25! CELEBRATING 25 YEARS

BONUS SECTION: PRO TRICKS FOR PREPPING YOUR LUMBER

NEW TOOL ALERT: WE PICK THE TOP 10 – NOW SHIPPING TO STORES

NOVEMBER 2005
ISSUE #151

POPULAR WOODWORKING

Learn How ▪ Discover Why ▪ Build Better

FINE FURNITURE THE EASY WAY

9 Great Tactics Make it Simple

Lasers on Power Tools

A Bright Idea or Just Plain Dim?

PLUS

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- Fact: You Need an Ax
- Build Easy Glass Doors

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Plans Inside: Lonnie Bird's Chest of Drawers

Holiday Savings

BEGINS OCTOBER 15th ENDS DECEMBER 31st, 2005

THE ULTIMATE 10" CONTRACTOR STYLE TABLE SAWS W/CAST IRON WINGS & TABLE

- Motor: 2 HP, 110V/220V, single-phase
- Precision ground cast iron table
- Table size with wings: 27" x 39⅝"
- Arbor: ⅝" • Rip capacity: 30"
- Cutting capacity: 3⅛" @ 90°, 2⅛" @ 45°
- Shop Fox® Aluma-Classic™ Fence
- Approx. shipping weight: 298 lbs.

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NEW FOR 2005!

G0576 LEFT-TILT
ONLY $615.00

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10" LEFT TILTING SUPER HEAVY-DUTY TABLE SAW

- Motor: 3 HP, 220V, single-phase, 3450 RPM
- Precision ground cast iron table
- Table size with wings: 27" x 40⅛"
- Arbor: ⅝" (accepts dado blades up to 13/16")
- Cutting capacity: 8" left, 26" right
- Max. depth of cut: 3" @ 90°, 2⅛" @ 45°
- Shop Fox® Classic Fence
- Approx. shipping weight: 465 lbs.

THE HOTTEST SELLING TABLE SAW IN THE COUNTRY!

G1023SL
ONLY $995.00

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12" PROFESSIONAL CABINET SAWS

- Motor: 5 HP, 220V, single-phase
- Precision ground cast iron table
- Table size with wings: 30¼" x 48"
- Dual arbors: ⅝" & 1"
- Max. rip capacity: 50"
- Max. depth of cut: 4" @ 90°, 2⅝" @ 45°
- Cast iron miter gauge
- Dust port: 4"
- Approx. shipping weight: 613 lbs.

FEATURES NEW SHOP FOX® LONG REACH FENCE

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8" x 65" SUPER HEAVY-DUTY JOINTER W/HANDWHEELS

8" JOINTER BLOWOUT!

- Motor: 1½ HP, 110V/220V, single-phase
- Precision ground cast iron table
- Cutterhead knives: 3 HSS
- Cutterhead diameter: 3"
- Cutterhead speed: 5000 RPM
- Max. depth of cut: ½"
- Magnetic safety switch
- Heavy-duty center mounted fence
- Approx. shipping weight: 451 lbs.

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FREE PAIR OF SAFETY PUSH BLOCKS!

G1018HW ~~$765.00~~
CLOSEOUT PRICE
ONLY $595.00
WHILE THEY LAST – NO BACKORDERS!

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Popular Woodworking TOOL BUYING GUIDE Editors' Choice

8" x 75" JOINTER

8" JOINTER BLOWOUT!

- Motor: 2 HP, 110V/220V, single-phase, TEFC
- Precision ground cast iron table (includes two 5" extensions)
- Cutterhead speed: 5500 RPM
- Max. depth of cut: ½"
- Magnetic safety switch
- Heavy-duty center mounted fence
- Approx. shipping weight: 489 lbs.

INCLUDES JACK SCREW & ACCESSORY SPRING KIT PLUS FREE PAIR OF SAFETY PUSH BLOCKS!

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Popular Woodworking BEST NEW TOOL 2005

G0500
4 BLADE CUTTERHEAD
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ONLY $695.00

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15" PLANER WITH CLOSED STAND

- Motor: 3 HP, 220V, single-phase, 3450 RPM
- Precision ground cast iron table
- Table size: 14⅞" x 20"
- Max. cutting height: 6⅛"
- Max. cutting depth: ⅛"
- Feed rate: 16 & 20 FPM
- Cutterhead knives: 3 HSS
- Cutterhead speed: 5000 RPM
- Cutterhead diameter: 3"
- Magnetic safety switch
- Dust port: 4"
- Approx. shipping weight: 555 lbs.

15" PLANER BLOWOUT!

FRONT & REAR 3 ROLLER EXTENSION TABLES

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OSCILLATING SPINDLE / 12" DISC SANDER

- Motor: 1 HP, 110V, single-phase, TEFC
- Precision ground cast iron tables
- Disc sander table: 17¾" x 10", tilts 45°
- Oscillating sander table: 14½" x 14½", tilts 45°
- Spindle sizes: ¼", ⅝", 1½" & 2"
- Spindle oscillation: 60 SPM
- Spindle speed: 1725 RPM
- Stroke length: 1"
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6" x 80" FLOOR MODEL EDGE SANDER

- Motor: 1½ HP, 110V/220V, single-phase, TEFC
- Precision ground cast iron table size: 22" x 10½"
- Table tilt: 60° - 0° - 60°
- End table size: 4¼" x 8"
- Belt speed: 1800 FPM
- Belt tilt: 90°
- Graphite coated platen: 6¾" x 29¾"
- Approx. shipping weight: 254 lbs.

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24" DRUM SANDER

- Drum motor: 5 HP, 220V, single-phase
- Conveyor motor: ¼ HP
- Feed rate: 11 FPM
- Max. stock thickness: 4¼"
- Drum size: 6"
- Computer balanced drums
- Dust ports: (2) 4"
- Approx. shipping weight: 442 lbs.

INCLUDES A HEAVY-DUTY RUBBER CONVEYOR BELT!

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OFFER ENDS DEC. 31, 2005

14" INDUSTRIAL BANDSAW

14" BANDSAW BLOWOUT!

- Motor: 1½ HP, 110V/220V, single-phase, TEFC
- Precision ground cast iron table
- Table size: 19¾" x 14⅜" x 1½"
- Max. cutting height: 8⅛"
- Blade length: 100½"
- Blade size: ⅛" - ¾"
- Blade speed: 3000 FPM
- Extruded aluminum fence
- Dust port: 4"
- Approx. shipping weight: 215 lbs.

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BALL BEARING BLADE GUIDES INCLUDED!

G0570 ~~$695.00~~
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17" HEAVY-DUTY BANDSAW

MADE IN ISO 9001 FACTORY!

- Motor: 2 HP, 110V/220V, single-phase, TEFC, 1725 RPM
- Precision ground cast iron table
- Table size: 17" x 17" x 1½"
- Max. cutting height: 12"
- Blade length: 131½"
- Blade sizes: ⅛" - 1"
- Blade speeds: 1600 & 3300 FPM
- Dust port: (2) 4"
- Approx. shipping weight: 342 lbs.

INCLUDES ½" BLADE, FENCE & HEAVY-DUTY MITER GAUGE

G0513
REG. ~~$845.00~~
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21" SUPER HEAVY-DUTY BANDSAW
WITH TILTING GEARED TABLE

- Motor: 3 HP, 220V, single-phase, TEFC
- Precision ground cast iron table
- Table size: 29½" x 20¾" x 1⅞"
- Max. cutting height: 14"
- Blade length: 165"
- Blade size: ¼" - 1⅜"
- Blade speed: 4600 FPM
- Cast iron fence
- Dust port: (2) 4"
- Approx. shipping weight: 684 lbs.

INCLUDES 1" BLADE & QUICK CHANGE BLADE RELEASE/ TENSIONER LEVER

NEW FOR 2005!

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G0566
INTRODUCTORY PRICE
ONLY $1595.00

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20" PLANER

20" PLANER BLOWOUT!

- Cutterhead motor: 3 HP, 220V, single-phase
- Precision ground cast iron table size: 25¾" x 20"
- 2 speed automatic feed: 18 & 23 FPM
- Max. cutting height: 8⅝"
- Max. cutting depth: ⅛"
- Cutterhead knives: 4 HSS
- Cutterhead speed: 5500 RPM
- Cutterhead diameter: 3¼"
- Approx. shipping weight: 776 lbs.

Popular Woodworking TOOL BUYING GUIDE Editor's Choice

1999 WOOD MAGAZINE READER'S CHOICE TOP VALUE

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G1033 ~~$1395.00~~
CLOSEOUT PRICE
ONLY $1150.00

WHILE THEY LAST – NO BACKORDERS!

$155 shipping ANYWHERE IN LOWER 48 STATES

3 HP SHAPER

- Motor: 3 HP, 220V, single-phase
- Precision ground cast iron table
- Table with standard wing attached: 30½" x 28¼"
- Spindle travel: 3"
- 3 interchangeable spindles: ½", ¾" & 1"
- Spindle openings on table: 1⅜", 2¾", 4" & 5½"
- Spindle speeds: 7000 & 10,000 RPM
- Magnetic power switch
- Approx. shipping weight: 357 lbs.

INCLUDES MITER GAUGE & FENCE WITH HOLD-DOWN SPRINGS

G1026
ONLY $935.00

$78 shipping ANYWHERE IN LOWER 48 STATES

PROFESSIONAL SPINDLE SHAPER

- Motor: 5 HP, 220V, single-phase, TEFC
- Precision ground cast iron table size: 35½" x 28"
- Cast iron fence assembly
- Spindle travel: 3¼"
- Spindle capacity: 5"
- Spindle sizes: ¾", 1" & 1¼" x 7½"
- Spindle speeds: 3600, 5100, 8000 & 10,000 RPM
- Max. cutter diameter: 5⅞"
- Approx. shipping weight: 602 lbs.

INCLUDES CAST IRON MITER GAUGE & 4 SPRING STEEL HOLD DOWNS

G5912Z
ONLY $2095.00

$130 shipping ANYWHERE IN LOWER 48 STATES

Z SERIES

18" WIDE-BELT SANDER

- Motor: 5 HP, 220V, single-phase
- Conveyor feed motor: ½ HP
- Elevation motor: ⅓ HP
- Sanding belt oscillation: ½" – ⅝"
- Conveyor speed: 16.4, 23, 32.8 FPM
- Max. board width: 17½"
- Max. board thickness: 6"
- Min. board length: 8½"
- Min. board thickness: ⅛"
- Surface speed of drums: 3550 FPM
- Approx. shipping weight: 1008 lbs.

MADE IN ISO 9001 FACTORY!

G0527
ONLY $4195.00

$210 shipping ANYWHERE IN LOWER 48 STATES

2 HP DUST COLLECTOR
W/2.5 MICRON BAG

- Motor: 2 HP, 220V, single-phase, 3450 RPM
- Air suction capacity: 1550 CFM
- Static pressure: 11"
- Standard bag filtration: 2.5 micron
- 6" inlet has removable "Y" fitting w/ two 4" inlets
- Impeller: 12" balanced steel, radial fin
- Height w/ bags inflated: 78"
- Bag capacity: 5.4 cubic feet
- Approx. shipping wt: 123 lbs.

Popular Woodworking TOOL BUYING GUIDE Editor's Choice

1999 WOOD MAGAZINE READER'S CHOICE TOP VALUE

2000 READER'S CHOICE AWARDS

RECEIVE A FREE G3376 2 STAGE CYCLONE SEPARATOR WITH PURCHASE OF G1029Z

MADE IN ISO 9001 FACTORY!

Z SERIES

G1029Z
ONLY $295.00

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2 HP DUST COLLECTOR

- Motor: 2 HP, 220V, single-phase
- Air suction capacity: 1700 CFM
- Static pressure: 10"
- Filter capacity: 1 micron
- 6" inlet has removable "Y" fitting w/ three 4" inlets
- Heavy-duty steel intake
- Bag capacity: 5.4 cubic feet
- Sound rating: 74dB
- Dimensions: 31½"W x 37⅜"L x 71"H
- Approx. shipping weight: 155 lbs.

MADE IN ISO 9001 FACTORY!

3 HANDLE CONTROLLED FLAPPERS CLEAN FINE DUST FROM FILTER

G0548
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The C12 Cordless Drill

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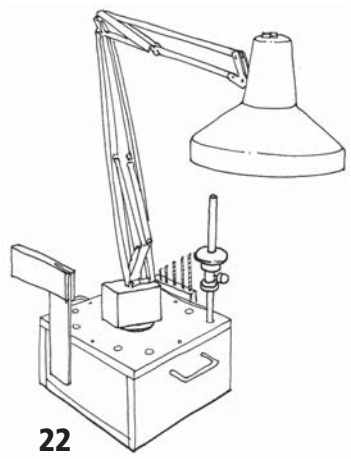
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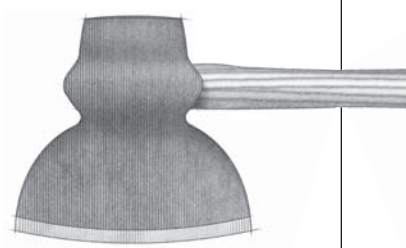
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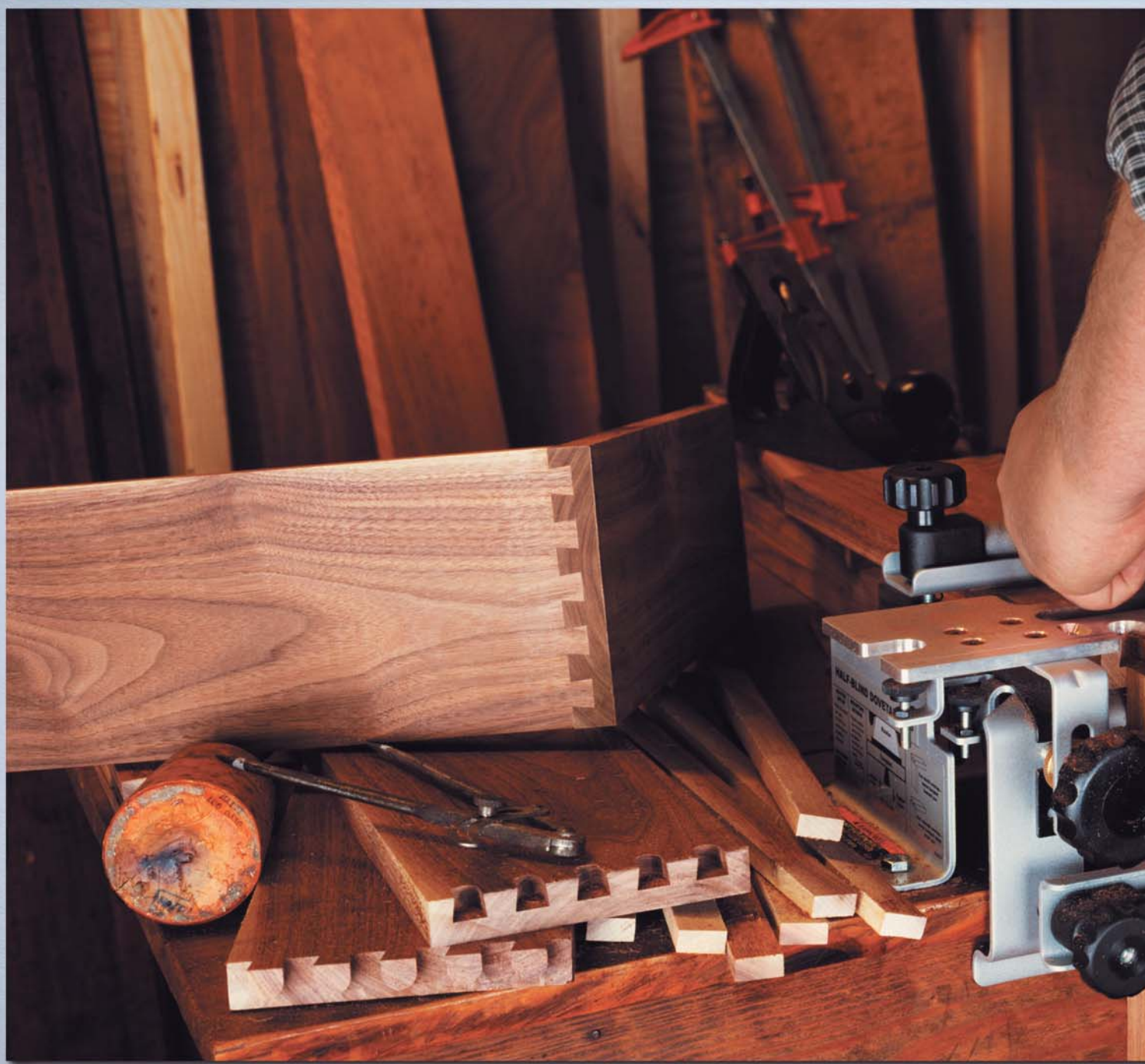

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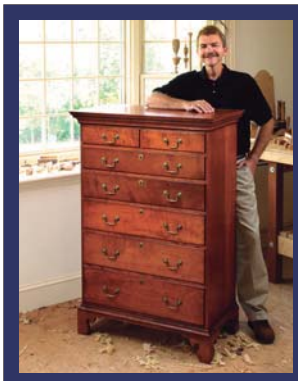


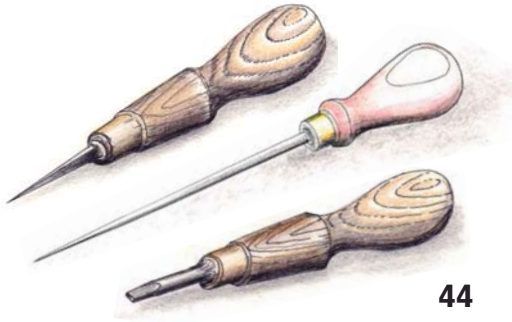
ON THE COVER

Large-scale projects often are simply boxes within boxes. Learning how to build solid, square casework efficiently is the first step to building fine furniture.

Cover photo by Al Parrish

DEPARTMENTS

PROJECTS, TOOLS AND TECHNIQUES



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CUT CIRCLES AROUND OTHER JIG SAWS.

All-metal lever-action keyless blade clamp for fast and easy blade changes.

6.5 Amp motor delivers the most power in class, enough power for the toughest applications.

Unique flush cutting blade cuts all the way to the front of the shoe.

Rubber grip provides better control and comfort in all applications.

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Eastern States Exposition
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4th Year! Ontario, CA
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SAFETY NOTE

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

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DESIGNED FOR PRACTICAL USE

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We've taken our extremely popular 10" left tilting table saw and made it even more versatile!

FEATURES: W1677EXT1

- 3 HP, 220V, single-phase motor
- Precision ground cast iron table with T-slots
- 7' long extension rails for 52" rip capacity
- Shop Fox® Classic Fence
- ⅝" arbor will also accept Dado set
- Approx. shipping weight: 474 lbs.

Includes Support Legs & Super Durable Laminate Extension Table

10" LEFT TILT TABLE SAW WITH EXTENSION KIT

We designed this 2 HP Shaper to give maximum performance.

FEATURES: W1674

- 2 HP, 110/220V, single-phase motor
- Large precision ground cast iron table: 24" x 21"
- Heavy-duty miter gauge
- ½" and ¾" spindles included
- 3" spindle travel
- Cabinet stand w/ powder coated paint
- Approx. shipping weight: 270 lbs.

2 HP SHAPER

Shown with D2057 Adjustable Mobile Base (not included)

This machine was designed for mortising ease. Super heavy-duty fence & hold-down, unique swiveling base, extra height & depth capacity and easy 2 door chuck access.

FEATURES: W1671

- ¾ HP, 3450 RPM motor
- Jacobs taper #2 spindle
- Double support columns
- ½" JT #2 chuck
- Mortises lumber to 8¾" thick
- Approx. shipping weight: 90 lbs.

MORTISING MACHINE

Adjustable Depth Stop Rod

2 HP, 10" CONTRACTOR TYPE SAW

Both Standard & Dado Inserts are included

6" JOINTER

Convenient Pedestal Mounted Controls!

26" Dual Head

DRUM SANDER

This saw is ready to rip with heavy-duty cast iron extension wings and the Shop Fox® Aluma-Classic™ Fence.

FEATURES: W1714

- 2 HP, 110V/220V, single-phase motor
- Precision ground cast iron table with T-slots
- Table size: 39⅝" x 27" (with extension wings)
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FEATURES: W1678

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Changing Editors After 11 Years and 69 Issues

Come next issue you'll find a different, but familiar, name authoring this column as Christopher Schwarz takes the helm as editor of *Popular Woodworking*, a position I'm relinquishing after 11 years and 69 issues. Of course the letting go is a bittersweet event in my life as a woodworker.

But I leave with confidence that the magazine is in very capable hands and knowing my influence will not be altogether absent. While stepping down as editor, I'll remain publisher and become editorial director of this and several other magazines published by our parent company, F+W Publications.

Popular Woodworking has undergone many changes during my tenure as we've tried to publish a magazine to best satisfy your needs. Some of the changes were good; some were, looking back, a little embarrassing (ah, the "Stumpy the Reindeer" project). We published some articles that were controversial (woodworking on death row) that you didn't like at all. We've published some groundbreaking articles (the truth about horsepower ratings) and hope to do more of that in the future.

Today's *Popular Woodworking* isn't perfect, but it's far better than ever before. This isn't the boast of a proud editor, but the comments we regularly receive from you and read in the form of posted comments on internet woodworking message boards. Heck, some even say it's the best woodworking magazine published today.

If it is, and I think it just may be, it's largely due to the hard work of a loyal staff of woodworking editors and a tremendous group of regular contributors. They all share an oversized zeal for the craft; all are woodworkers first, and editors or writers second. More important than their years of experience is their continuing passion for the craft and willingness to share their knowledge with you.

We're all just a bunch of woodworking geeks and proud of it! Hanging around this gang would be no fun at all if you weren't into woodworking. Just look at the short article from the October 2005 issue about the dovetails used on Pope John Paul II's elegantly simple coffin. I mean where else would a serious discussion occur about the joinery used in the papal coffin the day after the televised funeral?

The most amazing thing about these past 11 years is that the job was never boring – there's never a shortage of subjects and there continue to be subjects that have never been covered before, or at least with our generation of woodworkers.

There are many memories that stand out when looking back, but the one that is most apropos was made by Senior Editor David Thiel when we started working on the magazine. We were setting up our new shop when we caught each other's eye, then David said, "Can you believe they're paying us to do this?" All these years later, it's been that good.

So long, be safe and keep true to your craft. **PW**

Steve Shanesy

Steve Shanesy
Editor & Publisher

CONTRIBUTORS

PAUL SELLERS

Forty years ago Paul Sellers apprenticed in woodworking and joinery near Manchester, England. In the mid-1970s he began building furniture and, in 1986, he moved to Texas and started his own furniture-making business. In 1995 he started the School of Woodworking at the Center for Essential Education in Texas (cfeeschool.com). His foundational woodworking course and comprehensive curriculum in hand-tool woodworking has helped more than 2,000 students become better woodworkers. Paul says mastering hand-tool skills and techniques is essential to fine woodworking even in the modern shop. Paul discusses one of his favorite hand tools, awls, on page 44.

PETER SIELING

Peter Sieling owns and operates Garreson Lumber Co., specializing in domestic kiln-dried hardwoods, in Bath, New York. Also a woodworker, writer and beekeeper, Peter lives in Steuben County with his wife, children, a flock of peafowl and 500,000 honeybees. A regular contributor to several magazines, Peter has written four educational books for Mason Crest Publishers on folk music, folk medicine and farm life. Our "Out of the Woodwork" column often features his humorous lumberyard tales, such as this month's on his ability to divine moisture content from wood (page 104). He also amazes his customers by levitating boards and making perfectly square freehand crosscuts.

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More Projects From Greene & Greene

Most Plans or Details are Lacking

As a woodworker, I worship at the altar of Charles Greene and Henry Greene. I have made reproductions of Greene & Greene furniture as well as pieces of my own design by using the Greene & Greene design vocabulary. I collect books dedicated to their architecture and furniture, and I have many articles from woodworking magazines detailing Greene & Greene projects.

In most cases I find the result wanting in some way (often the overall look of the piece just doesn't seem right). So I was very pleasantly surprised by Robert Lang's article in your April 2005 issue. His Ford house server reproduction is excellent. The piece looks authentic and is constructed in a practical but "true-to-the-spirit" manner. I hope to see more Greene & Greene articles from Robert in future issues.

David Mathias
Dublin, Ohio

A Better Way to Remove Rust

I have a fairly simple question that I bet you guys could answer. I live in Miami, where, as you can guess, it's very humid almost year-round. I learned early in woodworking to keep a light coat of paste wax on all my machinery (and tools) to keep them from rusting.

I recently renovated my shop and, unfortunately, all my machinery had to stay outside while the additions were being put in. This was for a period of about two weeks. With some speculation on your part, you can probably (and correctly) assume that some of my tools received rust spots, the worst of which was my table saw with its cast-iron table. I asked a couple friends what they thought I should do and they assured me that a product called Naval Jelly would dissolve the rust. Someone also said to try rubbing the rust with steel wool. Well, I tried both. When I used the steel wool, I just ended up getting exhausted with no real progress in removing the rust. I tried some Naval Jelly on an inconspicuous area and it ended up staining the metal black (to be fair, it did remove the rust). I was lucky that I tried it only in a small area, as I really don't want a black table saw. I was wondering if you could tell me how to remove the rust. Are there techniques or products that would take the rust off without staining the metal? Thanks for any help!

Craig Gelbard
Miami, Florida

The Naval Jelly does work, but as you noted, it will stain the cast iron. Here is the method that works for me:

Get a little can of "Liquid Wrench." It's a light penetrating oil developed for freeing rusted nuts and bolts. Squirt this on the rusty spots, and work it in with a Scotch Brite pad or steel wool. You should be able to see the rust come up. If the rust is very bad, let the oil sit on the top for 20 minutes to half an hour, then rub with the pad again.

This will leave you with a dirty oily mess on the cast iron. Take some baby powder (make sure you get the kind made from talc, not the kind made with cornstarch) and sprinkle it on top of the oil. Let that sit for 15 or 20 minutes, and then wipe it off the surface with a rag. The talc will absorb the oily residue, and leave a slick surface on the cast iron. You might need to repeat these steps a couple times.

The talcum powder also offers decent protection for the top: sprinkle it on the surface, and let it sit for a few minutes to absorb moisture in the iron. Remove the excess by dusting it off with a rag. It gets into the pores of the cast iron, and it leaves a bit of a film.

If you ever have to store or leave your tools outside again, try smearing a thick coat of wax on the tops beforehand. This should help prevent moisture from getting to the iron.

— Robert W. Lang, senior editor

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What Wood Should Western Woodworkers Use for a Workbench?

Your magazine's web site has a downloadable plan for a workbench that I'm interested in building. (I believe this plan is similar to one you presented in a previous issue of the magazine.) The plan calls for Southern yellow pine, which is not stocked in my area. Would Douglas fir be a suitable alternative to the pine? My general feeling is that Doug fir is a little soft, and maybe a little sappy for a workbench, but I'd like to get your opinion.

Greg Long
Corvallis, Oregon

I've built several benches using Southern yellow pine and have been satisfied with it. However, the trick to choosing your wood isn't to worry about the particular species, but instead to focus on the properties of local woods that would be suitable for a bench. You need a wood that is stiff, dense, dry and inexpensive.

By every measure, yellow pine is tougher and stiffer than Douglas fir. Fir might be OK for a bench, but before you go forth, I'd investigate woods in your area that are similar in strength to yellow pine, including larch, oak, maple, ash, birch and beech. All of those species are excellent benchtop material.

— Christopher Schwarz, executive editor

On Norm and Nomenclature

As a follower of Norm Abram's work with wood from the days of the "Boston Old House," I enjoyed the additional background information in the August 2005 issue.

While Steve Shanesy commented on Norm's New England "drawr-ings" (possibly due to an "r" that fell out of some "draw?"), he didn't comment on his contribution to the demise of the verb "to drill." Why is it that every hole that he makes is "pre-drilled?" The only kind of fastener that goes into place as the hole is drilled is the drill-tipped sheet metal screw. For everything else, a drill bit must make a hole and be withdrawn before the fastener goes in; thus the "pre" is superfluous.

There is a perfectly good use of the word root as an adjective, however. Sometimes a hole must be drilled before parts are assembled in a way that will make the use of a drill impossible later. When the fastener is inserted at this later stage of assembly, it is correct to say that it goes into a "pre-drilled" hole, i.e. one drilled at some earlier time. However, languages being changing things, I suppose there will be more people who repeat this unnecessary prefix. At least it isn't like "nucular!" **PW**

Milford Brown
El Cerrito, California

WRITE TO US

Popular Woodworking welcomes letters from readers with comments about the magazine or woodworking in general. We try to respond to all correspondence. Published letters may be edited for length or style. All letters become the property of *Popular Woodworking*. How to send your letter:

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Are Dados A Good Joint for Casework?

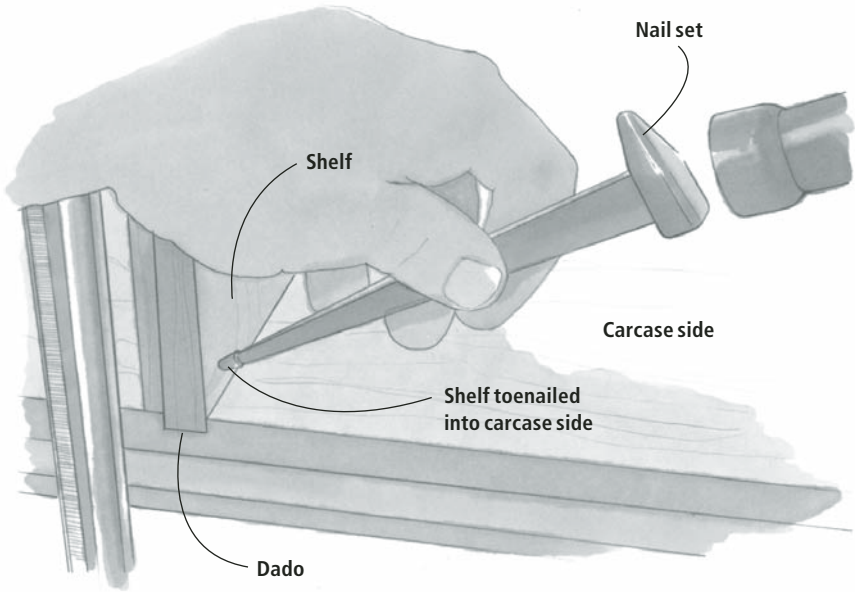

Illustration by Hayes Shanesy

Are Dados Alone a Strong Enough Joint for Bookcase Construction?

