mortiser from General International (model #75-040 MI) is an excellent choice.

At first glance, you notice the base. Not only is it large at 15 9/16" x 17 1/8", there are two telescoping extensions that expand the working surface to 35" to provide a more stable work area for lengthy workpieces. The large cast iron base helps the machine weigh in at 99 pounds – 23 pounds more than the company's earlier model. Weight helps reduce vibration and keeps the machine from dancing around your bench.

The fence of the 75-040 MI is held in position with two locking levers set into keyed slots in the base. This arrangement is more secure than a single lock at the machine's column as is found on some mortisers. Also attached to the fence is the workpiece hold-down. The thumb-turn screw used to lock the hold-down is a bit weak, but it does the job.

The 1,720 rpm, 1/2-horsepower motor has plenty of power to drive mortising chisel-and-bit sets from 1/4" to 5/8" in size. Included are four chisel-and-bit sets (1/4", 5/16", 3/8" and 1/2").

Other features include a multi-position handle that can switch to the opposite side of the machine, rubber table rollers that hold material tight to the fence and a tool holder.

How the slide plates (the covers over the 1/2" drill chuck) attach is a major drawback for me. I prefer a hinged access cover instead of the screwed-in lock knobs. Of course, many woodworkers would simply leave the covers open or entirely off.

The 75-040 MI has dual depth stops. A lower stop sets the depth of cut while the top stop limits upward travel to save time. The stops appear weak, but it takes extreme force to make it slip.

— Glen D. Huey

CONTINUED ON PAGE 20

Lots of cast iron. *General's mortiser base provides much of the machine's weight. Its extensions provide 35" of overall side-to-side support.*

Adjustable rollers. *Bumpers push material tight to the fence yet allow pieces to slide.*

Hollow Chisel Mortiser

General International ▪ general.ca or 888-949-1161

Street price ▪ $399

VIDEO: *Take a video tour of this machine at popularwoodworking.com/oct11.*

Price correct at time of publication.

PHOTOS BY AL PARRISH

CONTINUED FROM PAGE 18

Veritas Dual Marking Gauge

Most mortising gauges do a poor job and need to be heavily modified to mark out mortises. And when you modify them, they then do a poor job of marking the mating tenon.

Veritas has finally solved this problem with its brilliant Dual Marking Gauge. The trick to the gauge is that the round cutters at the end of each stem are beveled on one face and flat on the other.

The result is that you can set the gauge to mark a perfectly crisp through-mortise, then switch the position of the two rods – to change the angle of the cutters – to mark the mating tenon.

But the cleverness doesn't stop there. You can recess either cutter in the head so you can use it as a single-knife gauge. The two cutters are independent of each other so you can mark the lines of a mortise one at a time (instead of having to mark them simultaneously – which can be tricky). And the head of the gauge is shaped so that it won't easily roll off the bench.

Also cool: The stems of the gauge are machined to the same length. So you can touch one to your benchtop and touch the other to the side of your chisel – and the cutters are then instantly set to the width of the tool.

Like all Veritas tools, this dual marking gauge is made in Canada and built like a tank.

— Christopher Schwarz

Veritas Dual Marking Gauge

Lee Valley Tools ▪ leevalley.com or 800-871-8158

Street price ▪ $59

BLOG: *Read my online review of this tool at popularwoodworking.com/oct11.*

Price correct at time of publication.

'3RILL' Drill by Rockwell

On a construction site, impact drivers are big news. In a woodworking shop, the need for such a tool is less common, but occasionally it arises.

Rockwell has merged three tools – a drill, screwdriver and impact driver – into one handheld workhorse. The tool, which the company calls "3RILL," changes modes with the slide of a switch and has 22 clutch positions to select the setting that's best for your operation.

In drill mode, bits spin at 0-600 rpm (single setting only). Use the tool as a driver and choose between two speeds. Low-end speed is 0-600 rpm, but in the high-end setting you achieve an rpm of 0-2,200. Dial the selection switch to impact driver mode to ramp up between 0-3,000 beats per minute with a maximum 800 inch-pounds of torque.

The tool comes with two 12-volt batteries to eliminate downtime. The batteries charge in 30 minutes, or build to 75 percent in just 15 minutes. Of course, the batteries are lithium-ion so you won't experience trickle down.

The chuck is a 1/4"-hex design that uses hex shank bits so there is no slippage, and changes are quick.

The tool feels a bit nose heavy, but at 2.75 pounds and 7 3/4" in length, it's lightweight and ergonomic. It does what other drill-drivers do, and in impact mode it drives screws and bolts with ease. **PWM**

— GH

3RILL

Rockwell ▪ rockwelltools.com or 866-514-7625

Street price ▪ $180

BLOG: *Read about other Rockwell tools at popularwoodworking.com/oct11.*

Price correct at time of publication.

BY GEORGE R. WALKER

Curve Appeal

Getting off the straight path can be liberating.

Stunning. *The flowing curves of this Newport table are, quite simply, stunning.*

I can see it with my eyes shut: a curving stretch of highway snaking past Otter Cliffs in Acadia National Park. Each twist in the road opens up a jaw-dropping vista of surf crashing on the pink granite shoreline. You probably have a favorite stretch of road. Chances are good that highway has some curves that gently unveil a landscape dear to your memory.

For as long as woodworkers have been turning logs into boards, we've been making furniture with straight lines. Like our superhighway system, straight lines are functional, efficient and … predictable. No surprise, then, that we are tempted to experiment with curves. A simple flowing line or a combination of curves can add life and vibrancy to your designs.

Curved surfaces have an appeal on a number of levels. First, a curved surface has a tactile attraction. In a very real sense, our hands are a second set of eyes. Without thinking, we trace our fingertips across a curved drawer front, and small elements such as a sculpted handle or pull can be almost irresistible. Curves also have a powerful visual component in that they lead the eye, especially in areas of transition.

It's quite common in nature to see gentle curved transitions. Just look at your thumb. Does it jut out the end of your arm like a railroad spike nailed in place? Or does it flow from your hand like something that, well, grew there?

Finally, curved surfaces add life due to their reflective properties. A flat surface reflects light in a single monotone band while curved surfaces play with light and shadow. A convex surface has an area of maximum reflection that fades gradually back into shadow. Concave surfaces are just the opposite, with maximum areas of shadow gradually giving way to greater reflection. This play of reflection and shadow can make a piece seem alive. It gives an impression of movement as you walk past and view the piece from different angles.

Around the next bend. *Every turn on my favorite road unveils a stunning vista of sea, sky and granite.*

Naturally inspired. *Nature abounds with examples of curvature to fuel our imagination.*

Go Beyond the Straight & Narrow

If the thought of introducing curves causes you to break out in a cold sweat, you're not alone. Face it – much of our initial training in woodcraft is focused on creating straight cuts and square joints. That's also the sweet spot for many of the common power tools such as the table saw, radial arm saw and router table. But beyond the technical

LEAD PHOTO COURTESY LIE-NIELSEN TOOLWORKS; REMAINDER OF PHOTOS BY THE AUTHOR

challenges of working with curves, there is a legitimate fear of tackling the design aspects. There's a fine line between something lively and flowing vs. a jumbled collection of curved elements. Nature seems filled with curves to inspire us, but translating that into a furniture design is another kettle of fish.

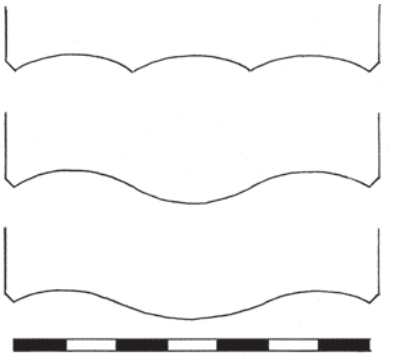
In addition, the reflective properties of curves are not something that you can easily model in a mock-up or drawing. This is no small issue because reflectivity tends to exaggerate the contours, often begging for some restraint. In many cases, it's not until the final finish is applied that you can see the full effect. So just what are some of the starting points to keep in mind when venturing onto that curvy highway? Let's start with a few basics.

Application

Keep in mind that the goal is to design something that flows and pulls your eye across a form. Just as a grid of repeated squares tends to be static, repeating a series of identical curves can have the same effect.

There are several ways to break this up. When assembling a composition with multiple curves, consider alternating convex and concave surfaces. You can also interject flat surfaces between the curves to act as punctuation or a border between one curve and the next.

Another way to liven it up is to organize the curves into major and minor parts. Above right are some profiles for the front of a dresser or a sideboard (the view is looking down). The top example simply divides the façade into three equal parts with three identical curves. The middle version divides it into three equal parts but alternates concave and convex. The bottom example divides the façade into seven parts, giving three parts to the major convex curve in the center and two parts to each of the flanking concave curves.

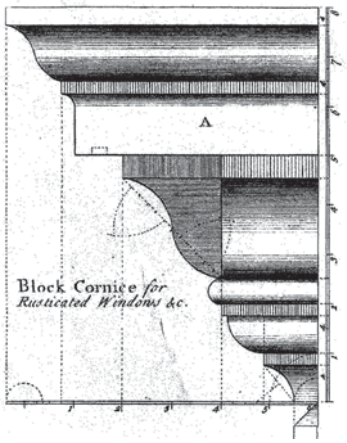


Most appealing? *Experiment with curves on a dresser or sideboard. Which of these looks best to your eye?*

Which profile looks best to your eye? On the last example my use of the ratio 2:3:2 to create a major-minor sequence was arbitrary, but I find it's helpful to work with simple whole-number ratios when searching for a combination that flows. Also, as you experiment with simple ratios you'll begin to build a working library in your mind of how curves work. This is especially helpful when you study curvature in a furniture masterwork or in nature, allowing you to unpack it visually and climb inside it.

Apply it on a Micro Scale

The same concepts apply on a smaller scale when combining the curved elements in a moulding profile. A lively composition alternates convex and concave, and it separates curved profiles with flat surfaces (fillets). Additionally, elements are sized into major and minor. Note how many curves are used in the cornice moulding above and how each element is scaled in relation to the adjoining element. This is a complex profile but also note that you could separate it into several smaller mouldings, each one able to stand on its own.



No monotony here. *This lively cornice composition uses simple curves to create a dramatic border.*

I hope this inspires you to venture out on that curvy highway. Who knows what discovery is just around the next bend! PWM

George is the author of the DVDs "Unlocking the Secrets of Traditional Design" and "Unlocking the Secrets of Design: Moldings" both from Lie-Nielsen Toolworks (lie-nielsen.com).

Inviting curves. *The contours in this sculpted tote beg you to grab hold of it.*

Reflection. *Note the play of light and shadow on these small drawer fronts.*

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About This Column

If you have a thirst to hone your creative skills, Design Matters dives into the basics of proportions, forms, contrast and composition to give you the skill to tackle furniture design challenges with confidence.

BY ADAM CHERUBINI

Whetstone Sharpening

Part 1: No flat back.

Whetstones. *I enjoy sharpening my tools with natural whetstones. Kept clean and used carefully, they can get your tools more than sharp enough. Better still, they are inexpensive and rarely need maintenance. If they are so great, why doesn't everyone use them?*

I've tried most sharpening systems. I started with sandpaper and glass because it was cost-effective. It's still tough to beat. You don't have to worry about maintenance. If the paper rips or clogs, you throw it away. The surface you are working on is always flat. But at finer grits, the paper tears easily. I switched to Mylar-backed abrasives, and later the adhesive-backed films. These helped, but I was still unsatisfied.

So I tried waterstones. I liked the feel of the ceramic composite stones. But I could never get over the mess with soak-it-in-a-tub stones. And while ceramic composite stones solved that problem, I realize now that the way I sharpen simply isn't suited to sandpaper or waterstones.

My first serious introduction to natural whetstones came when I eschewed modern sharpening equipment about six years ago. As with many of my experiments, I was left with more questions than answers. But I learned some things I'd like to share with you:

Flat Backs Not Required

No tool needs a flat back to be sharp (think: carving tools). I suspect lots of 18th-century tools were knife-edged to some degree. I think it's worth reviewing this important issue.

The wood doesn't care if the back of your tool is flat. If you have a 30° bevel angle and a 5° back bevel, the wood sees a tool with a 35° angle.

What's important is that we control the flatness of the back. The question is, how flat is flat enough? My guess is none of my "flat-backed" tools are out of flat by more than a degree or so. So I just don't think this is a big issue.

Because I use slow-wearing stones, I don't worry about flattening them. And if you think about it, flattening sharpening stones is a hassle. I'm not against it, mind you. I just wonder if we aren't getting dragged around by suppliers. We buy stones to flatten our tools and stones to flatten the stones that flatten our tools.

I asked Roy Underhill if he flattens his whetstones. Roy has found rocks in the woods to hone his tools so I know he's thought about it. He replied by pulling his chin into his neck and looked at me like I had three (bald) heads. I took that as a big, "No."

Grind Low, Hone High

Natural whetstones cut more slowly than other stones. Working broad faces (like a thick chisel or plane iron's bevel) takes a long time. This is likely where natural stones and even synthetic India stones got their bad reputation. What I do is grind a low angle, then hone up a few

Look closely. *The secondary bevel on this chisel is difficult to see in this picture. Part of the reason for that is that honing freehand rounds the bevel slightly. This isn't a problem as long as the angle at the very tip doesn't get too high.*

PHOTOS BY THE AUTHOR

Always the same. *I hold every tool the same way when I hone. I use my left forefinger to add pressure to the edge. The rubber mat on my bench keeps the stone from slipping.*

Hone. *I use my finest stone to remove the wire edge created by my coarser stones. No reason to scratch the back on a coarse stone. I just work the area adjacent to the edge. I prefer to hone front to back so I use the corners of the stone.*

Polish. *Fine scratches can be polished away using a leather strop charged with a polishing compound such as this chromium oxide.*

degrees. So if I want a chisel to have a 30-degree bevel angle, I grind it at 20-25 degrees, then hone a secondary bevel on the Arkansas stones. Thus, I'm removing very little metal with my stones.

What I lose by doing this is the advantage of using the bevel's hollow grind to position the chisel at a certain angle on the stone. But in my shop, freehand honing is an absolute necessity. Many of my blades are curved (carving gouges) or "cambered."

Once divorced from the hollow grind, I skipped my electric grinder (yes, I have one) altogether. I find my DMT Dia-Sharp extra-coarse diamond plate works plenty fast. I also use it to clean up the surface of clogged stones.

Honing Freehand

I hold blades in my right hand with my left forefinger atop the blade. Most of the motion comes from my elbow. I keep my wrist tight or locked. I prefer to "skew" my blades, holding them at a slight angle with respect to the motion. This is what one must do to sharpen a 3" blade on a 2"-wide stone. Maybe that's why I do it. Most old stones are narrow. Despite the skew angle, I try to work the blades front to back as much as possible.

I start honing on a soft Arkansas Ouachita (sometimes spelled Washita) stone. A hard India stone is a poor but acceptable substitute. You could probably produce an acceptable edge on a good clean Ouachita stone.

I hone the bevel until I raise a wire edge across the entire width of the tool. I don't maintain the flatness of this stone. No need. I don't use it for backs of tools, only bevels. I wipe the stone clean and dry with a paper towel after each use and store it in a wooden box.

I remove the wire edge by honing the flat side on my translucent Arkansas stone, then polish the bevel. My goal is to remove the wire edge and raise a new one on the fine stone. It can be difficult to detect a wire edge from a fine stone. I suspect this trips up many woodworkers who hone far beyond the initial wire. I think it's also true that some people stop before achieving the wire edge and fail to get their blades honed all the way to the cutting edge. My "paper test" (in the next issue) determines if you are getting the job done or not.

I use a fair amount of pressure when honing. I suspect that natural stones need higher pressure to cut quickly.

Similarly, because I'm working a small amount of metal (honing just a small portion of the bevel, for example), the contact pressure on the stone can be quite high. I believe this is why I tear paper and have found waterstones to not work well for me. These edge shapes just don't seem well suited to an abrasive with a soft matrix.

I finish my honing with a leather strop charged with chromium oxide. The strop polishes and smoothes the edge. I think it's an important step. Folks say that stropping "dubs" the edge. So does woodworking. When you are stropping the back, just don't lift the heel of the blade. The give of the leather is sufficient to work the entire surface.

Most people think natural whetstones are slower than waterstones and their derivatives like Shaptons. And if you sharpen the way most people sharpen, they are. These new uber stones are designed for individuals who produce flat beveled edges and who work the backs of their blades at every honing.

I was told this was the only way to achieve a good edge. Now I know that's not true. Kitchen knives are good edges. Carving tools are superb edges. Typically, neither has any flat surfaces. If you put a round-edged tool on softer stone, you'll risk ruining the stone. So you either have to slow down, making the process more time consuming, or skip that edge shape altogether, which is my concern.

Though natural whetstones cut slower (by the way, we could say the same things for ceramic stones such as those from Spyderco), their hard-wearing surfaces allow us to hone other, possibly more traditional edge shapes. So when we think about comparing stones, we need to keep in mind the edge shapes for which these stones were optimized (and vice versa). PWM

Editor's note: In the next issue, Adam shares his "paper test," how to sharpen curves and how to grind.

After a year-long hiatus, Adam has returned as our regular Arts & Mysteries columnist.

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BY MEGAN FITZPATRICK

Small Bench

This simple seat is ideal for a hallway or porch.

Easy seat. *This simple (but good-looking) bench can be built in just a few hours' shop time.*

This project is inspired by a period choir bench in my mom's dining room – but I modernized the Gothic revival design of the original with sweeping curves on the arms (instead of shelter arms), and left out the moulding and cutouts.

Panel Glueup

This bench is destined for a front porch, so to protect it from the elements, it's painted – a good thing, because the side panels are glued up from two distinctly different species of pine (one challenge of buying dimensional lumber from the home center) – and I used sticks pulled from the scrap bin for the cleat material (if you don't have suitable scrap, pick up 1x material at the home center).