I'm in the beginning stages of a solid-wood bookcase with doors. It has solid-wood shelves joined to the case's sides with dados.

As I research traditional joinery for Arts & Crafts-style cabinet and bookshelf pieces, I'm seeing that the joinery for solid-wood casework is almost always simple dados.

What are your thoughts on this method of joining solid wood? It seems to me that a dado joint gives you virtually zero long-grain-to-long-grain glue surface in solid-wood carcase assembly. The piece I'm making is almost all solid wood except the back. I'm interested in this piece specifically but also the overall philosophy with this method of joinery.

I'm debating several options: biscuits, screws, sliding dovetails, and simply to quit worrying about this and regard it as an acceptable method of joinery.

Kevin Bradley
Battle Creek, Michigan

Dados alone stink. They have no strength against wracking forces. Every long-grain surface of a dado is mated to an end-grain surface, so glue alone is weak. These joints need to be reinforced for when the glue fails – and it will. Sometimes, the face frame of the cabinet will keep the case together. But not all projects have a face frame.

So for reproduction pieces, I use cut nails toenailed through the shelf and sides through the underside of the shelf – a historically correct way to go about it. Sliding dovetails are another option. They offer a mechanical interlock, though they can be fussy to execute.

For more modern projects, I use dados with pocket screws driven into the sides through the underside of the shelves. Screws alone and biscuits alone don't provide the same resistance to shear forces (gravity). So my advice is to use a combination of dados, glue and some sort of mechanical fastener that's concealed. This provides strength against gravity, wracking and time.

— Christopher Schwarz, executive editor

What Sanding Grits Should I Use When Power Sanding Plywood?

I need to sand a chest built out of plywood. The problem is, because the face veneer is so thin, I don't know what sandpaper grit to start with and end with. Can you help?

Trevor Anderson
Bronx, New York

For solid wood, #80 grit is a good place to start, ending up with #220 grit. Most plywood veneers have been sanded after manufacture, so the initial #80-grit sanding that you might do on solid wood isn't necessary.

Power sanding with plywood is always something to be careful with and I'd recommend no coarser than #120-grit paper to start, moving up to #220 grit for a final finish. Take it easy on the edges of the sheet where it's easiest to roll the sander a little and burn through the veneer. If you're hand sanding, then you're still OK with the grits mentioned.

— David Thiel, senior editor

How Long a Piece of Wood Can My Powered Jointer Handle?

This question seems almost dumb to me, but I can't seem to get this straight in my head.

Recently I had to glue up some long boards to make long 3" x 3" square posts for a bed. I have a 6" jointer, and when jointing the stock, I seemed to have a problem with truing some but not all of the pieces. And so I started thinking about stock that is longer than my jointer's infeed table.

If I have a bow in the stock and the back edge isn't even on the jointer's table yet, isn't that going to cause the stock to raise up while I'm passing it over the knives? Is there a "trick" to flattening stock longer than your jointer's infeed table, or is this something that just can't be done? Would extending my infeed table with carefully placed medium-density fiberboard extensions help, or am I missing the whole function of the machine?

Rick Schuster
Coraopolis, Pennsylvania

The length of the bed absolutely controls the accuracy of your jointing. The rule of thumb is that you should be able to joint boards that are as long as your machine's infeed and outfeed tables combined. Most cabinet parts are shorter than 48", so it should come as no surprise that most 6" jointers have a bed that's about that length.

It's possible to true reasonably straight but over-long boards on short-bed jointers if you're careful. In general, it's best to first work on the concave face of a board. I'll remove the high spots

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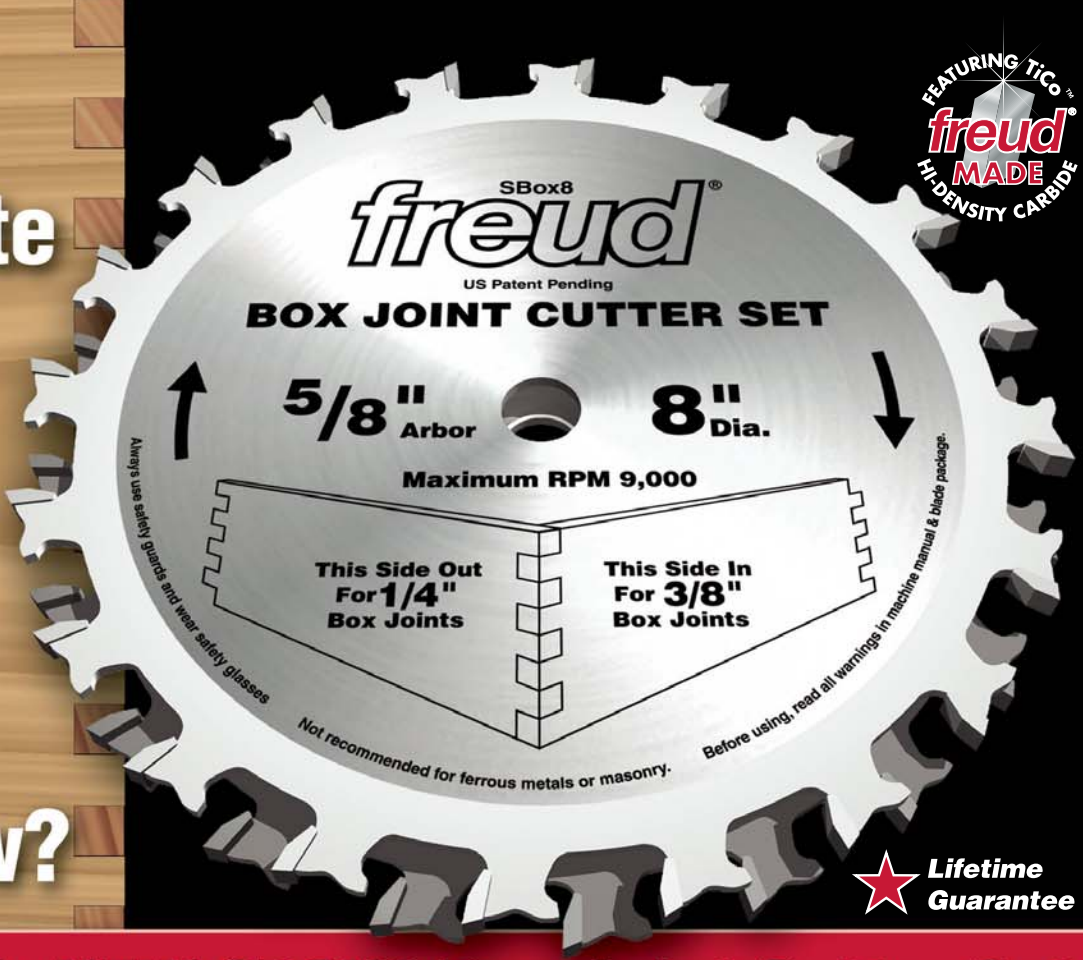
How Do You Create Flawless Box Joints On A Table Saw?



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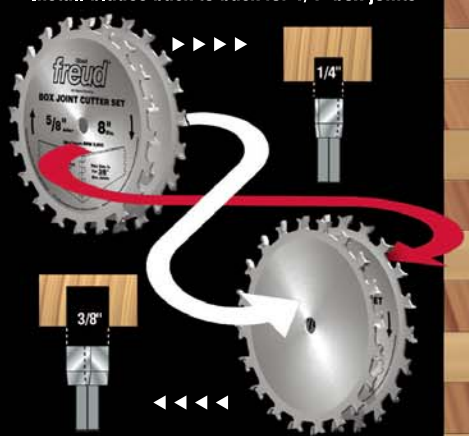

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continued from page 18

with a hand plane to get it reasonably true. And then I'll run it over the jointer.

As to extending the bed of your jointer, some manufacturers actually make bed extensions that can add 4" or so, but most do not. I've seen several woodworkers add a torsion box apparatus to the infeed table of their jointer. The problem is, it has to be physically attached to the bed because you move the bed up and down occasionally.

The best long-term solution is, of course, to buy a long-bed 6" or 8" jointer, which is what I generally recommend for people who work with solid wood a lot anyway.

— Christopher Schwarz, executive editor

Which Mortising Chisel to Buy?

I want to ask your opinion about mortising chisels. My question is this: I'm tossed between the Lie-Nielsen mortise chisels and everything else. I'm not a professional, but with some calculated saving, I like to use the same tools. And I'm only going to buy the basic three: 1/4", 3/8" and 1/2".

My mortises are usually cut with a Wood-Rat or hollow-chisel mortiser, but the stuff that I'm starting to build requires angled mortises or mortises that I'd rather either chop by hand or have to clean up by hand.

Brian Hayner
Glens Falls, New York

A proper mortise chisel blazes through wood and can do things that no hollow-chisel mortiser can. Until recently, many were poor copies of historical designs. But there are two brands I'm enthused by. The Lie-Nielsen (800-327-2520 or lie-nielsen.com) mortisers are excellent. They're technically sash mortising chisels and are suitable for cabinet-scale work. The other is by Ray Iles and is carried by Tools for Working Wood (800-426-4613 or toolsforworkingwood.com). These are nice copies of English mortise chisels. They're both higher-priced tools, but worth it.

Start with the 5/16", which is the right size for handmade mortises in 3/4" stock. Then expand the set a tool at a time as needed.

— Christopher Schwarz, executive editor

What are the Rules on Tenons For Building Large-scale Doors?

I am going to make an exterior door for my house and plan to use mortise-and-tenon joinery for the stiles and rails. The stiles will be about 8" wide, the rails about the same and the door will be 2" thick.

My question is: How big should I make the tenons? How long, how wide and how deep? Any thoughts you might have would help me out a lot. Also, I heard that you weren't supposed to glue the whole tenon, just the top half of it to leave room for any wood movement. Is there any truth in that?

Mike Lopez
Saukville, Wisconsin

The rule of thumb in both cabinetry and large-scale stuff is that the tenon thickness should be half the thickness of your stock. So 2" stock calls for 1"-thick tenons. As to the tenon's width, design the joint with edge shoulders of 1/2" to 3/4" – this will ensure you have lots of gluing surface and should protect you from blowing out the ends of your mortise walls during assembly.

As to tenon length, I would make the tenons as long as your tooling will allow for this application: 3" long should do the trick. Old doors commonly used through-tenons, and there are still a lot of these doors around today – a testament to their design.

Also, as to the gluing procedure you referenced, I would follow that procedure only with the really wide rails. The narrow rails should be firmly glued all around. Also, I would peg all the joints – double pegs in the 8"-wide rail. And ream out the lower set of holes for the pegs a bit to allow wood movement, much like in a breadboard construction.

— Christopher Schwarz, executive editor

Is There a List of Must-have Tools For Someone Who Can't Use Power Tools?

Many, many years ago when I was between 8 and 15 years old, I did a lot of minor woodworking with my grandfather. He had a full-blown shop in his basement with all the planes, files and rasps you could ever want. He also had a table saw, drill press, band saw, etc. I will be 47 in September and for a little more than a year I have been living with ALS (Amyotrophic lateral sclerosis). Often referred to as "Lou Gehrig's disease," it's a progressive neurodegenerative disease that affects nerve cells in the brain and the spinal cord resulting in muscle weakness and atrophy.

ALS affects my hands and legs. Legs aren't called on much in woodworking but obviously, hands are important. The motor functions aren't very good in either hand so picking up small objects like screws or nails is very hard for me. However, my overall strength is still OK, and because I have been asked by doctors and family not to use any power tools, (I will be getting a band saw though), I have come to rely on hand tools.

Moreover, I'm glad that I have had the chance to experience using hand tools because I find it much more interesting to try to build something this way. I believe that it is a more natural way of doing things. So I would like your advice on what hand tools I need for making boxes or small pieces of furniture.

Michael Rogen
South Salem, New York

Your question is one that is far beyond the scope of a short answer, I'm afraid. But there is good news – there are a couple out-of-print books that should help. Many good libraries have them; most libraries can get them through interlibrary loan.

They are both by Charles H. Hayward, one of my personal heroes. One is called "Tools for Woodwork." This book looks at all the hand tools you need in a shop that does hand work. It focuses on setting them up and using them.

The second book is called "The Complete Book of Woodwork." It's ideal because it gives you a long list of all the tools you need, plus a short list of the tools you really need to get started. And then this book shows you how to put all the tools into practice – how to cut mortises with chisels, how to cut tenons with saws, etc.

Even though I've been working wood since I was 8, I still consult Hayward's books just about every week. **PW**

— Christopher Schwarz, executive editor

WRITE TO US

Every day we get questions from readers on all subjects about their woodworking. Some are letters; many are e-mail messages. We are more than happy to share our woodworking experience with you by answering your questions or adding some clarity to whatever aspect of the craft you are unsure about. In addition to the hundreds we answer privately every month, we want to share the best questions here with readers.

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Lamp Caddy a Brilliant Idea

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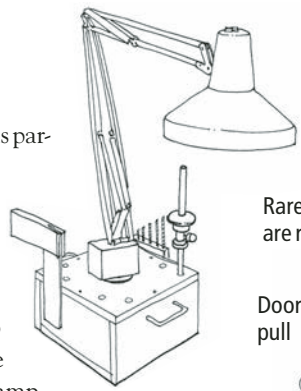
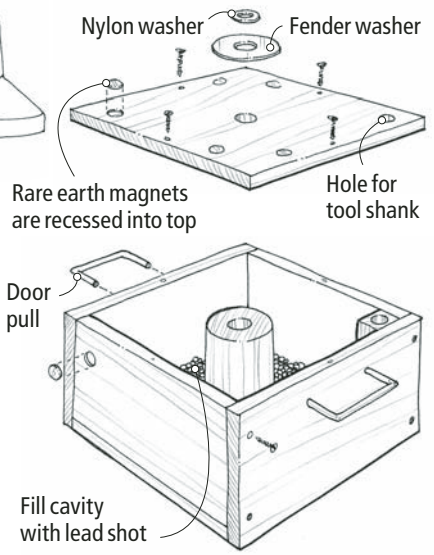


In woodworking, light is particularly important for the quality construction of projects. Gooseneck lamps are a good lighting choice because they're cheap and adjustable. These lamps come with a clamp for mounting, but they're neither convenient nor mobile. I found that a better approach was to build portable light pedestals that could easily be moved where needed.

At its most basic, each of my three pedestals is nothing more than a 3"-high, 6"-square box made from ½"-thick wood screwed together. A drilled dowel glued to the center of the bottom panel accepts the light post, while handles on the sides make for easy mobility. The interior cavity is filled with lead shot for stability. I added a fender washer and nylon washer on top of the post hole for better swiveling, and a layer of felt on the bottom to protect table surfaces. I decided to make the pedestals even more useful by festooning them with rare earth magnets epoxied into recesses to keep a variety of squares, rulers and other instruments within easy reach. You can also drill out sections of the box to accept round tool shafts and bits.



Bob Lloyd
San Clemente, California

continued on page 24

CASH AND PRIZES FOR YOUR TRICKS AND TIPS!

Each issue we publish useful woodworking tips from our readers. Next issue's winner receives a set of three bevel-up planes from Veritas. This set offers maximum versatility with a low angle jack, smoother and new jointer, all using the same blade size. Optional blades allow you to easily switch bevel angles. This gives the planes the cutting-angle capability of six additional planes. This set is worth $600.

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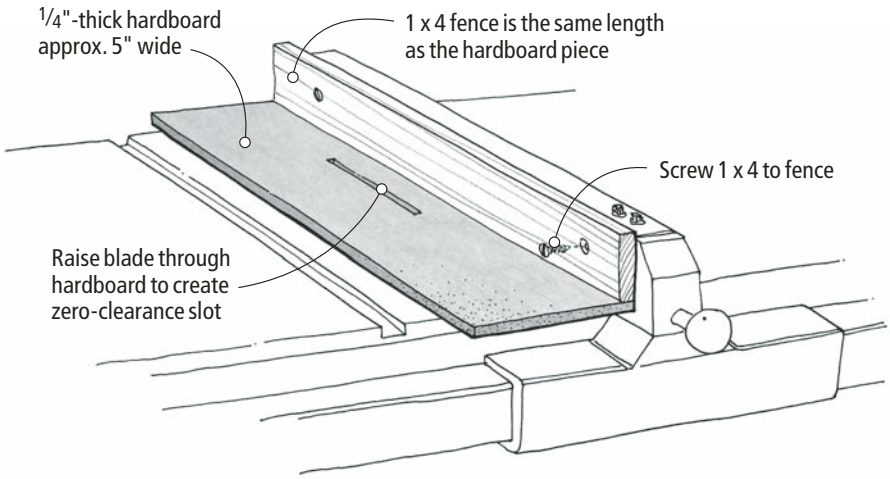
A Zero-clearance Fence Attachment

While trying to rip small strips of moulding recently, I realized that I needed to make a zero-clearance throat plate to prevent the small strips from falling into the saw. However, I discovered that even a piece of 1/8"-thick plywood was too thick to replace the thin metal insert that came with my $200 benchtop saw.

To solve the problem, I decided to make a zero-clearance overlay board that could be attached to the rip fence. I began by cutting a piece of 1/4"-thick hardboard roughly 5" wide by 20" long to serve as the overlay piece, which I screwed to the edge of a 1 x 4 about the same length. To set up to cut the moulding, I combined the thickness of the 1 x 4 with the desired width of my moulding strips, then set my rip fence to that measurement. After screwing the 2 x 4 to my rip fence, I raised the spinning blade up through the hardboard to the appropriate height. I was now able to safely and accurately rip the strips I needed.

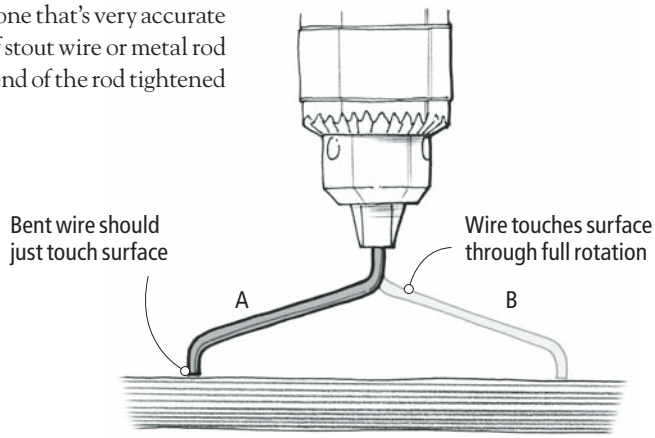
Heath Huskey
Batavia, Ohio



Squaring a Drill Press Table

Most drill press tables are designed to tilt for drilling angled holes. However, for most holes, we want the bit oriented exactly perpendicular to the table. Although you can place a small square on the table for this purpose, it can be troublesome to accurately sight the blade of the square against the flutes of a drill bit. An easier method – and one that's very accurate – is to bend a piece of stout wire or metal rod as shown. With one end of the rod tightened in the chuck and the other end extended toward the perimeter of the table, squaring up is a simple matter of making sure the rod just touches the table at every point during its rotation.

Joe English
St. Louis, Missouri



Jigging your Memory

I used to find that when I would pull out a jig that I hadn't used in a while, I would often forget exactly how to use it. In spite of notations on the jig itself and an unjustified confidence in my memory, I too often found myself scratching my head during subsequent uses. Fortunately, memory is actually pretty cheap and convenient in these days of pocket digital cameras. I grab mine to take a shot or two of the setup and process, printing out and filing the pictures either near the jig or in a reference folder. The nice thing about self-printed photos is that you can print them at any size you like and easily make all kinds of notations on them. (Now if I could just remember where I put that camera ….)

Albert Moody
Charleston, West Virginia

A Better Way to Prep for Water-based Finishes

Anyone who uses water-based finishing products knows that they can adversely raise the grain of the wood when they're applied. So it's important to "pre-raise" the grain with clean water before applying the finish. But there are a couple tricks to doing this preparation successfully.

After sanding the wood to #220 grit, wipe it with a wet sponge that's not damp, but not soppy either. It's best to use distilled water, as the chemicals in tap water can cause tannin-rich woods such as oak to discolor. After letting the wood dry, sand it again with #220-grit paper. But this time, begin by sanding very lightly diagonal to the grain. This will help cleanly cut off fibers that might otherwise simply be pressed down into the wood pores, only to rise again when the water-based finish is applied. Follow the diagonal sanding with light sanding strokes parallel to the grain to remove any diagonal scratches. Now thoroughly remove any sanding dust with a brush, tack cloth or compressed air, and you're ready to apply your finish.

Steven Silvan
Fargo, North Dakota

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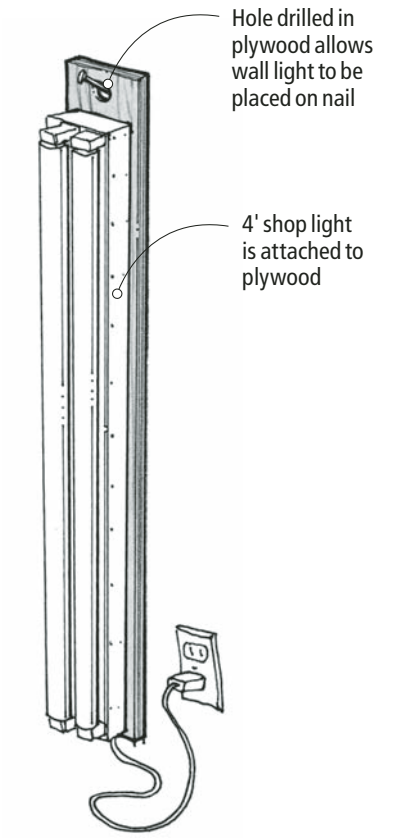
Shop Wall Lighting

My former shop was in a garage with plenty of windows for great lighting. However, I recently moved into a basement shop, and even with a dozen 4'-long fluorescent fixtures on the ceiling, I really missed the light I had in my garage. I realized that I particularly missed the side light coming in from the windows. So, I decided to hang double-tube fluorescent fixtures vertically on the wall to compensate. What a difference it has made! I like it so much that I added more, and a woodworker friend has decided to do the same thing in his basement shop.

Because I was initially not sure I would like the result, I screwed the fixtures onto boards that I hung on nails on the wall. That way, I could easily screw the boards to the ceiling should I choose to later. But, as it is, I keep them hanging on their nails on the wall. This also allows me to move them from one place to another if necessary to provide better light in one area, or to adapt to a different shop setup.

Serge Duclos
Quebec, Canada



Monitoring Dust

After unplugging my dust collector for the second inspection in a matter of hours, I started to think about a way to see if the drum is full at a glance. The problem is that my dust collector empties into a cardboard drum which, when full, causes the system to clog up, making a real mess. But there is no way to monitor the drum's status without popping off the lid. So what to do?

Well, I cut a vertical slot in the side of the drum about 1" wide and 6" long, starting just below the drum's rim. Then I took a piece of 1/16" x 4" x 8" clear, thin, acrylic plastic and pop riveted it over the slot, sealing the edges with silicone caulk. Now I can monitor the level of the chips inside the drum without having to shut everything down. So far, no more clogged system.

Ken Burton
New Tripoli, Pennsylvania

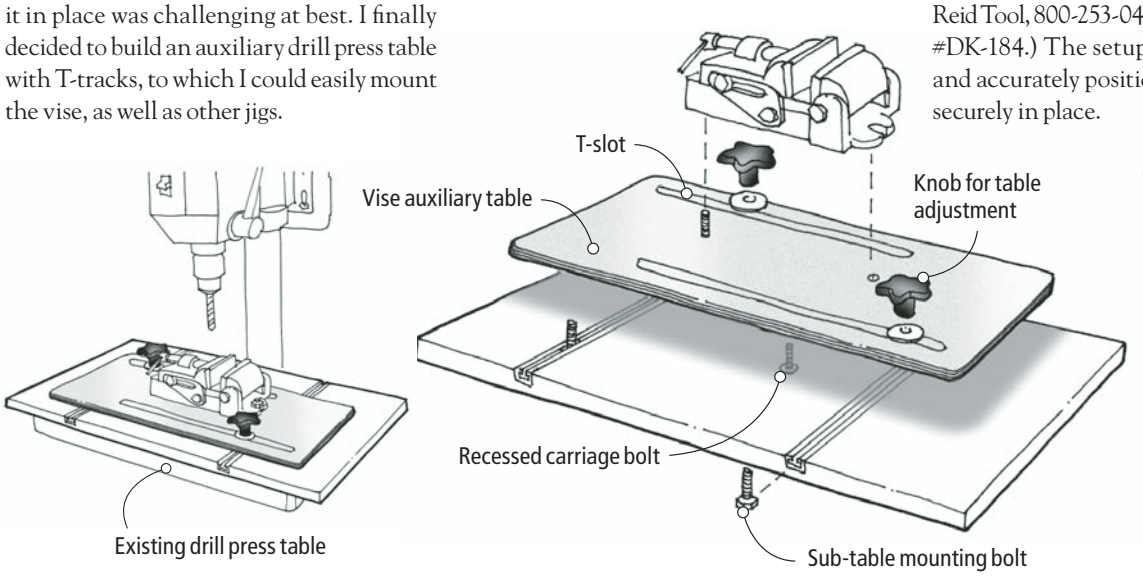
Drill Press Vise Platform

A long time ago, I bought a good quality machinist's drill press vise at a yard sale. I used it many times throughout the years, but it was almost impossible to secure it to my drill press table. The mounting slots didn't match up with the slots on my table, and clamping it in place was challenging at best. I finally decided to build an auxiliary drill press table with T-tracks, to which I could easily mount the vise, as well as other jigs.

My vise measures about 3 1/2" x 8", with 2 1/2"-wide jaws that open 2 1/2". I mounted it in the center of a 1/2" x 7" x 16" plywood panel using carriage bolts whose heads were recessed in counterbores on the underside of the panel. Next, I routed a 5/16"-wide x 9"-long slot near each edge. A 1/4-20 hex bolt passes through each slot, with the head of the bolt riding in the drill press table's T-track and a low-profile hand knob and fender washer on the other end. (Knobs are available from Reid Tool, 800-253-0421 or reidtool.com, item #DK-184.) The setup allows me to quickly and accurately position the vise and hold it securely in place.

Craig Bentzley
Chalfont, Pennsylvania

continued on page 28



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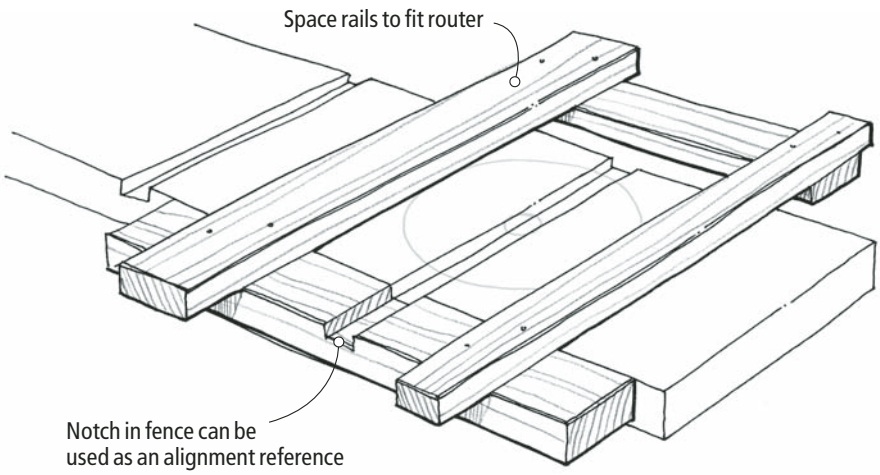
A Double-rail Router Guide

When routing dados across a board using a straight bit, it's usual to clamp on a guide rail, often as part of a T-square. This is fine as long as you keep the router base tight against the guide, and don't let it get diverted by a flaw in the wood or by a momentary distraction.

To make sure my router doesn't wander, I made a double-rail guide. The two rails are spaced to suit my router base, and are longer than the widest board I expect to use. After the first cut has been made through the front fence, the notch can be used as an alignment reference for subsequent cutlines. If you like, you can also space the guide bars far enough apart to make a wide dado with two passes of a narrower bit.

Percy Blandford
Stratford-upon-Avon, England



Preserving a Brush with Help from the Kitchen

I use lots of epoxy and solvent-based varnish for boatbuilding as well as various other woodworking projects. Rather than discard brushes, I used to clean them thoroughly with the appropriate solvent immediately after use to prevent them from hardening, especially with epoxy. Unfortunately, this can be nearly as expensive as simply buying new brushes every time.

Recently, I discovered that a brush can be preserved for repeated use by storing it in a plastic Ziploc bag in the freezer. Freezing it prevents the heat necessary for the epoxy to cure, and it prevents solvent-based varnish from hardening as well. Now I can do a small job the next day after letting the brush thaw to room temperature and squeezing the excess epoxy or varnish from the bristles. Of course, it's important to freeze an epoxy-laden brush quickly before the stuff starts to harden, but that's not a problem with many small repairs.

Arthur Lyndaker
Red Lake, Ontario

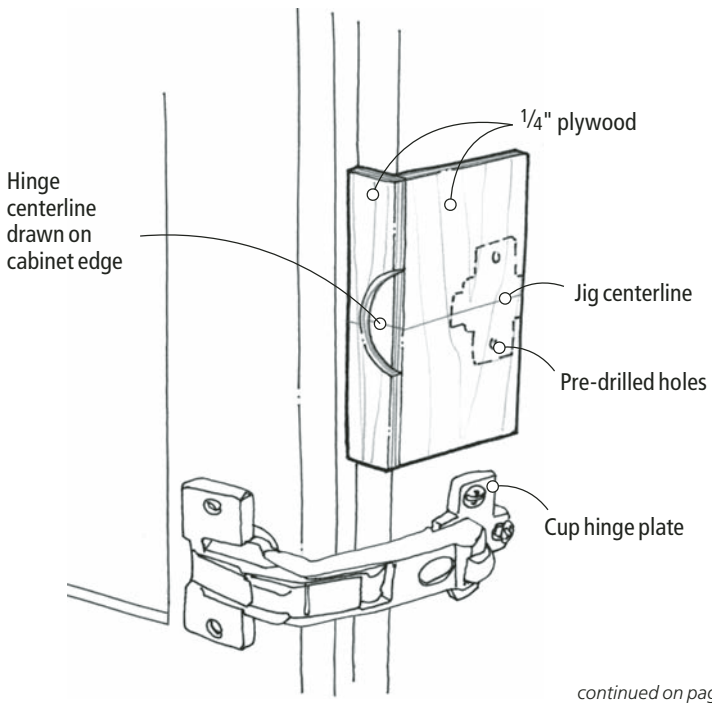
Locating Cup Hinge Plate

When using cup hinges for frameless cabinetry, I begin by drilling mortises in the backs of the doors for the cups. I do this on the drill press using a fence with stops for efficiency and accuracy. After installing the cup half of each hinge, I install the hinge plate on the cabinet side. I've found that using a jig to lay out the screw holes for the plates speeds things up and ensures accurate placement.

The jig consists of two pieces of 1/2"-thick hardwood plywood glued together at a 90° angle. One piece has been drilled out to properly locate the plate's screw holes using an awl. The scalloped cutout in the other piece allows alignment with hinge centerline markings made on the edge of the case sides. It's quite easy to make.

To construct the jig, first install a test hinge to determine the distance that a hinge plate should sit back from the edge of the cabinet side. Then drill the screw holes in the jig at the exact distance back from the front edge. To use the jig, first mark the centerline for each hinge on the cabinet. Then align the centerline on the jig with each marking, and insert an awl to locate the screw holes.

Ann Tonipol
Memphis, Tennessee



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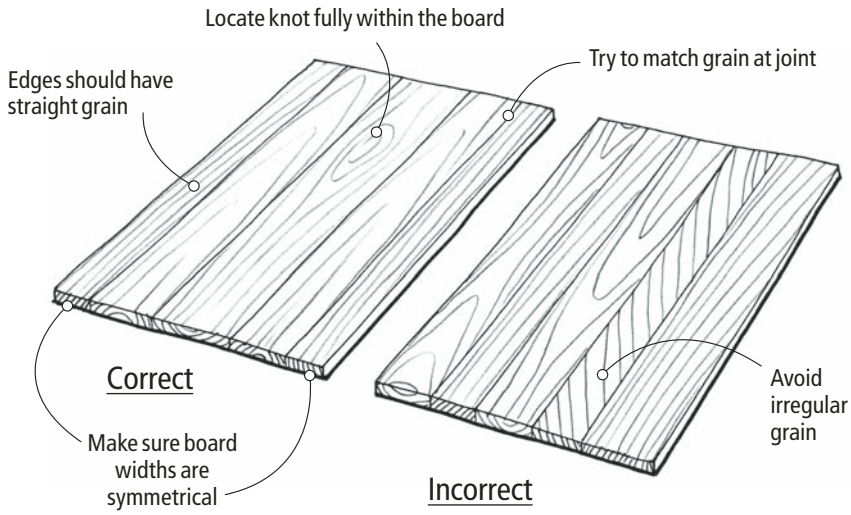
Composing Grain for Panels

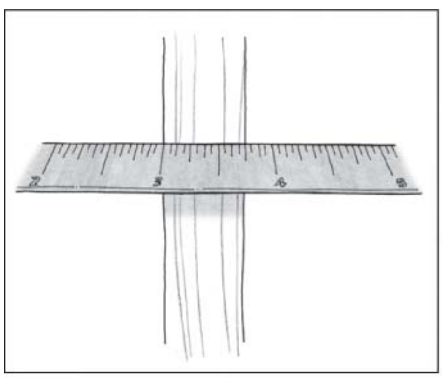
When edge-joining boards to make panels for tabletops or solid-panel doors, the composition of the grain can make all the difference between a truly attractive panel and one that's visually disturbing. When laying out the boards initially, work with pieces that are somewhat oversized in length so that you can slide them along each other to create as uninterrupted a grain pattern as possible along the joints, and as consistent a color match as you can. The guidelines shown in the drawing are suggestions. Rip, flip and slide the boards in whatever fashion is necessary to get the look you desire.

Paul Anthony
Riegelsville, Pennsylvania



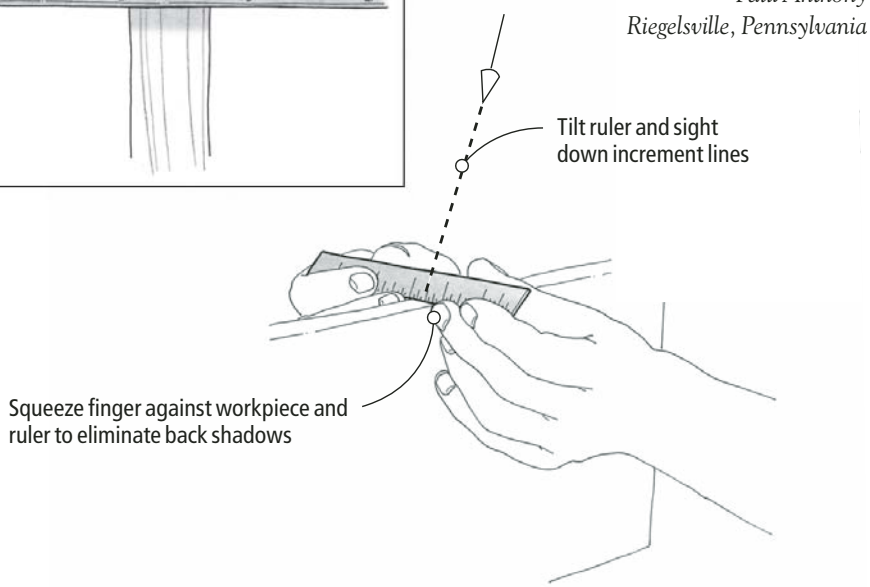
Fine Points for Fine Measurements

One of my most frequently used tools is my 6" pocket rule. Because of its precision and finely marked increments, I rely on it constantly to ensure accuracy of my joints and workpiece dimensions. In striving for maximum accuracy when using it, I've learned to employ a few helpful ruler-reading tricks.



First of all, whenever possible, read a dimension between increments rather than from the end of the ruler. Also, angle the ruler up on its edge to better sight down the increment line and to reduce parallax error due to the ruler's thickness. When measuring the thickness of a board, back up the ruler and workpiece by squeezing a fingertip into the junction where they meet, thereby eliminating any shadows that may contribute to error. Just as important, make sure to take full advantage of available light, orienting the workpiece and ruler toward a window or strong light, or bring a light to the work if necessary.

Paul Anthony
Riegelsville, Pennsylvania



Measuring Circumference

Sometimes you need to measure the circumference of an item such as a V-belt or cylinder. Or you might need to lay out evenly spaced mortises around a turned table post to accept the feet. Unfortunately, it's pretty difficult to measure cylindrical shapes using rulers or even tape measures. The trick is to wrap the item with masking tape, overlapping the starting point. Then knife through the overlap, remove the tape, and measure it to determine the circumference, or mark it for your desired spacing, then reapply it to the workpiece to transfer the markings.

Roger Dubois
Dudley, Massachusetts

Cutting Curls

Curly wood is inclined to tear out when planed. To minimize this, wet the wood first by sponging it with water, then let the water soak in for a minute or so before feeding the board through the planer. For best results, take light cuts for your final few passes through the planer. Beware of using tap water on tannin-rich woods like oak, as chemicals in the water can discolor the wood. Distilled water is a safer bet. **PW**

Shirley Church
Memphis, Tennessee

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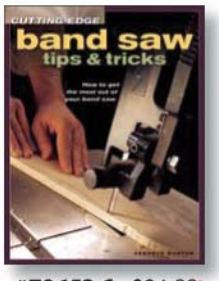

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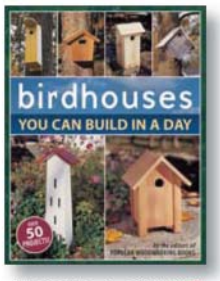

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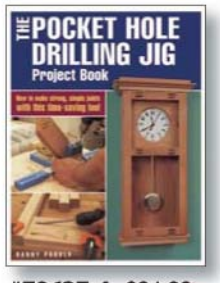

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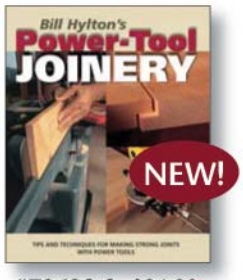

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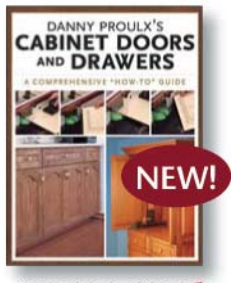

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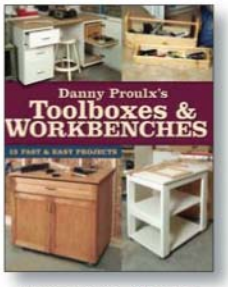

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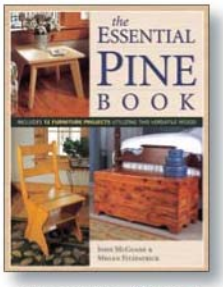

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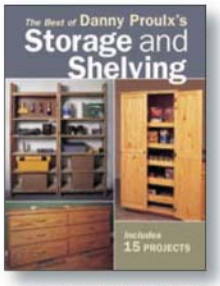

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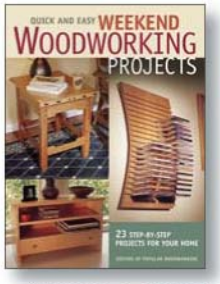

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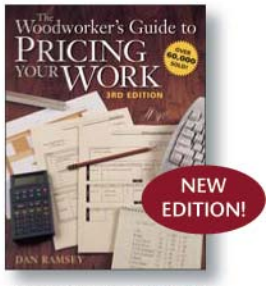

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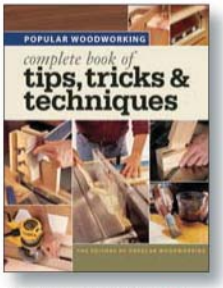

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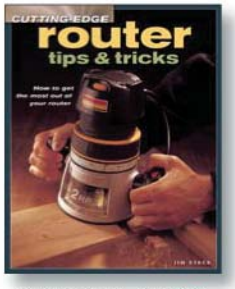

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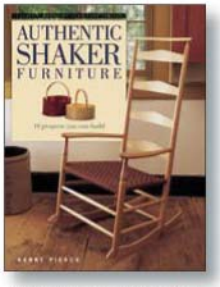

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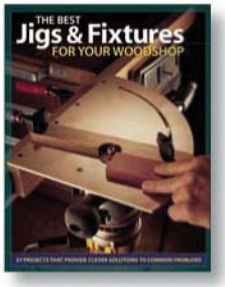

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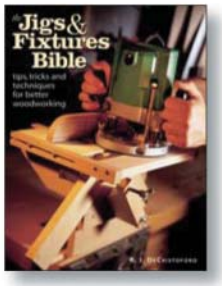

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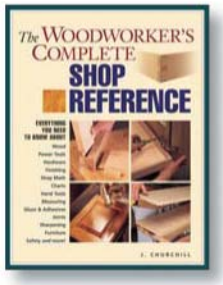

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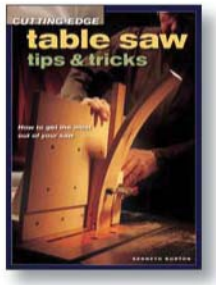

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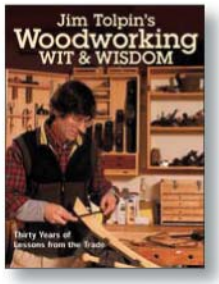

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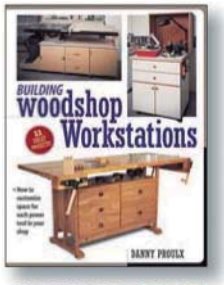

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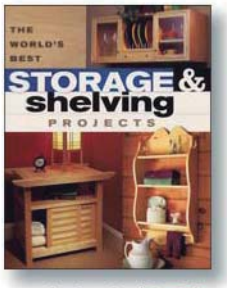

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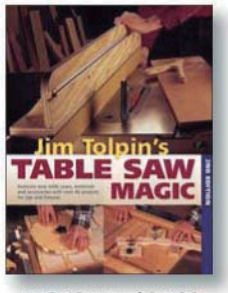

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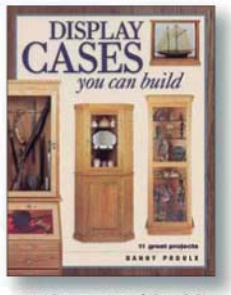

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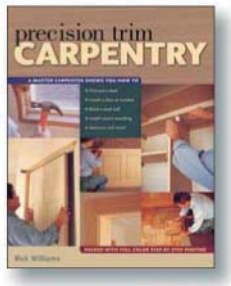

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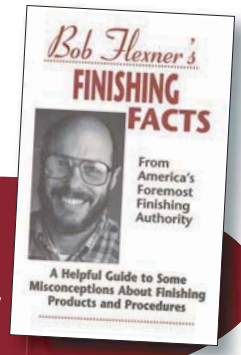

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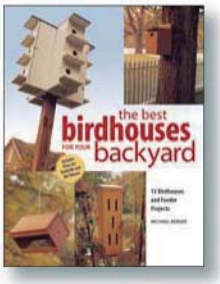

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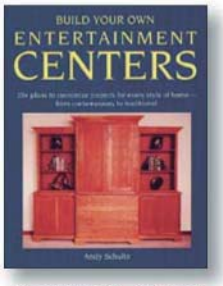

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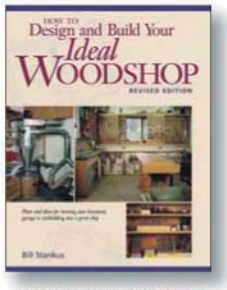

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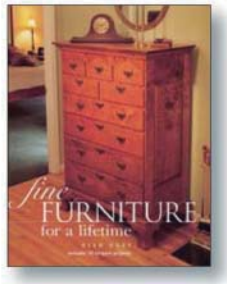

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Traditional English Mortising Chisels from Ray Iles

Most modern mortising chisels these days are poorly ground, misshapen and uncomfortable to use. It's no small wonder that we've invented many ways to get around using these difficult hand tools.

So I was particularly pleased when I learned that Ray Iles had begun making traditional English mortising chisels in the style that graced the tool chests of 18th- and 19th-century woodworkers. These chisels are something quite extraordinary.

They're massive (the 3/8" weighs more than 13 ounces) so the tools motor into the wood. The handles are oval and tapered side-to-side and front-to-back, so you always hold the chisel in line with your work. The blades are slightly pyramidical shaped in cross-section, so the tool is easy to remove after you drive it into the wood. And finally, Iles chose to use an exotic steel, D2, which promises to be tough and durable.

The D2 is indeed tough – a blessing and a curse. It took some extra time to flatten the backs and sharpen the secondary bevel (a steep and durable 35°). But once sharpened, they held an edge longer than my high-carbon and A2 mortising chisels.

The fit and finish on these tools is quite good. The handles are well-fitted to the blades. The backs were nearly flat out of the box (almost as good as a Lie-Nielsen) and all the details of the tools help justify the chisels' premium cost.

Once you use one of these old-school chisels, you're unlikely to switch back. Thanks to their weight and beefy handle (which endures hard blows), the tools dive through difficult woods such as white oak. And because you're not tied to a jig or a machine, your mortises can be at any angle and anywhere you can reach. It's a liberating experience to use one. If you want to try one tool, buy the 5/16". I think you'll be hooked. — *Christopher Schwarz*

For more information, circle #179 on Free Information Card.

SPECIFICATIONS

Ray Iles Mortising Chisels

Street price: $53.95 to $97.95 each
Sizes: 3/16", 1/4", 5/16", 3/8", 7/16", 1/2"
Handles: Beech
Blades: D2
Performance: ●●●●●
Price range: $$$$$
Tools for Working Wood: 800-426-4613 or Toolsforworkingwood.com

JDS Dust Gate Switches Dust Collector

Even in a small shop, traipsing back and forth to the dust collector to turn it on and off can be a nuisance. Sometimes, laziness rules and the collector won't get switched on at all – the "I only have a small cut to make syndrome."

JDS Co. has packaged a clever, inexpensive and easy-to-install device that will save you shoe leather and time; and it will end the excuses for not switching on your dust collector every time. Simply stated, this low-voltage rig moves the collector's on/off switch from the collector itself to the dust gate, which regulates air flow to your machine. Open the blast gate and on goes the collector; close the gate and it shuts off. You can connect multiple gates together so each one regulates the collector.

The setup couldn't be more simple. Mount the system control box near your dust collector. Install a JDS Dust Gate then connect the two gate wires to the length of 22-gauge wire provided, run the connecting wire to the control box and connect the wires to the two wire terminals on the controller. Polarity isn't important so any connection will work fine. Next, unplug the dust collector and plug in the control box in its place. Lastly, plug the dust collector into the control box. Done. Additional blast gates are added by simply splicing those switch wires into the existing gate wires.

JDS offers control boxes for either 110-volt collectors up to 1.5 horsepower, or 220V for up to 3-hp dust collectors. All JDS Dust Gates are well-made metal units that fit standard 4" rigid dust collection pipes or 4" hoses. The 110V Start-Up Kit includes the control box, one blast gate, wire connectors and 100 feet of low-voltage wire. It sells for $53.99. The 220V version is $62.99. The available expansion kit includes two Dust Gates, wire connectors and 100 feet of wire. It sells for $35.99. — *Steve Shanesy*

For more information, circle #180 on Free Information Card.

SPECIFICATIONS

JDS Co. Dust Gate

Street price: $53.99 110V/$69.95 220V
Includes: Controller box, electronic dust gate, 100 feet low-volt wire, connectors
Performance: ●●●●●
Price range: $$$$
Company: 800-480-7269 or jdstools.com

Amana Carbide Countersinks

While using screws on a woodworking project may not be fine woodworking, it happens all the time. To improve the look of those screws, a good countersink and plug cutter help a lot. To make things even easier, I prefer a combination pilot drill/countersink bit. But countersinks can dull quicker than I like. That's why we were excited to hear that Amana is now offering carbide countersinks.

The combination bits are sold either separately, or in a set as shown here with a plug cutter included. The countersinks are carbide for extended life, while the bits and plug cutter are high-speed steel.

Carbide does make a difference. These countersinks cut through the wood so efficiently that I actually had to pull back a bit to keep from drilling too deep, which is a pleasant change from pushing my old countersinks.

While a bit more expensive (pun intended), these bits cut quick and smooth the first time, and for many more times to come.

— David Thiel

For more information, circle #181 on Free Information Card.

SPECIFICATIONS

Amana PS-500 Countersink Set
Street price: $90
Sizes included: 1/8", 9/64", 5/32" and 11/64", plus plug cutter
Performance: ●●●●○
Price range: $$$$$
Amana Tool: 800-445-0077 or amanatool.com

KIK Forstner Bits

Woodworkers need a good set of Forstner bits. Designed to cut clean, flat-bottomed holes, they're very handy to have in the shop. If you want a Forstner that goes a step further – look to KIK Forstners from TG Tools.

These Forstner bits are designed to cut in any direction while a standard Forstner requires fairly straight-on pressure. The nine cutting edges found on the KIK bits (as opposed to four) make this possible. In addition, these bits have a thin shaft to allow boring angled or shaped channels – which is handy if you're running any through studs.

From a woodworking point of view, the bits cut fairly well (I wasn't blown away by the speed, but they did alright) and the design does provide excellent waste removal. This is a real advantage over standard Forstner bits, which clog easily. The cutting edges can be touched up with a standard file or sharpening stone. While these specialty bits aren't for everyone (the price is steep for steel bits), if you have the need, these are the bits.

— DT

For more information, circle #182 on Free Information Card.

SPECIFICATIONS

KIK Forstner Bit Set
Street price: $74.99
Diameters included: 3/8", 1/2", 5/8", 3/4", 13/16", 7/8", 1", 1 1/4"
Materials: Steel, titanium nitride coating
Performance: ●●●○○
Price range: $$$$$
TG Tools: 800-687-4122 or mytgtools.com

THE RIGHT ANGLE TOOL

I have a right-angle cordless drill and I really need it about once a month. Unfortunately, because it's used infrequently, it usually doesn't have a charged battery when I need it. Milwaukee came up with an accessory that makes more sense to me.

The Right Angle Attachment accepts 1/4"-hex drive accessories (for drilling or screwing) and with just the screw tip it measures only 2 1/2", allowing you to get into really tight places. This accessory will fit any make of corded or cordless drill and is rated up to 235 in./lbs. of torque.

The attachment is of all-metal construction and is equipped with an offset handle that can be locked in 48 different positions for the best support during use. It's always a little tricky to support the back of a right-angle drill once it's slipped into the tight work quarters, but this handle adds the extra oomph you need.

Priced between $45 and $65 (look for sales!), it's not inexpensive, but it's still less than a right-angle drill (about $150) and it never needs a charge.

The Right Angle Attachment is available from a number of catalog sales companies and a number of internet retailers including Tyler Tool Co. (item #49-22-8510; shop.store.yahoo.com/tylertool). For more information about this handy drill accessory for your shop, contact Milwaukee Electric Tool at 800-729-3878 or milwaukeetool.com.

—DT

TOOL RATINGS

Performance is rated on a one-to-five scale. You won't see a low rating ("one or two") because we don't publicize inferior tools. "Five" indicates the leader in the category. Five dollar signs indicates the highest price in the category. Three indicates an average price. If you have tool questions, call me at 513-531-2690 ext. 1255, or e-mail me at david.thiel@fwpubs.com. Or visit our web site at popularwoodworking.com to sign up for our free e-mail newsletter.

— David Thiel, senior editor

Dovetail Square Adds Accuracy to Marking Joints

Hand-cut dovetails can be tricky at first, so anything you can do to eliminate marking errors will improve your joints.

One of my favorite marking tools for dovetails is the Woodjoy Precision Dovetail Template. This simple and elegant layout tool allows you to mark both the straight and angled lines of a dovetail joint with one square. Switching between a try square and a sliding T-bevel to mark a dovetail joint is a royal invitation to error.

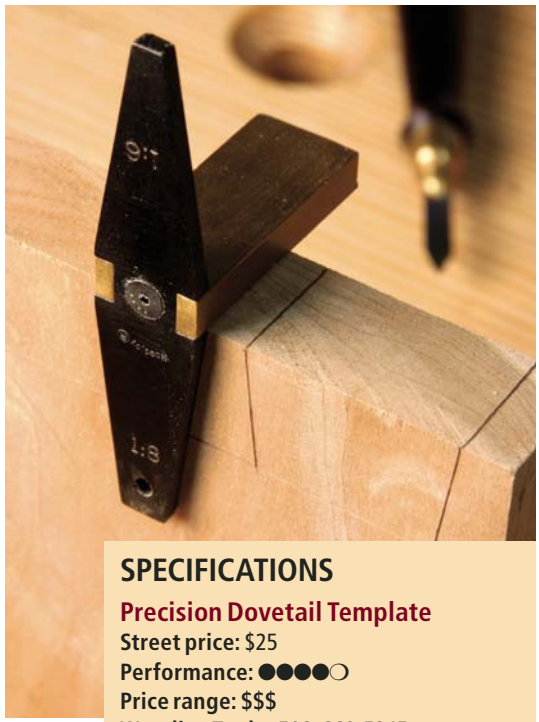
Another advantage of this all-in-one square is that it can be used to mark the angled part of the joint in both hardwoods (a 1:8 ratio) and softwoods (a 1:6). Also, the tool is sized so you can mark dovetails in stock up to 1⅜" thick – that's more than I ever need (until I start building coffins I suppose). And finally, the all-metal construction makes it durable enough to live in my shop apron.

The only complaint I have about the Precision Dovetail Template is that it can shift a bit, left-to-right, as you mark out your work. This is a problem with all metal marking gear, but there is a way around the problem. I added a thin slice of "Super High-friction Tape" to the brass face of the working surface. This inexpensive tape ($2.50 for a 12" roll from Lee Valley Tools, 800-871-8158 or leevalley.com) is peel-and-stick, durable and makes this square (and some other layout tools) hang onto the work like a bulldog while I'm marking out joints.

With the tape added, the tool is near-perfect. I hold the square on the work with my left hand and mark with a knife in my right.

In dovetailing, the ultimate goal is to get to the point where you don't need layout tools like this. But until I can dovetail with my eyes closed, I'll keep the Precision Dovetail Template handy. — *CS*

For more information, circle #183 on Free Information Card.



SPECIFICATIONS

Precision Dovetail Template
Street price: $25
Performance: ●●●●○
Price range: $$$
Woodjoy Tools : 508-669-5245 or woodjoytools.com

DeWalt's New 5" Random-orbit Sander

Random-orbit sanders have made my woodworking career a much happier thing. And each year there are improvements to the basic concept that make them even better.

The newest 5" orbiter from DeWalt has beefed up the power some and improved the dampening system that keeps the sander from gouging as the grit hits the wood.

Specifically speaking, the D26453 sander has a 3-amp electronic variable-speed motor that offers between 7,000 and 12,000 orbits per minute. Comparing it to similarly priced sanders in the category, that's more oomph than most by half to one amp of power.

Testing it against the competition, the new DeWalt performed well with a decent stock-removal rate and an acceptable level of vibration reaching the users' (my) hand, but with a little more wobble than others.

DeWalt's Controlled Finishing System (CFS) is designed to control pad speed to minimize gouging on start-up. Not bad, but again it's not significantly better than some of the competition.

The pad is of hook-and-loop design that holds the paper well, but not as tightly as some of the competition. The eight-hole design for dust collection and the semi-rigid bag did an excellent job of keeping dust out of the air – and out of my lungs.

The DeWalt tested well for noise level (81dB), but I noticed a slight vibrating noise from the air deflection ring under the pad. Nothing bad, just an unusual noise.

Bottom line: the sander is a nice option within the category, but priced at the top. The dust collection was good and the sanding performance decent, but not obviously better in light of the larger motor. The comfort level was also good, including the well-styled body that easily accommodates gripping the top or around the neck. **PW** — *DT*

For more information, circle #184 on Free Information Card.

SPECIFICATIONS

DeWalt D26453 Sander
Street price: $89.99
Motor: 3 amp, variable speed
Pad: 5", eight-hole, hook-and-loop
Orbit: 3/32" dia., 7,000-12,000 orbits/min.
Weight: 3.5 lbs
Performance: ●●●○○
Price range: $$$$$
DeWalt: 800-433-9258 or dewalt.com

Jet 14" Band Saw

You can buy this machine with a variety of features, but what's critical is that Jet got the basics just right.

Photo by Al Parrish

When I purchased a Jet 14" band saw four years ago it was an amazing deal. The saw came loaded with features, including a fancy rip fence and miter gauge, and it cost hundreds less than comparable saws.

Today, that same band saw is an even better deal because Jet has upgraded the motor, the blade guides and the blade-tensioning mechanism, and still kept the reasonable price tag.

Like crows that are drawn to shiny objects, woodworkers are easily dazzled by the features and gizmos on their machines. But instead of focusing on all the features available on this saw, I'd like to turn your attention to what's absolutely important and nonnegotiable on a band saw. Because beneath all the extras on this machine beats the heart of a well-designed, solidly built and accurate saw.

Let's start with the table. Some 14" band saws have a table that flexes easily under hand pressure (and this will spoil your cut). Sometimes this flex is because of spotty trunnions that secure the table to the saw's frame; sometimes the table flexes because of the way the trunnions are attached.

The Jet, however, offers a solid working surface that has never flexed under a heavy load, even when resawing big stuff.

The second important characteristic of band saws is that they retain their settings during use. Band saws are surprisingly fussy instruments that need tuning to really perform. And there's nothing more frustrating than having to constantly adjust the blade guides, blade tension or the orientation of the top wheel. I can report that the Jet is a real trooper in this department. I rarely have to make any adjustments, except when changing blades. And I have the stock guide assembly on my saw (not fancy ball-bearing guides). The only upgrade I've made to my guides is to replace the metal blocks with ceramic ones.

Band saws also need a decent motor. I have the ¾-horsepower version and have no complaints in the guts department – resawing is a bit slow, but not at all onerous. Jet now makes this saw with 1-hp and 1¼-hp motors, giving you power to spare.

And finally, the saw needs to run smoothly to get an accurate cut. I tweaked my saw in two ways to make it as smooth as a cabinet saw: I replaced the stock drive belt with a Powertwist link belt; and I balanced the top wheel of the saw so it ran true by drilling out a little material in seven places near one spoke of the upper wheel. (All decent band saw books explain how to do this.)

Here are some other features and tweaks worth mentioning: The fit and finish of this saw is excellent; the paint job is first-rate and has endured lots of shop dings; and the welds on the base and frame are neat and tight.

The only exception to this is with the accessory riser block, which I added to my saw. The metal casting that goes between the top and bottom wheel of the saw had a rough spot that rubbed the blades, shortening their life. About 10 minutes with a file fixed that.