The two side boards are solid panels; I glued up each from one 29"-long piece of 1x10 and one 29"-long piece of 1x8 (while you can purchase panels wide enough for the sides, I think they're insanely expensive).

So the first step is to set a stop-block 29" to the left of your miter saw blade, then cut two pieces from a 1x10 and two from a 1x8. Then, glue up your two 16½"-wide panels and set them aside to allow the glue to dry overnight.

Cut the Remaining Pieces

Usually, it's better to wait to cut your pieces until you need them, because often your actual build won't exactly match the cutlist. But for this bench, with the exception of the cleats, all the remaining pieces need to be the same length so set up your miter saw once and make all but the cleat cuts. Move the stop-block to 34" left of the blade, then cut the four boards for the seat and back from 1x8 stock, cut the stretcher from 1x4 stock and the shelf (which also acts as a lower stretcher) from 1x6 stock.

You can now set your stop-block to cut the two 13"-long cleats for the seat, then the two 5½"-long cleats for the shelf.

Curve Appeal

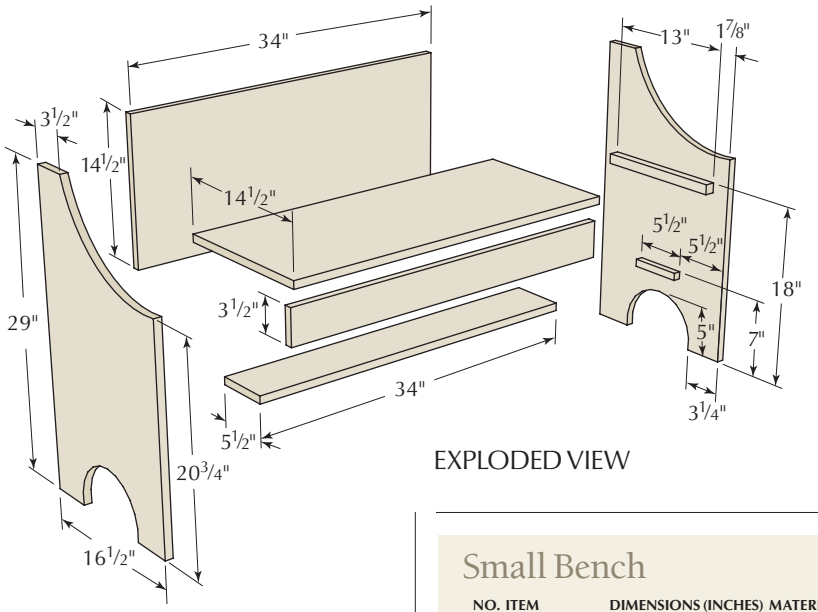
I played with a number of different curves for the arms, including no curve (which felt too boxed in) and a convex curve on the top corners to match the bottom cutouts (it still seemed bulky) before deciding on a sweeping concave curve. You should play around with it, and see what feels right to you.

To mark the curve I used, sink a nail 3½" in from the back edge, just deep enough to stay in place, then mark the front edge 20¾" up from the bottom (or 8¼" down from the top). I used a thin, flexible offcut from the trash can, but you can use a flexible ruler or anything that will bend neatly, and put one end against the nail, hold the other in place at your mark, then draw the curve with a pencil.

Now mark 3¼" in from the sides at the bottom, then pencil in a curve for the bottom cutout using the same method – or, if you have a large enough compass, that works, too. (The radius on the curve as shown is 5".) Be sure to leave enough meat on the ends to support a body's weight, and don't go above 6½" up with the apex of your curve; the

Mark a curve. *A nail acts as a third hand while I mark the concave curve at the top of one side piece.*

LEAD PHOTO BY AL PARRISH; STEP PHOTOS BY THE AUTHOR; ILLUSTRATION BY ROBERT W. LANG



EXPLODED VIEW

top edge of the cleat for the shelf is 7" up from the bottom.

Use a jigsaw to remove the waste at both locations. If you've cut close to your lines, go ahead and use the first side to mark the curves on the second side. If you're way off the lines, you might want to shape the arm and base arc with a rasp and sandpaper before using it as a pattern.

Once both sides are cut, clamp them together to shape and sand the curves simultaneously so they'll match.

Start Screwing

Mark the cleat locations from the plan, drill clearance holes and countersinks, then put a line of glue on each, and screw the four cleats in place.

Plane to fit. *If your backboards are slightly proud of the sides, take a few passes with a block plane at either end to curve the back pieces in to meet the sides. If the sides are proud and need planing, wet the end grain with alcohol to soften it, then plane them down to meet the backboards.*

Small Bench

NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑ 2	Sides	¾	16½	29	Pine
❑ 2	Seatboards	¾	7¼	34	Pine
❑ 2	Backboards	¾	7¼	34	Pine
❑ 1	Stretcher	¾	3½	34	Pine
❑ 1	Shelf	¾	5½	34	Pine
❑ 2	Seatboard cleats	¾	¾	13	Pine
❑ 2	Shelf cleats	¾	¾	5½	Pine

Get someone to help hold a side in place as you drop your seatboards and shelf onto their respective cleats, then clamp across the width just tightly enough to hold things together. Now you can dismiss your helper.

Adjust the front seat board so it's ½" back from the front edge of the sides, tighten the clamp to hold it securely, then drill, countersink and screw through the outside into the end grain of the seatboard using #8 screws, at least 1½" long (and make sure you drill straight – you have only a ¾"-thick piece into which you're drilling; you don't want screw tips poking through into seated bottoms).

The shelf can be screwed or nailed to the cleats.

Now loosen the clamp, butt the second seat board against the first, and repeat.

The stretcher butts against the front end of the seatboard cleats. Clamp it in place and again, drill, countersink and screw through the outside of the side pieces.

It's easier to attach the bottom backboard first, because you can flip the bench on its front to position the lower backboard against the back seatboard (7¼" down from the top edge of the sides). Drill, countersink and screw it in place, both through the sides and into the rear seatboard. Then flip the bench back on its feet and secure the top backboard by screwing through the sides.

If your top backboard ends up proud of the sides (or the sides end up proud of the backboards), a few strokes with a block plane will solve the problem.

A Bright Finish

Fill your screw holes (if you like) with wood filler, let it dry, then sand it flush as you sand the rest of the piece up to #150 grit.

This piece is going on a front porch, so I chose bright red paint for a cheerful welcome. **PWM**

Megan is managing editor of this magazine. She can be reached at megan.fitzpatrick@fwmedia.com or 513-531-2690 X11348.

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About This Column

Our "I Can Do That" column features projects that can be completed by any woodworker with a modest (but decent) kit of tools in less than two days of shop time, and using raw materials that are available at any home center. We offer a free online manual in PDF format that explains all the tools and shows you how to perform the basic operations in a step-by-step format. Visit ICanDoThatExtras.com to download the free manual.

Try for Your Best Work

BY JOHN ECONOMAKI

Make the square that launched Bridge City with tools found in most home shops.

From 1977-1983 I made my living as a studio furniture designer and maker. In addition to making furniture, I found most of the hand tools available at the time so uninspiring and inconsistent with the craftsmanship values I was trying to impart in my furniture, that I made my own.

The roots of my personal "homemade" try square, however, go back to the fall of 1973 and my first days as a rookie woodshop teacher. Amongst the supplies ordered by my predecessor were a dozen Stanley try squares. Several of them were so visibly off I remember asking myself, "What do you call a square that is not square?" The answer I like best today: paint can opener.

Consequently, the first project for my 9th-grade students was pragmatic – they were to make their own try squares. The design was centered on available materials – a local veneer mill had donated all its solid Brazilian rosewood shorts to the school, and the adjacent metal shop had brass strips sitting around. So those became the materials for the square. The design was quickly revealed as flawed; too many students were splitting the handles while seating the rivets. My original design was modified to add a brass rivet seat, and that did the trick. Little did I know that 10 years later, in 1983, that exact square would launch a new company named Bridge City Tool Works.

Student work. *These beautiful try squares were made by John Economaki's tool-making class at the Marc Adams School of Woodworking.*

Later in the fall, a vice principal asked me if we had any projects to represent the Industrial Arts program for Back-to-School-Night. I asked for a student volunteer and about 20 students enthusiastically responded with polished try squares. We arranged them in an arc on a glass shelf in the display case in the main hall. Beside each square was the maker's name.

That little display completely gobsmacked the parents, students, most of the faculty and the administrators. Nobody could believe such quality and beauty could be accomplished in a "shop class." It was an awesome experience for the kids and enrollment in the program took off overnight. Quality work became the theme of all subsequent projects.

"Everything's a kit."

— Michael Burns, instructor
College of the Redwoods

LEAD PHOTO BY AL PARRISH (TOOLS MADE BY BOB KING, DANTE DIIANNI, MASOOD GARAHI, BOB KINK & SAM PRATHER); STEP PHOTOS BY AJAX ALEXANDRE; ILLUSTRATION BY ROBERT W. LANG

Teacher, Maker, Toolmaker

I quit my teaching job in 1978 and became a full-time furniture designer and maker. In the late 1970s I had a "lunch hunch" that a couple of the tools I had designed and made would be of interest to others – visitors to my shop almost always commented on them. So, in the summer months when my shop was unbearably hot, I would do small runs of my try square and a scratch awl, and place them on consignment at the Contemporary Crafts Gallery in Portland, Ore. It was nice to get a check in the mail every now and then.

Unfortunately, I took better care of my tools than I did of my body. I rarely wore a dust mask, and in early 1983 I woke up with double pneumonia and was informed that it was caused by a hyper-allergic reaction to wood dust. My days as a furniture maker were over – as in overnight.

I thought high-quality tools might be of interest to woodworkers but all of the major mail-order companies at the time were adamant that Americans would not pay for quality. Consequently, the TS-2 Master Try Square and the SA-2 Scratch Awl were introduced to the woodworking community in the November/December 1983 issue of *Fine Woodworking*. I had spent every penny in the bank on that ad to find out that the mail-order companies were only partly correct.

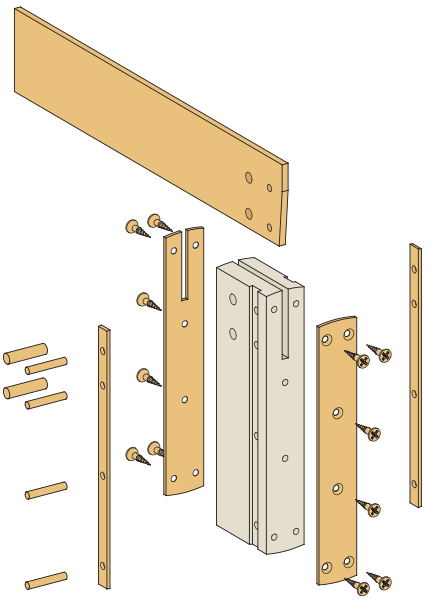
There is an elegance and soul to the TS-2 try square, and I am thrilled to be able to share how to make it with you. During the past four decades we have produced tens of thousands of TS-2 try squares and it is my hope you can find the time and inspiration to create a version for your shop. I believe it is one of the most rewarding weekend projects you will ever make and with a little care, will become an heirloom that will inspire future woodworkers in your family for multiple generations.

Design Philosophy

A try square is a simple tool that is candidly two "straight edges" affixed at 90° to each other. And when both components are parallel, both the inside surfaces of the square and the outside edges can be used as references. In addition, the inside square and the outside square are perfectly offset from each other, which means you can use the inside of the handle as a reference and scribe a line using either the inside or outside of the blade. Few woodworkers understand that a traditional wooden-handled try square (where just the inside face of the handle is brass) is an inside square only. You use the outside square at your own risk.

1 ***Rout the groove.*** *After the handle stock is prepped to 1.5" wide x .625" thick, rout the .0625"-deep rivet seat grooves on the router table using a 1/4" straight bit. (Toolmakers always work in decimal inches.)*

2 ***Clean before glue.*** *Using a maroon Scotch-Brite pad, clean all brass surfaces of tarnish – the material should be shiny prior to applying adhesive.*



EXPLODED VIEW

3 ***Glue in the brass.*** *Rosewoods need to be wiped with acetone to remove the surface oils. Contact cement is a good first-choice adhesive if the components need to be separated. In addition to the rivet seat, adhere one brass wear strip (.0625" x 1") to the face farthest from the rivet seat grooves.*

4 ***Two at a time.*** *Note the orientation of the brass wear face and the rivet seats in this image. It is difficult to find 1/16" x 1/4" 360 brass, but 1/4" x 1/4" is readily available. This can be beneficial when making more than one handle at a time. Multiple handles can share a length of 1/4" x 1/4" brass and be separated on a band saw with a metal-cutting blade. After sawing, both faces of the handle need to be flush sanded on either a horizontal or vertical belt sander – #120 grit is ideal. Never allow the brass to get too hot to the touch. Handles can also be flattened by drawfiling with a mill file. The square's second wear face will be attached after the handle is slotted.*

Over the years I have been involved in many discussions about what makes a "great tool." On one hand you have proponents who lament that any effort (read cost) that does not contribute to the obvious function is waste at best, and arrogance at worst.

Consider this: Most of the tools in your workshop sit and do nothing most of the time. I believe there is another function for these "do nothing" tools (besides the obvious) that is equally important. That function is to inspire. While they are sitting and doing nothing, tools can inspire you to give your best effort 100 percent of the time. This is accomplished by their beauty, craftsmanship and soul – making it difficult for you to justify quick or shabby work.

In short, quality is contagious.

Materials

The TS-2 looks and works best when made with a dark, stable (dry) wood. Most of the dark rosewoods look great with brass because the subtle reds in the wood and brass work together to create a rich, visual harmony. Whatever wood you select, imagine it photographed in black and white alongside brass. If the tonal ranges are close, the contrast will not be significant enough to create visual interest.

The caveat to using exotics is that it is rare to find them dried – the volume

5 ***Trim the handle.*** *Use a non-ferrous blade to trim the ends square to a final length of 4.75".*

6 ***Slot the handle.*** *Using a table saw sled with a tenon attachment, slot the handle. The kerf of the sawblade must be thinner than your square blade. Avoid overcutting or undercutting the slot. If the blade fits loose, your square won't last. If it's too tight, you won't be able to seat the blade.*

7 ***The other wear face.*** *After slotting, attach the other .0625" brass wear plate. Remove the overhanging brass with the band saw and flush sand both faces. When the glue is dry, the large faces of the brass blade are grained by "going through the grits" (#80 through #400 followed by a maroon Scotch-Brite pad), using a wooden sanding block – graining is along the length.*

8 ***Drill. Screw. Sand.*** *Lay out the screw holes using the exploded image on page 29 as your pattern. Carefully drill the shank holes to the proper depth (not too deep!), drill the pilot holes, and carefully countersink (single-flute countersinks do not chatter) each hole so the screw heads seat proud; they will be dressed flush on a stationary belt sander. Use the bottom of an aerosol can to lay out a crown on both ends. Sand to the crown line using a belt sander, or by hand with a file. Once it's shaped, go through the grits and polish the ends but make sure to keep the hard line between the faces and ends crisp.*

9 ***Parallel & identical.*** *After flush sanding, both faces should look like this. Now, the square edges need to be paralleled by hand on a flat surface. Using a caliper, measure across the brass wear plates and both ends should have identical measurements. Once the edges are parallel, ensure the faces are flat.*

produced is so low that nobody has a reliable kiln schedule. Over the years we had all of our rosewoods dried in vacuum kilns to a moisture content of less than 8 percent. Ebonized woods would be a great alternative to exotics. If you are going to make this tool, the most important step you can take is to make sure your material is in the range of 6- to 8-percent moisture content.

There are generally two types of brass alloy readily available that are commonly referred to as 260 and 360 brass. In its half-hard condition, 260 brass has a machinability rating of 30 compared to 360 brass, which is rated at 100. Consequently, when you purchase brass for the TS-2 Try Square, specify 360 half-hard, or "free machining" brass stock.

There are two brass rivets and four steel rivets used in making the TS-2. The steel rivets are cut from 1/8" drill rod and the brass rivets are cut from 3/16" brass round stock.

Proportions

Try square proportions are a big deal to avoid looking awkward or "gangly." All of the major dimensions of Bridge City squares have conformed to the Golden Mean, or a 1:1.618 ratio. The TS-2, when made correctly, should fit precisely in a box with inside dimensions of 8" x 5".

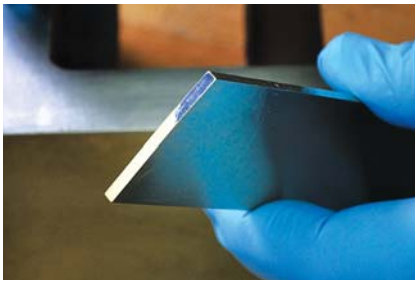
The other proportional dimensions that are important include the width and thickness of the handle in relation to the blade. Because the TS-2 can be used as either an inside or outside reference, it must be able to sit on a flat surface with the blade vertical. When used this way, the handle becomes a base for the blade and therefore needs to be wide enough to avoid a top-heavy and unstable square.

The width of the handle determines the amount of surface area that is exposed to the blade for joinery purposes as well as the gripping surfaces. Too narrow and the joint integrity is at risk; too large and the square looks awkward. We recommend that the handle width be equal to the blade width plus or minus 10 percent.

Lastly, you will want the blade to protrude about .250" from the top of the handle. (FYI: Toolmakers always work in decimal inches – good calipers are a must.)