The rip fence on this band saw is good, though I have opted for a shop-made one that I simply clamp to the saw's table. Similarly, the miter gauge is fine, though it's not something you should take into account when buying any band saw.

In the end, I would purchase this saw again. It is a nearly perfect machine for the home woodworker. The engineers got the basics right, they added a lot of nice (and useful) features and the price is still fantastic. **PW**

— Christopher Schwarz

ABOUT OUR ENDURANCE TESTS Every tool featured in our Endurance Test column has survived at least two years of heavy use in our shop here at *Popular Woodworking*.

SPECIFICATIONS

Jet 14" Band Saw

Street price: $529 to $599
Motor: ¾ hp, 1 hp or 1¼ hp
Table: 15" x 15" cast iron
Table tilt: 45° right; 10° left
Blade speed: 3,000 sfpm
Max blade: ¾"
Weight: 172 to 194 pounds
For more information: Contact Jet at 800-274-6848 or www.jettools.com

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The Plane My Brother Is

How (and why) you should use the broad hatchet in the modern shop.

Photos by the author

The broad hatchet is well suited for roughly preparing stock. There's good evidence that this tool was put to use in early craft shops and there's good reason to incorporate it in modern shops as well.

Estate inventories of cabinetmakers' shops often include hatchets. Likewise, most of the admittedly few images of period shops depict hatchets prominently. It could well be that these tools were used solely for the preparation of firewood. But the 15th-century poem "Debate of the Carpenter's Tools" provides us with an important clue regarding the use of hatchets in period shops:

"The broad ax said without a miss,
He said: 'The plane my brother is;'
We two shall cleanse and make full plain..."

The broad ax has a long (broad) cutting edge. While our notion of axes naturally centers on tree chopping, the broad ax is a delicate tool. Its short, sometimes offset handle allows only a compact swing. Its wide blade, often flat on one side, rubs against the wood while its sharp edge removes the high spots in a manner not wholly unlike a plane. This tool, or a smaller version of it sometimes called a joiner's or broad hatchet, may have been used in early craft shops for the rough preparation of stock. These aren't tools for firewood.

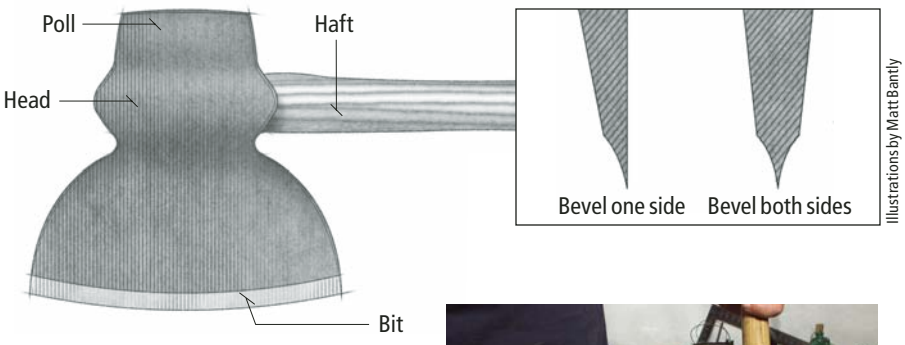
Coincidentally, the poem above suggests a relationship between two otherwise unrelated tools (the broad ax and the plane). Here again we get a glimpse of the cooperative nature of the tools within the period workshop suggested in a previous Arts & Mysteries article.

I know hand planes are quite popular among this magazine's readers, but I'm less certain about the popularity of hatchets. Modern planes have setscrews and brass adjusting wheels enough to satisfy the gadget hound lurking in each of us. But hatchets reside much lower on the gizmo scale. They also conjure images of a breathless, possibly bleeding, red-haired man in suspenders. I recognize that this isn't exactly the mainstream image of modern woodworking. So I'm going to ask for your indulgence just once more. If you work with solid wood, I think you should own and use a hatchet. Please allow me to tell you why.

I started using a hatchet in my shop several years ago in an effort to save time roughing at the lathe and to reduce wear on my roughing gouge (which I have trouble sharpening). I had no faster or safer way to remove stock. In a short time, I found I could rough shape stock from the firewood pile for a whole host of projects. Tool handles split from an ash log were strong, light and easy to finish with a spokeshave. I chopped beautifully straight-grained drawbore pegs for frame-and-panel work. As my familiarity with the hatchet grew, I found I could remove an inch or two from a board's edge faster with my hatchet than I could with my saw. Either way, the rough surface would be planed smooth. The speed with which I could remove stock was the first thing that attracted me to the tool.

by Adam Cherubini

Adam makes reproduction furniture using the tools and techniques of the 18th century. He demonstrates his crafts at Pennsbury Manor in Bucks County, Pennsylvania, on Historic Trades Days. You can contact him at adam.cherubini@verizon.net.



Illustrations by Matt Bantly

As time went on, I saw that using a hatchet created a level of intimacy with wood that went beyond hand planing. Only a hatchet can provide you with the full sense for the relative strength of different species of wood, each species' unique working characteristics, and differences between heartwood and sapwood, and curled grain and straight. So productivity aside, I recommend using a hatchet because it offers a free education with every swing. This is reason enough to try using a hatchet.

This is my fifth article in my Arts & Mysteries series. Each of the previous articles has attempted to reveal some secret to working quickly and efficiently with hand tools. Instead of simply blurting them out, I've attempted to do what the 18th-century masters surely did. I've provided concrete examples of how each concept worked and left it to you to discover the "secret" concept behind each example. This article is no different. In my next article, the last in this series, I will summarize the five preceding articles, and offer my thoughts on the secret "Arts & Mysteries." If you've not read all of the preceding articles, I suggest you do so before reading the summary. I hope you've enjoyed reading these articles as much as I've enjoyed writing them.

Hatchet Techniques

Here are the three techniques I use most often: splitting, hewing and paring.

Splitting

Splitting wood along its grain produces workpieces of superior strength, workability and sometimes beauty. It's also faster than sawing in most cases. For really small pieces, splitting may be the safest and most reliable approach. I never swing the hatchet to create a split because that doesn't give me the control I need for cabinetry. Instead, I use it like a wedge and strike its poll (the back of the tool) with a cudgel (froe club) or a mallet. I always use the splitting technique when the workpiece is small.

In the woodshop, splitting is a bit more delicate than the sort of splitting you might do for firewood. Any hatchet will do. Place the stock to be split on a solid surface. Next, place the hatchet in the end grain where you want the split to be, then hit the poll of the hatchet with a wooden club, cudgel or mallet. (Never hit metal with metal.)

If you have a very short workpiece, such that a mallet blow drives the hatchet clear

Starting with straight-grained stock helps. A single whack from the froe cudgel (a dogwood root) has produced a nice straight crack. The froe, another splitting tool, has little influence directing the crack on boards like these, but it's a little better than using a hatchet for long splits.

In my woodshop, most of my delicate splitting work is performed to make drawbore pegs required for mortise-and-tenon construction. Here you can see I'm using a double-beveled hatchet and my froe cudgel (a mallet also will work) to split small pieces off of this block of black cherry.

I steady the piece with the hatchet, then clap the hatchet's poll with my cudgel. My right thigh isn't quite as close as it appears in this picture. Just a reminder: When using your hatchet to split end grain, don't try to steady the stock in one hand and swing at the end grain with the other. Keep both hands behind the edge, please.

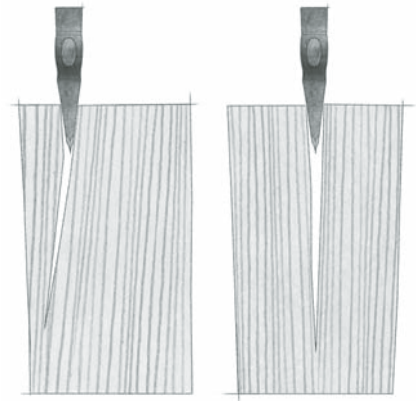
Once I have finished splitting, the resulting pieces are driven through a device called a doweling plate, as shown above. The holdfast hole in my sawhorse is quite convenient for this job. I prefer to sit while working because I may be here awhile. A simple table may easily require 20 or 30 pegs to complete.

through the stock, you can split off pieces of virtually any size. When the stock is longer, it's best to split into halves, as shown at right. If you want to remove a small piece from a large piece, the froe is the right tool. It allows you to control the direction of the split.

Hewing

Hewing is a controlled chopping technique. I hew to rough shape wood or remove excess from a board's edge. You can hew to a line quite accurately, or you can rough hew a piece destined for the wood lathe. In either example, this is a faster alternative to sawing when the offcut is destined for the woodstove. The basic process for hewing usually begins with crosscuts I call "breaks."

When hewing a log square for example, the task begins by chopping or sawing breaks from the bark to the chalk line every two or three feet down the length of the log. These breaks make hewing easier because you can simply split off the short chunks between them. You can use the exact same technique for making curved cabriole legs or for just knocking an inch off a board's edge. In this case, the break is necessary to stop crack propagation. Hewing should never be splitting. Proper technique produces thick shavings.



When splitting long pieces of stock, it's best to split into halves. This illustration shows what happens if you try to split a narrow piece from a wide piece without a froe. The only time this will work is when the workpiece is so short the first blow knocks the ax clear through. The best way is to just split in halves (right).

When hewing a board's edge, I often simply chop the "breaks." As before, the waste between the chops is simply chopped away. To hew the end you are holding, simply invert the workpiece. There's no reason to swing with all your might. Hewing is more finesse than anything else. Note: Be sure to watch the grain direction. Make sure you are never hewing parallel to it. Otherwise, a larger than expected chip may be the result. Always cut through the grain and always start with breaks. Although I'm not a carver, it's my understanding that carvers use a similar technique when they work.

Paring

Because my hatchet is so sharp, I sometimes use it to pare wood, much like you would with a drawknife or paring chisel. I'm amazed what a nice job my hatchet can do. Paring with a hatchet is less comfortable for me than using a drawknife, but it can be more convenient because you don't need a shaving horse. There's no trick to this except that both hands should be behind the edge and the workpiece always should be held securely. You can try skewing the blade, or drawing it across the work as you would with a drawknife. Otherwise, experiment. You needn't always swing it to cut.

Conclusion

I began this article with the hypothesis that broad hatchets were used by period cabinetmakers. To support my theory I consulted estate inventories, images of period shops and an arcane middle-English poem (the quote earlier is a translation) about carpentry. But I can imagine that some of you are not convinced by this not particularly compelling evidence. Basic common sense tells us that axes are for tree chopping, not fine furniture making. It's easy to imagine a shave horse made with an ax, but much more difficult to imagine a fine chest of drawers constructed with such a crude tool.

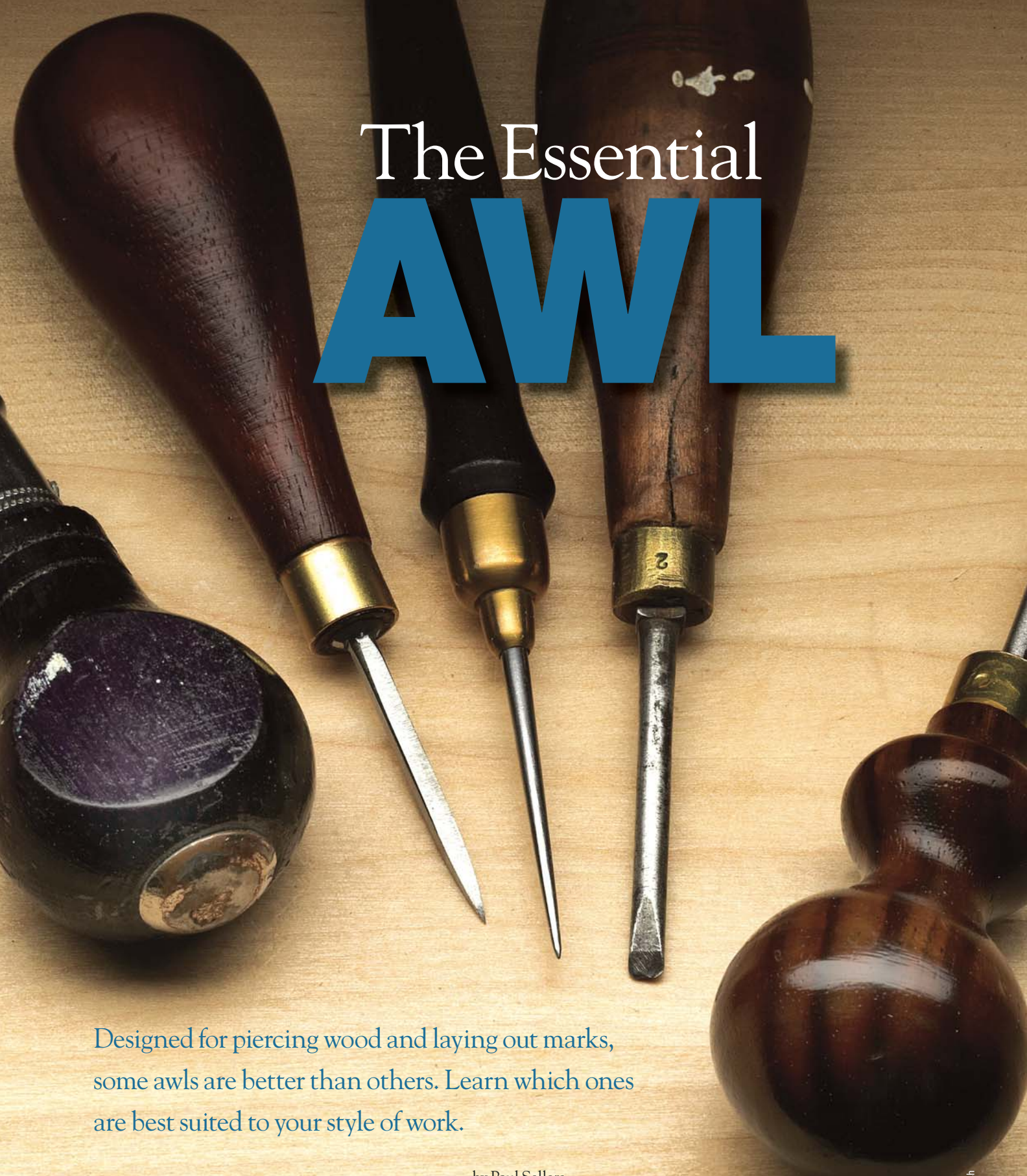
For you skeptics, I'd like to offer additional dubious support for my theory. We can observe in some pieces of period furniture a surface quality that suggests broad hatchet use was acceptable, particularly in areas that were not readily visible. How's that? On closer inspection, it's impossible to determine whether these irregular surfaces were produced by a broad ax, a wedge, a froe or a drawknife. They certainly don't appear to have been sawn.

But the point is that we know they had axes and these surfaces could have been created with axes. The larger question is why. Why did these surfaces find their way onto otherwise very nice pieces of furniture? Was the maker having a bad day? Did the master rely on apprentice labor to produce less conspicuous components? Did he just run out of time?

I think this is all very interesting to think about. Unfortunately we have very little on which to base our conclusions. Whatever you choose to believe, know that the hatchet can be a useful tool once you have acquainted yourself with the techniques I have offered pertaining to its use in the cabinet shop. However the most important technique has nothing whatsoever to do with the hatchet. **PW**

If this stock were harder, I would have to chop away the material between the breaks. But this eastern white pine is so soft, I can pare instead. This hatchet is as sharp as a kitchen knife.

The Essential AWL



Designed for piercing wood and laying out marks, some awls are better than others. Learn which ones are best suited to your style of work.

by Paul Sellers

Paul began his woodworking career 40 years ago as an apprentice in England. An advocate of hand tools in the modern shop, today he builds furniture and teaches in Texas at the School of Woodworking, which he started in 1995 (cfeeschool.com).

Photo by Al Parrish

Many tools seen for the first time express their full function by their very existence. They need no explanation. Hammers, a saw and a vise are such tools. There is an informal aesthetic working that delivers the tool's function and technique to the observant viewer. This aesthetic immediately conveys all the information without explanation. Awls are that type of tool.

With one glance a woodworker knows an awl's function. Piercing awls (sometimes called brad awls) pierce wood. Scratch awls (also known as marking awls) are used for laying out projects and joints. Here I discuss how to identify, use and maintain three types of piercing awls and the scratch awl.

The aesthetics of an awl are complete when the awl "looks" as though it will fit the hand and do the work. There are two ends to an awl, the business end and the handle. Both are important. Good awls have bulbous handles that serve to distribute the pressure needed to push the awl into the wood over a wide area of the heel of the palm of the hand. Use an awl that is too narrow all day long and you'll see my point – no pun intended.

Not 'Awl' That Common

A few years ago while I was demonstrating at a national woodworking show, a couple young men came by my demonstration area and caught the tail end of my presentation. When I had finished, they joined the usual crowd, traced their fingertips over the handles of my hand planes and saws, and said, "Man! Where did you get all these old tools?"

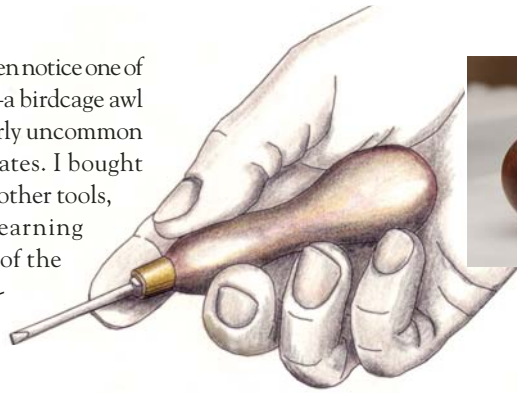
However, while looking among the scattering of tools, these men didn't pick up or even notice one of my piercing awls – a birdcage awl – which is still fairly uncommon in the United States. I bought it, along with my other tools, as a young man earning my modest wage of the English equivalent of $4.50 for a 52-hour week. Though the awl's real value compared to planes and saws lay somewhat obscured to the men's cursory glances, I have grown to depend on my square-pointed birdcage awl more than any other type of awl.

For the most part all awls are fairly underestimated tools. Mention awls to most woodworkers and they will likely stare back at you blankly and wonder what you are talking about, that is until they hinge a few doors and box lids.

The true appreciation of this unobtrusive little tool comes only when, with swift, single-handed dexterity, you locate the sharpened point in the center of the hinge hole, press and twist, and there you have the most perfectly tapered hole, ready to receive the likewise tapered screw threads of even the smallest of screws. Hand tools such as these only become truly appreciated when they have fulfilled their function time and time again, year after year.

All Awls Aren't Created Equal

Awls once came in a wide variety of shapes and sizes. R.A. Salaman, in his comprehensive "Dictionary of Woodworking Tools" (Astragal Press) describes 14 different types of awls including the brad awl, upholsterers awl, flooring awl, sprig awl, scratch awl and marking awl. In the United States it's common to term any of the more specific awl names under the singular heading of "awl." But not all awls are created equal. In fact, they can be quite different.



See the difference between the oval wood and the triangular-shaped piece of plastic. Bulbous, oval handles better distribute pressure.

Generally, we use awls for two purposes: piercing wood or scribing wood surfaces for layout. Most people put awls in two categories: brad awls (also called sprig bits) and scratch awls (also called marking awls). However, a brad awl is just one kind of piercing awl – many different types of piercing awls exist.

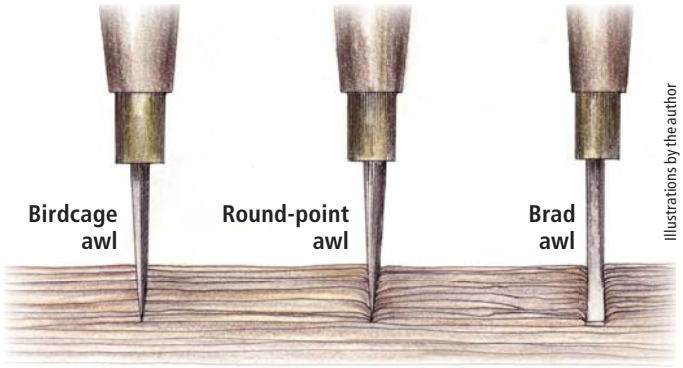
Here I discuss three types of piercing awls (the screwdriver-shaped brad awl, the square-point birdcage awl and the round-point awl), and the scratch awl.

'Awl in Awl,' What's the Difference?

The most common use for piercing awls is to pierce wood fibers for starting screws or nails. All piercing awls are used the same way with a push-and-twist-of-the-wrist action back and forth to the required depth. There are definite differences between each of the three types of piercing awls, even though their objective while in use and the end result are always the same.

All planes plane wood. Some are dedicated to straightening boards whereas some merely smooth surfaces. Others create shapes and still others fit parts. But all of them remove shavings. So, too, piercing awls are used to pierce wood fibers in some way. It's how they pierce wood and what the result of that piercing is that has a bearing on which type of piercing awl you choose.

To show the difference between the three piercing awls,



Awls may be intended for the same purpose, but all awls aren't created equal.

moreover, to feel the difference, I suggest that you cut some strips of wood about 1/8" thick by 1/2" wide by 10" long. Pine, maple, cherry or walnut will work fine, or you can use Popsicle sticks as shown.

Take a round-point awl and, about 1/2" from the end of the stick, press and twist the awl through the wood. Inevitably the awl will split the wood along the grain. It will do this in almost all wood types.

Now try the same with a screwdriver-shaped brad awl. The wood will usually split, though not quite so quickly or automatically as with the round-point awl, provided you begin penetrating the fibers with the screwdriver point initially placed across the grain as shown in the illustration at right, and then pushing and twisting the awl as it penetrates the fibers.

This twisting technique accompanied an intentional design feature of the tool. The problem was that nobody passed on the technique with the tool. The idea is that the cross-grain positioning of the flat blade acts something like a chisel to first cut the fibers and prepare for deeper penetration with subsequent pressure as you twist and push deeper through the fibers.

Now take a square-point birdcage awl and use the standard technique of twist and push continuously but carefully as you continue through the Popsicle stick. You should have a perfectly round hole all the way through to the diameter of the corner-to-corner measurement of the awl.

Notice how the birdcage awl acts more like a reamer with the sharp, angular corners of the awl cutting the wood fibers instead of parting them and splitting the wood. Because round-point awls have no way of cutting the fibers, they instead serve only to compress, force and bruise the wood. The round point only parts the fibers and this inevitably causes the fibers to split.

In some situations, compression isn't bad. Sometimes it's good to leave all the fibers in place, such as in a large door stile or door frame where there is enough mass surrounding the hole to support the pressure given by the awl.

But for more delicate situations, such as near the ends of wood pieces, the birdcage awl finds its true value as a crafts-

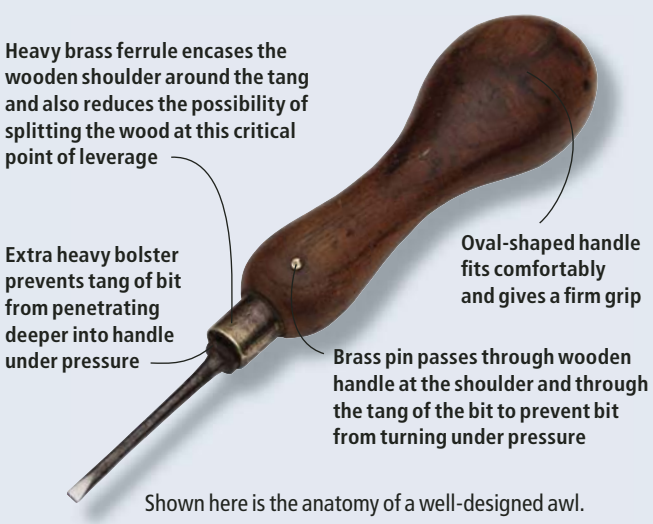
ALL ABOUT ERGONOMICS

With its wide, oval-shaped bulbous handle designed to resist slippage and to fit up against the heel of the palm, my favorite brad awl was ergonomic long before anyone ever heard the word.

Comfort, fashioned by a man's hand, had little to do with the kind of economy that concerns us today. It was more a sense of commonplace frugality and carefulness because the very tools a man worked with were intrinsic to his life as a craftsman. Tools handed down through centuries of work still serve as perfect examples of true craftsmanship because the qualities of the man were reflected in the tools he made and were passed on to those of us who follow. The tool shown here tells its own story.

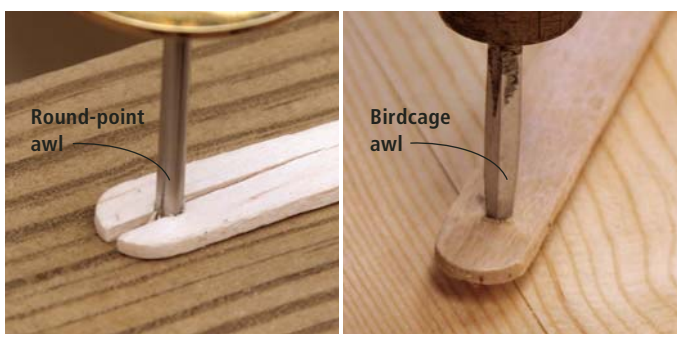
The awl is old and English in origin. Economy was of little consequence to its maker, except that he respected time and so used the best materials at hand. The heavy-gauge brass ferrule he used was a scrap found and saved as treasure in the till of his tool chest. The steel awl gently tapers up to the bolster that intersects the square, hammer-drawn tang. The brass-securing pin barely protruding through the shoulders of the handle prevents the tang of the awl bit from twisting in the handle.

But above all, don't overlook the oval-shaped, English ash handle. It never twists or slips under torque. When all the raw components were shaped into a tool to fit his own hand – one that would serve him for six decades or more – this tool meant more to him than gold. His heir would one day find the same tool to treasure with his own scraps from which a replica would soon allow the original to rest in its corner of the tool chest as this one did. *– PS*

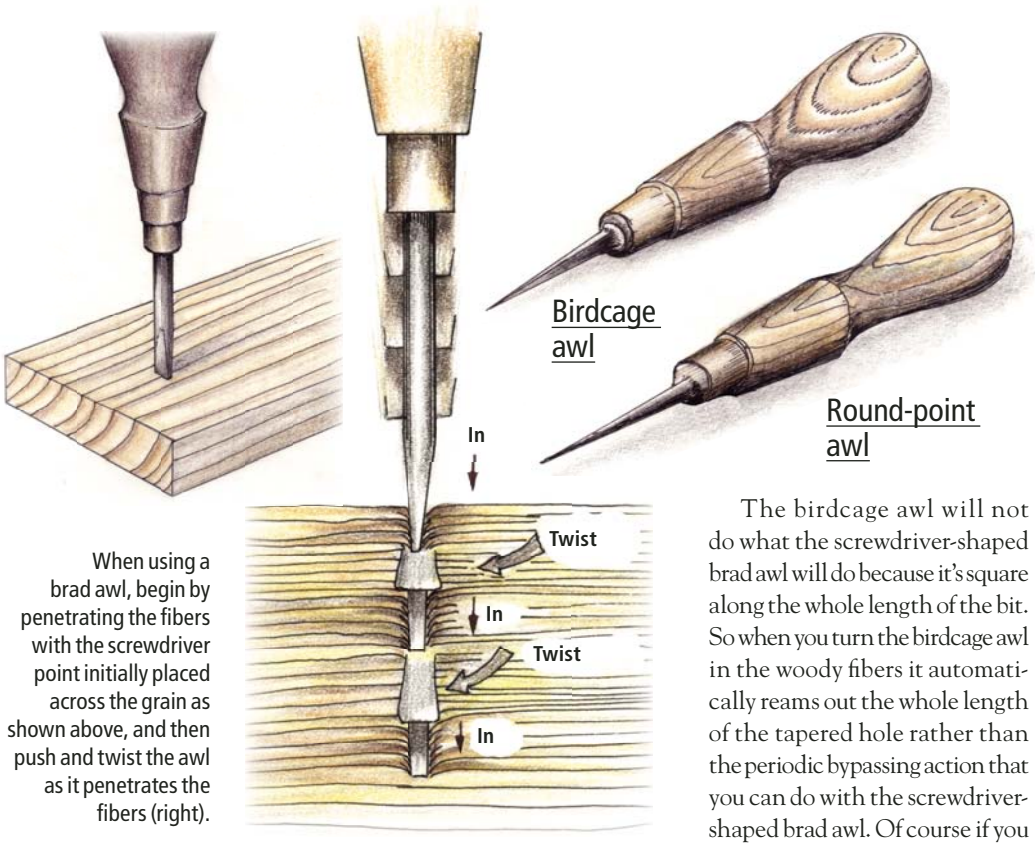


Shown here is the anatomy of a well-designed awl.

From left to right: birdcage awl, round-point awl and brad awl.



Press and twist different types of awls into the ends of Popsicle sticks and you can easily see the different ways different types of awls pierce wood.



When using a brad awl, begin by penetrating the fibers with the screwdriver point initially placed across the grain as shown above, and then push and twist the awl as it penetrates the fibers (right).

man-designed tool. Though we no longer use the birdcage awl for its original task (more about that later) this tool has this main advantage: It will make large or small holes to receive large and small screws as needed. Another advantage is its convenient size, which makes it much handier than a conventional hand drill or even a screw gun because of its single-handed simplicity, weight and compact size.

Now let's take a closer look at the three piercing awls described above and the scratch awl.

The Birdcage Awl

The square-point birdcage awl also is known as the square awl or a sprig bit. Any one of these names will do, but the two true names are birdcage awl and square awl.

The term "birdcage" identifies and isolates the tool to its original application rather than its more common function in our modern woodworking era – creating simple holes. At one time, country woodworkers made all types and sizes of birdcages for catching, transporting and keeping birds. The cages were made from wooden frames within which wood, bamboo cane or metal bars were fitted to contain the captive birds.