Construction Considerations

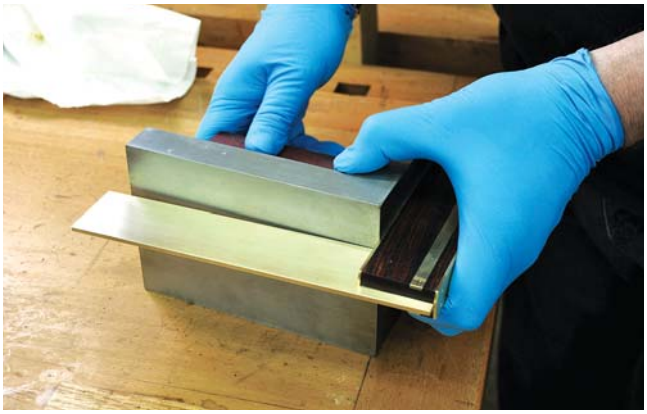
Working with brass is not difficult – it can be thought of as a really hard, grainless wood. It can be sawn on a table saw, miter saw or radial-arm saw equipped



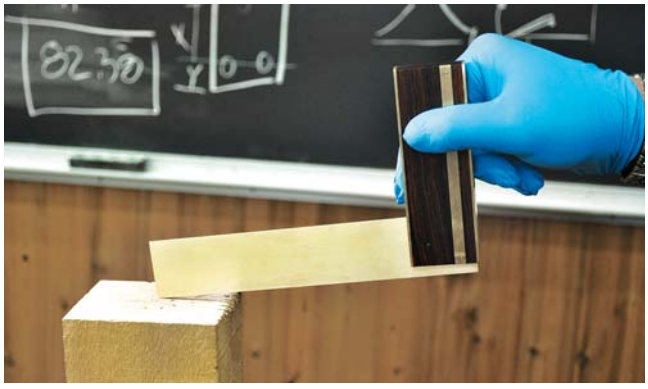
10 ***Dress the blade.*** *Remove the factory tarnish and scale by sanding through all grits (from #80 to #400 – don't skip any – then a maroon Scotch-Brite pad). Beginning .375" from the blade's top edge, file a bevel to the opposite edge ultimately removing .0625" from the blade's bottom. This taper is a glue pocket that prevents adhesive from squirting out of the square slot during assembly.*

11 ***Just a dab.*** *All it takes is two small drops of slow-setting (30 seconds) cyanoacrylate per slot face. Wipe off excess with a rag. Rubber gloves are a must, unless you enjoy having a partially assembled try square stuck to your hand.*

12 ***And slide them together.*** *Carefully insert the blade working the adhesive down and back.*



13 ***Out of whack.*** *Here you can clearly see the square is obtuse – there are about 15 seconds left to adjust.*



14 ***Taps fix it.*** *This block of wood in a vise is great way to persuade the blade to where it belongs. A couple light taps usually does the trick.*

with a triple-chip blade or any blade that is designed for non-ferrous metals. Safety glasses are a must, and I highly recommend a face shield. Other ways of cutting brass include metal-cutting band saws, reciprocating saws and, of course, a hacksaw. I also strongly recommend a zero-clearance throat plate for the table saw or the less expensive alternative, a false table slotted in 1/8"-thick hardboard, such as Masonite.

It is always best to attach brass to wood with both a chemical (adhesive) and a mechanical bond. In making the TS-2 we will use both adhesives and brass wood screws. Exotic woods tend to be oily so you will want to wipe the surfaces to be glued with acetone prior to applying an adhesive. Any quality contact cement will work great – both the wood and brass surfaces need to be coated – and when they are no longer tacky, pressed together. The main advantage of contact cement is that if the project takes an unexpected turn south, the material can be removed and replaced without damaging the wood substrate.

Mechanical bonds are not limited to fasteners. If you have access to a milling machine, the brass and wood can be dovetailed together – it is not an easy joint but it looks great.

The beauty of the TS-2 is in the perfect flush surfaces of the steel, brass and wood. Whenever you have multiple materials with disparate hardness, the only way to flush them is with abrasives. This can be done by draw filing with a mill file, or using a stationary belt sander – the latter is not without considerable risk.

Power-sanding metal, such as the steel and brass in this case, simultaneously generates substantial heat. Both the rivet seats and the wear plates are mechanically bonded to the wooden handle. As these metal surfaces get hot they expand between the anchor points and away from the wooden handle. If you are not extremely careful, you will ruin the handle blank.

Squaring the Blade to the Handle

The blade is affixed to the handle with a slow-setting cyanoacrylate adhesive and when dry, four rivets are inserted for shock protection.

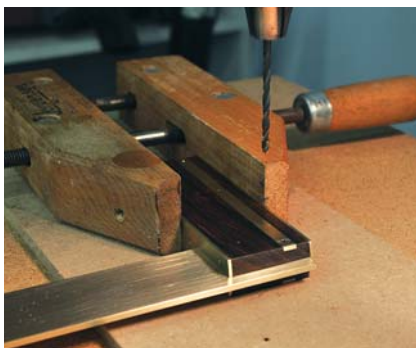
But first you need a reference for 90°, and this is easier than you might imagine. In the home shop, you can create a 90° reference by using the "flip-flop method" of crosscutting stock with parallel edges. Take your stock and crosscut it in half. Flip one half, and with both

Supplies

- 1 ▶ handle blank, wood of your choice, L = 6", W = 1.5", T = .75"; edges and faces parallel to each other, all corners and ends square
- 1 ▶ blade, 360 brass bar, 1/8" x 1 1/2", L = 7.9385" (7 15/16")
- 2 ▶ wear faces, 360 brass bar, 1/16" x 1", L = 6"
- 2 ▶ rivet seats: 360 brass bar, 1/16" x 1/4", L = 6"
- 2 ▶ brass rivets: 360 brass round, 3/16" diameter x 1"
- 4 ▶ steel rivets: drill rod, 1/8" diameter
- 12 ▶ brass wood screws, #4 x 3/8" Phillips (McMaster-Carr #92114A108)
- ▶ non-ferrous table saw blade, or chop saw blade with a kerf less than 0.120"
- ▶ ball-peen hammer
- ▶ center punch
- ▶ scratch awl/marking knife
- ▶ drill press or drilling jig
- ▶ mill file
- ▶ cyanoacrylate adhesive (slow set)
- ▶ contact cement
- ▶ #120-, #180-, #220-,#320- and #400-grit abrasive paper
- ▶ Scotch-Brite pad (maroon)
- ▶ paste wax
- ▶ 82° countersink (chatter free)
- ▶ safety glasses and face shield

15 ***Another adjustment.*** *Oops! Went too far … a couple taps with a rubber mallet.*

16 ***Victory.*** *The square is now light-tight to the reference.*



17 ***Ready to rivet.*** *Once the blade is seated lay out the five rivet holes: four 1/8" holes in the rivet seat and one 3/16" rivet. Mark with a center punch (don't punch too hard) and drill on a drill press.*

18 ***Only slightly proud.*** *The rivets should be only .0625" longer than the handle thickness. Insert rivets into the holes as shown.*

pieces resting against a known straight edge, the "gap" between the ends is twice the error of your cut. Adjust until the cuts "click" together and you will have a reference that is plenty accurate for an 8" try square. In my toolmaking classes we set the blades against a machinist 90° angle plate to save time.

Caveats

There are a couple caveats in making this square that, if ignored, will ruin the project. First is the slotting of the blade. In my toolmaking classes each blade is hand-dressed. Consequently, all are different thicknesses. We used the KM-1 Kerfmaker on a sliding table with a tenon jig to cut the slots. They all came out spot on. The alternative is to creep up on the final dimension with multiple cuts. All it takes is a little slip and the square's blade will be too loose to remain attached to the handle over time. Too tight and you will never be able to adjust the blade to 90° before the adhesive sets. (If this happens, use a rubber mallet to break the blade free and start again.)

The 82° countersinks need to be dead on. Too deep and there will be a ring around each screw head. Too shallow and you will sand away the Phillips recess. Here is where a little practice pays big visual dividends.

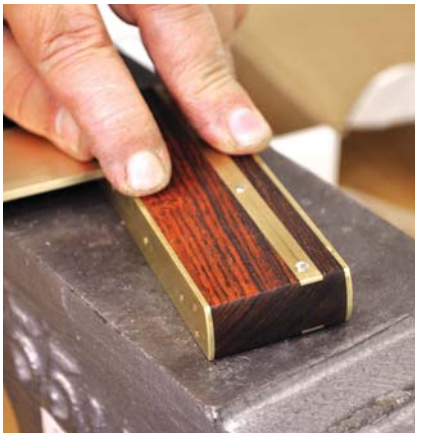
Last, both the blade and the handle need to have dead-parallel edges. This can be done by hand by carefully sanding on a flat surface (glass or machine top). It is possible to get them within .001" or better with this method. A good pair of calipers is needed for this step.

Summary

For almost 40 years this try square has been a pure joy in my life. It is one of the most popular tools we have ever made and it will be a trusty and faithful addition to your shop. When not in use, put it in a place where you can see it – or more accurately, where it can see you. I assure you, repeating 9th grade will never be more fun nor more rewarding. PWM

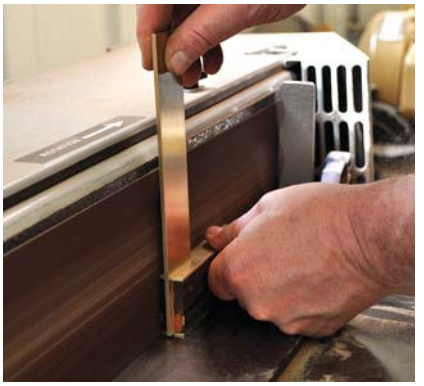
John is the founder of Bridge City Tool Works and teaches classes in toolmaking, design and creativity.

19 ***Tap the rivets.*** *Use a ball-peen hammer and seven to 10 taps (the weight of the hammer is sufficient – save your effort for the gym). All you are trying to do here is slightly flare the top of the rivet.*



20 ***Tap the other side.*** *Flip the handle and repeat the previous step. You should see no gaps between the rivet and the hole, nor should the rivets move. Do not use too much force – you can split the handle.*

21 ***Brass rivet.*** *Use the same steps for the 3/16" rivet. These rivets provide shock protection if the square is dropped.*



22 ***Flushed.*** *Carefully flush sand the rivets on a stationary sander. (I prefer a horizontal sander for this step but an edge sander was all I had available for this build.) Do not let the brass get too hot – it has nowhere to go but into the sanding belt.*

23 ***Final sanding.*** *Once the rivets are flush, hand sand through the grits all the way up to #400. Take a couple strokes on the corners to remove burrs. The handle should not feel sharp on the corners. Use a maroon Scotch-Brite pad on all surfaces and finish with a high-quality paste wax.*

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Diamond Banding

BY ROB MILLARD

A common router bit and simple jig yield a jewel of an inlay piece.

Period hallmarks. *Inlay bandings are an instantly recognizable feature of furniture from the Federal period.*

I'm in awe of the cleverness of period woodworkers. Working with simple tools, they created objects of art that have stood the test of time. Of particular interest to me are the inlay bandings produced during the Federal period (1775-1815).

At first glance they would seem an impossible task, even with today's tools. Yet for the most part they are simple laminations sliced at various angles which are then glued in a pattern between sheets of veneer. When I first examined photos of diamond bandings, I assumed they were made by cutting a three-layer stack of contrasting wood on a diagonal and gluing them back together between veneers. This is how modern diamond bandings are made. But period bandings often have what can be best described as a horizontal pattern shift.

This shifting results in the top and bottom points of each diamond not aligning vertically. I couldn't see how this misalignment would occur with segments cut from a stack. Then I saw an original banding in person – which raised more questions than it answered because the grain ran horizontally through the banding, rather than on the diagonal as I had assumed.

The only thing that was clear was how the misalignment could occur, because even the slightest variation in the size of the components would cause the pattern to shift. Period cabinetmakers were masters, but cutting small, delicate diamonds and triangles with the precision required, and in a timely manner, seemed a tall order. Then it occurred to me that the key was to cut the contrasting woods at the same time, ensuring precise alignment.

With a router this would be easy, but I wanted to be sure it was possible with hand tools. So to test the theory I made a crude plane with a V-shaped iron and a jig to guide the plane. The banding proved surprisingly simple (if not quick) to make with hand tools.

Using a router greatly increases the speed at which you can make the banding, and (to a degree) the accuracy of the finished product. I was actually concerned the router would be too pre-

PHOTOS BY THE AUTHOR

cise, and the resulting banding would lose the handmade variations crucial for a period look. In the end, this was an unfounded concern, because even with a carefully made jig and well-prepared stock, considerable potential for "errors" exists.

Accuracy is Essential

This banding begins where all projects begin, with the stock preparation. The banding is easy to make if every step is done with great precision. Errors tend to be cumulative, so starting with stock that is accurately milled is essential.

This particular banding starts with two strips of holly and one of ebony that are milled to 1/4" x 2" x 37". The dimensions aren't critical, but uniformity is. Flatten the strips with a handplane, using a straightedge and winding sticks to check for accuracy. With one face flat, run the strips through the planer.

Be sure your planer knives are adjusted so they are absolutely parallel to the bed – otherwise the strips won't have the necessary accuracy. The edges of the strips also need to be parallel with a high degree of accuracy. To assist in checking setups, also make a strip of scrap wood using the same settings.

Edge-glue one strip of holly and the ebony together. I did this with the strips lying on the bench to aid in getting the faces flush. Handscrews provide the clamping pressure, which is more than enough because the joint isn't structural. Use plastic food wrap to keep the strips from adhering to the bench.

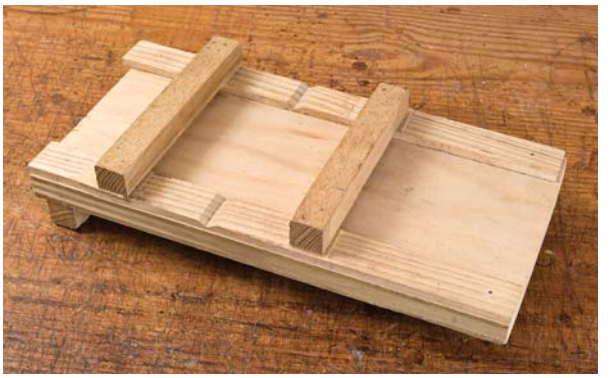
Jig Details

At the heart of making the banding is a jig that guides the router and properly spaces the V-grooves. The jig has a bed of 3/4" hardwood plywood. A cleat underneath it allows the jig to be secured in a vise and provides a place to clamp the strips while routing. Glue and nail two guides of the same thickness as your strips to the bed with 4 1/2" between them. At an exact 90° to the guide strips you'll need two guides that are spaced to allow the router base to glide effortlessly between them, but without play (wax helps). The accuracy of the router guides is critical to the proper outcome of the finished banding. Because of the way the strips will be arranged, any deviation from true will be doubled, making a successful banding all but impossible.

To provide clearance for the strips, place pieces of veneer under the router guides. Like the guide strips, the router guides and veneer are glued and pinned in place. This banding is made with a 120° router bit. Set up the router with the bit so it projects about 1/64" shy of half the thickness of the strips.

First make a test cut in your scrap from both sides, adjusting as necessary to set the depth. Complicating this setup is the fact that the bit leaves a small flat at the bottom of the V-groove, which means that routing halfway through the strip would make the V too deep.

Setting the spacing of the V- grooves involves a bit of trial and error, too. The V-cut in the jig will aid in setting the spacing. Moving the test strip over until the edge of the V intersects with the edge of the V in the jig will result



Just as it should be. *A simple, precise, and effective jig helps you produce perfect work.*

Choices. *The 120° V-bit shown here is only one choice; other angles also make interesting bandings.*

Indexing. *Spacing the V-grooves is critical and the index mark makes for foolproof accuracy.*

The pattern emerges. *The router and jig work together to produce astonishingly accurate grooves.*

Flat out. *The V-gouge removes the flat left by the router bit. Note the difference in the groove bottom, to the right of the gouge.*

in the proper spacing, but make a few test cuts to be sure. The goal is to have the peaks of the Vs in the strips come to a sharp point without reducing the thickness of the strips. To confirm that the peaks come to a sharp point, put a straightedge across the top – that will reveal any gaps.

Once you get the spacing correct, make an index mark on the inside face of the guide strip. This mark will set the spacing by placing it in the bottom center of the previously cut V.

Clamp the strips firmly as the cuts are made, with the clamps as close as possible to the cut. Holly burns easily, so watch your feed speed to prevent this. The cutting goes rather quickly, taking a little over an hour to complete the 37" strip.

When you near the end of the strips, you'll have to move the clamps to the already routed section. To prevent deforming the peaks of the V, pad the clamps with soft scrap wood. When you are done routing, remove the flat left at the bottom of each V with a V-gouge. (I've found that the angle of the V-gouge does not need to match the angle of the groove, it is only important to remove the flat.)

In the Fold

Now comes the magical part. Rip the strip to separate the holly and ebony sections and fold them together like closing a book. Because the pieces were cut at the same time, they will nest together nicely even if the spacing isn't perfect. Having said that, sometimes the fit will improve if the sections are offset by one V. This offset is also why the pieces were cut to 37" long. You will lose some length, so 37" will leave you with at least a finished length of at least 36".

Now spread a generous coat of white glue on one strip and glue the pieces together between boards that are covered in packing tape to prevent sticking. To ensure firm contact between the holly and ebony, add C-clamps about every $2\frac{1}{2}$". Normally, I don't like to apply excessive clamping pressure but in this case I bear down on the clamps.

When the glue has dried, plane the holly away until the peaks of the ebony show through, leaving the triangular pieces of holly as infills in the ebony sawtooth pattern. I remove the bulk of the holly with a portable power plane before switching to a smooth plane.

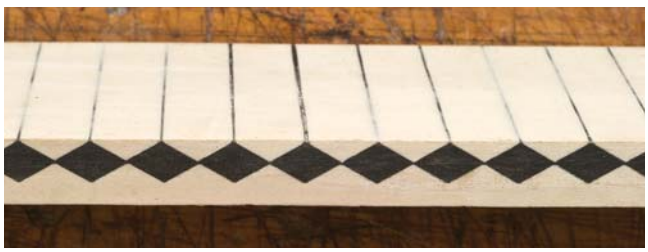
A short plane is an advantage here because the strip will have likely distorted both from uneven removal of material and the moisture from the glue. Occasionally, I have to place a

Closing the book. *Sawn apart and folded together, the banding starts to take shape.*

Keep it square. *The peaks of the ebony, must be square to the edge before the second set of V-grooves are made.*

Clamps, clamps and more clamps. *Closely spaced clamps, alternated up and down for easy access, supply the pressure needed to secure the ebony and holly strips in firm contact.*

Before and after. *The upper surface shows the holly planed away, and the peaks of the ebony showing through. The lower surface shows the holly as it came from the clamps.*



Make a sandwich. *Holly and black dyed veneers enclose the diamond banding, giving it extra strength and visual interest.*

"Fast is fine, but accuracy is everything."

— Wyatt Earp (1849 - 1929)
famous frontier lawman
of the American West

shim under the strip while planing because the plane wants to ride over a low spot.

Plane the edges of the strip straight and parallel. It's unlikely that the edges will have to have any significant amount planed away, but you have to check that the peaks of the ebony are at 90° to the strip's edges. As before, a strip of holly is edge-glued to the ebony/holly strip.

The 'Vs' – Part Deux

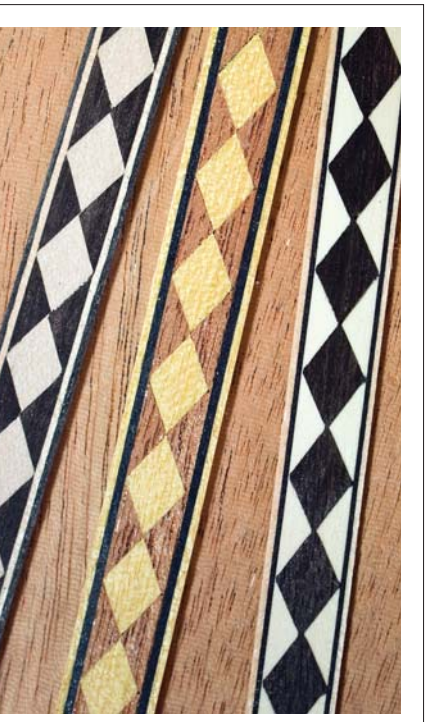
Now it's time to rout away a portion of the ebony to create the finished diamond shape and to create the second half of the holly that sandwiches the ebony diamonds.

When running the first set of V-grooves, a certain amount of variation in the spacing of the grooves wouldn't be noticeable, but not so with this set. This time, instead of using the index mark on your jig, set the spacing by sighting the peak of the holly's triangle showing at the bottom of the V-groove in your guide rail.

With repeated use, the V-groove in your guide rail will become enlarged from arbor runout and the slight amount of play necessary to have the router fit between the guides. This will make it difficult to accurately set the spacing, so after each cut, slide the strip back and check the alignment visually. You can make extremely small adjustments to keep the pattern intact. It is this misalignment that caused the horizontal shift seen in the original. Completely eliminating it isn't possible or even desirable, but letting it get out of hand is to be avoided.

As before, rip the strips apart. Fold and glue them together. Then plane the holly until the peaks of the ebony are exposed. The only difference is this time the banding is fragile. If handplaned from end to end, the piece may buckle and fracture. To avoid this, plane from the center to the end. This means that when planing one end, you'll be going against the grain, but with a finely set smooth plane this isn't a problem.

Gluing surface. *Before sawing, each strip of banding is planed to provide the best glue surface for inlaying. Note that the components fit so precisely that the shavings hold together.*



Chameleon like. *Change the combinations or the species for endless variations.*

Outer Veneers

Now sandwich the core with holly and black-dyed veneer. When the glue has dried, true the edges and glue a strip of scrap to one edge. This strip acts as a handle to keep your fingers safely away from the band saw blade while getting the best yield out of the banding.

Sawing the Bandings

The individual strips of banding are ripped off on the band saw to about .040" thick. At this thickness the banding is easily handled, and up to 24 individual strips are obtained from a single 2"-wide stack. My saw is fitted with a .014" x 3/8" blade from Starrett. This thin blade reduces the amount of your carefully made banding that ends up as sawdust. Between each cut at the band saw, plane the edge of the banding to remove the saw marks and provide the best possible glue surface when the banding is glued in place.

Despite precise work, the width of the finish banding isn't predictable. The groove or rabbet that the banding will be inlaid into needs to be made undersized and the banding held in place and one edge scribed to set the actual width of the recess.

It took approximately five hours to make this inlay, which yielded more 70' of banding – a pretty good use of time by any measure. All that is left is to inlay the banding into your project and admire the elegant appearance this type of banding lends to a project. PWM

Rob Millard is an Ohio-based woodworker who specializes in Federal furniture. To see more of his work and learn about his DVDs, drawings and classes visit americanfederalperiod.com.

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The Best Oak Money Can't Buy

BY PETER FOLLANSBEE

The cost of this stock is physical exertion, but it's fun and rewarding.

The riven oak that I use for joinery work is the best stock available; but it comes at a cost – the labor invested to produce it. Money can't buy this material; you must split and plane it. But the rewards are many. The oak produced in this manner is unsurpassed, better even than quartersawn stock. Each riven board is perfectly radial, and consequently very dimensionally stable. Straight-grained oak, freshly split, or "green," works like a dream. The effort involved in splitting and "dressing" the stock is physical, but fun work.

Another benefit of working this way is that you learn a good deal about trees and wood – how they grow, how it behaves. Green wood cuts much more easily than dry stock. Some planning is necessary in scheduling the processes that follow the splitting and planing, but it's simple enough. In this article, I will outline the steps I go through to produce stock for joinery projects.

Search for perfection. *A dead-straight and perfectly round log, free of branches, will give you the best results when riving.*

Start with a log. *For my style of woodworking, "green" is best. So, I always split my own oak planks from a freshly felled log.*

The log is key. I look for an oak that is dead-straight, and free of branches, knots or other deformities. It should have a nice round trunk, not oval or misshapen in any way. Crosscut the log between the swelled butt and the first branches. Over the years, I have had success buying logs from a local sawmill; firewood cutters are also sometimes a good source for a log.

Crosscutting

If you are not experienced with handling large logs and the equipment to work them, it's best to work with someone skilled at it. Chainsaws are a great aid to cutting large logs, but are best left to someone who is trained with them. Follow all safety precautions. Oak logs are quite heavy; use levers and other aids to move the log, and to prop it for crosscutting.

Set your log up on spacers, timbers or some large split sections of firewood to get it up off the ground. When crosscutting, set these supports so that the saw is not between two spacers, but beyond the pair of them. Trying to saw between them results in the log closing in on itself and pinching the sawblade. A pinched saw is not fun. Clear the area underneath the intended cut to avoid hitting debris with the saw. Sometimes it's best to saw partway through the log, then roll it and come in from the other side to finish the cut.

The lengths of log I work with vary, depending on the projects at hand. For a

PHOTOS BY THE AUTHOR

joined stool or a carved box, I can make the pieces from a log as short as 2' plus a few inches; for joined chests I need some pieces longer than 4', but a great deal of the stock is short. All these are approximate lengths. Diameters are critical to the width of the board you will get. I like logs 2' or more in diameter. Sometimes you can get narrow stock out of a really clear smaller log; but I wouldn't work with one much under 18".

Time to Split

For short lengths, as for the joined stool or box, I stand the log up to split it; it's easier on the back. Score across the middle of the log, right through the pith, or center. You can score this line with the wedges and maul, or use a dull hatchet struck with a wooden club. The idea is to begin to sever the fibers with this scoring.

Then I place a thin steel wedge at each side of the end grain, out toward the sapwood/heartwood demarcation. Drive these in little by little. Light blows of the maul work best; heavy handedness tends to cause the wedges to bounce out of the log. Drive them in tandem. Listen for the cracking sound of the fibers tearing up. Stop hitting the wedges when they still have an inch or two sticking up from the log. The tendency is to bury them all the way in, but if for whatever reason the log does not give up, you can rescue your wedges if you have left an inch or two to strike side-to-side.

"And many strokes though with a little axe hew down and fell the hardest-timbered oak."

— William Shakespeare (1564 - 1616)
English playwright

Usually by now a split has opened up enough to get a wooden wedge in place; I often locate this between the two steel wedges. As you drive this, the steel wedges come loose. Get them out of the way. Then drive the wooden wedge nearly to its head. By now a split should be running down the sides of the log. You can leapfrog the steel wedges into these side splits, and knock them in. More wooden wedges might be necessary as well. If there are fibers of wood criss-crossed inside, remove the steel wedges, drive wooden ones in to open the log up as much as possible, then get in there with a hatchet or long-handled axe and snip these fibers. Watch for the log falling open when these let go. Shins and feet are particularly at risk.

I sometimes will hew away the bark from the sides of the split; it helps you see what's happening. I am more likely to do this on a longer log than the short one shown here.

If I can see inside the split and there are no large fibers crossing inside the log, I go ahead to the next step before separating the halves. I score and split one half into quarters. This is easier if the log is still standing. Good straight stock will split reliably in this length.

Aim to always split the stock in halves – this equalizes stress on the log, and it results in splits that run true. Trying to break it into odd sections (thirds, fifths, etc.) usually results in some waste. Sometimes you get lucky, but it takes a really good log. At this stage, I tend to work one quarter, or at most one half, all the way into boards, as shown in the opening picture. I split it out into the desired stock thickness, then dress it in the shop with my bench planes. Leaving the rest of the log in large chunks retains its moisture. This is counter-intuitive to modern woodworking – I want my stock as green as possible for as long as possible – just the opposite of the kiln-dried crowd.

Splitting Into Boards: Froe & Riving Brake

Sometimes to further split the oak into rough boards I use a froe and riving "brake." The froe is a wedge-shaped blade, about 10" to 12" long, with an eye at one end. The handle fits upward into this eye. In use, the froe is struck with a wooden club that drives the blade into the end grain of the billet. This starts the split. Then you put down the club, and twist the froe's handle, advancing the split. Shove the froe down to the bottom of the split, and twist again. To distinguish this aspect of the work from the maul and wedges work, I call this

Split. *After starting the split with steel wedges at the outer edges of the log, drive a wooden wedge at the center. With the end wedge holding open the split, drive steel wedges along the side.*

Riving. *To rive a section of a log instead of split it, use a mallet and froe. Start the work by knocking the blade of the froe into the top of the billet, then push (or pull) the blade parallel to the ground, and continue working down the split in that manner until the two pieces separate.*

Riving brake. *This shop-made appliance allows me to exert more or less pressure to direct the path of the split – to a point.*

"riving" or cleaving the stock, and the previous step "splitting."

The riving brake is an aid in this step; it is a large wooden tripod with two rails fixed to its front legs (which are about 3' apart at the height of the crossbars). I like to make my brakes with the bottom rail on the front of the legs, and positioned pretty much level. The top rail is nailed/fixed to the front of the leg on my right, just above the bottom rail. Its other end is angled upward, and fixed to the inside face of the leg on my left. Leave 8"-9" between them at the wider end. Other rails fasten the front legs to the rear leg. These increase the stability of the brake, and also sometimes give you another spot to brace your workpiece.

The brake allows you to manipulate the split; by exerting more or less pressure you can direct the path of the split – to a degree. Drop a billet of wood into the brake's cross-rails, standing it up with the thinner end up. Drive the froe into the end grain with the club. Aim to divide it in half, as before. Drive the froe all the way into the wood.

At this stage I put down the club, and pull the workpiece up between the rails, until it's just about level, and with its bottom end caught in the fork of the rails. Twist the froe handle to continue the split. The rails provide the leverage. If the split "runs" to one side, turn

Approach it right. *When hewing, proper stance is important. Drop your right leg back (if you're right-handed), and keep the hatchet blade perpendicular to your work-surface.*

Relief. *Make a series of relief cuts working from bottom to top (stop before you get near the hand holding the board).*

the stock over so the thicker half of the piece is downward. Then exert leverage against that thick half as you twist the froe. This should start to bring the split back in line. Sometimes it is necessary to flip the piece a number of times.

Stock for furniture is usually around 1" to 2" thick, and at that thickness the riving is easiest. Slow going is good for beginners. Listen to the sound; with practice you will learn to hear differences in the riving.

Looks Like a Board

So now the stock should be radially riven to an oversized thickness and width; and it begins to look like boards at this point. The bark and sapwood must be removed before you can work it in the shop with bench planes. For this step, we purposely sidestep the rule about always splitting in halves. I usually use the froe to knock off the sapwood and bark. Drive the froe just inside the area of sapwood, then twist. Most likely, your split will run out. Come in from the other end and repeat. With the joiners' hatchet (broad hatchet, hewing hatchet, side hatchet – it has a lot of names) hew away any sapwood that remains.

Hewing

Hewing is something new for many furniture makers; it is very rewarding work, but there is a degree of finesse involved. You don't just go hacking away at the wood. First, consider the shape of the tool – the hatchet has only one bevel. Mostly flat on its back, it has a slight scoop along the cutting edge, and is fitted with a short handle, which is held in one hand. You will also want a large hewing stump (also called a hacking stock or chopping block). Mine are about 20" diameter or more, and about 24" high. I keep one or two outside where I break open the logs, and another in the shop. Keep the surface of the stump free of debris, otherwise the hatchet's edge is dulled quickly.

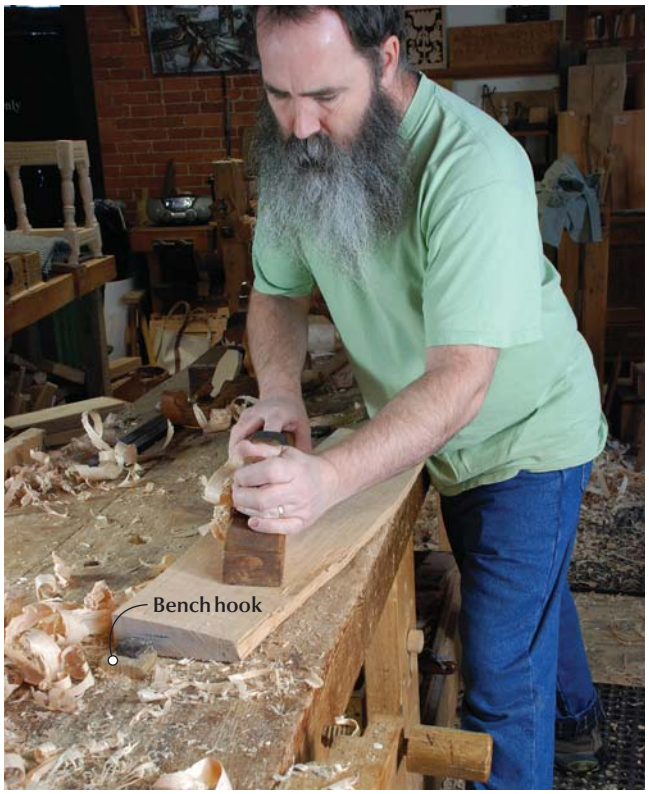
Posture and stance are important. Hold the stock on end, positioned across the stump from you. I lean the stock a little, and the action of the hatchet is plumb, or perpendicular to the surface of the stump. I'm right-handed, so I drop my right leg a good bit behind me. This serves two purposes. The first is with my feet spread apart like this, it makes a more stable base from which to work. Second, with my leg back out of the way, an errant blow from the hatchet is less likely to make contact with my body.

Make relief cuts with the hatchet to a visual line just inside the sapwood. You can strike a chalkline, too, if that helps. Use a light chopping action. Start at the bottom and work upward about three-quarters of the way up the stock. Stop before you get close to your upper hand. Now straighten the stock up, and keeping the hatchet in the same path as before, swing it lightly to remove the stock you have scored with the first cuts. Removing sapwood this way is good practice for actually hewing the finished surface as preparation for planing.

Next comes dressing the stock into boards. For this work, I usually move into the shop, where I work at the bench and stump. Check each radial face to see which is best. We are looking for whichever face is closest to flat with no twist, no bow or hump. If there are problems, use a hatchet to remove the bulk of excess material so that planing will go more quickly.

Get Ready to Plane

There are many methods for holding the stock for planing. I will describe the bench I use; it's based on 17th-century engravings to a large extent. I use a "bench hook" – a 17th-century term for a toothed iron planing stop set in a wooden block in the bench. Raise or lower the bench hook so that it catches the end grain of the workpiece, but make sure it's low enough so the plane iron doesn't hit it. I just shove the workpiece into the teeth of the bench hook. I sight down along the top surface of the stock to check for wind or twist and other deviations from flat. While there is no 17th-century evidence for winding sticks, I find them quite useful. You can make them from two pieces of very straight-grained stock. Plane them to an



17th-century bench hook. *What you might call a planing stop, I call a bench hook.*

Fore plane. *The convex iron in this fore plane (you may know it as a "scrub" plane) takes big bites to quickly remove stock from a rough board.*

Jointer plane. *The long jointer plane is used to true up the face and one edge of the board. The other edge trueing takes place after I decide what width I need, and have removed the gross excess with a hatchet or fore plane.*

even width. Check them against each other to ensure that they are straight. To use the winding sticks, set one near each end of the board, crouch down, close one eye and sight across them. If their top edges both lie in a plane, then the board is not twisted. If there is a twist, the winding sticks will readily reveal it. Then the first strokes of your planing will be aimed at correcting this twist.