Cages for all types of poultry as well as exotic and singing birds were common throughout the world, and so this tool found its greatest use for boring fine, medium and large holes in rails of wood to build bird enclosures and all types of cages. Simple six-sided boxes and ornate, multilevel palace cages came from the craftsman's hands to entertain and decorate peasant homes and royal households alike. In fact, birdcages predate metal screws by many hundreds of years.

In reality the birdcage awl was the only awl capable of producing a round hole in wood by actually removing material from the hole by its reaming action. Other awls, such as the brad awl, may come close but the birdcage awl could produce round holes more efficiently than any other tool of its type and in locations that no other awl could.

The birdcage awl will not do what the screwdriver-shaped brad awl will do because it's square along the whole length of the bit. So when you turn the birdcage awl in the woody fibers it automatically reams out the whole length of the tapered hole rather than the periodic bypassing action that you can do with the screwdriver-shaped brad awl. Of course if you simply push and waggle the birdcage awl as you would a round-point awl and refrain from the twist-and-turn action, the birdcage awl will leave all the wood fibers in place.

The Round-point Awl

The round-point awl is simply pushed into the wood to the necessary depth. The advantage of this awl is that, particularly in soft-fibered woods, the fibers are compressed rather than cut or reamed away.

When the awl is removed, the compressed fibers spring back so that when you screw into the parted fibers of the hole with a wood screw, you have retained all the original fibers of the wood to then surround the threads of the screw. Also, because of the elasticity of the compressed wood fibers pressing against the wall of the screw's main body, you add even more security to the screw.

The downside of the round-point awl is its tendency to split the wood rather than cut the fibers. It's a handy but sometimes restrictive tool.

The Brad Awl

Again, the name "brad awl" is a generic term meant for a pointed tool used primarily for piercing and separating wood fibers to receive screws and small nails. Woodworkers are typically called on to work with other materials such as cloth or leather. So for many years this tool also has been employed as a support tool for furniture makers undertaking upholstery or boat builders working with sail cloth and other canvas awning fabrics.

Most woodworkers use the screwdriver-shaped brad awl until they discover the birdcage awl or the round-point awl. Discovering these other two awls, how to use them, sharpen them and how they effectively work the wood fibers, will exponentially change your perspective of awls.

Both the brad awl and the birdcage awl will achieve similar results as each other. You can use them to simply separate fibers, or you can use them to ream out the fibers and bore clean, clear and round holes with a simple twist of the wrist back and forth.

Although the screwdriver-shaped brad awl can be used both with or across the grain, we generally enter the wood cross-grain so that the leading edge of the awl performs similar to a dull chisel, severing the cross-grain fibers rather than simply parting the wood fibers to create a pointed hole. By repeatedly pressing and turning the awl alternately back and forth to deepen the hole, the awl parts the fibers and then reams the next section of fibers below.

This action of successive twisting and pushing retains more of the fibers on either side of the spade bit. As the point first forces and compresses the fibers apart, and then rips the fibers below, we effectively create a "compression, rip, compression, rip" effect

to the depth of penetration. This makes it a hybrid of the birdcage awl and the tapered cone point of the round-point awl. (See the illustration on the previous page.) Alternatively, pushing the brad awl into the wood with its spade point in line with the grain, the brad awl will simply part the fibers only, performing more like the round-point awl.

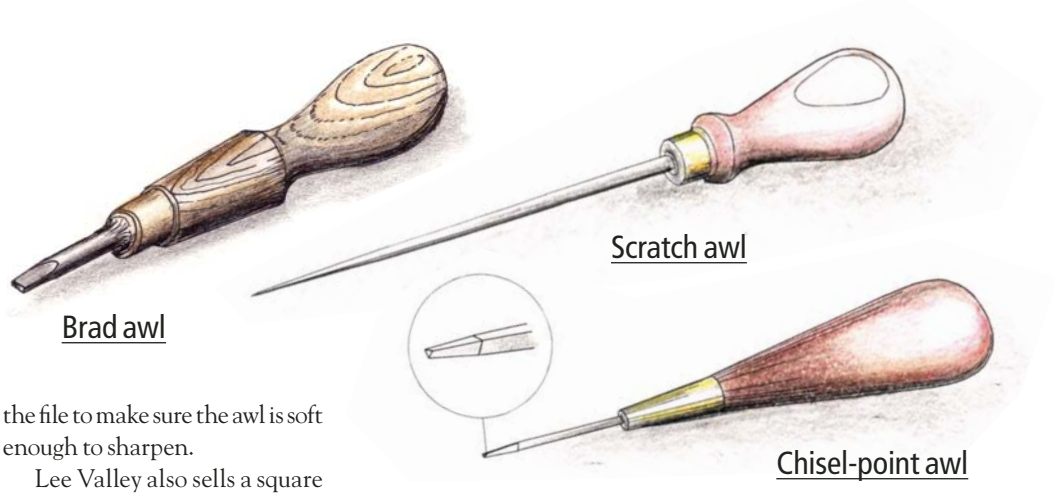
My Favorite Piercing Awl

I prefer the birdcage awl followed quickly by the brad awl. I'm often working in more dense, hard-grained woods, and birdcage awls clear a passage for the main body of the screw while allowing for the screw threads to actually bite into and thread the wall of the hole as I drive the screw home. Hardwoods have more of a tendency to split because many of them have a brittle nature. The reaming function of the corners of the birdcage awl creates a perfectly tapered round hole, which is the ideal shape for traditional wood screws.

I didn't arrive at my conclusion by some conscious decision after discovering each successive awl to be better than the previous one. I simply realized that after 40 years I always reach for the same awl every time and so the birdcage awl, for me, became the better awl.

Finding a Piercing Awl

There are several ways to acquire your first square-point birdcage awl. They are relatively inexpensive to buy, but you can also make one yourself by simply filing an inexpensive round-point awl or screwdriver to a square tapered point. I once did this when I misplaced mine and I am still using it today (see the photo at right). However, many awls have hardened steel bits that are harder than the teeth of a file and so will easily ruin the file for further use. Test it first at a less important part of the file to make sure the awl is soft enough to sharpen.



Lee Valley also sells a square awl (800-871-8158 or leevalley.com, #35N13.01, $15.95) that is made in England using traditional methods, and it has a turned rosewood handle, solid brass ferrule, and a forged and ground steel bit. The bulbous handle fits my hand well and allows me to give full pressure to the tool.

An awl unique to Veritas is its own "chisel point" brad awl (# 05N60.01, $15.50) designed to efficiently bore through the wood fibers using the typical twisting action associated with awls. Veritas hybridized the traditional brad awl with the birdcage awl (see illustration above), which resulted in another well-thought through, finely crafted tool so typical of Veritas engineering.

The Scratch Awl

One other awl in R.A. Salaman's "Dictionary of Woodworking Tools" (though in a completely different category) is a longer version of the round-point awl that goes under the more modern title of "scratch awl." The scratch awl is self-descriptive and is simply used by carpenters and joiners to mark or scratch the shoulders of tenons, dovetails and the positions for parts of furniture and various other woodworking projects.

Though it does scribe the surface fibers by either cutting or indenting the wood, this tool is not as definitive as the layout knife and is therefore used more for carpentry work, timber framing, and making farm implement parts, wheels and so on. The pencil actually replaced the awl for many preparatory steps because it allowed temporary marking without permanently marking the wood in readiness for subsequent permanent markings with the knife, or the marking or mortise gauge for instance.

Its secondary use for most and maybe its true value comes when the nozzle of my glue bottle gums up, and also when I have some caulking to do and I need to pierce the silver foil seal inside the nozzle of the tube.

I ordered a scratch awl from Lee Valley (#50K06.01, $9.95). The scratch awl is typical of most scratch awls except that instead of simply providing a round handle, this tool has two flats on either side so that the awl stays in place wherever you lay it down. The 5"-long hardened carbon steel point is hardened to Rc 55, which means it will keep its edge, yet can be readily resharpened as needed.

Replacing an Awl Handle

All too often the twisting action wallows out the walls of the hole and there is no substance there to securely hold the tang of the awl. At this point you can either fill the hole with two-part epoxy and push the tang back in place or replace the handle.

As a beginning craftsman I repaired many a tanged tool with a replacement handle. That was how I acquired many of my first tools. Hot coals from the heat stove quickly turned the tang bright yellow and pushing the point into the center of the handle was like pushing a hot knife into butter. Stopping just short of the bolster of the bit bottoming out at the tang shoulder, withdrawing the hot tang and quenching it, and then driving the bit home into the handle resulted in a well-held bit.

Sharpening Awls

Woodworking tools deteriorate through extended years of use and awls are no exception. I simply sharpen my birdcage awl with a fine single-cut file on all four faces working from the wider flat areas of each face and along toward the point. I find a fishhook sharpener works great for sharpening round awls. To sharpen brad awls, simply lay each of the flat faces on the bench stone and rub the faces back and forth until they are flat. Trim the flat point with a file. **PW**

You can easily make your own birdcage awl by filing an inexpensive round-point awl or screwdriver to a square tapered point. I made the awl shown here after I misplaced mine.

WOODWORKING ESSENTIALS

BY DAVID THIEL

CHAPTER 2

Casework Construction: Wood Selection and Prep

In this chapter of our series on case construction we focus on the materials that make up the boxes-within-boxes that are casework.

We'll discuss using solid wood versus plywood, and discuss the properties, both pro and con, for each. Along that same line, we'll consider the concerns of wood movement when using solid wood. For that concern alone, a lot of casework is constructed out of plywood.

Whether it's plywood or solid wood, getting the boards ready to use takes some particular steps to get it right. These steps include proper planing, joining and even gluing techniques. We'll show you the best ways to work in either medium and we'll also take a look at using either power or hand tools for these steps, and a combination of both.

Photo by Al Parrish

Casework can be made from both plywood and solid wood, or a combination of the two, as shown in this blanket chest.

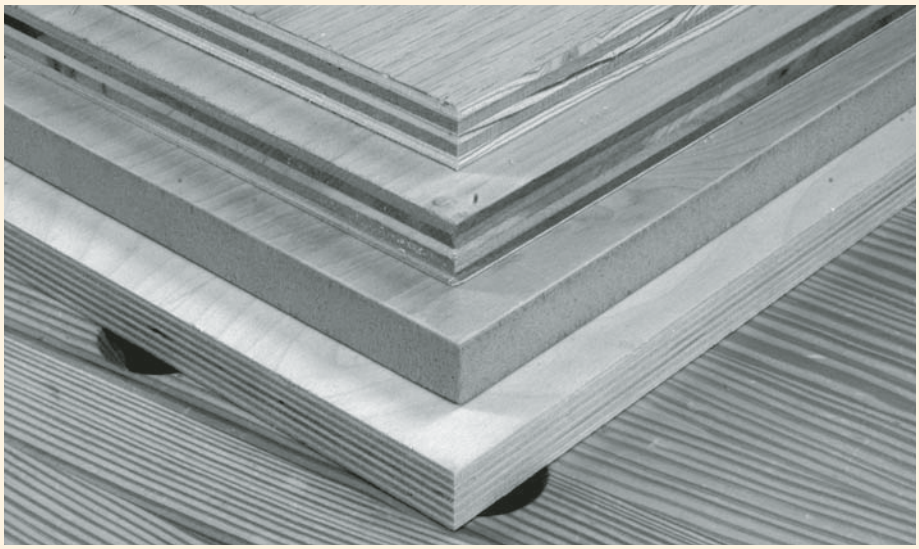
Plywood or Solid Wood?

Case construction is mostly about joining panels together to form one or more boxes. Coming up with the panels is where we start.

Plywood is actually a very old invention. The Egyptians used a crude form of plywood by cross layering thin sheets of wood, alternating the grain direction. Their intent was to make a stronger, more stable piece of wood and that's the same reason we continue to use plywood in our projects today.

We've added veneer to the equation to make plywood an even more valuable building material. Rather than go to the expense of using solid panels of what can be very expensive wood types, a thin veneer of these woods is used as the outer surface of plywood. This gives the appearance of nicely figured, solid wood, with the structural benefits of plywood, and it'll save some money.

That said, solid wood is still a more-than-adequate option for casework panels and we'll talk about some ways to negate the movement issues involved in wood panels. And, of course, solid lumber is still the major component used in case construction as the framework pieces that hold many of the panels in place and tie them together.



Above are examples of the four most common types of plywood, all in 3/4" thickness. At the top is a piece of furniture-grade red oak veneer ply. Below it is a piece of shop-grade plywood veneered on both sides with poplar. This would be a good paint-grade plywood. Directly underneath that is a piece of MDF with birch veneer. While not normally considered a plywood, because the fibers are arranged in a cross-grain pattern it fits in this category and is a useful material for case construction. At the bottom of the stack is a piece of Baltic birch high-density plywood. Notice the number of layers compared to the other two plywoods.

Choosing Plywood

There are three main grades of plywood we'll discuss here: furniture grade, shop grade and what we'll call high-density plywood. In each category there are sub-categories, but I'll try to keep this from getting too complicated.

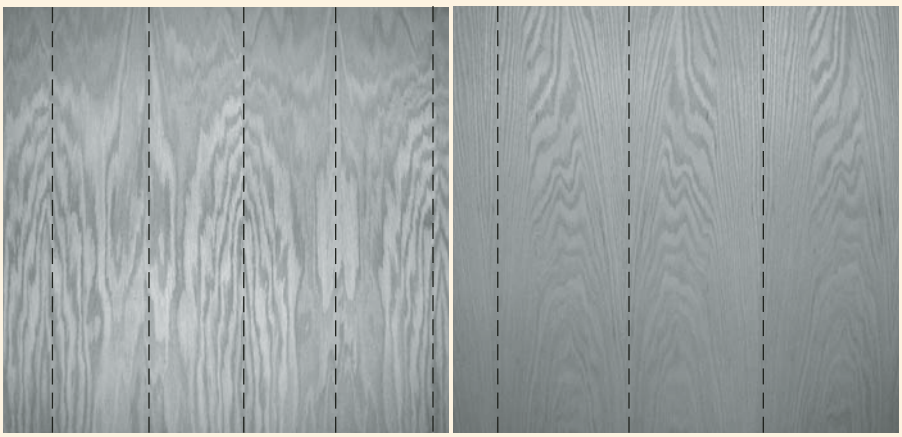
Furniture-grade Plywood

Furniture-grade plywood is a plywood that has quality veneer faces on both sides. The inner core can be a variety of materials including softwoods, hardwoods and fiber core. The number of plies, or layers, can also vary. As long as the interior layers are oriented 90° to one another (including fiber core) it still counts as a plywood.

These furniture-grade plywoods are graded by appearance, the best face is graded by letter, with "A" being the best and "D" the worst. The back side is graded by number, with "1" being the best and "4" the worst. For furniture projects you're generally looking for A1 or A2 plywood. The other grades are often relegated to paint-grade projects.

You'll also need to pay attention to the way the veneer is sliced off the log. Rotary-cut veneer is peeled off the log like an apple skin and will have an unnatural appearance to the eye. It's not ugly, it's just not the best pattern.

Plain-sliced veneer is layed-up in sheets as it's cut from the log, from one side to the other, and then seamed – much like you would glue up a panel from multiple boards. This is the veneer pattern that is considered best for visible casework pieces.



Above are two samples of red oak veneer-clad plywood. At left is an example of rotary-cut veneer, while the right-hand photo is plain-sliced veneer. The plain sliced is a more natural pattern for use in panels, more closely imitating glued-up individual solid boards. The rotary veneer is peeled from a log like an apple skin, leaving a repeating pattern. The dashed lines show the pattern breaks on each piece. As these photos illustrate, just selecting a veneer pattern will not ensure an attractive pattern. Seeing the piece in person is valuable for a reliable appearance.

Shop-grade Plywood

Shop-grade plywood is plywood without the fancy veneer. It usually includes a veneer, but the material may be a less valued species such as birch or poplar. The usage of lesser materials will extend to the inside of the sheet as well, with more inexpensive materials, and the possibility of more voids and patches acceptable in the plywood layers.

You may have raised an eyebrow when I included fiber-core materials with plywood. Fiber core, or particleboard or medium-density fiberboard (MDF), are technically plywoods because of the orientation of the wood fibers. In fact, though fiber-core sheets are often thought of as lesser quality, they're actually a better surface for casework. They remain flat and offer more consistent thickness than hardwood or softwood ply-core sheets.

Another benefit to MDF-core plywood is that there is no chance of telegraphing any wood imperfections from the core materials through the veneer. These imperfections are usually something that won't show up until you apply a finish – with very disappointing results.

Shop-grade plywood is often used for just what it sounds like. If your casework happens to be a cabinet for underneath your table saw, or a storage cabinet for

all of your pneumatic nailers, this is the sound and economical material for you.

Shop-grade ply can also be handy for less visible case projects, such as built-in closets and cabinetry in utility rooms such as laundry areas.

■ High-density Plywood

High-density plywood is a valuable, but utilitarian plywood grade. Often branded as Baltic birch, appleply or other names, these plywoods use thinner and more numerous interior layers, while a furniture- or shop-grade plywood may have seven interior layers in a 3/4" thickness. By using more plies of thinner wood the plywood offers a more stable and straighter panel.

You won't find MDF-core materials in this category and in general the veneers used for these plywoods are of secondary woods, similar to shop-grade plywood. These "veneers" are usually one of the interior plies that just happens to be on the outside of the sheet and can include football-shaped patches.

This is a great material for the interiors of your case pieces. Many professional furniture makers will use this ultra-stable material for drawer boxes. And it makes a great sheet product for jigs and workshop fixtures.

Choosing Solid Wood

Choosing solid wood for a project, whether for panels or for frame pieces, is almost akin to an art form. Where you get your lumber will dictate how particular you can be when shopping. If one of the larger home-center stores is your usual shopping spot, you'll be limited by species, grade and quality.

I'd recommend finding a lumber dealer somewhere near you (check the phone book, or contact a local woodworking shop or woodworking club to find the name of their supplier). Short of that, consider ordering wood by mail or from the internet. We've had good success with these "remote" lumber suppliers, but it still removes you from the lumber selection process, which is what I'll discuss now.

After determining the species of wood you want to use for your project (and that's a chapter or book on its own), you must figure out how much wood you need. Unlike plywood, solid lumber comes in random widths, so the calculations are a little involved.

Three versions of high-density ply. The top is a 1/2 "-thick Baltic birch, the middle is a 3/4" luan ply and the bottom is a 3/4" Baltic birch. All are very stable and a useful addition to any shop.

You first need to determine the thickness required. Most case pieces will use 3/4"-thick material. If you're buying lumber in the rough (just sawn at the mill, with no surface planing completed) you'll be looking for 4/4 material. The easy way to remember the "quarter" method of referring to rough lumber is to think of it in terms of 1/4". Four-quarter rough material will measure 1", or four 1/4"s. Six-quarter will measure 1 1/2" in the rough, and so on.

If you're buying lumber already surfaced (planed) you should check that it actually does measure the indicated thickness (slightly under or over is possible) and you should also understand some of the terms used to grade and mark solid wood.

S2S: Planed on two faces, with the edges left in the rough.

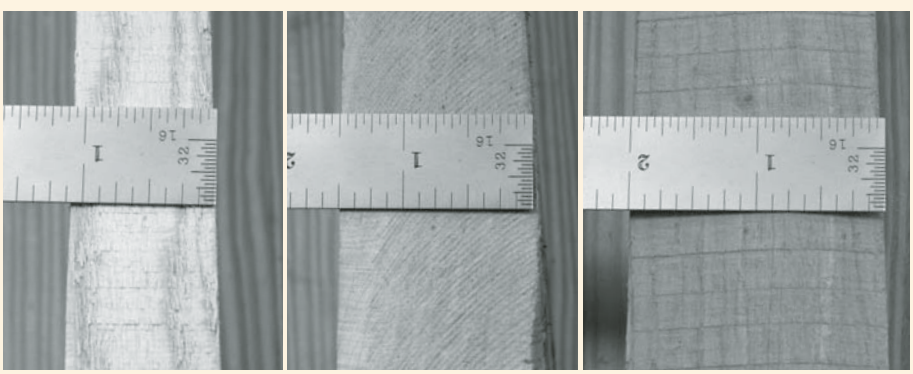
S3S: Planed on two faces and jointed on one edge, with the opposite edge left in the rough.

S4S: Planed/jointed on all four long edges of the board.

Anticipate a slight upcharge on surfaced lumber, and be prepared to still deal with possible twists or warps in wood that is already the required thickness.

Now back to how much wood you need to purchase: Multiplying each required piece's width and length in inches and then dividing the total by 144 will give you the board feet required for each piece and then you can add all the pieces together. That gives you a gross amount required, but because wood doesn't come that way you need to figure it differently.

If you can go to the lumberyard with your list and calculate what parts will

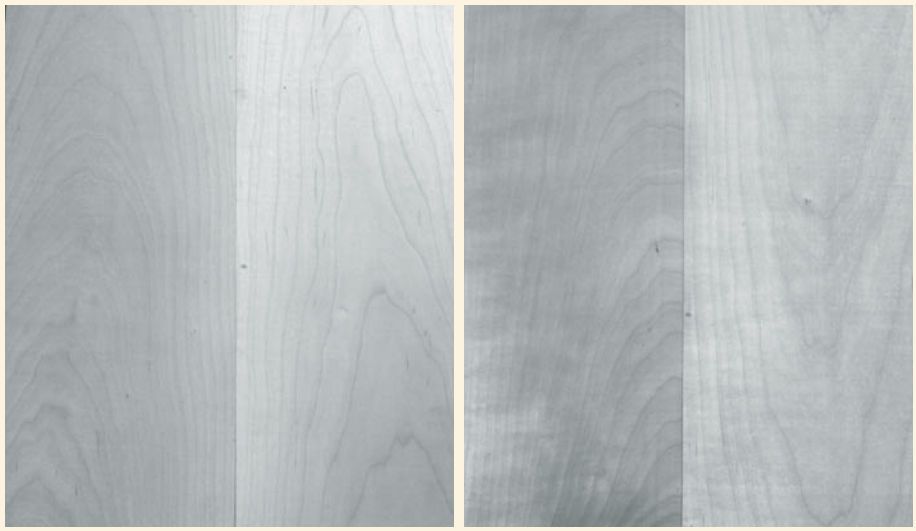


Shown here is rough lumber from a mill. This is how you should think of the "quarter" system when shopping. The left board is 4/4 and measures roughly one inch (you get a little extra on this one and that's possible if you shop carefully), the middle is 6/4 and measures roughly 1 1/2" and the right is 8/4 and should measure roughly 2".

come from each board, you'll be pretty close. Of course, this assumes you have the luxury of picking through the boards for this process. If you're ordering lumber from a local yard or the internet, you can't rely on that.

Your best method is to round up to the nearest whole inch dimension in each direction and then add a little extra to cover loss through planing, checking and other unforeseen occurrences. How much extra? A minimum of 10 percent makes sense and some woodworkers will recommend up to 40 percent. I'd suggest 20 percent, myself.

Now you have your shopping list, it's time to go to the store. You want to



Shown here are two boards arranged to give an example of a good, solid-wood grain match (left) and an example of a bad grain match (right). Even though the boards aren't exactly the same shade, by matching two sections that are long grain, the boards on the left look balanced. The boards on the right have an interrupted cathedral and the cathedral figure on the far right board is pointing the wrong direction.

Jointing and Planing 101

1

Start with the board positioned on the infeed table with only light pressure on the board, and your hands positioned back from the cutterhead.

2

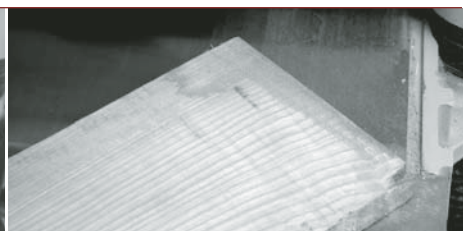
As you feed the board across the cutterhead, maintain light pressure on the infeed side of the board until you reach mid-point. You don't want to try to push the board flat to the table. This will only maintain the board's curvature, and it won't end up straight.

3

Once the board has passed mid-point over the cutterhead, transfer your pressure (one hand at a time) to the outfeed side of the jointer, keeping the pressure over the outfeed table as you push the board past the knives. Use a push block for this last part to keep your hands away from the knives.

8

Planing a board is easier than jointing, but you still need to pay attention to a couple things. Determine which direction the grain is running on the board by running your hand over the surface (left). This step is actually like petting a dog or cat. The grain will lay down in one direction similar to an animal's fur. The board should be run with the grain laying down, starting with the leading edge of the board, to avoid tear-out. Start with the jointed face down on the planer's tables and take light passes until the rough face is mostly leveled (right).



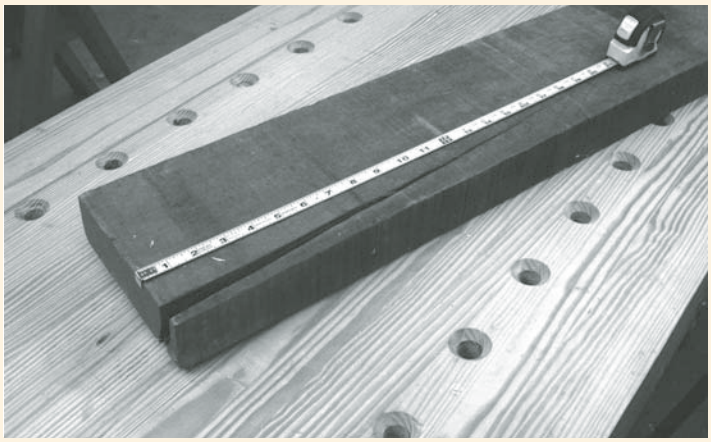
You're now ready to work down to the final thickness of the board, but it's important to take material from both sides of the board during this step. Because moisture evaporates from wood more quickly on the surface of the board than in the center, as you expose the board's center the moisture content can shift from face to face. There are also internal pressures in wood that benefit from balanced planing. By flipping the board with each pass you help to maintain an even moisture and stress rate in the board and can avoid cupping and twisting after the board has been planed.

consider a number of visual and physical aspects of the lumber beyond size. Color consistency and grain pattern can make or break a project. Unless you're planning on including a sap streak down the middle of your doors, it's best to pick boards with as little sap as possible.

Grain pattern can be a huge factor. Because much of this wood will end up in wide panels for your casework, the idea is to make it look like it came from one board's width. Matching cathedral patterns, or just finding the most straight-grained boards will move you further toward that goal.

Physical aspects to look for include knots, splits and moisture content. If you find a really pretty board with a knot down the middle, don't discard it. Get your cutting list out and decide if you can cut away the knot and still get the pieces you need from the rest of the board.

Most lumber that woodworkers purchase is kiln dried. This speeds up the process of getting the wood into the store, but it can also cause the ends of boards to split, sometimes as much as 10". Check your boards for this defect and calculate it into your shopping. By the



Board checks are caused by kiln drying and will affect your board yield. Remember to calculate that loss into your plans and don't pay full price for that imperfect 18" of the board!

4

What if your board is 10" wide and you have a 6" jointer? You can actually still flatten the board successfully. You will need to remove the guard for this operation, so be extremely careful and remember to replace the guard once you're done with the operation. Set the fence to a little wider than half the width of the board you're surfacing. Then run the board taking no more than a 1/32"-deep cut. Allow the board to extend over the jointer bed, but keep steady pressure above the tables.

5

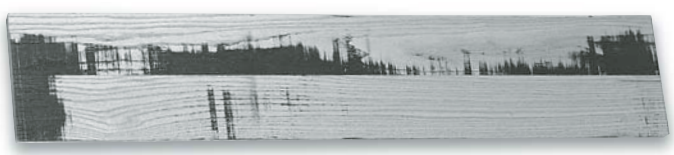
Then rotate the board so that the part that was hanging off the table is resting on the table. Carefully run the board across the jointer again, maintaining pressure over the tables. Because the knives are cutting at the same depth on each pass you're taking off the same amount of material with each pass. Repeat these steps until the board's face is reasonably flat.

6

With one face flat, you're ready to run one of the edges to straighten it, and also form a square corner. With the flattened face against the fence, start with all your hand pressure on the board over the infeed table of the jointer.

7

As when flattening the face, maintain pressure only on the infeed table until the board is mid-way past the knives. Then transfer your pressure to the outfeed table and finish the cut.



This is a view of a board that was too wide for the jointer. You can see the division line down the center of the board, where the cuts overlap. With a couple more passes this board will be ready for the planer.

way, you shouldn't pay for that section of the board if it's split. Make them take that off the total board footage, or at least discount the price some.

As I mentioned, kiln drying gets the wood into your hands faster than air drying, and it routinely provides a consistent moisture content in the lumber. But it's still a good idea to take a moisture meter along with you to the lumberyard. The wood should ideally be about 7 percent moisture content. A few percent in either direction is acceptable. If your lumber is registering more than 10 percent moisture content, be prepared for some possible warping as it dries to match your shop conditions. This may adversely affect the yield of usable wood.

Preparing Solid Wood

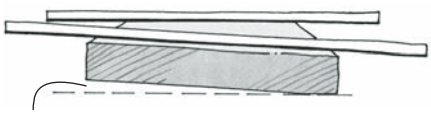
This is one of the more time-intensive steps in making case furniture. Of course, if you're experienced in these steps (jointing and planing solid lumber) then you're already a step ahead, but you still need to do the work before making your panels.

By definition you want a panel for your casework to be flat and straight. You need to get your solid lumber in that shape prior to glue-up, and then check it again after.

After checking the lumber for grain

Prepping Lumber by Hand

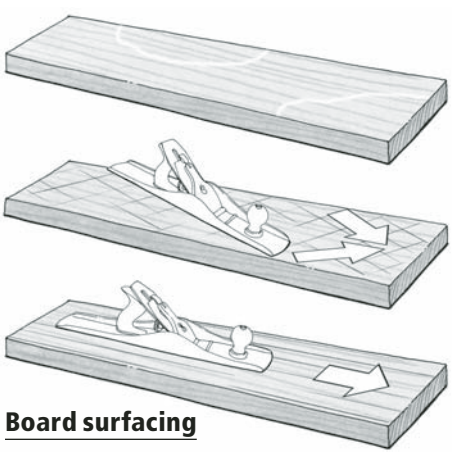
Even if you own a powered jointer and planer, there are times that you'll want to prepare boards by hand. Sometimes the boards will be too wide to face-joint on your jointer, or even too wide to surface with your planer. The process requires three planes and a couple other simple tools.