Fore Plane

The first plane I use is a "fore" plane – similar to a "scrub" plane these days. The one thing both these planes have in common is the shape of the cutting iron, and the thickness of the shaving they are set to cut. The cutting end of the iron is a convex curve, sometimes quite pronounced. The shavings are thick, to quickly remove as much stock as possible. There is at times debate about the proper length and width for these planes. I think there is a great deal of leeway here. I prefer a wide plane for this work. I find it more comfortable to handle than the narrow planes commonly sold as scrub planes these days. Mine are usually shorter (about 8"-10") than what we think was used in some 17th-century contexts. Some of my fore planes are German smooth planes that I reground to a convex iron. I sometimes throw away the cap iron and make a new wedge for them while I am at it.

The aim for this planing is to remove the bulk of the material, in preparation for finish planing the surface. The green wood shaves with remarkable ease. The fore plane can be used in line with the grain, or directly across it, or anywhere in between. At this point, the condition of the surface is of no concern. Check frequently with winding sticks and a straightedge to be certain of your progress. The planing strokes head toward the bench hook. I often am shuffling the workpiece this way and that so that my plane aims for the hook. If the stroke does not aim for the bench hook, the workpiece can whip around and go skittering off the bench – not a problem unless someone is watching, or is in the line of fire.

Jointer Plane

If the stock is really the best quality, my next step is to plane it with a jointer plane. A fine shaving is all I want; the gist is to smooth and flatten the stock, and remove the marks from the fore plane. The wet wood planes quite easily, but it will not take the best finish right now. The main goal at this stage is to

produce a nice flat face that is as smooth as the stock will allow at this point.

I next strike a chalkline on this face, near the edge where the sapwood was removed. This edge is easiest to straighten. I trim the edge with the hatchet, then use the jointer to plane it nice and even. To secure the stock for planing the edge, my bench has two options. For some short stock, I secure the end of the stock in a double screw – a pair of wooden cheeks fixed to each other with large wooden screws. This keeps the stock up on edge, then I jam its forward end against the bench hook. For longer stock, I fix the piece in the single screw on the bench's edge. This sometimes requires its other end be propped up on a peg in a sliding deadman.

Now with the face and edge done, I mark the thickness on the planed edge; use either a chalkline or marking gauge. Depending on how much thickness needs to be removed, you can rive some off with the froe, this time employing the tendency for uneven splits to run out – otherwise you can hew off the excess or plane it with the fore plane.

That's a lot of options, but over time all of these techniques are employed, depending on the specifics of each board. I try to work the boards down to rough thickness. Sometimes the rear face is only worked to the fore plane stage. Frequently I will leave the second edge for later. These riven boards often taper in width as well as thickness, and sometimes I can't decide what width I need until I have a project in mind.

Now Wait

The surface you plane in dead-green stock like this is excellent, but not the best. There tend to be some fuzzy qualities to it. Before I proceed further, I sticker the boards in the shop, and let them sit for a while. How long depends on several factors – the relative humidity in the shop is the most critical. Winters in my shop are dry with the heat on; summers are humid with the windows and doors open. So stock takes longer to settle down in summer than in winter.

If the room is too dry, you might want to seal the end grain of the boards, particularly with thicker stock like that for the stiles for joined stools, and chairs and chests. I use yellow glue; I often have it around the shop, but only rarely use it as an adhesive. Thus mine goes bad before I finish the bottle, so I don't mind using it for this. Dedicated sealers can be found as well. Latex paint can work, too.

The heavier stock I even bury in a pile of fresh shavings for the first few days. Then I sticker it in a pile (away from any heat source or sunlight). I find that white oak is trickier to dry than red oak. Thick (2" or more) pieces of white oak often want to check on the end grain, or even along the tangential surface. Burying them in shavings for a while first often is enough to slow down this drying.

Take them out now and then to look them over. Slower is better; this is not to be rushed. Stickers provide air flow between the boards. If you stack the boards without them, mold will form on the faces of the stock.

When I am really organized, and working a lot of boards at once, I often write the date on the end grain. This makes it easier to keep track of a lot of stock.

Smoothing plane. *After the boards have seasoned enough (two to four weeks), I take a few strokes on each wide surface to remove any fuzzy fibers. Then the piece is ready for carving, joinery or turning.*

Smoothing Plane

After the boards have sat for a while (roughly two to four weeks) I can then take them from the stack, and with a sharp smoothing plane, re-plane the surface. We're just talking about a few strokes to clean up any torn, fuzzy fibers. The surface of the stock has dried enough now to take a finer finish cut with the plane; but the interior of the stock is still moist. Thus cutting is still easier than it would be on kiln-dried stuff. Now is the time to carve decoration, cut joinery, and do any turned work for the project at hand.

When things go really well with a log, I end up with stock prepared far ahead. If it gets drier than I want, I reserve it for boxes, panels in joined work, some framing parts, etc. I store it on shelves up on edge so I can easily see the width of the stock. In this pile, it needs no spacers between.

That's about the run of it. It sounds like more work than it is. As with any handwork, with practice you end up making various critiques and decisions as you work the stock; it needs to be thinner here, wider there. It is an ongoing culling process, making boards directly from logs. But you won't get better stock anywhere – and by the time it gets to your bench for a project, you'll know that board backward and forward. PWM

Peter is the joiner at Plimoth Plantation in Plymouth, Mass.

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Portuguese Folding Table

BY AJAX ALEXANDRE

A clever design yields portable functionality.

Just the right size. *By using the same widths for all of the parts, this table can be sized and constructed in no time at all.*

My father-in-law gave me a table just like this one on our last trip to Portugal. He picked it up in Serra de Monchique, a small mountain village in the Algarve in the southern part of the country. He has a good eye for design, and knew I would appreciate the simple, ingenious way the table folds up. Because it is so light, compact and strong, it could also serve as a stool. And, when my family returned home, it fit easily into my suitcase.

The table my father-in-law gave me is made out of a species of mahogany, as it was intended to serve outdoors. If I were going to build one for my deck here in Ohio, I would use cedar, mahogany or maybe even teak – but the tables I built for this story are for inside use. I wanted a pair of utility tables for my shop, and because I had a lot of poplar and plywood collecting dust, my decision on what woods to use was an easy one.

Set it Up Once & Run With it

The legs on the original table are 1¼" wide. I wanted them to be a little more sturdy, so I bumped up that dimension to 2". To make things quick and easy, I used the same width for the slats on top. That way, I had to set up the table saw only once, and all of my ripping was done in a matter of minutes.

Next I moved to the miter saw, cutting the final lengths for my legs and slats using a stop-block to ensure consistent lengths – 20" for the slats, for the legs, 25 ½".

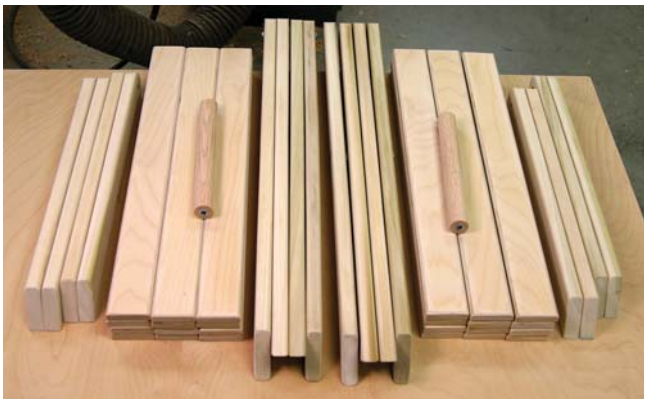
After I had all the pieces sized, I marked all of my hole locations. It is always a good idea to mark the pieces clearly when all of the pieces are still square, but it is especially important with this table. With all of the rounded and angled pieces, this will eliminate any confusion when you are ready for assembly.

One end of each leg needs to be rounded off, as does the pivot end of the arms. You can mark the curve in a variety of ways. If you have 2" PVC pipe, cut off a small piece and use the inner radius as a template. I used a compass set to a 1" radius and scribed a 2" circle.

Rounding off those corners is easy, too. I used the disc sander in our shop because the amount of wood was so negligible and I had a clean edge when I was

Folding wings. *When opening the table, the slats resemble the wings of a bird.*

LEAD PHOTO BY AL PARRISH; STEP PHOTOS BY THE AUTHOR; ILLUSTRATIONS BY ROBERT W. LANG



Two are better than one. *With not much more effort, you can mill the stock for a second table.*

Round the legs and arms. *Use a disc sander to round the pivot points on the legs and arms.*

finished. If the pieces had been larger, I would have taken the bulk of the waste off at the band saw. If you don't have the shop machinery I used, you can simply use a coping saw to remove the bulk of the waste then sand it smooth.

Edge it Off

I was in full production mode by this point. I installed a 1/4" roundover bit in the router table and proceeded to take the edge off all the leg and arm boards. For the top slats, I only rounded over the top edges. Because I was dealing with plywood for the slats, and the widths were only 2", I held off using the router table to round over the ends of the slats. I reserved those edges for a hand sander. In a matter of minutes, I had neat stacks of stock ready for the drill press.

Drill Press Stop-blocks

As with the miter saw, I set up a couple stop-blocks on the drill press because I had a lot of repetitive holes that needed to be identical. Even though I marked out all of my holes with care and precision, I still drilled the holes at the end of the legs first then used the bolts as an index. That way, when it came time to drill out the holes for the pivot in the middle of the leg, I was sure they would line up.

I used a 3/4" Forstner bit to cut 3/8"-deep counterbores then a 1/4"-brad-point bit to drill all the through-holes. These dimensions allowed me to use standard 1/4"-20 hex bolts for the leg assembly.

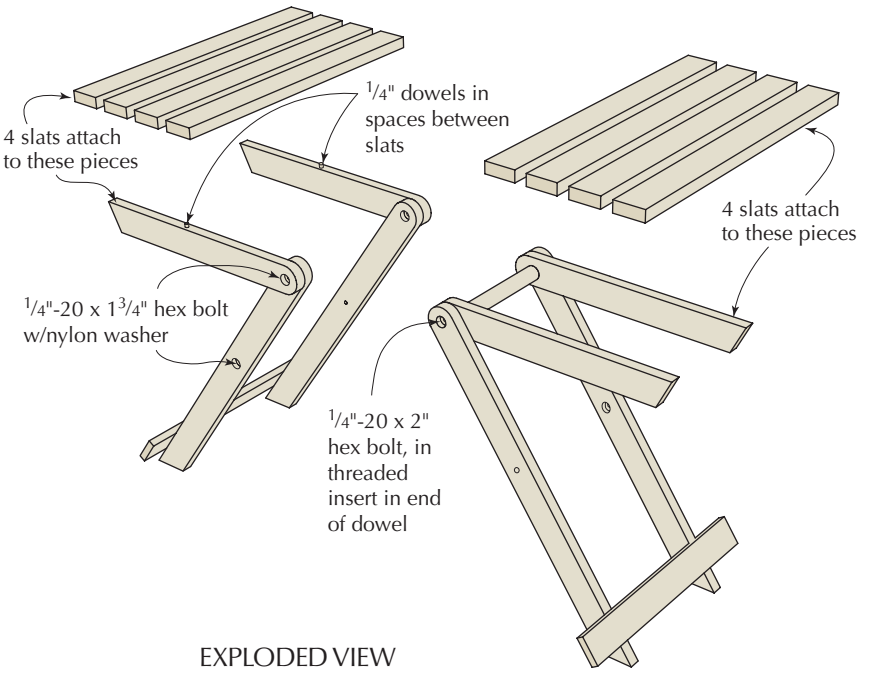
Mirror Image

As you can see from the photos on the previous page and above right, the table has inside and outside legs, as well as inside and outside arms – two sets of identical legs and arms. The inside arms are the only pieces that don't get a counterbore. Because they are wedged between a dowel handle and the inside legs, they only require a 1/4" hole to handle the hex bolt.

The only piece that is not 2" wide is the 1" dowel that is used as the handle. The original table had a screw that was just drilled straight into the dowel. Because this joint has the potential of getting some regular use, I added a threaded insert for durability.

Even if you've never used inserts before, you'll find installation easy. I used two 1/4"-20 flanged hex-drive inserts. You'll need a 23/64" drill bit and a 1/4" Allen wrench to install them. Drill

Identical legs*. The only difference between the legs is where the holes are drilled (left). You will need two sets of mirror-image legs (right) per table.*



EXPLODED VIEW

the holes at a drill press to ensure that they are straight and run parallel to the dowel. I drilled the holes 1 3/4" deep so I would have plenty of room for the hex bolt.

Sand Away

After all the drilling is completed, sand all of the pieces smooth. My stock was already in good shape when I started, so I used #150 grit and was done with it. I was especially careful about making the edges on my plywood slats unified in the amount of layers that I sanded off. I like the little variations in the black line that remains after sanding is completed; it gives it a handmade look.

Ink-stained

Finishing the piece before assembling will save you a lot of headaches and give you nicer results. Because there are repetitive design elements with the slats on top, I added a little visual interest with some black India ink on every other slat. I like to use ink because it has a nice matte appearance and is easy to clean up with water. Also, it doesn't harden on your brush. You can safely leave your brush in the ink and it won't dry up like an oil stain will.

Threaded insert. *Use an Allen wrench to drive the insert into the oak handle.*

After the ink was dry, I used a clear brushing lacquer with a satin finish as a topcoat on all the pieces. This is potent stuff – make sure you have plenty of ventilation. The main benefit of the brushing lacquer is the quick dry time – and it's nice that each layer melds into the previous one.

Slats with Spacers

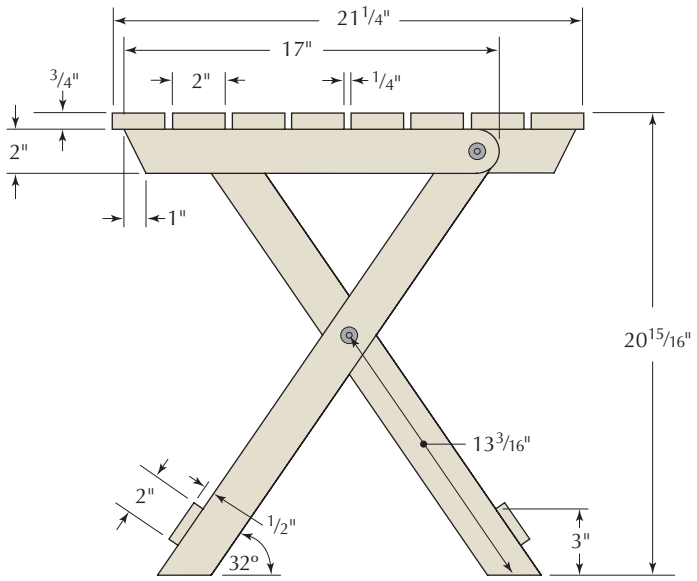
The table is finished by screwing the slats into place. I used #8 x 1 1/2" flathead #2 square recess bronze boat screws, simply because I liked the way the bronze looked with the black ink. You need to turn the clutch down on your driver though, as the square head on a bronze screw will distort more eas-

Portuguese Folding Table

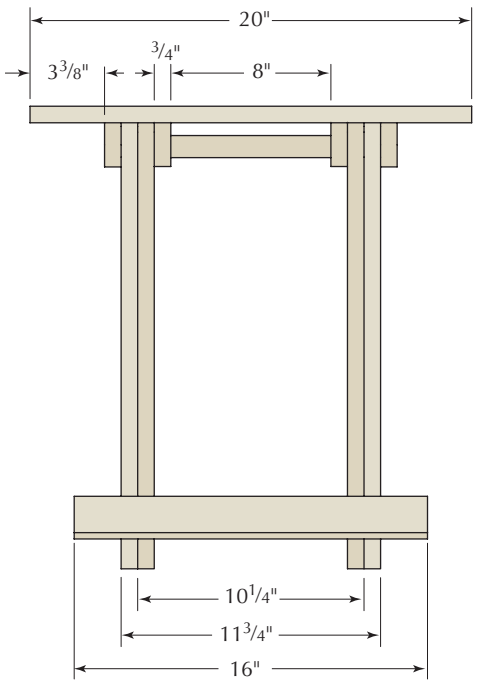
	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑	4	Legs	3/4	2	25 1/2	Poplar
❑	2	Arms	3/4	2	17	Poplar
❑	8	Top slats	1/2	2	20	Baltic birch plywood
❑	2	Leg braces	1/2	2	16	Baltic birch plywood
❑	1	Handle – dowel	1		8	Oak

Supplies

- 6 ▸ 1/4"-20 hex bolts
- 4 ▸ 1/4 -20 nylon lock nuts
- 2 ▸ 1/4"-20 flanged hex-drive threaded inserts
- 24 ▸ #8 x 1 1/2" flathead screws
- 12 ▸ 1/4" flat washers, nylon
- ▸ black India ink



SIDE VIEW



FRONT VIEW

ily than on a stainless steel screw. The sequence that I used for assembly is as follows:

Connect the legs together with the counterbores facing out. When you fasten the legs together, the angled feet will be facing in the opposite direction of each other (see image at right).

Assemble the table on a flat surface. Stand the legs on edge and make sure the outside leg has the head of the hex bolt facing inward, and that you can see the end grain on the bottom of the outside feet.

Next, connect the handle between the two arms (the ones that don't have a counterbore) with the inside legs. After the handle has been tightened, cut a spacer that equals the length of the handle. In my case, it is 8" long. You will place this spacer (not shown) between the arms to ensure that the arms stay parallel while you install the slats.

The remaining assembly is easy if you use spacers. When measuring is kept to a minimum, you ensure a quick and accurate assembly. You will need to install the leg brace first. I measured 4" up from the tip of the foot and countersunk two screws on each side into the brace. This brace serves two purposes: It keeps the legs straight and functions as a stop to keep the legs from opening in the wrong direction.