Winding sticks

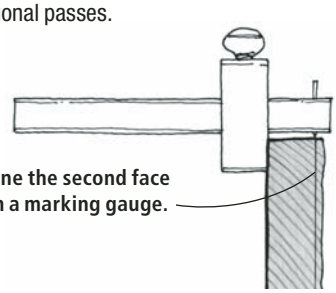
For typical furniture-scale projects, use a jointer plane, jack plane, smoothing plane and two winding sticks – winding sticks can be two matching lengths of straight wood (usually of contrasting colors) or you can also use aluminum angle purchased from the home center.

Use the winding sticks to find out where the high spots are and if the board is twisted. By putting one stick at the front of the board, one at the back and sighting down across them, you'll quickly see any problem areas. Mark the high spots in chalk and knock them down with your jack plane. The cutting edge of the jack plane should be curved and set to remove thick shavings. Check your progress periodically using your winding sticks.



Board surfacing

When things look nearly flat, switch to the jointer plane, which should have a slightly curved blade that's set for a finer cut. Work diagonally across the face, then diagonally the other way. Don't worry about tear-out yet. When the face of the board is flat, come back with the jointer plane and smooth the board with strokes following the grain. Clean up all the marks left from the diagonal passes.



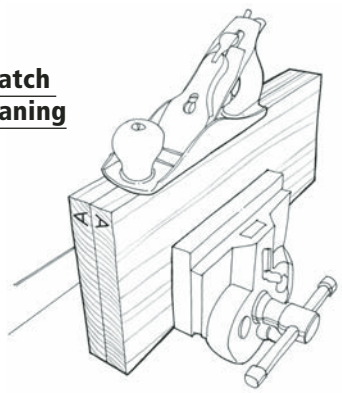
One face is now flat. Using a marking gauge, scribe the finished thickness of the board on the long edges and ends – the face of the marking gauge should ride on the board's finished face.

Repeat the flattening process on the other face of the board and work down to the scribed line on all four edges. Finally, use a smoothing plane on both faces to complete your work.

This sounds a bit arduous – it is harder than working with a powered jointer and thickness planer. But if you have your jack and jointer planes set to cut aggressively, you'll be surprised by how quickly the work can go.

Learning to edge-joint a board with a jointer plane is also a good skill to acquire. Sometimes

Match planing

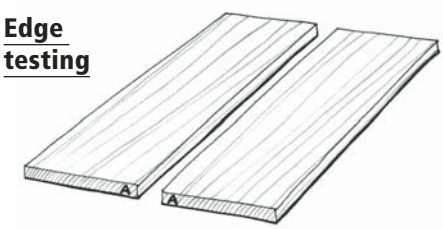


Illustrations by Matt Bantly

boards that you want to edge-glue into a panel will be too long for your powered jointer.

One accepted technique is called "match planing" (shown above). With this process you sandwich the two boards together in a vise and plane both edges at the same time. Any small differences in the angle of the plane will be canceled out by the fact that the two angles will be complementary. For this process, sharpen your jointer plane with a perfectly straight edge, like that of a chisel or a block plane.

Edge testing



Another traditional technique is to plane each long edge individually and test the boards' edges against one another. For this process, sharpen a very slight camber on your iron. The position of the plane's body on the edge of the work will allow you to correct the angle of the edge. With a little practice, this will become second nature.

— Christopher Schwarz, executive editor

match and imperfections, cut the lumber oversized for the needed panel. A few extra inches in length is a good idea, and only one extra inch in width is fine.

The first stop is the jointer. To true a board (make it flat and straight) the jointer is a must. You want to make one face and one edge true at this stage.

After the board is jointed, it's time to head for the planer to make sure all the boards are the same thickness. I've added some photos on the previous pages to walk you through these steps.

Of course you don't have to use machinery to true and thickness a board. You can use hand planes. This process is quieter, creates less dust and many woodworkers find it therapeutic. Truing rough stock with hand tools is a bit of a challenge, but it's do-able once you develop a few skills and have the right tools. See "Prepping Lumber by Hand" (left) for tips on getting this right.

Preparing Plywood

One of the reasons I enjoy using plywood in a project (beyond the stability and uniform appearance benefits) is the lack of preparation required to put it into the project. Prepping solid lumber can take a day all by itself, jointing and planing to the proper dimensions. And that's before cutting it to finished size. Working with plywood, it's just cutting to finished size.

Well, almost – you do need to be aware of the fact the plywood is frequently not the full thickness as marked. Three-quarter-inch plywood may be $^{11}/_{16}$" or some other dimension in the thirty-seconds. This isn't a crisis, but you need to be aware of it as part of your preparation to build. Dados, grooves and rabbets may need to be adjusted to make everything fit tightly.

Also, while plywood is manufactured so that the full 48" x 96" sheet can be used, the edges are often dinged, not square to the face and the layers can be uneven at the edges. Most woodworkers plan on having to joint or trim plywood sheets to give an acceptable edge. So, you'll need to anticipate that and probably allow about $^1/_2$" loss in either direction when planning your cutting list.

Assembling Solid Panels

One of the happy situations with joining solid lumber into panels is that a long-grain to long-grain glue joint is the strongest joint possible. There's no need for biscuits, screws or anything. The joint will be stronger than the wood.

Of course you still need to pay attention to the way the boards match up for the best appearance. And you also need to prepare the mating edges to ensure a flat panel. This sends us back to the jointer to – make a joint!

Plywood fresh from the store may show signs of wear and general mishandling. Be prepared to have to trim away corners or edges to remove damage. The dirt on the surface of the lower board will likely sand off, but it's still something to be aware of.

The edge created by a sharp jointer pass is an excellent glue joint. But you need to make sure that the two edges to be joined are darn-near-perfect right angles to the board face. Even after setting the jointer fence, slight imperfections are possible. That's why I like using a little geometry to cheat.

If you take two boards with one edge at 89° to the face and the other edge at 91° to the face and glued the two together, you'd end up with a flat panel. Because the two angles are complementary, they combine to form a 90° relationship.

With your jointer's fence set slightly off of 90° (for any reason) you can form the complementary angle for glue-up by simply reversing the faces of the boards against the fence. Run your first board (seam edge down) with the face against the fence. Run the second board with the face facing away from the fence. When the two are paired, you'll have a perfect joint.

Gluing up the panel is next. Pre-set your clamps so that you'll have a clamp spaced approximately every 6" to 8" along the board, alternating the clamps from one side to the next to keep the panel as flat as possible.

Apply just enough glue to cover one edge completely with a thin layer of glue. Then put the panels together and clamp just enough to cause the glue to squeeze out slightly. Along with cleaning up the glue, it's a good idea to throw a straight-

Photo by Al Parrish

The most important step in gluing up a flat panel is starting with a square edge on each of the mating boards. Accurately setting up the jointer will save lots of headaches. If you're not comfortable with the accuracy of your jointer's fence, cheat by making two complementary angles on the mating boards as discussed in the article.

Photo by Al Parrish

When working with parallel jaw clamps (as shown) it's not necessary to place clamps on both sides of the panel. The clamp's design holds the panel flat, but it's still a good idea to check the panel to make sure. Align the two (or more) boards' thickness as carefully as possible when applying the clamps. With less offset between the boards there will be less planing or sanding to completely flatten the board.

edge on the panel to check for flat.

When the glue is dry you still need to flatten the panel. If you're lucky enough to have a drum sander capable of handling the width of the panel, a few minutes of work will have you ready for joinery. You can also use a random orbit or belt sander to flatten your panel, but take pains to remove material evenly (checking for flat as you go) and be careful not to round over the edges.

If power sanding isn't your first choice, remember how we flattened the single board by hand earlier? It's time to take that same technique to the next level by flattening your joined panel.

Assembling Plywood Panels

Making plywood panels is relatively easy if you use the right tool – a biscuit joiner. While not a common task, arranging a veneer pattern to fit your project is possible with this technique. A biscuit joint on a plywood edge isn't very strong, but it will align accurately and provide stability for use with panels.

Start by using your jointer to make the same type of complementary mating joint as we discussed for solid lumber. Be aware that if your jointer has high-speed steel knives, the plywood can dull or nick the knives. Take light passes.

With the edges prepared, set your biscuit joiner to cut the pockets in the center of the edge and work only from one side of the boards. If your biscuits are placed too close to one face of the plywood, it's possible that the biscuit shape can be telegraphed through the plies and be visible on the face.

Take care when clamping the panel, though the biscuits make alignment easier. Light sanding should be all that's required to finish the panel face. **PW**

Using biscuits in plywood panels makes sense to more easily align the faces. But the biscuits need to be in the middle of the plywood edge as shown in the top board here. The lower board has the biscuits cut too close to the top edge. Any swelling in the biscuit will telegraph to the face.

TALL CHEST:

CARCASE CONSTRUCTION

Building fine furniture is challenging, but never impossible. Learn the techniques necessary for efficiently building any casework.

If you've never tried your hand at building a chest of drawers but you've built several projects with success, the simple tall chest in this article is a good place to begin. Because of its scale, a chest of drawers can seem intimidating at first glance. But stripped of its feet and moulding, this chest, like all chests, is just a box. And of course the drawers are simply boxes, too, which are made to fit within the large box.

The key to building casework is to make it square. Otherwise, as you can imagine, it becomes very difficult to fit the drawers and mouldings. The key to making the casework square is to use a stop-block when cutting parts to final length. Remember, for the corners of a box to be 90°, or square, parallel parts must be the exact same length. If you measure, mark and cut parallel parts separately they probably will not be exactly the same length. Instead, if you measure and mark just one piece and set up a stop-block, the mating parts will be identical.

Once the basic case is constructed there is no longer a need to measure at all. Instead, the remaining parts of the case, such as drawers and moulding, are marked directly from the case. Using these tested and traditional techniques not only ensures that the parts fit, the construction process is much more efficient as well.

Chests of drawers such as the one shown at right were very popular two centuries ago in the New England Colonies. I like them for their simplicity. They rely on good proportions and careful selection of figured wood rather than lots of curves and carvings; this chest fits within a golden rectangle and the drawers graduate using arithmetic progression. The casework is supported by tall bracket feet, which were common on New England chests of this classic period. And capping off the chest is a bold crown moulding.

Many of the surviving antique chests are made from tiger maple; a few are crafted of cherry. Tiger maple is one of my favorite woods but I opted for cherry because I had some special planks that I cut and dried myself. The case sides and top are made from a matching set of 22"-wide boards. As you can imagine it was a large, old tree. In fact, it was so old that the base of the tree was beginning to rot and so the commercial mills just were not interested in the tree. It's a good example of what you can often find when you develop rapport with a professional logger. Finding lumber like this at a lumberyard is difficult to impossible.

One-board sides and a top are dramatic, but two well-matched boards look great, too. And the specialty lumber dealers in Pennsylvania (see "Specialty Lumber Dealers" on page 60) often have wide, figured boards in stock. So gather the necessary materials, sharpen your chisels, grab your dovetail saw and let's begin.

by Lonnie Bird

Lonnie is the author of "The Complete Illustrated Guide to Using Woodworking Tools" (The Taunton Press) and teaches woodworking. You can learn more about his classes online at lonniebird.com.

Mill the Stock

Before you lay out and cut the first dovetail, it's important to mill the stock flat and square. Cutting dovetails on warped boards is difficult at best. I flatten one face of each board with my jointer before planing the stock to thickness. Afterwards, I square one end of each board and cut the stock to length using a stop-block for accuracy. The stop-block is a critical part of the setup when sawing to final length. For the corners of the chest to be square, the parallel members must be equal in length. Afterward, cut a ½" by ½" rabbet along the inside edges of the sides and top to accept the carcase's backboards.

Photo by Al Parrish

Dovetail the Box

Once you've milled the four planks for the box, you're ready for joinery. I always use dovetails for furniture casework; no other joint can match the strength and beauty of a row of dovetails. Remember, too, that the chest stands only 53" tall – so the joinery at the top is easily visible; rows of contrasting tails and pins are an eye-catching part of this classic piece of furniture.

It's important to start the layout at the back of the case with a half tail to hide the rabbet. Otherwise, if you begin with a pin, the rabbet will create an ugly void.

Crisp, well-delineated baselines are critical for making a dovetail joint that you'll be proud of. If the marking gauge is sharp, it will incise a crisp layout line as opposed to a line that is torn or ragged. A clean incision will allow you to easily locate the layout line with the chisel edge as you chop the waste areas in the joint. It's a good idea to test the marking gauge in an inconspicuous area and sharpen it if necessary.

For casework such as this chest of drawers, I use half-blind dovetails even though the joint is partially covered by moulding. Remember, solid wood is continually expanding and contracting with the change of seasons. If through dovetails are used, the ends of the tails will push the moulding slightly away from the case during the dry winter months. Half-blind dovetails provide a neat appearance year-round.

Despite what you may have heard, half-blind dovetails are really no more difficult or time-consuming to cut than through dovetails. The technique I use is to cut the waste from between the pins with a router. I don't use a jig. Instead, I lay out the joint carefully with a knife and carefully rout freehand to the layout lines. It may sound difficult, but it's not really; like most woodworking skills it just requires a bit of practice. After routing the waste I chop the rounded, inside corners square with a chisel and mallet. Then I scribe the tails from the pins and saw them by hand. The result is an authentic, hand-cut dovetail joint. The router is used only to efficiently remove the waste from between the pins, which makes the process less tedious and far more efficient. For more on cutting dovetails, see my article in the February 2005 issue and see the photo essay on page 64.

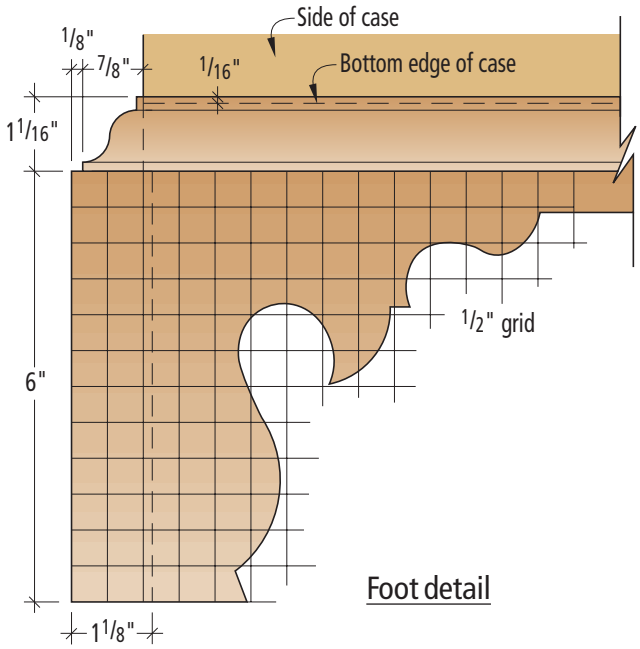
Assemble the Box

Once all the dovetail joints have been cut and fit, you're ready to assemble the box. To make the glue-up stress-free I first assemble the box and then gently tap each joint halfway open with a mallet to apply the glue. By partially opening the joints I can easily apply the glue and tap the joints closed again; there's no need to match and align mating corners after spreading the glue. I don't use clamps to assemble the case; if the fit is snug the joints will stay closed without clamps. However, if you decide to use clamps, be certain that the clamp pressure doesn't inadvertently twist the case.

Once the joints are assembled, I check the corners for squareness. If the case isn't square, a slight amount of pressure on the acute corners will make it square. I don't use a clamp to square the case. The limited reach of the clamp applies pressure only in a small spot at the clamp head. This causes the box to twist. Instead, I position a corner of the case on the floor of my shop and push gently on the opposite corner. This method applies pressure across the entire depth of the box and easily brings it into square. Now set the box on your bench, undisturbed while the glue dries.

Add the Dividers

After the box is assembled you're ready to construct the interior



Foot detail

TALL CHEST: CARCASE CONSTRUCTION

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑	2	Sides	7/8	19	46	Cherry
❑	1	Top	7/8	19	31	Cherry
❑	1	Bottom	7/8	18	31	Poplar
❑	1	Bottom edging	1/2	7/8	31	Cherry
❑	1	Front foot	1 1/8	6	33 1/2	Cherry
❑	2	Side feet	1 1/8	6	20	Cherry
❑	2	Back support blocks	7/8	6	12	Poplar
❑	2	Base frame	7/8	2	31 1/2	Poplar
❑	2	Base frame	7/8	2	17	Poplar
❑	7	Dividers	7/8	2	30 1/2	Cherry
❑	7	Dividers	7/8	2	30 1/2	Poplar
❑	14	Drawer runners	7/8	1 3/4	16 3/8	Poplar
❑		Crown moulding	2 1/4	4 1/4	48	Cherry
❑		Base moulding	1 1/16	4	48	Cherry
❑		Back	1/2	30	45 7/8	Poplar
❑		Glue blocks	1/2	1/2	72	Poplar

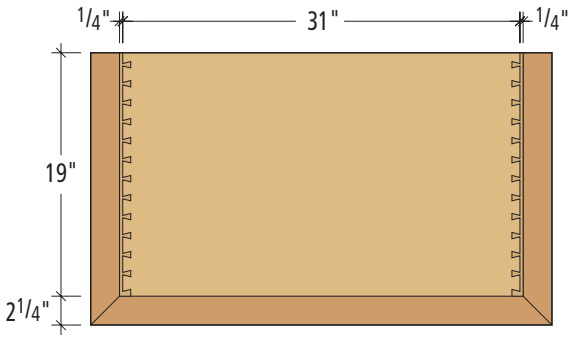
SPECIALTY LUMBER DEALERS

Good Hope Hardwoods
610-274-8842 or
goodhope.com

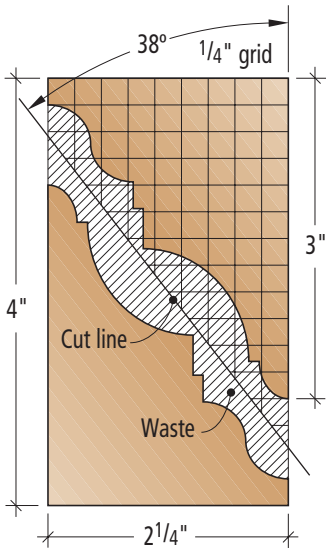
Groff & Groff
800-342-0001 or
groffslumber.com

Hearne Hardwoods
888-814-0007 or
hearnehardwoods.com

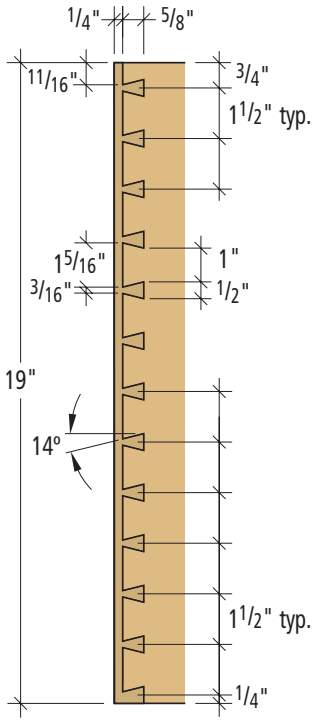
Irion Lumber
570-724-1895 or
irionlumber.com



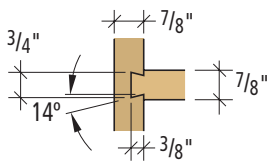
Plan



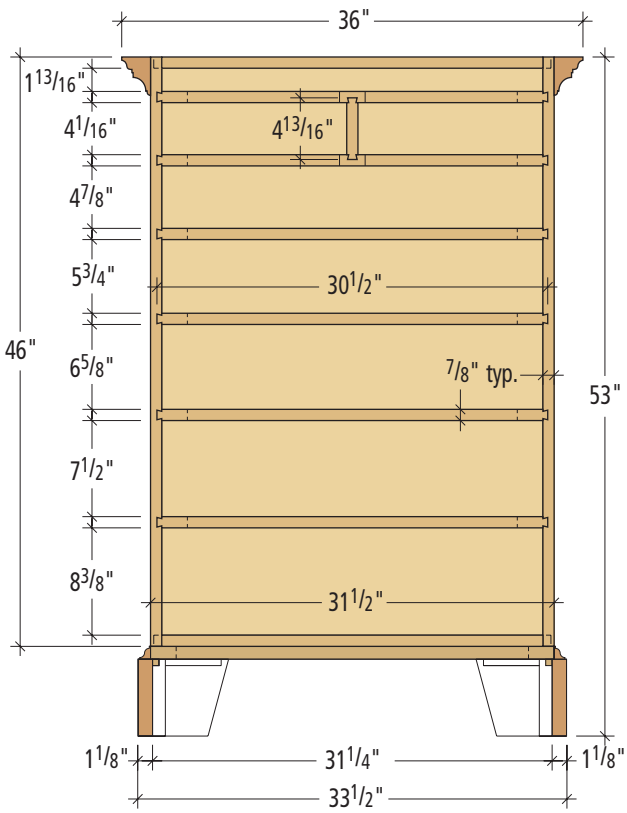
Moulding pattern



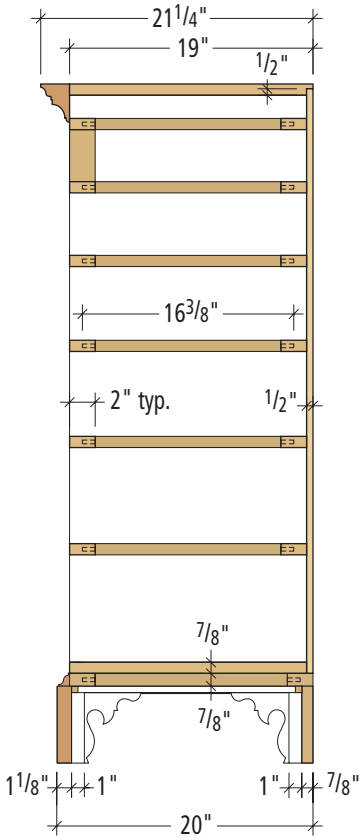
Dovetail detail



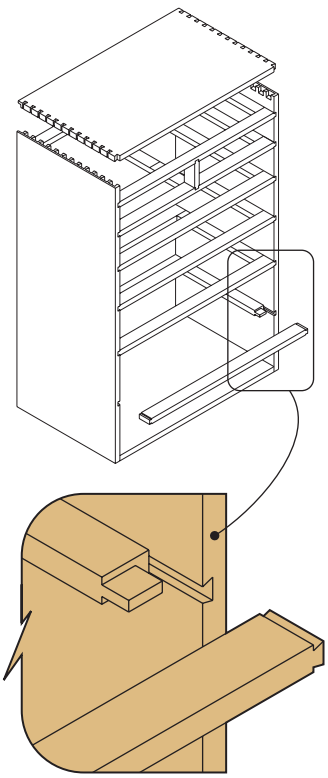
Divider detail



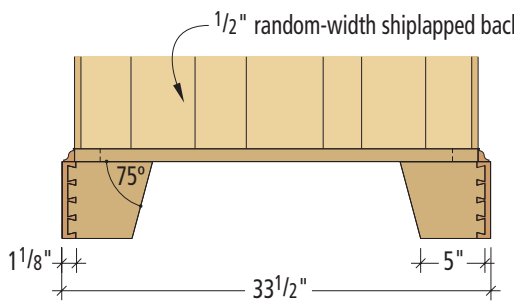
Elevation



Profile section

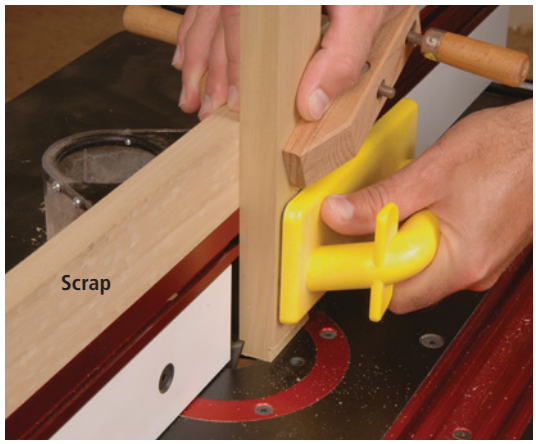


Divider/runner detail



Elevation rear

A plywood template registers against the case bottom to ensure perfect alignment of the joints as I rout the sockets for the case dividers.



Two passes across the router table creates the dovetail on the end of the divider. The scrap above stabilizes the workpiece.

framework of dividers and runners. There are actually two sets of drawer dividers: one at the case front and one at the back. Each pair is joined by a set of runners with mortises and tenons. The ends of each divider have dovetails, which fit snug within matching dovetailed sockets in the case sides. Once assembled, the dividers and runners create a rigid framework, which adds greatly to the strength and stiffness of the case.

I begin by routing the dovetailed sockets in the case to accept the dividers. To ensure that each divider is square to the case, I use a template to guide the router for corresponding cuts. There's no need to measure because the template registers against the bottom of the case. Besides greatly reducing the amount of time required to cut the sockets, this technique also eliminates potential layout errors. I use a separate template for each set of sockets. This way I'll have the templates ready next time I receive an order for the chest. You may prefer to use one template; start with the uppermost set of dividers and reduce the length of the template after each set of cuts.

After cutting the sockets, I'll rout the dovetails on the ends of the dividers with the same 14° dovetail bit in my router table. But first I cut the dividers to the final length, which corresponds to the distance between the sockets. Instead of measuring, I position the end of the divider in one socket and mark the length at the opposite socket. This method eliminates potential measuring errors.

All of the dividers should be the same length. I mark the divider closest to the top of the case, clamp a stop on the saw and cut all dividers to this length. You may find that the sides of the case have bowed slightly; the dividers will push or pull the bow out of the case as they're installed. In contrast, if you cut each divider a different length to correspond with the bow, the case will remain permanently bowed.

Next, I mount the dovetail bit in my router table and run the stock through twice to cut the tail, one pass on each face. The end of the divider has a small footprint; in fact, it's too small to steady the workpiece as you push it across the router table. For additional support I clamp a stick of wood to the divider at a right angle. The stick rides along the top of the fence to support the divider while making the cut. I use a push block to keep the workpiece firmly against the fence and distance my hand from the router bit.

A screw driven into the case side helps keep it flat throughout the years.

Before cutting the dovetails on the dividers I first test the fit on a sample piece of stock. The dovetail should fit snug within the socket and require gentle taps with a mallet to coax it together. Unlike a row of dovetails on a box, this joint doesn't have mating long-grain surfaces for glue; for the joint to be strong the fit must be somewhat tight. Before you go to the next step remember to cut and dovetail the short center divider at the top drawer opening.

Runners

With the dovetails cut on the dividers, you're ready to work on the runners. Besides supporting a drawer, each pair of runners also serves as a kicker to keep the drawer below from tipping as it is opened. The runners have 1"-long tenons on each end that fit in mortises in the dividers. After assembly each runner is fastened to the case side with one or two screws. Once screwed to the case side, the runner serves as a batten to prevent the case side from warping. Stagger the locations of the screws, so they're not in a straight line. Here's where you can run into a cross-grain construction problem.

As the case sides contract during the dry, winter months the runners can push the dovetailed dividers out of the case. Cut the runners $\frac{1}{8}$" short to leave room for seasonal movement. During assembly, apply glue only at the mortise-and-tenon joint at the front. The tenon at the back is dry and has a $\frac{1}{8}$" gap at the shoulder. As the sides contract, the rear

tenon will slide into the mortise. When the relative humidity rises during the summer months, the case sides will expand and the tenons will slide out slightly.

Once the joints are cut, you're ready to apply glue, and assemble the dividers and runners within the case. Begin by gluing the front dividers in place. Use caution and apply pressure equally to each end of the divider as you fit it into the case; if the divider is installed askew it will bind and may break the joint. Next, glue the runners into the front dividers. The last step is to glue in the back dividers. Remember, the back dividers are glued to the case but not to the runners. Once all the parts are in place the case is amazingly rigid.

Feet

With the "box" completed, turn your attention to the feet. Besides supporting the case, the feet and crown moulding transform the box into a piece of furniture. Miters join the feet at the front; half-blind dovetails join the feet at the rear to the poplar support blocks, cut from one 12"-long board. Once the joints are cut and fit, I band saw the foot's profile. Then I assemble the feet; first the dovetails, then the miters. To glue the miters apply a coat of yellow glue to each half of the miter, rub the joint together, check for square, and let it sit while the glue dries; no clamping is necessary. After the glue has dried reinforce the miter with a glue block in the back. The grain in the glue block must run horizontally to correspond with the grain in the foot. Otherwise the foot may crack with seasonal humidity changes.

The base frame is glued at the front only, and the front edge is glued under the bottom edge of the case bottom. The rest of the frame is attached with screws in slots. Glue blocks, 1/2" square, connect the feet to the frame.

Crown Moulding

The crown moulding is shaped from solid stock by using a series of passes over a router table. It's not possible to use flat architectural-style crown moulding because it creates a void on the top of the case. Instead, it's necessary to use triangular stock. To avoid excessive waste I band saw a rectangular plank diagonally as shown in the illustration on page 61.

After shaping the moulding, I carefully miter the front piece; the length of the front strip of moulding is critical. If it's too long it will prevent the returns from coming in full contact with the case and create a gap. If it's too short, it creates a gap in the miter. I miter the first end of the moulding, mark the opposite end and "creep" up to the miter with the saw. Once I'm satisfied with the front strip of crown moulding, I miter the "returns" or side pieces to match. Then I cut the other end of the returns flush with the back of the case.