I wanted the slat to overhang 1/4" on beyond the end of the arms. Because the leg brace is screwed in place, I used it to determine my space width. I measured from the edge of the brace to the tip of the arm – 2 1/2". So I subtracted 1/4" and cut a spacer that was 2 1/4" wide and long enough to reach both legs.

For the first slat, because the end of the arm is cut at an angle, I placed the countersunk screw 5/8" from the inside edge to keep the screw from coming through the arm; unlike on the remaining slats, the screws are centered.

After the first slat is positioned and screwed onto the inside arms, use a 1/4" spacer to set the remaining slats. I used a section of plywood, but a dowel of the same thickness will also work fine.

When all four slats are attached to the inside arms, flip the table over and repeat the process for the outside arms. When all four slats are attached, drill a 1/4" hole that's 1/2"deep after you attach the last slat on the outside arms. These holes hold small dowels that act as spacers between the two sides of the table.

The dowels should butt up against the last slat and be centered on the arms. These dowels need only to protrude 1/4". You will need to put a slight chamfer on the top of the dowels and glue them in. I used oak because the plywood slats will be putting pressure on the sides of the dowels so I wanted them to be strong.

As with most woodworking projects, the finishing of the table took the most time. But with a little planning, you'll have two very versatile and portable tables in no time at all. PWM

Ajax is the online community editor of this magazine and a fan of all things Portuguese: the music, writers and, especially, his wife.

"A table, a chair, a bowl of fruit and a violin; what else does a man need to be happy?"

— AlbertEinstein (1879-1955)
American physicist

Quick assembly. *Start by attaching the leg brace first with the angle on the outside legs facing up, so that you can see end grain.*

Spacers are our friends. *Spacers are a great way to ensure accurate and consistent results during assembly. The striped one above keeps the slat spacing consistent; the other locates the first slat.*

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Make a Chair That Rocks

BY JEFF MILLER

A little geometry and a simple prototype ensure a pleasant ride.

Rest in peace. *A rocking chair should take some of the weight off your spine and soothe you with its rocking motion. The rockers and the center of gravity are key to the equation.*

I recently set out to design and build a new rocking chair. I've designed and built a handful of rockers, but my past efforts didn't rock as well as I would have liked. I have confidence in my ability to make a comfortable "regular" chair, but it seemed like I was dealing with an entirely different problem with a rocker. So I decided to look a bit more carefully than before into what makes a rocking chair "work." I wanted to understand the geometry of a rocking chair in hopes that I could improve my overall results.

A rocking chair has a lot of factors in play. In addition to the usual requirements that a chair be structurally sound, comfortable and look good (these are my requirements at least), the rocker adds the challenge of dynamic motion. Does the chair tip back too far, or stay too upright? Does it rock back easily into a comfortable position, or does it take work to push the chair back? Does the rocking chair wander all over the room as you rock back and forth? Does it rock quickly, or is the rhythm more relaxed? Is it easy to settle into the chair? Is it possible to get up out of the chair without a huge effort?

Adding to those complications, I also noticed that, although the perceived comfort of any given (static) chair tends to be consistent for the majority of people, what's expected of a rocker seems to be a little more personal.

My "book" research was fascinating, although not very enlightening. There's an awful lot of opinion, lore and conflicting information. Everyone who has made a rocker seems to have a strong opinion. Some people swear by a particular relationship between the seat and curve, or a special shape of curve for the rocker, only to be contradicted by the next person's opinion. There was little common ground in all the information. I think there are two main reasons for this. First, as I mentioned above, expectations of what a rocking chair should be seem to be somewhat personal. And second, each chair really does seem to generate its own set of requirements.

"Arguments with furniture are rarely productive."

— Kehlog Albran (fictional author)
"The Profit: Albran's Serial" (1973)

What Makes a Rocking Chair Work

The most basic way to look at any rocking chair is to see it as the relationship between the center of gravity of the chair (plus the person sitting in it) and the shape of the rockers. What is a "center of gravity?" It's defined as the average location of the weight of an object. It also can be seen as the balance point of the entire object.

What it means in the case of a rocking chair is best explained with an example. Imagine a wheel standing on

PHOTOS BY THE AUTHOR; ILLUSTRATIONS BY ROBERT W. LANG BASED ON THE AUTHOR'S DRAWINGS

edge that has a lead weight added to it somewhere between the center and the edge. Depending on how heavy the weight is in relation to the weight of the rest of the wheel, the center of gravity will shift a certain amount toward that weight. What happens to the wheel? It will roll so that the weight (the center of gravity) eventually ends up closest to the ground. If the wheel is shifted away from that position, it will always return there.

Of course, it won't settle there all at once, but will overshoot (due to inertia), then reverse and head back down, over and again until gravity and friction overcome the inertial forces and the wheel stops with the weight at the lowest point. The relative distance between the weight and the edge of the wheel will have a large effect on just how the wheel behaves, too.

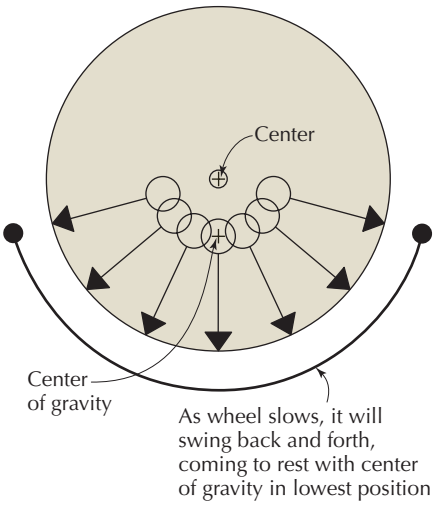
Locate the weight close to the edge and it will settle there quickly. Locate it close to the center and the wheel will rotate much more slowly, farther and it will take longer to settle down.

Translating this back to an actual rocking chair, if you locate the center of gravity close to the center of the circle, you'll get a pretty wild ride, tipping way back then far forward; if it's too close to the rockers (the edge of the circle), you will just sit there.

This is the basic mechanism of the rocking chair. The location and orientation of the seat and the person – and therefore the center of gravity – in relation to the rockers control how it will rock. In reality, the exact location of the center of gravity varies, however, due to body type, body position and the configuration of the chair itself.

The chair influences this location not just through the seat and back positions, but also a little bit by the weight distribution of its components. Just where is the center of gravity? In general, the center of gravity of a person seated upright in a chair will be roughly an inch or so in front of the navel. But each chair is different, and not only is each person slightly different, but every sitting position (feet outstretched, feet tucked under, slouching, etc.) changes the location of the center of gravity.

The shape of the rockers themselves is a subject with even more contrasting



GRAVITY ROCKS

opinions and no clear answers. Suggestions abound for arcs of a certain radius, or an elliptical shape, or a catenary curve (the curve you get by hanging a chain or string between points), a cyma (which Sam Maloof called a cygnet curve due to its swan's neck shape), or some magical combination of the above. The essential fact is that very little of the rocker is actually involved in rocking.

A typical rocking motion only covers about 8" to 10" of the rocker. If you account for settling into the chair and for pushing it back pretty far, that might involve all of 14" of the rockers. This critical part of the curve is most likely very close to an arc of a circle, but slight variations can change the feel of the rock a little. Outside of the critical area, variations in the curve are either cosmetic or work to limit the possibility of tipping the chair over in an extreme situation (such as a child standing up on the chair and leaning back).

Of course, the radius of the arc is important in relation to the center of gravity. If the center of gravity is roughly 25" or 26" off the floor (a typical rocking chair would put it there), you can see that a rocker radius of only 30" would put the center of gravity close to the center of the circle. This would make for a very tippy chair (as well as a very odd-looking one).

At the other extreme, a rocker with a radius of 80" would tend to just sit there. A reasonable radius with this center of gravity would be in the 39" to 42" range. Why am I talking about the height of the center of gravity and not the seat height? The shapes and angles of rocker seats can be very different, and it's hard to define a consistent reference point that is significant from one chair to the next.

This may all create a better understanding of what's going on with a rocking chair, but despite that, not much practical information has emerged. You should be getting a little clearer understanding of why that is, though. Each chair really is different, and other than some basic parameters, it's difficult to apply any hard and fast rules to come up with a solution that works. In other words, there is no foolproof way to calculate how all of the various factors will come together.

Rocking Chair Goals

Let's look at what we want out of a rocking chair, then at how we can get there.

There are two main qualities that I think set a rocking chair apart from other chairs. First, the chair should tip you back to a position that takes pressure off your back. How does this happen? Sitting upright in a chair, your muscles are primarily responsible for keeping you upright.

As you tip back in a chair, your muscles don't need to work as hard to support your spine because the back of the chair, assisted by gravity, takes over more of that job. Assuming that the shape of the back is appropriate, this puts your spine in a relaxed and neutral position. And this feels good. What you want is for the chair to naturally tip you back to that neutral position (somewhere around 25° behind vertical seems to work well).

The other important quality is the rocking motion – the simple movement into and out of that neutral position when you move farther forward or back.

Why this rhythmic motion is so important is a little harder to explain. It seems to be naturally calming. It avoids the discomforts of sitting in a static position, works off nervous energy and is said to promote better blood flow. In terms of rocking chair design, the goal is simply to wind up with a rocking motion that feels comfortable.

Prototype to the Rescue

To sort all of this out into useful design information, I decided to do some hands-on research and build and play around with a functional prototype. This is something I encourage you to do as well before tackling a new rocking chair project. The prototype was fun to build, and extremely helpful.

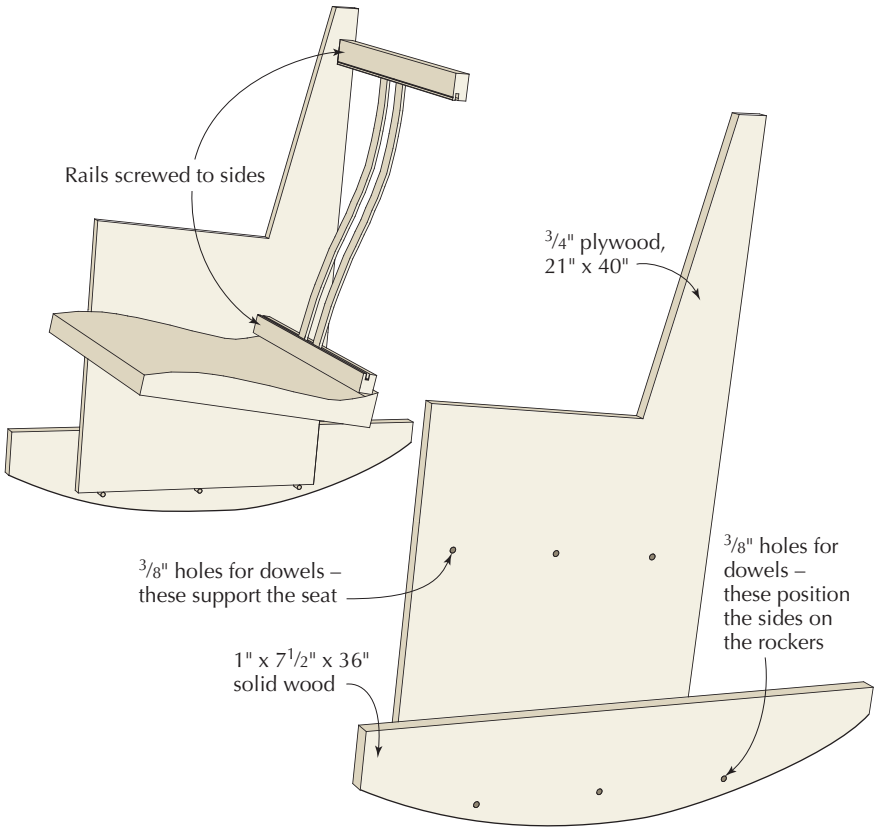
I laid out a potential shape for the basic chair I wanted to build on two pieces of 3/4" plywood, roughly 21" wide x 40" long. I wasn't concerned with the look of the chair; I just wanted to get the positions of the seat and the back right to start with, then start my experiments with different shapes, sizes and locations for the rockers.

I made up a contoured seat by skinning a set of hardwood ribs with a piece of 3/8" bending plywood. If you plan to make a flat seat, just use another piece of plywood (you can attach it with cleats to the sides). I also happened to have a couple laminated slats that were quite comfortable left over from an earlier chair project. But for this purpose, it's just as good to cut some slats to shape.

I placed the seat where I thought it should go on one of the plywood sides, then marked out the locations for a pair of holes just below. I then put the two plywood sides back together, drilled 3/8" holes on my marks and inserted dowels so the seat would register in exactly the same place on both sides. I put the seat in place and screwed through the sides to attach it. I made up some cross pieces to hold the back slats, played around a little with the angle of the back slats then screwed the rails in place. The rough chair was comfortable. Break time. I had to think a bit about adding the rockers.

It's crucial on any rocking chair that the two rockers be shaped exactly the same and aligned perfectly with each other. The end result should be as if they were cut from the surface of a large cylinder. I started with two pieces of wood that were about 1" thick, 7 1/2" wide and 36" long, and temporarily screwed them together face to face, with the edges aligned. Then I cut out and smoothed a potential shape, leaving the tops of the boards flat.

I used an approach similar to what I had used for locating the seat to be sure I got the rockers properly aligned. Prior to separating the rockers I drilled a series of 3/8" holes 5 1/4" down from the top edge. Inserting dowels into the holes on each side established a "track" so I could slide the set of rockers back and forth as needed along the bottom of the plywood sides. I just needed to measure from the ends an equal amount to line them up, then screw them into place. When I needed to move the rockers up and down, I simply drilled a new row of holes as necessary.



A ROCKING CHAIR MOCK-UP

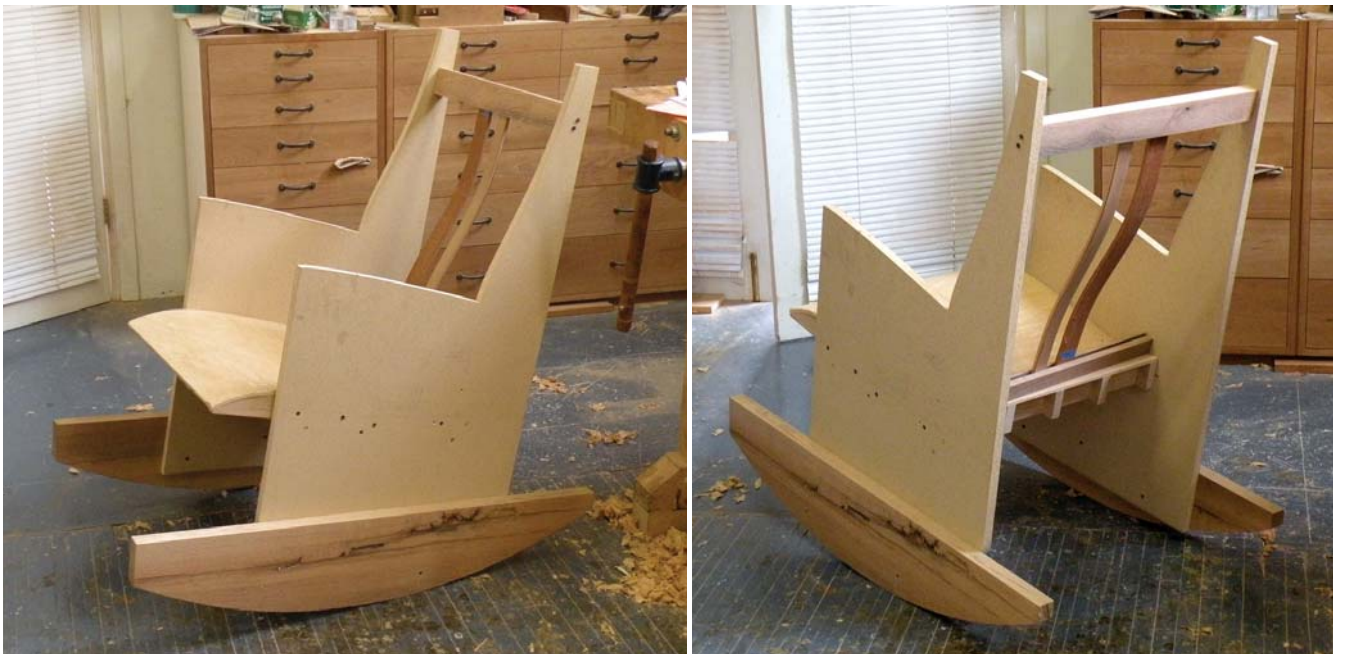
I experimented. The plywood and rockers got more holes as I tried different positions. I made up new rockers of different radii, and some different shapes. I adjusted angles. Finally, I made up a second prototype so I could compare two versions that seemed to work well.

What Did I Discover?

The prototype allowed me to isolate various elements of the design that I had been having trouble with before. I could play around with seat angles and have that be somewhat separate from the height of the seat, and also from the way the chair rocked. To change the seat height I could either cut a little bit off the bottoms of the plywood sides or re-drill the rockers with a new set of holes.

I found it most helpful to be able to slide the rockers back and forth without having to think about leg lengths. Moving the rockers forward or back made predictable changes; the chair rocked back more easily as the rockers moved forward, and vice versa. I knew I had come upon a good configuration when I fell asleep in the chair at lunch one day.

Playing with the shape of the rockers also was interesting, although I thought that rocker location was the more significant factor. I found the difference between a 39" radius and a 40" radius very subtle. As I went larger or smaller, the differences were more noticeable. Smaller radii felt less stable; larger ones felt too unresponsive. And I did not notice huge differences with different rocker shapes. This was not altogether



Mock you to sleep. *This mock-up of my rocker design allowed to me to quickly change variables and immediately feel the outcome.*

unexpected, because it is hard to see that much difference over the 8" to 10" of the rockers that actually come into play. For this particular chair I settled on a 39" radius.