The next step is to attach the crown moulding to the case. I attach the front strip of crown moulding with glue. Because the grain direction on the case corresponds with that on the moulding, glue will hold the piece secure without interfering with seasonal wood movement. However, the return mouldings must be attached to allow for seasonal movement in the case side. Otherwise, the case sides will crack. To solve the problem, I apply glue to the miter as well as the first couple inches of the moulding. I attach the remainder of the moulding with a couple screws from inside the case. In order to allow the case sides to expand without restriction from the moulding, I slot the screw holes in the case sides.

Back

I use 1/2"-thick poplar for the backboards. The edges of the boards are shiplapped. I wait to attach them to the case once the finishing is complete. This provides easy access to the inside of the case for finishing.

In the December 2005 issue I'll cover the techniques for making the drawers.

A standard-angle block plane with a 55° cutting angle is useful for leveling the joints. This high cutting angle reduces tear-out in some tricky woods.

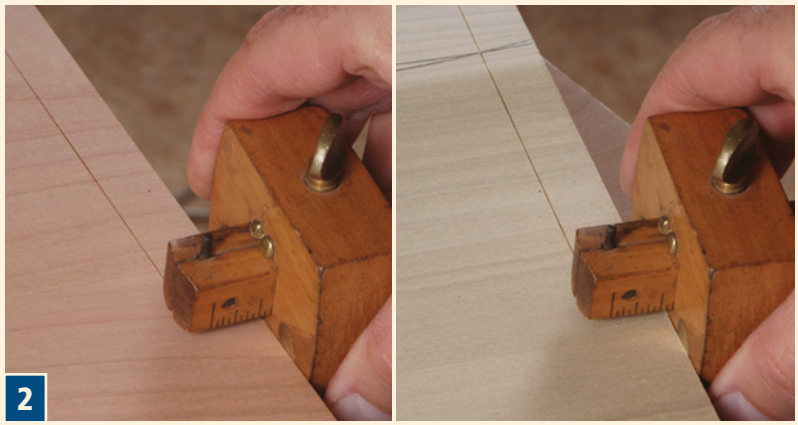
Note that the grain pattern in the glue block is parallel to the grain pattern of the foot to which it's applied.

Apply a liberal coat of glue to the miter for the moulding. The glue ensures the miter will stay tight over time.

Align the two halves of the miter and hold the joint in position for a minute or two.

SOLID CARCASE JOINERY: HALF-BLIND DOVETAILS

Begin by marking the baseline on the ends of the sides.



Mark the baseline on the faces of the top (left) and bottom (right).

Set the gauge to equal the thickness of the top and bottom.

Mark the inside face of the sides.

Begin by marking the half-tail, which covers the back rabbet.

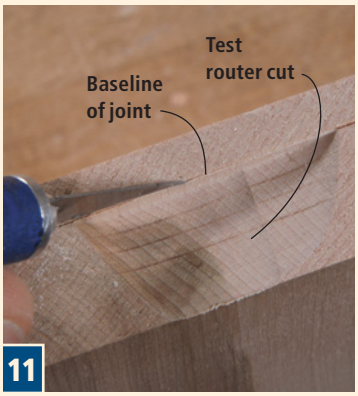
Use dividers to accurately step off the location of each pin.

Mark the slope of each pin.

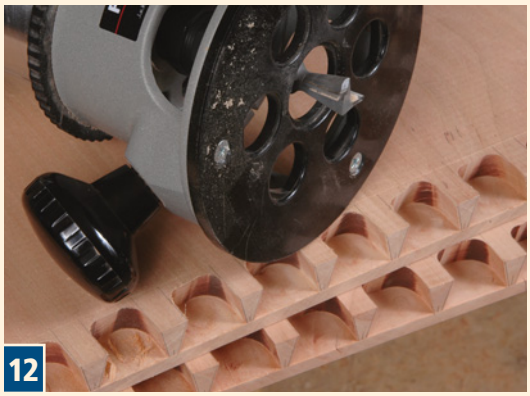
Transfer the pin layout to the mating board.

Use a square to mark the sides of the pins.

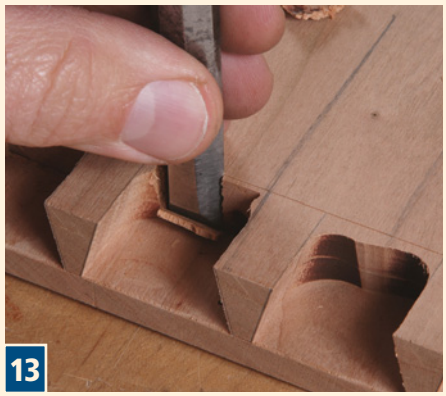
The pin board layout is complete.



Set the depth of the router bit so that it slightly contacts the baseline.



As you rout the space between the pins, avoid undercutting the back wall, which can weaken the joint.



Finish each space by chopping out the corners with a sharp chisel.

The pins are complete and ready for marking the corresponding tails.

Position the pin board over the tail board and mark the tails with a knife.

Transfer the marks to the end with a square.

Saw each tail to the baseline.

Chisel the space between each tail.

Tap the joint together with a mallet. **PW**

Photos courtesy Colonial Williamsburg Foundation, Williamsburg, Va.

the Anthony Hay Cabinet Shop

A look at Williamsburg's period shop through the eyes of a passionate hand-tool woodworker.

by Adam Cherubini

Adam Cherubini makes reproduction furniture using the tools and techniques of the 18th century. He demonstrates his craft at Pennsbury Manor in Bucks County, Pennsylvania, on Historic Trades Days. You can contact him at adam.cherubini@verizon.net.

Last year I visited Colonial Williamsburg's The Cabinetmaker Shop for the first time in 25 years. It was a real treat for me. Woodworkers get special treatment there to be sure. It's a little like going to a foreign country and being able to speak the language. New opportunities to explore become available to you.

I would like to have explored the shop's selection of chisels and saws, the glues and finishes, marking and dadoing techniques. It would have been nice to spend an afternoon examining the great wheel lathe. But on this visit, I choose to explore the shop itself. I've read several articles on "great two-car garage woodshops." Colonial Williamsburg's woodshop is roughly the size of a two-car garage, but there the similarities end.

The reconstructed Anthony Hay cabinet shop is comprised of two rooms. The first is a narrow, hall-like space called the wareroom. When I was there, a large Chippendale secretary stood opposite a harpsichord. High-style carved tables and chairs seemed almost pedes-

trian in such company. By outward appearance, I saw very few indications of what I euphemistically call "hand craftsmanship." The tear-out and loose joints that particularly characterize my work are not to be seen here. Surfaces have the uniformity of machined surfaces. Finishes are as perfect as those from any spray booth. If you have any reservations about the capabilities of hand tools, then this room will allay them.

The wareroom leads to the workshop. The workshop is a large airy space with high ceilings and large windows. Its whitewashed walls disguise the lack of electric light. At the end of the room is a cozy fireplace. Nothing in the room particularly suggests its use. There are no ugly hanging fluorescent shop lights, no dust collection system and no orange extension cords anywhere to be seen. Were the room not positively cluttered with workbenches, it would seem a very suitable living space.

Get ready to hit me in the face with a pie: The Hay shop has a certain indescribable, almost spiritual feel to it. I don't know about you, but I enjoy working wood in part because I like the material. Everything, and I mean everything, in the Hay shop is wood. The window frames are wood, the walls, the ceiling and the floor are all wood. Contrast that with the average cement-floor shop filled with metal machinery. That's not the kind of space I want to be creative in. It's the kind of space I expect to be paid in.

Colonial Williamsburg's cabinet shop features a spacious-feeling workshop with high ceilings, large windows and no electricity. And it's all in the space of a two-car garage.

The majority of woodshops with which I am familiar have a coating of Medium-density Fiberboard (MDF) dust in them. It coats the flickering fluorescent lights and gives a nasty brown haze to everything. The overall effect is like that of a bad black-and-white movie about Soviet Russia made during the Cold War. Everything is bleak and gray and hopeless.

The light in the Hay shop is strong, but without the harshness that usually accompanies artificial light. I don't know whether it's the large windows or white walls. I asked Mack Headley, the shop's current master, how he manages in a shop devoid of electric light.

"I don't know that I miss it much … electric lighting," Headley says. "Directional light is very good. The shadow allows you to read depth and dimension on a surface much better. Fluorescents flooding in from two directions illuminate things, but the shadow is gone, and it's actually very hard to read the (surface). You can't actually carve decently with fluorescents coming in from several directions …. It actually is easier and better to work in natural light. That's really the best of all. Not having electric light at all."

I've always been of the belief that more is better. And that's certainly always been my feeling about workshop lighting. I guess I always looked at not having artificial light as a huge disadvantage to be overcome. When I asked the question, I suspected that the craftsmen in the Hay shop have found some tricks to getting around not having electric light. But I was surprised to hear Master

Cabinetmaker David Salisbury secures a piece of work in one of the traditional vises, which tend to wrack. The benches are copies of examples shown in Peter Nicholson's 1812 "Mechanical Exercises."

LEARNING AT WILLIAMSBURG

I attended the "Working Wood in the Eighteenth Century" conference at Colonial Williamsburg last January. Each year, 400 or so woodworkers attend one of the two back-to-back sessions to learn more about 18th-century woodworking from the resident master craftsmen, conservators and several other experts.

This year's topic was "Making Case Furniture – Desks and Bookcases." On the stage in the museum's auditorium, craftsmen performed the difficult aspects of making secretaries, including octagonal 13-panel doors, decoratively carved raised panels and the tiny drawers and secret compartments that characterize secretaries from this period. The skill of these craftsmen is overwhelming. They shape wood into complex shapes with little more than a chisel or rabbet plane.

Each year Colonial Williamsburg's craftsmen and conservators cast their eyes toward a different topic. So far they've examined chairs and tables, tall case clocks and secretaries. But it doesn't matter what the topic is. For me, the conference elucidates possibilities. Regardless of your taste in furniture, I recommend attending at least once. For details on the next conference, see history.org/institute/ or contact Deborah Chapman at 800-603-0948 or dchapman@cwf.org. —*AC*

Master Cabinetmaker Mack Headley shows off a hand-carved ball-and-claw chair leg, which is typical of the finely detailed work Williamsburg's craftsmen produce.

Headley tout the benefits of directional or raking light. And I guess this is why I like Williamsburg; I don't know where else you'd go to get a perspective like that.

The Hay shop's primary purpose is to receive guests, so its atmosphere must be inviting. We may not have a choice about working with MDF, but wouldn't it be nice if our shops could welcome a spouse, child, grandchild or neighbor? My wife usually rubs her arms, shivers and leaves my cold subterranean woodshop. I'm not exactly sure how to make a space inviting. But I think the issue is worth considering. Light is probably a big part of how a shop feels.

The size of the Hay shop isn't particularly exceptional compared to a modern cabinet shop. What is exceptional is the fact that the original shop (the reconstruction is built on the original shop's foundations) probably housed as many as six workmen.

There is a certain inherent advantage to moving small tools over large boards as opposed to moving large boards over larger fixed tools. The Hay shop illustrates the fact that a hand-tools-only shop can be a fraction of the size of a shop in which power tools are used. This isn't a hobby shop, but a real working shop capable of producing very fine items. I know there aren't many woodworkers working in hand-tools-only shops. But if space is tight for you, switching to hand tools for some operations may be a solution.

I saw only a single tool chest in the shop, and I'm not certain to whom it belonged. Behind nearly every bench (some are free-standing) chisels hung from racks and moulding planes rested on short shelves. Bench planes resided either on or under the benches where scrap wood and large wooden clamps were stored. A few sawhorses lurked between the benches. Saws were hung at a single location by way of pegs in the paneling.

Other than that, it was surprising to see so few tools. Modern workshops with which I am familiar are positively dominated by tools and tool paraphernalia. Many of the hand-tool storage solutions I've read about discuss storing all the tools in one place (hanging wall cabinet, tool chest, etc.). While they may have put no conscious effort behind it, the Hay shop craftsmen appear to store their tools according to the frequency and location of each tool's use. Perhaps there's a lesson here for every style of workshop.

The workbenches are copies of the benches shown in Peter Nicholson's 1812 "Mechanical Exercises." While it is impossible to place this specific design into Anthony Hay's 18th-century shop, they fit well within the "plain and neat" aesthetic that characterizes Williamsburg's style.

A deep apron bored for holdfasts or pegs substitutes for a sliding board jack for the support of boards on edge. The apron also stiffens the 8/4-thick benchtop. A single, apparently poorly functioning face vise resides at the traditional left side of the benches. This vise is identical to those I've seen in period images. Stock placed at a distance from the single wooden screw wracks the jaw. But Hay shop craftsmen, either by nature or vocation, aren't complainers. Wracking is nothing a piece of scrap can't fix and work is continued uninterrupted.

Planing stops identical to those depicted in Jacques-Andre Roubo's 1769 "L'Art du Menusier" are present on these workbenches. I thought it interesting to note that the traditional metal-toothed part

Headley demonstrates carving. Left to right: Amber Baden-Lopez, Basaree Gajjar, Martin Harcourt, Headley and Milton Wooley.

of the planing stop was removed from the benches, leaving only a 2"-square wooden block, which is height adjustable by mallet blows. Planing into a single stop requires a specific approach. Holdfasts and battens can be used to stop the work from rotating, but I didn't see this done in the Hay shop.

Instead I saw workmen controlling their stock under their planes, moving the stock continuously. I think it bears mentioning that the benches seemed a bit lower than usual. Getting your body over the stock might be the key to controlling it.

The Hay shop challenges our notions of the basic woodshop. How much space do we really need to be productive? How many tools? How sophisticated must a workbench be to be useful? And can you really do good work in a shop without electricity?

We've talked about getting young people interested in woodworking and reaching out to female woodworkers. Maybe tearing down some of the barriers such as the cost of woodworking equipment, the space required, the noise, the mess and the idea that woodshops are by nature nasty, dusty places, would help.

The Anthony Hay shop in Williamsburg might be a recreation of a 200-year-old woodshop, but it is also a place to go for new ideas. **PW**

Blacksmith Ken Schwarz works in the James Anderson Blacksmith Shop.

BEHIND THE SCENES THERE'S A THRIVING COLONIAL ECONOMY

Colonial Williamsburg is a town in Virginia authentically reconstructed to appear as it did in 1775, the dawn of the American War for Independence. Then the capital of the British colony of Virginia, Williamsburg's architecture conveys the lifestyle of the wealthier residents of the 18th century.

Prim and tidy Colonial buildings with whitewashed clapboards and pretty little fences line the streets. There are boxwood gardens and authentically dressed friendly guides suitable for any picture postcard.

But behind the scenery, a much less scenic aspect of Colonial life has been reconstructed. The 20 or so individual craft shops in town function within a reconstructed Colonial economy. I believe it is this economy, more than any organizational directive, that drives Williamsburg's crafts shops to produce authentically.

Today, Williamsburg's craftsmen can reproduce almost every aspect of Colonial life. This hasn't always been the case.

The blacksmiths at the James Anderson Blacksmith Shop for example, demonstrate their craft for their visitors. Often unbeknownst to their guests, the items they are forging may well be products required for projects or tradesmen elsewhere in the town.

These items must be made to the customers' standards and schedules, just as they would have been 200 years ago. It's not good enough to make something that looks like a nail. It must function as a nail, must be capable of being driven by a hammer, and be made quickly enough to support the construction effort. In at least some instances, this has challenged preconceived notions of 18th-century trades and precipitated additional research on the subject. For modern craftsmen willing to look beyond the scenery, Williamsburg's crafts shops provide us a chance to view alternative methods and technologies. These aren't just museum spaces but real working shops staffed by real craftspeople.

Williamsburg's "plain and neat" buildings may be its prime attraction, but there's a lot more to see than meets the eye. —*AC*

Costumed "play actors" they are not. Smiths (such as Steve Mankowski, above) at the James Anderson Blacksmith Shop are hard at work.

THE BASICS OF Wiping Varnish

Its durability and ease of use make searching out this hard-to-identify finish worth it.

Of all finishes available, none offers as much protection and durability with as little difficulty in application as wiping varnish.

With wiping varnish you can achieve a run-free, brush-mark-free, air-bubble-free and almost dust-free finish, which after several coats is very protective against moisture penetration, and resistant to scratches, heat and solvents. And you can do this with no more effort than wiping or brushing on the finish, and either leaving it, or wiping off some or all of the excess.

No other finish offers all of these great qualities. The only finish that competes is gel varnish, but it's messy to apply, and it can't be built up as fast on the wood without leaving brush marks. Wiping varnish is arguably the single best finish for most amateur woodworking projects.

What is Wiping Varnish?

Wiping varnish is simply common oil-based varnish (any type, including alkyd varnish, polyurethane varnish or spar varnish) that is thinned enough with mineral spirits (paint thinner) so it is easy to wipe on wood. You can easily make your own.

The name, which I created in 1990, and which has been adopted by most writers and teachers of wood finishing, makes sense because the purpose of thinning is to make the varnish easy to wipe.

You may already be using wiping varnish and not realize it because it isn't sold under that name (maybe because that would give away the simplicity of the finish). It's sold under many different brand names, and few indicate what the finish really is.

This is the problem with wiping varnish and the reason it isn't widely recognized as one of the best finishes for anyone not using a spray gun. Manufacturers obscure the true nature of the finish by their misleading, and sometimes outright deceptive, product labeling. They want you to think they are selling you something different and special.

In this article I will tell you about varnish, how wiping varnish came to be, how to make and identify wiping varnish and how

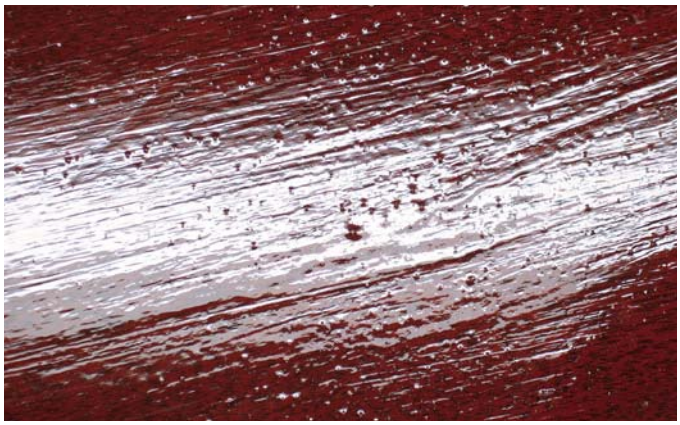
by Bob Flexner

All of these finishes are wiping varnish. If you shop at a home center or paint store, you will find the brands above. If you shop at a woodworking store or from a woodworking catalog, you will find the brands on the right. All of these finishes are essentially the same. They are varnish thinned enough with mineral spirits so they are easy to wipe on the wood.

Bob is author of "Understanding Wood Finishing," now in its second, fully revised, edition. To purchase, visit amazon.com, your local bookstore or a woodworking supply store.

Photo by Jim Roberson & Associates

to apply wiping varnish. I will also explain how wiping varnish differs from oil, and mixtures of oil and varnish. (See "Testing for Oil: Does It Get Hard?" on page 74.)



Varnish is a difficult finish to apply with near-perfect results because it cures slowly and is relatively viscous. The slow curing creates time for dust to settle and become embedded, and for runs to develop. The thickness makes brush marks likely and increases the possibility of bubbles curing in the finish.

What is Varnish?

Varnish is a very common finish that is appreciated for its terrific moisture, scratch, heat and solvent resistance. No matter how new you are to woodworking, you have probably used some type of varnish or oil-based paint, which is varnish with pigment added.

One way to identify varnish is by the thinner and clean-up solvent listed on the container. This is mineral spirits, which is usually identified by its more all-inclusive name, "petroleum distillate." The only other finishes that thin and clean up with mineral spirits are oil, blends of oil and varnish, and wax. None of these finishes cure hard, so they can't be built-up thick on the wood like varnish can.

All types of varnish are made by cooking an oil with a resin. (This is done in controlled conditions; you shouldn't try it yourself because of the fire hazard.) The oil, which is usually linseed oil, tung oil or modified soybean (soya) oil, makes it possible for the finish to cure in contact with the oxygen in air. The resin, which is usually alkyd or polyurethane, provides the hardness in the finish.

The most popular type of clear varnish is polyurethane varnish. It is the most protective and durable of the varnishes. That is, it is the most resistant to moisture penetration, and it is the most resistant to being damaged itself by coarse objects, heat or solvents.

Spar or "marine" varnish is also widely available. Its unique quality is increased flexibility created in the manufacturing process by including a higher ratio of oil to resin. Spar varnishes are meant to withstand the greater shrinking and swelling of wood placed outdoors. Sometimes this varnish contains UV absorbers to resist damage from sunlight.

If the varnish is not labeled "polyurethane" or "spar," it is probably alkyd varnish. Alkyd is the workhorse of the varnish resins. Almost all varnishes contain some alkyd, including polyurethane varnish. Oil paints are almost always made with alkyd resin and are often simply called "alkyd paint."

These are the common types of varnish on the market. You can thin any of them with as much mineral spirits as you want. The more mineral spirits you add, the less "solids" the varnish contains and the thinner each layer of finish will be on the wood. (In some parts of the country it is illegal to thin varnish because of VOC laws, and some brands of varnish reflect this by telling you not to thin their varnish; but you can't harm any varnish by thinning it.)

No finish is perfect in every way, and varnish is no exception. Varnish has two critical flaws: It cures slowly, and it has a fairly thick or viscous consistency.

The slow curing gives dust a lot of time to settle and become stuck, and runs and sags have a lot of time to develop on vertical surfaces.

The thickness is responsible for brush marks and bubbles curing in the finish because it doesn't flatten out well and bubbles don't pop out easily.

To tell if a finish that thins with mineral spirits and is sold as oil or labeled with some uninformative name is wiping varnish, put a puddle on top of the can and let it cure. If it cures hard and smooth within a day or two, it is wiping varnish. If it takes a lot longer and finally cures soft and wrinkled, it is oil or a mixture of oil and varnish.

Each of these finishes is a type of varnish. You can thin any one of them with mineral spirits to make a wiping varnish. The wiping varnish will have the characteristics of the varnish you use.

As a result, varnish is actually the most difficult of all finishes to apply with near-perfect results. But there is a way around the problem: Thin the varnish so it cures faster (the thinner film combines faster with oxygen in the air), levels better and releases bubbles easier.

The product made by thinning varnish is "wiping varnish."

To make your own wiping varnish, add mineral spirits to any varnish. The more thinner you add, the better the finish will level and the less dust it will collect. But the thickness of each coat will be less. Begin by thinning with one part mineral spirits to two or three parts varnish, and adjust from there to your satisfaction.

History of Wiping Varnish

Wiping varnish has been very popular with amateur woodworkers and refinishers for at least 35 years, but few have actually known that it was wiping varnish they were using. The finish was made popular in the late 1960s and early 1970s by Homer Formby. He traveled the country doing demonstrations of his new miracle finish, "Tung Oil," at shopping malls and antique clubs, and he made a number of infomercials that were broadcast on TV.

Few people were familiar with tung oil, which has its origins in China, so the exoticness of the name and source made the finish seem special. Formby was a master salesman.

But he wasn't selling tung oil. He was selling thinned varnish that he labeled "Tung Oil Finish." This finish is still available and the oil used to make the varnish isn't even tung oil. It's modified soybean oil.

It's important to note that even if this finish were made with tung oil – that is, tung oil cooked with a resin to make varnish – it still wouldn't be "tung oil." It would simply be varnish made with tung oil instead of some other oil.

Formby made contact with a very large number of people, however, and his mislabeled wiping varnish was a very good finish. So he won a big following and created a market for finishes labeled "tung oil." Soon other manufacturers joined in with their own "tung oils." Some made their varnish like Formby did – by cooking alkyd resin with modified soybean oil. Others cooked real tung oil with one of the resins.

Some misunderstood what was happening and actually sold real tung oil in its raw state and this really created problems. Incorrectly labeled or not, thinned varnish is an excellent finish because it cures hard. Tung oil doesn't cure hard, so it can't be built up on the wood without being sticky and gummy.

Moreover, unlike boiled linseed oil, which will produce an evenly attractive satin sheen after just two or three coats, tung oil requires five or more coats to produce an equivalent satin sheen. And each coat requires several days to cure and then has to be sanded smooth before the next is applied. Tung oil is a difficult finish to apply effectively, and many people who have tried it have been very dissatisfied.

Despite the difficulties with real tung oil, the market for a thinned varnish finish had been established. So as time passed, other manufacturers marketed their own versions of wiping varnish. Unfortunately, many of the manufacturers further confused the marketplace by labeling their finishes with non-informative names such as Waterlox, Seal-a-Cell, Salad Bowl Finish, Val-Oil, Profin and more.

The result is that no one using one of these brands now knows what finish they are using if they do no more than read the label. But all of these brands, being wiping varnish, are easy to use, and they produce excellent results.

Make Your Own

You don't, of course, have to buy pre-packaged wiping varnish. You can easily make your own. If you do, you can choose which type of varnish to use, polyurethane, spar or alkyd, and you can also choose between gloss and satin.

After choosing a varnish, turn it into a wiping varnish by thinning it with mineral spirits. (You can also use turpentine, but there is no advantage, and turpentine is more expensive and has a more pungent odor.)

To recreate a commercial wiping varnish, thin the varnish 50/50 with mineral spirits. To get a faster build, thin the varnish less. The less you thin the varnish, the

You can see the differences in the build of four coats of varnish thinned with 25 percent mineral spirits (top) and 75 percent mineral spirits (bottom). Each coat was brushed on and not wiped off. The lower the percentage of mineral spirits the greater the build of each coat, but the more likely you are to get brush marks and dust nibs.

TESTING FOR OIL: DOES IT GET HARD?

With all of the confused labeling from manufacturers, how can you tell if a finish is wiping varnish? It's simple. If the finish meets these three criteria, it's wiping varnish:

• It thins and cleans up with paint thinner. ("Mineral spirits," "petroleum distillate" or "aromatic hydrocarbon" will be listed on the container.)

• A puddle on top of the can, or on any non-porous surface such as glass, gets hard within a day or two.

• It is watery thin. (Full-strength varnish and polyurethane meet the first two criteria, but they are relatively thick, like syrup. They are also labeled "varnish" or "polyurethane," and wiping varnish is not.)

Curing hard is the critical characteristic because it makes it possible to leave each coat of wiping varnish wet on the surface – as wet and thick as you want as long as the finish doesn't puddle or run. You can build coats one on top of another to achieve a thicker coating for better protection of the wood against moisture.

Confusion is caused because wiping varnish is often sold or marketed as "oil," and it is sometimes included in the same category as oil in books and magazine articles. But oil doesn't cure hard unless you leave it for many months or years, and then only if it is applied very thin. So all the excess oil has to be wiped off after each application or you will end up with a sticky, gummy mess. Oil is about as different from wiping varnish as any finish can be.

It's true that oil is used as an ingredient in the making of varnish, but remember that once the oil and resin have been cooked, they are no longer oil or resin. (See page 72.) I like to compare what happens in varnish to bread. Once you add water to flour and yeast to make bread, you can't go back to flour or yeast, and it would be foolish to call the bread "flour" or "yeast." Likewise, it is totally inaccurate to call thinned varnish "oil" or "resin."

There are two categories of oil: natural oil, and mixtures of oil and varnish. The two common natural oils that can be used successfully as wood finishes are linseed oil and tung oil. Linseed oil is pressed from the seeds of the flax plant. Tung oil is pressed from the nuts of the tung tree. This tree is native to China but is now also grown in Argentina and the U.S. Gulf States.

Linseed oil is sold as "boiled" linseed oil when "driers" are added to cause the oil to cure faster (overnight in a warm room when the excess is wiped off). Without the driers, "raw" linseed oil takes weeks or months to cure, even when all the excess is wiped off. With or without the driers, the oil still cures soft, the same as tung oil.

Both linseed oil and tung oil can be mixed with any type of varnish, and the mixture can be thinned with mineral spirits or turpentine. Many brands of these mixtures are sold in home centers, paint stores and in woodworking stores and catalogs.

It's important to stress that these are mixtures or blends of oil and varnish. They are different than varnish itself, which is oil and a hard resin that are cooked together.

Because of the oil included in these mixtures, oil/varnish blends don't cure hard. So you have to wipe off all the excess after each application just as you do with linseed oil and tung oil. Otherwise, you will end up with a sticky, gummy surface.

Recently, I saw a woodworking magazine article that compared a large number of "wipe-on" finishes for characteristics such as viscosity, dry time, penetration and solids content (ratio of finish to thinner). Some of the finishes in the comparison were wiping varnishes. Others were oil/varnish blends.

The article was virtually useless as an aid to choosing a finish because the characteristic that matters most, "Does it cure hard?" wasn't included. You will never make sense of "wipe-on" finishes and overcome the confusion caused by misleading labeling until you understand this distinction.

If a finish thins with mineral spirits, cures hard, and is watery thin, it is wiping varnish. If a finish thins with mineral spirits, is in liquid form (it isn't wax), and cures soft, it is oil or a mixture of oil and varnish. There aren't any other possibilities for a finish that thins with mineral spirits. *– BF*

These are examples of oil/varnish blends, simply mixtures of linseed oil or tung oil and varnish, usually thinned with mineral spirits. You can tell that a finish is an oil/varnish blend if it contains mineral spirits and a puddle on top of the can or other non-porous surface takes days or weeks to cure to a very soft and usually wrinkled film.

more you increase the possibility of brush marks and bubbles curing in the finish. You also increase the amount of dust that can stick to the finish because a thicker film (after the thinner evaporates) takes longer to cure.

I suggest you begin with one part thinner to two or three parts varnish, and see how it feels to you. You can always adjust the ratio as you are applying the finish.

Applying Wiping Varnish

There are three good methods of applying wiping varnish: wipe off all the excess; wipe off most of the excess; leave the excess.

No matter which method you use, you need to prepare the wood first by sanding out all the machine marks and other flaws. The finish won't disguise them; it may highlight them.