Interesting, although less useful, was the realization that a perpendicular line drawn up from the point of contact between the rocker and the floor will pass through the center of gravity and the center of the circle that generates the rocker arc. As I expected, this was not exactly the same when the chair was empty as it was with a person seated in it, but it was remarkably close.

The final version of the prototype worked well for most people. I was pesky about asking lots of students and visitors to the shop to try it out, and most found it comfortable. I did learn that preferences in arm height vary over a wide range, and that seemed to be the most common complaint from my testers. I had simply cut the plywood sides to a height that worked well for me. It would certainly pay to make adjustable arms if I were to do this again.

Turning the prototype into a real design was an interesting process. Somehow, I needed to pull all of the necessary information off the prototype. What I did wasn't anything fancy. I pulled one side off my prototype and traced all of the important elements – the rockers, the seat, the back and the arms – directly from the prototype to a piece of foam-core insulation that a neighbor had discarded (1/4" plywood is my usual choice).

I had an overall concept of the piece with its branching components, and I played around for a few hours filling in details around the pre-determined seat, back, arm and rocker locations until I had a basic sketch to work with. A good eraser really helped with this! Then came the hard work of turning the sketches into a real piece of furniture.

The end results were very satisfying, although I did still have to do a little bit of functional tweaking on the actual chair design. I was surprised to discover that – at least with the design I came up with – those tweaks were minor, and the finished chair was actually quite close to the prototype. PWM

Where the action is. *The 8" to 10" of curve below the seat is one of the key variables in the comfort of the rocker.*

Jeff is a Chicago furniture maker and woodworking teacher at J. Miller Handcrafted Furniture (furnituremaking.com).

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A Teacup & 8 Dinner Plates

BY TOSHIO ODATE

Not only living beings retain a soul; some objects do as well.

Serendipity. *A long-treasured teacup alongside a later gift of plates by the same maker.*

The word "Pantheism" is defined as "the religious belief or philosophical doctrine, which identifies the universe with God." And, "The doctrine that God is not a personality, but that all laws, forces and manifestations, etc. of the universe are God." God is everything and everything is God.

"Panpsychism" is a similar ideology, defined as, "The doctrine that the entire universe or any least particle of it has a psychic or mental as well as a physical or aspect." PSY-CHE = personification of breath, spirit, soul, mind.

Many Japanese people believe that gods are all over and around us – in the kitchen, in the bathroom, on the roof, in a tree, a rock, river, mountain, etc. So, we often treat objects as living beings and sometimes worship them.

I do not know if I can call Japan a pantheistic or a panpsychistic country, as Ancient Greece was. However, both of these ideologies are deeply embedded in Japanese life, and especially in Buddhism and Shintoism. I am not a conscientious believer of these ideologies. However, the ideologies are so naturally woven into the Japanese way of life that we practice them without any special psychological or spiritual resistance. It is simply part of our culture.

One often witnesses a scene in Japan – a gentle mother mildly rebuking her son, "Don't take your frustration away by kicking things." The mother is telling her child to respect objects; things have their own spirits.

Tools are Treated with Respect

The Japanese woodworker cleans his tools and toolbox at the end of the year then decorates and places them in the *Tokonoma* – a special corner in the room or cleaned workshop, to show his family's and his own gratitude for the tools' hard work and the crucial role they play in the craftsman's life. Hand tools are an extension of the craftsman's body, thus the craftsman gives extreme care to his tools and handles them with respect.

The Japanese also believe that the craftsman's heart and mind are married during the making process. I heard, in my childhood, an example that will clarify this point:

"Self-knowledge has no end – you don't come to an achievement, you don't come to a conclusion. It is an endless river."

– J. Krishnamurti (1895 - 1986)
Indian-born philosopher

The story involves two swordsmiths, Muramasa and Masamune. Both were reputed to produce excellent swords that were prized among the Samurai. Muramasa was said to be jealous and cynical; his ambition and sense of competitiveness motivated him to concentrate on forging blades that cut keenly. Thus, the story went, Muramasa created brilliant swords; any Samurai who possessed a Muramasa sword, it was said, felt its power and quality and was urged to cut people mercilessly.

Masamune's swords, on the other hand, were said to invest their owner with a sense of confidence and serenity. Though these swords also cut well and were brilliantly beautiful, much of the time they remained calmly sheathed.

The moral of the story is that the quality also concerns itself with attitude and motivation.

It was quite early in my life (during my late 20s) that I started believing that anything I do – any action or any of my behaviors – is manipulated by my heart and mind. For example, when one walks or handles objects with anger

PHOTOS BY LAURE OLENDER

in one's heart and mind, one behaves quite unpleasantly. But when one speaks or talks with peace and happiness in one's heart and mind, one creates, in contrast, a very pleasant atmosphere around oneself.

As I said, I am not a conscientious follower of these ideologies, however, in my 80-plus years of life, I have often heard of, read about and practiced them. Somehow, I started to suspect that some kind of energy, force or will is present in some objects.

A Father's Love

I know a man who loves woodworking but he is not a trained woodworker. He had a little baby girl, whom he loved dearly. He knew that the baby girl would grow older and some day fly away from home and from him.

One day he decided to make a "hope chest" for her. He had stashed away some special wood for it and he wanted to make the best construction he knew, including dovetailed corner joints. He acquired a dovetail joint book and at night and on weekends he did his best to construct the chest, always thinking of his lovely daughter and the day she might leave.

Because he was not a trained woodworker, I can only imagine the result. But the chest he built – as rough as it might have been – had his palm holding the sandpaper as he caressed the chest, full of love and care. These feelings are retained in the chest very deeply. Years later, long after he is gone, his daughter will feel her father's love and care with the warmth and comfort retained by this chest.

A Saw Brought Back to Life

A friend of my master was a *Geta-Shokunin* – a wooden clog maker. When the *shokunin* died, he left no apprentice to continue his trade. So his son, who had dedicated himself to farming, gave his father's tools away.

It was a short time after the *shokunin*'s death that my brother and I visited the son. I remembered all the tools that used to hang on the wall of the workshop, so it surprised me that the son had not kept even a single plane. He merely said: "I have none," in response to my question about the tools.

Respect. *On Jan. 1 every year, we decorate our tools and toolbox as a symbol of respect.*

Intimate emotions are not easily understood by others. I am certain that the son had good reasons for giving or throwing away his father's tools. I remember the son truly loved his father, who was a very soft-spoken gentle man. Not wanting to invade his personal feelings, I stopped asking about the tools. But the son then said, "Wait a minute," and disappeared into the barn. He reappeared carrying a large saw with a badly rusted blade and a handle that was half rotted away, "This was buried under the dirt floor," as if he was saying, "I thought I cleared out my father's tools completely."

"If you like this," the son said, "you may have it."

At that offer, I felt great sorrow for the *shokunin* who had died and great pity for this ignored tool. I accepted the offer and took the saw back home. At my brother's house, I immediately started to clean it. The rust wasn't too deep. Soon thereafter, an almost bluish body began to appear as if awakening from a long sleep. The blacksmith's signature came out brightly and clearly; it seems like the saw had been waiting for me to rescue him.

Tenjin's saw. *This* Maebiki-saw *(ripsaw) belonged to Tenjin, a master whom I greatly admired.*

Geta-Shokunin's saw. *Since its arrival in America this saw is now rust free and wearing a new handle, and bearing proudly its signature.*

A Reminder of the Master

When I was 16 years old, I met a *Kobiki Shokunin* (sawyer) named Tenjin (guardian of heaven). Tenjin was a good friend of my master. Together, we often worked at the house of our customers. I respected and admired him so much; I often thought that some day, I would like to be a master just like Tenjin.

Many years later, when I visited my master in 1976, I asked him about Tenjin. My master replied, "Tenjin passed away." I then told my master that I wanted to acquire a *Kobiki's Maebiki-saw* (sawyer's rip saw) for my collection.

We decided to visit Tenjin's elder brother, who was also a *Kobiki Shokunin*, to pay our respects. After a very formal and stilted conversation, I said, "I would like to take a *Maebiki-saw* to America." Tenjin's brother brought out two *Maebiki-saws*. One was very large, shiny and clean with sharp, perfect teeth. The other was much smaller and had two teeth missing, a dark shiny handle (a sign that it was well used) and a beautiful shape. When I expressed difficulty in choosing between the two, the brother pointed to the smaller, older saw and said, "This was Tenjin's."

That, of course, decided it for me. I knew that Tenjin loved this saw and used it well. Did the saw know that I loved and respected Tenjin so much? Is that why he wanted to travel to America with me?

Soul of the Teacup

My professor Shinji Koike wrote a short essay titled "The Soul of the Teacup," that I will summarize here:

I met a young ceramist named Katō, he offered me one tea cup from several available. I chose one and took it home. However, the teacup was so special I didn't use it too often; soon it was pushed to the back recesses of the cabinet. Years later, my friend Akanuma visited me and our conversation turned to the tea ceremony. This discussion reminded me of Katō's teacup.

Mr. Akanuma, who in contrast to me, liked to brew Maccha – a powdered green tea. I thought the cup more suited to his taste in tea, and I felt that the cup itself wanted a new master because I had given up on it.

Just as a lecturer at the Tokyo Museum of Natural History had spoken of the "life and death of tools," I thought that teacups also lived or died depending on their masters. Twenty years later, a royal lady came to Akanuma's tea house. Akanuma then consulted a tea master to determine which cup he should offer the lady. The master decided that the correct cup would be one that I once owned. This teacup was made by a young ceramist named Katō. Today, he is a well-known and celebrated ceramist. That cup was presented to the royal lady who loved ceramics so much that she had her own kiln. Perhaps it was fate but that lady's ceramic teacher was Katō.

Symbolic Meaning

I came to America in 1958, and married an American woman of Hungarian decent. We had a baby boy. We wanted to give him a Japanese name but not a common one, so we named him "Shobu," which means "iris" in Japanese. Giving a flower name to a boy is not a Japanese custom. However, the iris is a symbol for "Boy's Day" in Japan (May 5th; now it is called "Children's Day").

My ex-wife's cousins – Dr. Howard Hochman and his wife, Patricia – had three children. They are a very generous and warm family and they accepted Shobu as if he were one of their own. Perhaps because of my special devotion to Shobu, and the unusual name "iris," Pat went out of her way to find anything with an iris flower on it, like a wine bottle with an iris label or a pad with a printed iris flower on it. It pleased me deeply.

Even long afterward, when Shobu left home to go to college, Pat still would surprise me with iris items. One of them was a Japanese coffee cup with a beautiful blue-purple iris on a gray background. The shape of the cup is just like a deep Japanese tea cup. It was a little bit too skinny for a regular coffee cup, however I was very much charmed by it and used it every day.

One day, as I took it out of the cabinet, the cup slipped from my hand and the handle broke into pieces. I was shocked, then immediately tried to mend it, but it was beyond repair. Usually, after such an accident, a cup would become another pencil holder. However, the handle broke off very cleanly and now the handle-less cup looked just like a beautiful traditional Japanese teacup. Then I felt as if the cup itself did not want the flimsy handle to begin with and so it took it off by itself. I ground down the scars cleanly, flat and smooth. Now it is one of my favorite teacups in my house. When I use it for tea, on very special occasions, the cup seems to be very proud of itself.

Shobu finished school, and on Aug. 11, 2007, he married in Cape Cod, Mass. Of course the Hochman family was there. I stayed at the same motel as they did, and on the morning of the wedding day I met Pat in the motel parking lot. She was holding several plates that seemed very heavy. "Aren't these beautiful?" she said. "I found these at the flea market in town." They were Japanese ceramic dinner plates – more like large individual serving plates – with wild flowers painted in a beautiful deep purplish-blue, with light-brown leaves

Cedar standing in snow. *I named my favorite teacup* sezzai *(standing in snow) and made a box for him from aromatic cedar. The calligraphy was written by the chisel maker Iyoroi. In this same way Katō's tea cup was given a name, and placed into a paulownia box.*

A clean break. *A broken handle made this cup complete – its form now suits me better.*

A birthday gift. *The Hochmans gave me these matching plates of theirs I'd admired for years.*

on a light green gray base. They were very subtle and elegant. I saw three of them, all hand-painted with the same motif but each slightly different.

I went to the same flea market hoping, in my heart, to find some similar plates. However, I had no luck. The wedding was over that evening and the next day I drove back home. The design and glaze of the plates, however, stayed in my mind for quite a long time.

After the wedding, I went to the Hochman's house many times, for many occasions. However, I never saw the plates and forgot about them.

Friday July 9th, 2010, was my 80th birthday. Pat and Howard invited us to their house for dinner. Just before we were leaving Pat brought out the eight dinner plates and said, "Many times in the past Howard and I thought and tried to give these to you, but we could not find the perfect occasion. Here they are! Happy birthday, Toshio!" I could not find any words. I thanked them from the bottom of my heart. It had been almost three years since I last saw these plates but I remembered the blue, the brown, the touch of the brush so clearly – as if I had seen them every day.

I arrived home and looked at all eight of the plates one more time. Each one of them was slightly different with no mark or signature. I placed them safely in the cabinet. As I lay in bed that evening, one thing puzzled me. Why did the color and design of the plates seem so familiar? While thinking, I fell asleep.

The next morning, I woke up a little bit earlier than usual and continued thinking about the plates. Then I realized that the plates' blue, the brown and the gray base were the same as my iris tea cup with the broken handle. I was very excited that I had solved the puzzle.

I got up from bed right away, went downstairs and took out the tea cup from the cabinet. Yes, it was the same! I also took out all the plates and noticed that they have the same glaze, the same brush touch and a similar base clay. Was it at all possible that this teacup and these plates were produced by one ceramist? Yes, it is possible. All the evidence indicates that they were! Yes, I am sure of it.

When Pat picked up the iris coffee cup she was thinking about me, but when she showed me the plates in the parking lot, she wasn't thinking about giving them to me. I only expressed how beautiful they were and she was already imagining serving dinner to her guests, what kind of food to offer and how to present them. She was enjoying the idea of using them and obviously loved them.

However, now the plates are here, with me, and with the teacup. Pat had found the coffee cup around Stonington, Conn., many years ago, and she found these plates much later at Cape Cod Mass., miles away. I wonder what kind of energy was involved for this extraordinary event to take place?

A Lasting Energy

When a person creates an item, a painting, a sculpture or artifact, there are feelings and senses of the maker that stay in the piece. There is, of course, the material, color, form, function, etc., and all these characteristics are somewhat tangible elements.

However, there are also invisible, complex and powerful forces within each object. This special kind of energy, which the creator knowingly or unknowingly injects into the object, forms the character and quality of the item. In some way, I think this energy itself becomes the spirit of the object and somehow the object develops some kind of will of its own. Sometimes, it will find the right person to care for it and keep its spirit alive and appreciated. Other times it will carry on the creator's strong will and wisdom. These forces are so powerful that they will stay in an object long after it's parted from its creator, or the person who cared deeply for it.

My professor describes this phenomenon as "a fate"; many people might say it is a simple coincidence. I don't have any clear answer for that. However, I strongly believe that a creator's heart and mind or will and wisdom goes into the entity which he or she creates, and also the beneficiary's loving and caring energy will remain as part of the force of an object as well. **PWM**

As an author, lecturer and teacher, Toshio has been pivotal in spreading knowledge about Japanese tools and woodworking techniques throughout the Western world. He now works out of his Connecticut shop with the assistance of Laure Olender, who builds alongside Toshio and photographs his work.

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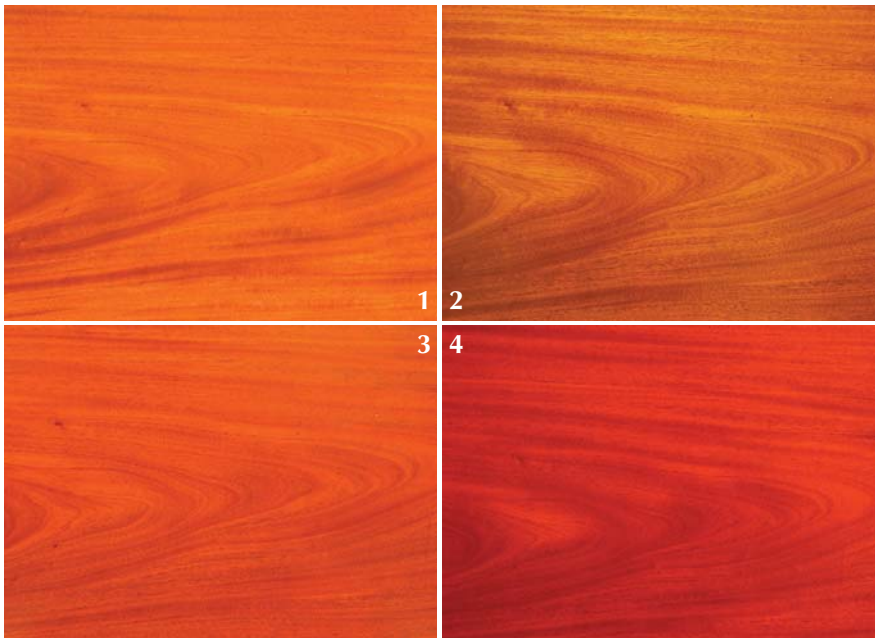
BY BOB FLEXNER

Odds & Ends

Four short (but crucial) finishing subjects.



Metamerism. *The light source makes a big difference in the way color is seen. Photo #1 of a stained mahogany panel is the control, taken in daylight. Photo #2 shows the increased green revealed under cool-white fluorescent light. Photo #3 shows how the panel looks in full-spectrum light. Photo #4 shows the enhanced red seen in incandescent light.*

What follows are four concise – but important – finishing topics about which you've likely wondered.

1 – Metamerism

Most of us have experienced a situation where we finish a project in our shop or garage to the exact color we want, only to discover that the color isn't right when we move the project into the house (or to a client's location). The explanation is the phenomenon of "metamerism." The lighting is different in the two locations.

The light source makes a big difference. It's important to be aware of this even though it can be difficult to do anything about it.

Digital cameras have made it easy for me to illustrate the phenomenon. To establish a control, I set the white balance on my camera to daylight and took photo #1 of a stained mahogany panel outdoors in the shade.

Then, without changing the white balance, I took additional pictures indoors under the cool-white fluorescent lighting I use in my shop (photo #2), the full-spectrum fluorescent lighting I use in my finishing area (photo #3), and finally in the incandescent lighting in my house (photo #4).

Notice how the cool-white lighting brings out more green in the stained wood, the full-spectrum lighting produces a color that is closest to natural daylight, and the incandescent lighting brings out more red tones. This is what you should expect when you move a project from one light source to another.

Because it's rarely possible to create the same type of lighting in both your shop and eventual location of a piece, and because the lighting in any area can change between daytime and nighttime, the best way to handle the situation, if you are matching a color, is to have a sample of the color in the same light while you're doing the matching.

Alternatively, install full-spectrum fluorescent lights in your finishing area. These lights bring out the wide spectrum of colors, so they make possible the closest matches for all situations.

2 – Polyurethane is Polyurethane

This is not true. Among consumer products, oil-based polyurethane is much more durable (meaning scratch, heat and solvent resistant) than water-based polyurethane, and, if you include high-performance spray finishes, two-part polyurethane, which is not a consumer product, is more durable still.

It's not the "polyurethane" that's different. It's the way the finish cures. Oil-based polyurethane cures by oxidation – crosslinking in contact with air. Water-based polyurethane cures first by the evaporation of water and solvent, then by coalescing (the tiny finish particles stick together). Two-part polyurethane cures by crosslinking between the two parts, similar to the way epoxy adhesives cure.

Polyurethane. *Among consumer finishes, oil-based polyurethane, shown here on a pine floor, wears best of all finishes.*

CONTINUED ON PAGE 60

PHOTOS BY THE AUTHOR

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CONTINUED FROM PAGE 58

Oil-based polyurethane wears better on floors than water-based polyurethane. Two-part polyurethane, which dries much faster than oil- or water-based polyurethane, is better to use in a production shop where objects requiring a very durable finish are being sprayed.

On the other hand, water-based polyurethane is still more durable than nitrocellulose lacquer or shellac, and is unique in that it adds no color to the wood. No finish is best for all situations. You may choose to give up a little durability to eliminate the yellowing.

3 – Edges of Cabinet Doors

If you're spraying rather than brushing, you need to be diligent in applying product to the edges of cabinet doors. It's quite common that these edges don't receive enough finish to protect them adequately from water splashes under sinks.

Most finishers spray the edges at an angle so the fan pattern strikes the edge and face simultaneously – one angled pass around the door, then overlapping passes on the face.

For most locations, having too little finish on door edges is not a big problem. Edges aren't as visible as faces, and water doesn't get on the doors. The exceptions are the edges, especially the top and bottom edges, below a sink. These edges get a lot of water contact and, if the finish is too thin, the water can break through and get into the wood. The water then works its way under the finish and causes it to peel.

Just being conscious of this problem will lead you to be more careful when spraying, but it may also help if you adjust your spraying technique. Begin by narrowing the fan pattern of your spray gun so the fan is only a little wider than the thickness of the door. You may have to adjust the fluid-control knob also, to reduce the volume of material being sprayed.

Then spray the edges straight on, the same number of times you spray the face and back with the wide fan pattern. For profiled edges, it may be wise to also spray at an angle.

One more precaution. Be sure to soften all sharp edges with sandpaper. Finishes pull away from sharp edges leaving the finish too thin to be water-resistant.

4 – Luster in a Finish

The luster, or shine, in a finish dulls over time, primarily due to exposure to light – especially sunlight and fluorescent light, which are both high in ultraviolet light. Once a finish has dulled, there are three ways to bring back the shine.

If there is no crazing (cracking), the application of a furniture polish or paste wax may be sufficient. Paste wax is far more permanent than liquid furniture polishes, with the limitation being that you can't then use furniture polish for dusting or you'll remove the wax.

If there's mild crazing, you can remove it with very fine sandpaper. Then rub a shine into the finish using fine abrasive compounds, such as rottenstone. The finer the abrasive grit, the higher the shine.

Shine up a surface. *Paste wax is best for adding shine to a dull surface as long as the finish isn't badly crazed.*

If the condition of the finish is worse but not totally deteriorated, you can sand it level and apply more finish on top. The safest finishes to use are oil (which is not very effective because it can't be built up) and shellac. Shellac can be applied with a pad (called French polishing), or with a brush or spray gun.

Varnish (including polyurethane varnish), water-based finish and lacquer can also be applied. But the surface should be perfectly clean, especially from the silicone oil contained in many furniture polishes, or the finish will fish eye. Lacquer should be sprayed very lightly at first, or the lacquer thinner may attack and blister the old finish.

PWM

Bob Flexner is author of "Flexner on Finishing" and "Wood Finishing 101."

Cabinet door edges. *The edges of cabinet doors installed under sinks have to be finished well to avoid damage from water working its way through a too-thin (or deteriorated) coat of finish.*

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GLOSSARY

Woodworking's lexicon can be overwhelming for beginners. The following is a list of terms used in this issue that may be unfamiliar to you.

billet (n)
A short, thick piece of wood; a section from a log.

camber (n)
In woodworking, a slightly curved edge, as one might choose to grind or hone on the blade of a bench plane.

clout nail (n)
Also known as a wrought head nail, cut nail and rosehead nail, this mechanical fastener has a wedge-shaped shank that must be aligned with the grain.

cornice moulding (n)
A decorative horizontal moulding that crowns a piece of furniture, a building or element on a building, such as a doorway.

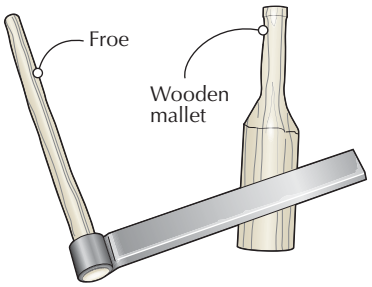
"That's a great deal to make one word mean," Alice said in a thoughtful tone. "When I make a word do a lot of work like that," said Humpty Dumpty, "I always pay it extra."

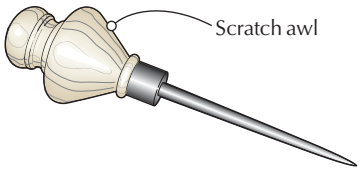
— Lewis Carroll (1832-1898)
(pen name of Charles Dodgson)
English mathematician and writer

crazing (n)
A network of fine cracks on the surface of a finish. If the cracks worsen and penetrate through the finish, damage may occur to the underlying surface.

cygnet (n)
The term Sam Maloof used to refer to an S-shaped (or swan's neck) curve; more often called a "cyma."

dimensional lumber (n)
Lumber that has been surfaced on all four sides and cut to standard sizes (e.g. 1x2, 2x4). The dimensional sizes (or nominal sizes) do not match the actual widths and thicknesses of the pieces. Lumber that is sold as 1x6, for example, is actually ¾" thick and 5½" wide.





Federal (n)
American furniture style dating approximately 1775-1815, characterized by geometric forms, straight-tapered legs, contrasting veneers and geometric inlay patterns. Well-known makers include Duncan Phyfe and Thomas Seymour.

fillet (n)
A flat area that separates two curves (or other shapes) on a piece of moulding.

froe (n)
A metal bladed, wooden handled L-shaped tool used for cleaving a log into sections. It's sometimes struck with a wooden mallet.

inertia (n)
The tendency of a body or object to resist change in its state of rest or motion, unless acted upon by external force.

maul (n)
A heavy hammer with a wedge-shaped head used for splitting logs.

metamerism (n)
An optical phenomenon in which colors may match under one light source, but not another.

non-ferrous (adj)
Metal other than iron and iron alloys.

rivet (n)
A permanent mechanical fastener with a cylindrical shaft and a head on one end. After being inserted into a clearance hole, the tail end of the rivet is peened (either mechanically or by hand) so that it expands to hold in place.

scratch awl (n)
A layout tool with a fine, spiked point that's used to scribe a line.

skin (v)
To apply a bendable piece of plywood (or other thin material) over a set of ribs to contour a seat or other curved surface.

studio furniture (n)
Used to describe one-of-a-kind (or limited) pieces designed and built by the maker, as opposed to mass-produced in a factory.

toothing plane (n)
A high-angle plane with a blade that has a serrated edge (the coarseness of the teeth can vary). In use, the plane makes a series of small scratches on a workpiece surface. Because of the high angle and teeth, it doesn't get caught in reverse grain, and allows for working a board in any direction. May also be used to prepare for the adhesion of veneer by texturing both of the glue surfaces.

try square (n)
A woodworking tool available in a variety of sizes consisting of two blades affixed to each other at right angles. May be made of metal, wood or a combination thereof. **PWM**

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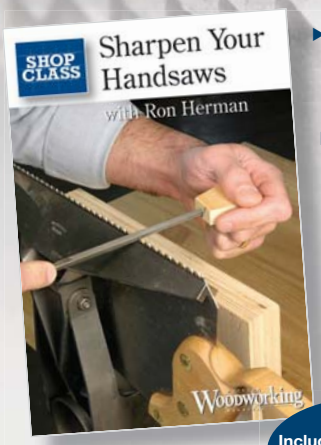

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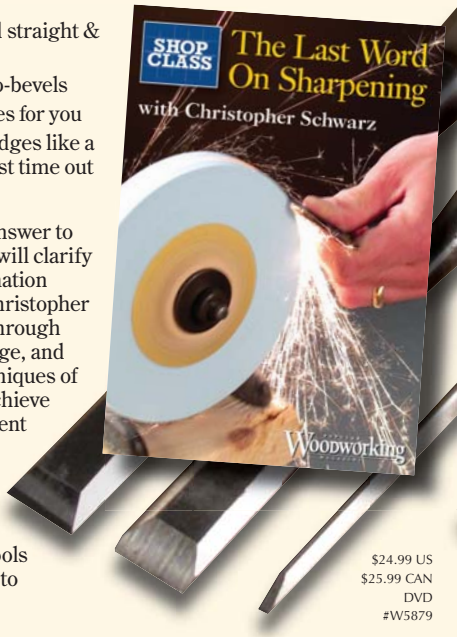

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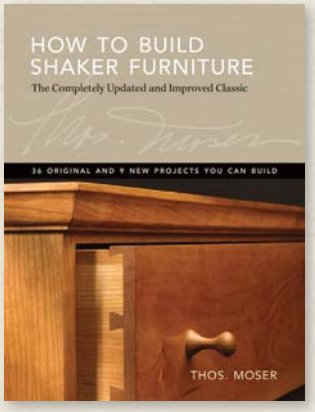

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BY KEVIN THOMAS

The Addict

It's not a problem – and I don't want a cure.

"Hi. My name is Kevin and I'm a woodworking addict." That's how I feel I should start each meeting of our local woodworkers' guild. My only problem is, it's a habit I don't want to break. I meet with approximately 80 guys and gals every month who feel the same way as I do.

Most addicts can remember the exact moment they were hooked. I'm no different. I was able to delay the addiction's onset in junior high school – the desire to drive and a redheaded girl named Lois did the trick. But that was long, long ago. Lois found someone else and I got my driver's license.

But six or so years ago, while channel surfing on a rainy Saturday, I ran across a guy named Norm and he was building furniture. It all looked so simple. "Why, I could do that!" I told myself. And the rest is my downward spiral into routers, planes, red oak and whisper-thin shavings. I was hooked.

My wife looked at my addiction as something to keep me out of trouble. If only she knew then what she knows now. I started out by collecting the tools I would need to become a proficient woodworker. Some were inherited, such as my father's Montgomery-Ward's Power-Kraft 9" table saw. There were estate sales, antique stores and "Oh My God" eBay.

My wife still was unaware of what she had allowed to be unleashed. For Christmas the next year, she bought me a gift certificate for a class at the local Woodcraft store on making a jewelry box. She had no idea what the smell of sawdust was doing to me.

The next February, The Woodworking Show came to town and I had a whole new sensation to explore. In the back of the hall was a little booth manned by a gentleman named Wayne. Wayne was the president of the Kansas City Woodworkers' Guild, and he soon became another enabler.

Wayne invited me to attend a meeting of the guild. He promised camaraderie with other like-minded individuals, and an educational atmosphere. I already had a subscription to almost every woodworking magazine; now I had people to talk with about what I read. The hole got deeper yet. There were guild-sponsored classes and mentoring. There was always someone from whom to learn something.

Then someone mentioned all the great schools: Marc Adams, Kelly Mehler's and more. I couldn't resist another temptation. So when my wife offered a week-long class at Kelly Mehler's School of Woodworking for my 50th birthday, I knew I was sunk. It was during that week in Berea, Ky., that my wife finally realized the monster she had allowed to be released. And there was now nothing she could do about it.

I've since embraced my addiction. I've built a new shop and I'm working on filling it with what I need to feed this habit. I joined the woodworkers' guild and within a year I was editing the monthly newsletter. Then I ran for the guild's board of directors and was elected.

So, as I sit back and gaze at my new Holtzapffel workbench that's covered with shavings, I say "What a great addiction to have." PWM

Kevin is a bail bondsman and woodworker. When he's not building projects for his grandchildren, he's busy as president of the Kansas City Woodworkers' Guild.

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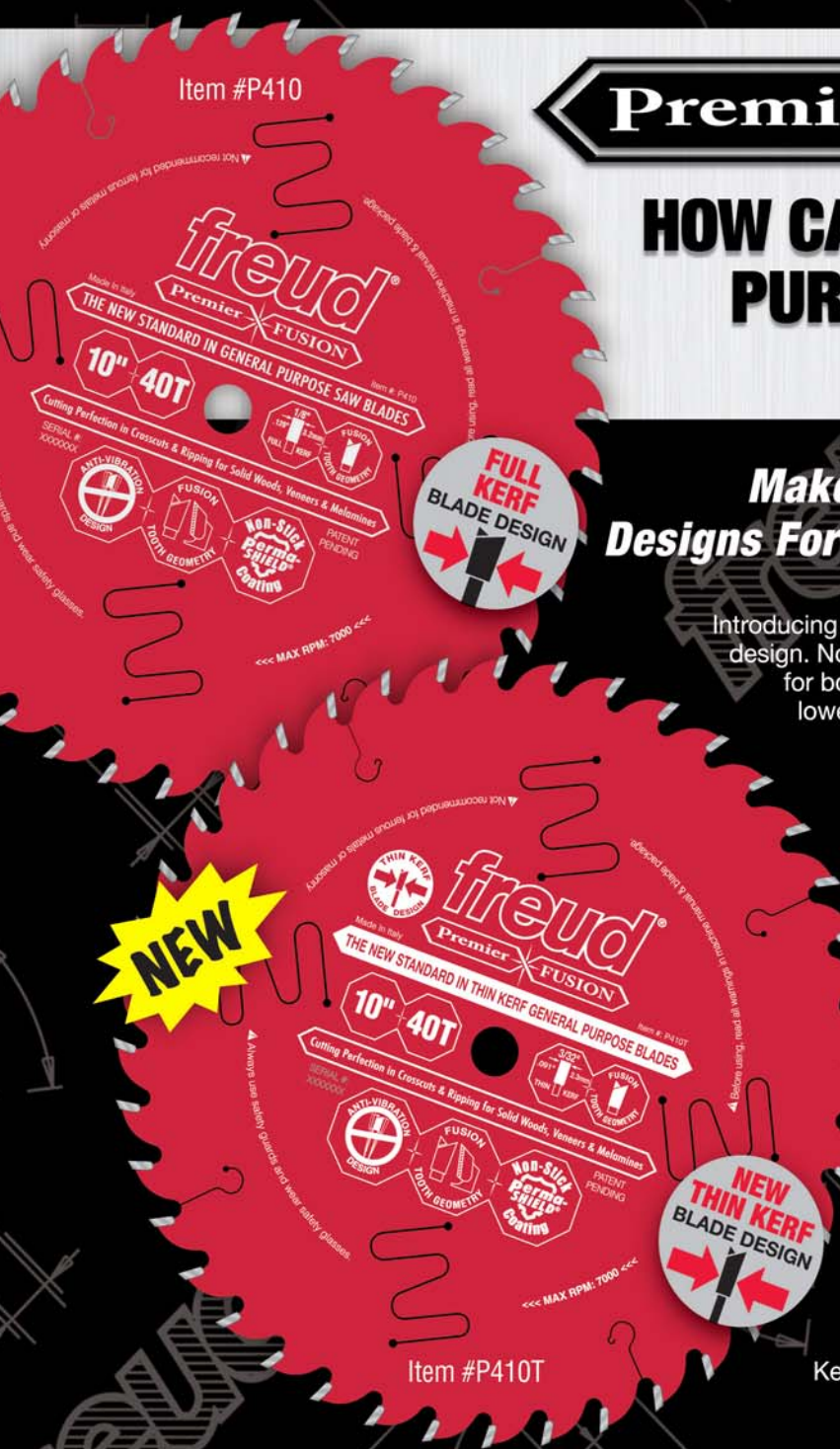

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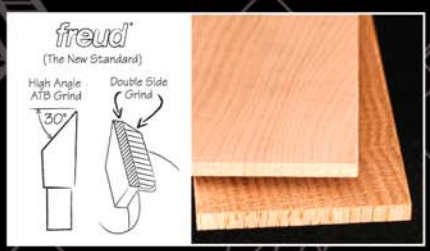

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