In most cases begin sanding by hand or with a power sander using #100- or #120-grit sandpaper. Sand through all the "washboarding" left by jointers, planers, routers and shapers, and sand out any other problems.

Then sand with #150- or #180-grit sandpaper. If you use a power sander – for example, a random-orbit sander – it's a good idea to finish off by hand-sanding in the direction of the wood grain using the same grit or one numbered grit finer to remove "squigglies."

Of the three application methods the most foolproof is to apply the finish just like you do an oil finish. Wipe or brush the finish onto the wood, keep it wet for a few minutes until no more dry spots develop, then wipe off the excess with a cloth, leaving the surface just barely damp.

Let the finish cure for four hours to overnight depending on how warm your shop is, then sand the finish smooth using #280 or finer grit sandpaper. I usually use #320 or #400 stearated (gray)

sandpaper, which includes a soap-type lubricant to resist clogging. Sand just enough so the surface feels smooth. Don't sand through to the wood.

Dust the surface using a vacuum or a tack (sticky-varnish) cloth you can buy at paint stores, and apply another coat in the same manner as the first. Continuing with the same steps, apply as many coats as you need to achieve the look you want.

Don't sand the last coat. Instead, if there are some dust nibs that you can feel, simply rub the surface lightly with a brown paper bag. This will smooth over the dust nibs so that you don't feel them anymore (though you may still be able to see the flaws in a reflected light).

Because you are wiping off the excess, you may need to apply five or more coats to get enough build for a nice-looking finish. To reduce the number of coats, simply leave more of the wiping varnish on the surface. In other words, don't wipe off as much of the excess.

To get an even faster build, brush the wiping varnish and leave it just as you would full-strength varnish. The finish will collect more dust nibs this way because it will take longer to dry. But it will level well (as long as it has been thinned enough), and you can always sand out the dust nibs and apply a thinner final coat to achieve near perfection.

You can get an even faster build by brushing several coats of full-strength varnish, and then sand the surface level to remove brush marks and dust nibs. Finally, apply a final coat or two of wiping varnish, which you mostly wipe off.

If you apply a coat of wiping varnish, or full-strength varnish for that matter, and the varnish doesn't level well, bubbles don't pop out, or excessive dust collects on the surface, you can remove the still uncured finish for up to an hour or so by wiping with a rag soaked with mineral spirits or naphtha. You won't damage the cured finish underneath.

At any time in the life of the finish, you can recoat with more wiping varnish to "renew" the surface. Just be sure that the surface is clean and dull – clean of grease and other foreign material and not glossy. One method of achieving this is to wash the surface with detergent, and then lightly sand or use steel wool. **PW**

After sanding the wood to remove machine marks and other flaws, use a cloth to wipe on a wet coat of wiping varnish. You can control the wetness of the cloth to apply an evenly wet coat of finish everywhere. Otherwise, come back over with a drier cloth and even out the thickness or totally remove the excess. You can also use a brush for application, of course, but I find that using a cloth is much faster unless you intend to leave all the excess.

After each coat has cured hard enough so it powders when sanded (four hours to overnight, with the time being longer the thicker the finish and the lower the room temperature), hand sand the finish smooth. Remove the raised grain after the first coat, and dust nibs after all coats. Use the finest grit that will remove the roughness efficiently – usually #280 to #400 grit. Don't sand more than necessary to make the surface feel smooth or you might sand through.

After removing the sanding dust using a "tack cloth" or vacuum (so as not to stir up dust in the air), brush or wipe on another coat of wiping varnish. Brush and leave the excess if you want to build the thickness with fewer coats. Wipe and remove part or all of the excess if you are trying to keep the finish build thin, or if you are having problems with brush marks, bubbles or too much dust sticking to the wet finish.

If dust nibs remain in the finish after the final coat, rub the surface lightly with a brown paper bag. The paper is abrasive enough to smooth over the nibs, but not so abrasive that it leaves scratches in the finish. Be sure the finish has thoroughly hardened before doing this.

Arts & Crafts
BRIDAL CHEST

Contrasting woods highlight the elegant lines of this Gustav Stickley-designed classic.

In days gone by, a chest similar to this would contain a bride's dowry. The form goes back to Gothic times, but this is an adaptation of a Gustav Stickley piece from 1901. Admiring the lines of this piece, I was curious to see how the design would look with contrasting materials, not the usual Craftsman dark oak. The panels are quilted bird's eye maple, and the other parts are Jatoba, also known as Brazilian cherry.

The original was made of quartersawn white oak with wrought-iron braces on the corners. What makes this unusual for a Stickley design are the decorative corbels on the panels. These also appeared on a few dining room case pieces made in the early 1900s.

Decorative curved elements in Stickley furniture are usually associated with Harvey Ellis, who worked for Stickley in 1903. This design appeared well before Ellis worked for Stickley, and before Stickley wrote against using purely decorative elements in his furniture catalogs.

Stickley doesn't always get the credit he deserves as a furniture designer. Building this bridal chest with non-traditional materials takes his design out of the Craftsman context, and shows Stickley's remarkable sense of line, proportion and texture.

In many of the original bridal chests I have seen, the center panels have cracked. I think the corbels are the culprits, keeping the solid-wood panels from expanding and contracting in the grooves of the stiles. To avoid this problem, I decided to use veneered panels. The veneer is on a core of ½"-thick Medium-density Fiberboard (MDF), and the backing veneer is sycamore, a less-expensive alternative to the figured faces.

The veneer on the wider center and end panels is bookmatched. I pressed the panels one at a time in a simple shop-made cold press, and worked on the chest's solid-wood components while the glue on the panels was curing.

If you think of this chest as a simple box, most of the work is in the five paneled assemblies: the front and back, two ends and

by Robert W. Lang

Comments or questions? Contact Bob at 513-531-2690 ext. 1327 or robert.lang@fwpubs.com

Photo by Al Parrish

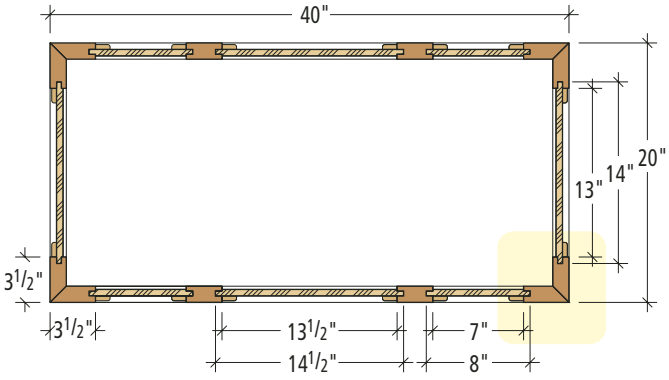
the top. The panel assemblies are joined with mortises and tenons, and each of the four legs is really two stiles with the long edges mitered together.

I fabricated all of the stiles and rails, and then dry-fit each of the panel assemblies before cutting and assembling the miter joints that connect the legs.

Managing Bits and Pieces

This isn't really a difficult project to build; the hardest part is keeping track of what piece goes where. The applied corbels make it necessary for the panel grooves to be off-center on the edges of the stiles and rails. As I cut the parts I decided where they would go in the finished chest, and marked each one with a lumber crayon. As I worked on the joints I paid close attention to which face of each part was the outside piece.

After cutting the panel parts to size, I grouped four of the leg pieces together and marked them out as



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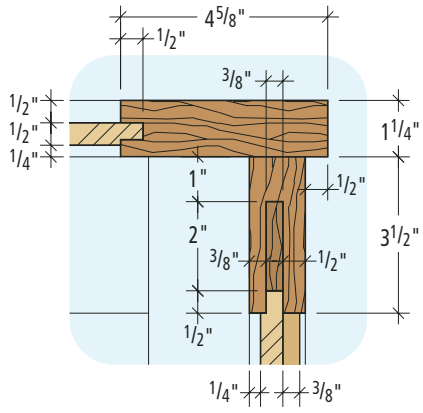
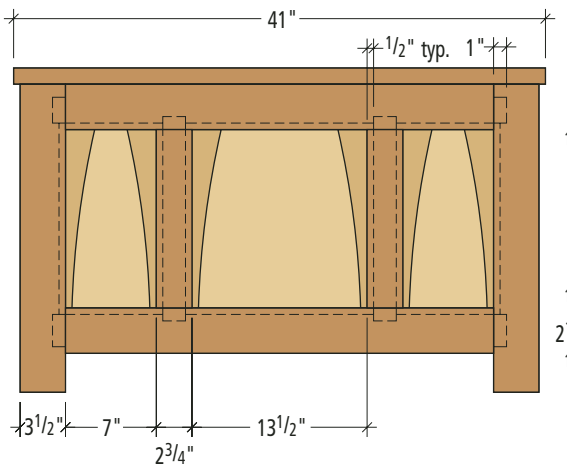
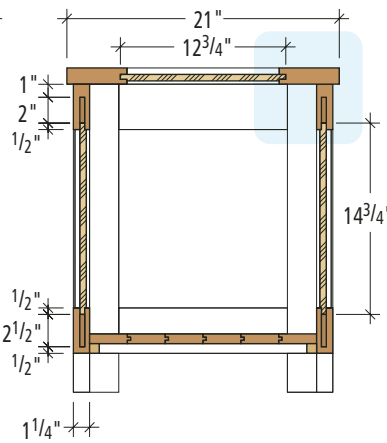


Section detail



Elevation



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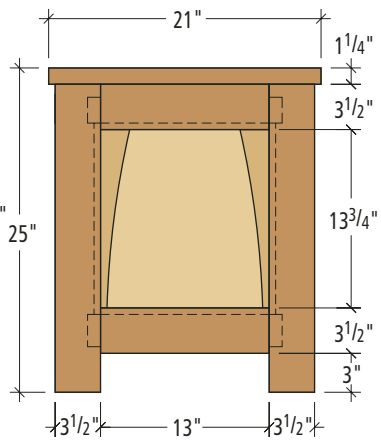
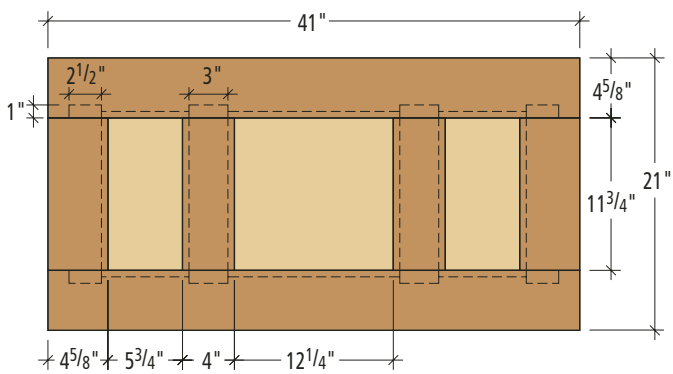
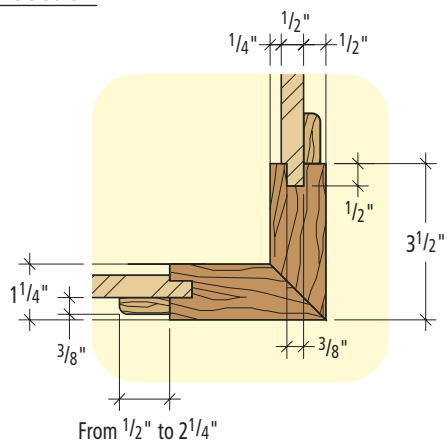


Profile



Lid plan



Section detail

left-handed pieces, using a story pole to transfer the measurements. I then laid out the other four leg pieces as right-handed, marking the locations of the grooves for the panels and the mortises that hold the stiles and rails together.

The mortises are the same width as, and in line with, the grooves that capture the panels. These 3/8"-wide grooves are set 1/2" back from the outside face of the stiles and rails, so I had to be careful to keep all the parts oriented correctly as I milled the grooves.

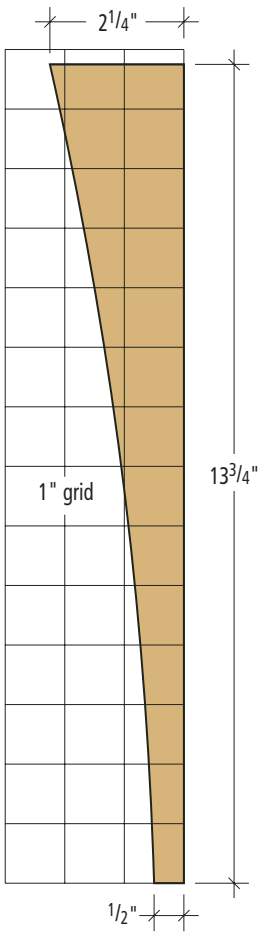
I cut the stopped grooves with a stack dado set on the table saw, carefully lowering and raising the legs on and off the cutters. Because the mortises fall in the ends of the grooves, the exact length of the grooves isn't critical. The grooves in the rails and in the intermediate stiles run the full length of those parts. After milling all the grooves, I began making mortises with my hollow-chisel mortiser, setting the distance from the fence to the chisel to match the location of the groove.

The tenons were cut with a stack dado set on the table saw, and then trimmed to a piston fit with a shoulder plane. With the individual panels dry-assembled, I made sure that the faces of the joints were flush with a few swipes of my smoothing plane.

With the dimensions marked on a story pole, the locations for the mortises are marked on the legs as a group.

The mortiser is set with the chisel flush with the panel groove. Plunge the bit and chisel to make distinct holes, then come back and clean up the waste in between.

Each of the tenons is planed to fit snugly in its mortise. A batten across the bench eliminates the need to clamp the parts while fitting.



Corbel pattern

ARTS & CRAFTS BRIDAL CHEST

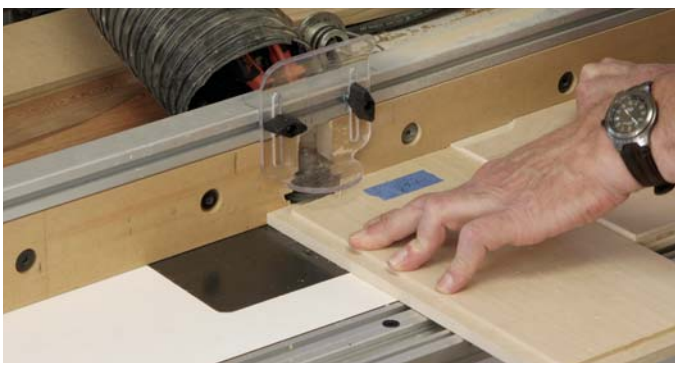
	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
❑	2	Top stiles	1 1/4	4 5/8	41	Jatoba	
❑	2	Top end rails	1 1/4	4 5/8	13 3/4	Jatoba	11 3/4" between tenons, 1" TBE
❑	2	Top center rails	1 1/4	4	13 3/4	Jatoba	11 3/4" between tenons, 1" TBE
❑	2	Top end panels	1/2	6 3/4	12 3/4	Maple	3/8" x 1/2" tongue around edge
❑	1	Top center panel	1/2	13 1/4	12 3/4	Maple	3/8" x 1/2" tongue around edge
❑	8	Legs	1 1/4	3 1/2	23 3/4	Jatoba	
❑	4	F&B, top & bottom rails	1 1/4	3 1/2	35	Jatoba	33" between tenons, 1" TBE
❑	4	F&B, center stiles	1 1/4	2 3/4	15 3/4	Jatoba	13 3/4" between tenons, 1" TBE
❑	4	F&B end panels	1/2	8	14 3/4	Maple	3/8" x 1/2" tongue around edge
❑	2	F&B center panels	1/2	14 1/2	14 3/4	Maple	3/8" x 1/2" tongue around edge
❑	4	Side, top & bottom rails	1 1/4	3 1/2	15	Jatoba	13" between tenons, 1" TBE
❑	2	Side panels	1/2	14	14 3/4	Maple	3/8" x 1/2" tongue around edge
❑	16	Corbels	3/8	2 1/4	13 3/4	Jatoba	Cut to pattern
❑	2	Bottom cleats	3/4	3/4	37 1/2	Jatoba	
❑	2	Bottom cleats	3/4	3/4	16	Jatoba	
❑	5	Bottom planks	3/4	3 3/16	37 1/2	Cedar	1/4" x 1/4" tongue & groove
❑	1	Bottom plank	3/4	2 15/16	37 1/2	Cedar	1/4" x 1/4" groove

TBE: Tenon both ends

Getting Ready to Assemble

I cut the veneered panels to their final size, and then milled a rabbet on the back of each panel on the router table. With a slot-cutting bit set just under 3/8" above the table surface, I made a tongue that slipped in the grooves of the stiles and rails. This is a good technique when working with plywood panels of inconsistent thickness as the fixed distance between the table and cutter will produce a consistent part that matches the width of the groove. I then sanded the veneered panels to #220 grit to prepare things for assembly.

Before assembling any of the panels, I cut 45° bevels on the long edge of each leg that didn't have the groove for the panels. I glued pairs of legs together, clamping them with a combination of clear packing tape and clamps. After letting the glue on these joints dry overnight, I glued together the front- and back-panel assemblies. The two end-panel assemblies are put together as the entire case is assembled.



Setting the cutter above the table surface cuts a consistently sized tongue on the back of the panels.

With the back panel lying face down on the bench, I assembled the rails and panels for the sides. Once they were in place, I put glue on the tenons and dropped the front panel assembly in place. I then set the chest upright on my bench and clamped across the ends, checking for square.

After the glue on the solid parts had dried, I sanded the outside of the chest with a random-orbit sander, working from #100 grit up to #220, followed by a hand sanding with #280 grit. The top panel was then put together and sanded smooth.

Adding the Corbels

I made the 3/8"-thick corbels by resawing some of the 1 1/4"-thick stock left over from making the rest of the chest. After planing them to thickness, I stacked four pieces together with double-faced carpet tape holding the layers together. I made a pattern of the corbel shape from 1/2" MDF, and traced the outline on the top layer of the stack.

Using stock a few inches longer than I needed, and interlocking the patterns, I was able to get eight corbels from each stack. I cut the pieces on the band saw, and sanded the curved edges on the spindle sander before taking the stacks apart. With a 1/8"-radius roundover bit in my laminate trimmer, I eased the curved edges before sanding the corbels.

The corbels are glued to the panels and edges of the stiles. I used a couple 3/4"-long 23-gauge headless pins to fasten the wider part of the corbels to the panels, filling the nail holes with some sawdust and cyanoacrylate glue. I hand sanded the entire cabinet, and applied three coats of Waterlox wiping varnish before hinging the lid and putting in the tongue-and-groove bottom.

I used four 2 1/2"-long, no-mortise hinges for the lid, spacing them evenly along the top rail of the back of the chest. To hold the lid in the open position, I used a pair of toy-box supports. Because the chest was still bot-

Strips of clear packing tape across the joint let the miters fold together. More tape and additional clamps provide a tight, strong joint.

Rails and panels for the sides are slipped into the already-assembled back panel.

tomless, I could lay it on its back on my bench, and reach inside to position the supports.

Getting to the Bottom

I don't have a daughter, so this chest will live at the foot of our bed, holding extra blankets. I placed ¾" by ¾" cleats around the perimeter of the bottom, flush with the bottom edge of the rails. The bottom planks are ¾"-thick aromatic cedar, held together with simple tongue-and-groove joints. I nailed the bottom planks to the cleats at the edges and ends. The cedar is left unfinished.

In the end, this chest has a clean, contemporary look with classic proportions. Changing the material may have disguised its origin, but the strength of the design shines through. Good design, after all, is timeless. **PW**

SUPPLIES

Rockler
800-279-4441 or rockler.com

2 pair • bronze no-mortise hinges
#28696, $1.99/pair

1 • RH lid support
#26229, $4.39

1 • LH lid support
#26195, $4.39

Assembling the front and back panels first simplifies the final assembly – putting the sides together results in a completed case.

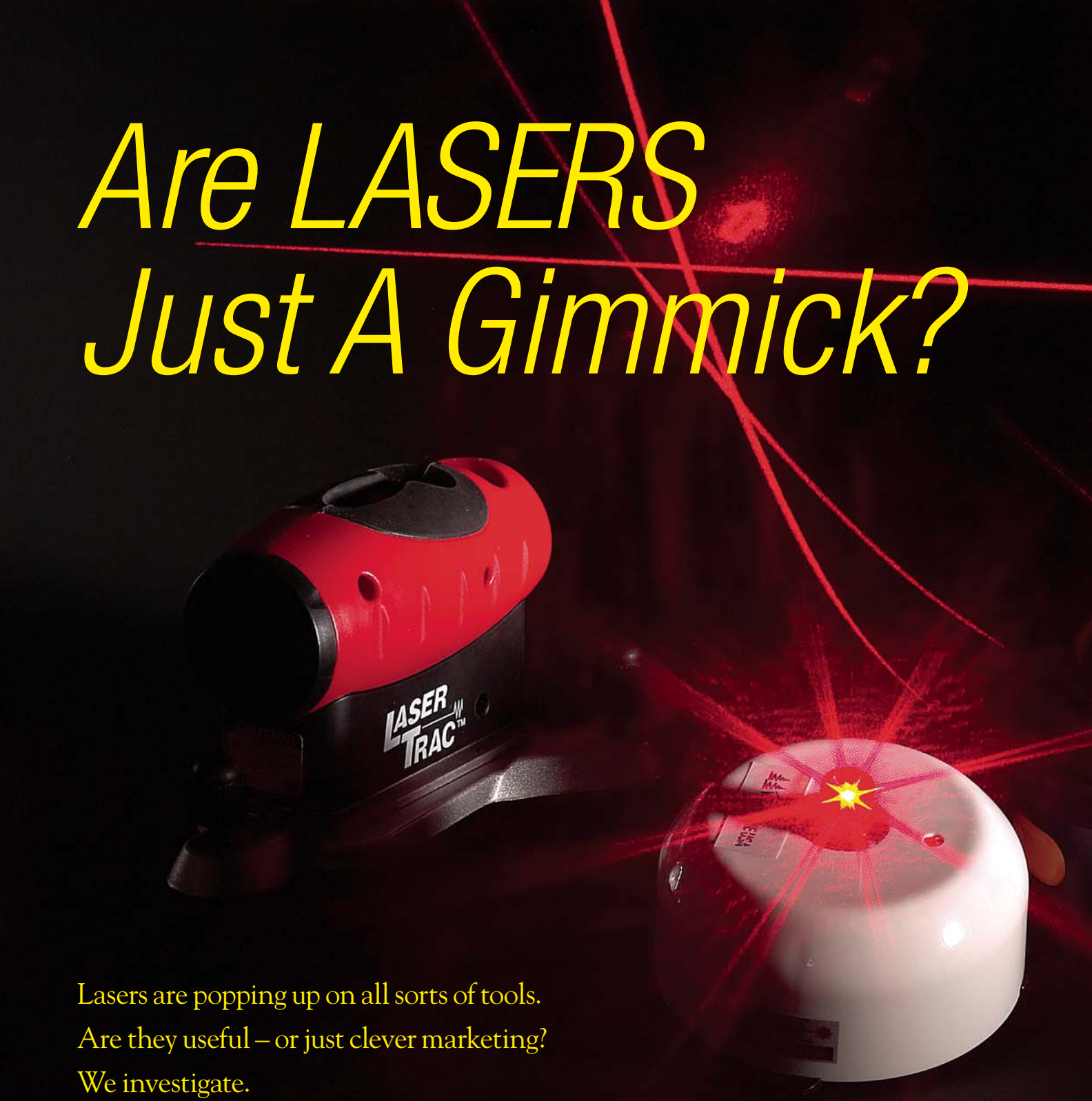
The assembled chest is flipped upright, the corners are checked for square and the case is clamped.

A stack of four blanks held together with double-sided tape yields eight matching corbels.

After cutting, the edges are sanded with the stack still stuck together.

The difference in thickness between the corbel and the adjacent stile and rail adds visual interest.

Are LASERS Just A Gimmick?



Lasers are popping up on all sorts of tools. Are they useful – or just clever marketing? We investigate.

If you take a look at all the new tools that are now sporting laser-guidance devices (disregarding laser levels – we'll come back to those shortly) you'll notice that in general the tools are designed for the do-it-yourselfer category, not the professional. Do the professional woodworkers know something that everyone should know? We think so.

I reviewed all the woodworking tools available online and found the following tools equipped with lasers for a variety of promised benefits: drill presses, miter saws (a lot of miter saws), jigsaws, table saws (OK, it's an accessory), levels (an unbelievable number of levels), drills, circular saws, band saws and even a scrollsaw.

Photo by Al Parrish

Don't get me wrong, lasers are really cool and if I find a tool with a laser on it, I want to give it a try. But the reality is, many of these tools don't benefit in performance from the addition of a laser, though their sales might benefit because of lack of knowledge.

So where did all these lasers come from? The first tools to add a laser were levels. This was a commercial application for an installation problem and it worked well. Installers hanging drywall, construction workers sighting walls, ceilings and more benefit daily from an accurate, level line that doesn't have to be erased. Since that successful inception, the technology has become so affordable that there are laser levels popping up for home use at a great price. Good for us, because these can be handy tools to have in the toolbox!

But before you run out and buy one, I do want to point out something that may escape your attention when you're being blinded by the ruby light in the checkout line: Professional laser levels will generate an accurate line up to 100' and maintain a +/– 1/64" level of accuracy. I'll buy that, but it'll cost me $200. A consumer laser costing about $40 will give a +/– 1/8" accuracy at 14'. I think you get the point. It's not the laser's fault, it's the levelling platform that is built around the laser itself. It still comes back to the accuracy of the bubble level used to set up the laser. So shop with knowledge about what you're buying.

by David Thiel

Comments or questions? Contact David at 513-531-2690 ext. 1255 or david.thiel@fwpubs.com.

GOOD idea . . .

Beyond levels, what other tools benefit from the addition of light amplification by stimulated emission of radiation?

Miter Saws

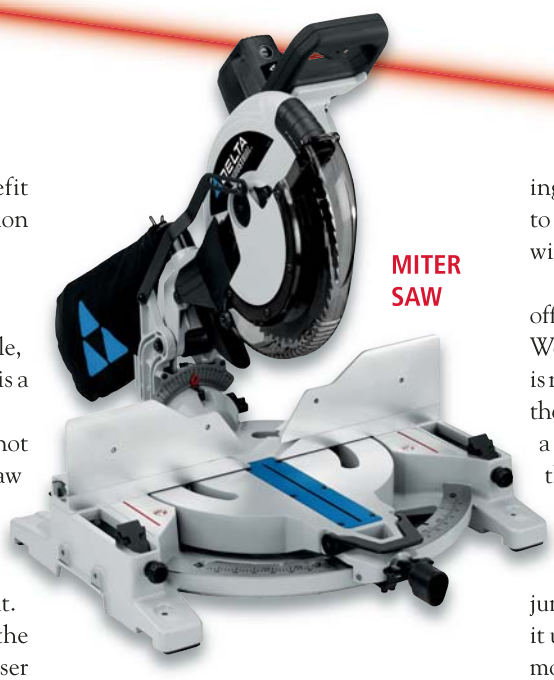
Once lasers started getting really affordable, they began appearing on miter saws. Is this a good idea or bad?

Well, it's generally good, but it might not be the best thing for you. Using a miter saw has always posed the difficulty of lining up the blade with your mark on the board. You get used to bringing the non-spinning blade down to the work to check your cut. Then you bring the blade back up, start the motor and make your cut. By adding a laser that can tell you exactly where your cut will be on the board without bringing the blade down, you cut your time in half. So laser miter saws are good.

That is, unless the laser mark isn't accurate, you can't remember which side of the blade it indicates, it moves during the cut, it can't be adjusted or it requires the blade to be spinning at speed before you can position your board.

All of these are difficulties that have arisen on the many models of miter saws now sporting lasers. Not all of them are bad, but if you don't trust your clever laser, then you end up aligning the board with the laser, still testing the mark by bringing the blade to the wood and then making the cut. Now you've added a third step to the two-step process.

Two companies, Delta (800-223-7278 or deltawoodworking.com) and Porter-Cable (800-487-8665 or portercable.com), have saws



MITER SAW

that use twin laser emitters that put parallel lines on the work indicating both sides of the blade, so there's no question where the cut will occur. The laser is switched independent of the motor and can be used without the blade spinning. Both laser lines are adjustable to compensate for misalignment or when using a thinner blade. If you can't pop for the dual laser, find a single laser that adjusts easily and works without requiring a spinning blade.

You'll need to decide if your work will benefit from a laser miter saw, but look at one that offers benefit rather than sizzle.

Drill Presses

The first time someone told me that Craftsman (800-549-4505 or craftsman.com) had a drill press with a laser guide, I started to laugh, then stopped. Just like a miter saw, the drill press requires bringing the cutting tool to the work to align the cut. So the idea of a laser to guide the way does make sense on a drill press.

Craftsman isn't the only one offering a laser-guided drill press these days. Some manufacturers offer integral lasers and others are aftermarket accessories. All give you a set of crosshairs to identify the center of the bit, rather than a single straight line.

The caveat with the drill press lasers is making sure they can be easily adjusted if they're off-calibration. The concept itself is sound, as long as it can be accurately adjusted. So laser drill presses aren't a gimmick.

DRILL PRESS

Table Saws

I've been making cuts on table saws for 25 years and I've developed my own method for aligning the blade with my cut mark. I know when to squint at the blade and from what position with darn-good results.

But I also know that it's pretty easy to be off by 1/8" if you're not squinting just right. So Woodline (800-472-6950 or woodline.com) is now offering a laser that can be mounted to the ceiling above your table saw that will throw a nice red line across your work right where the blade will cut – a neat concept.

Problems? Well, you need to make sure that your ceiling is stable enough to support a laser without wiggling and jumping. You also need to make sure you set it up perfectly and that your table saw won't move (even 1/32") or your line will be off. That pretty much rules out contractor-style table saws. This is a pretty new idea, and if they can figure out some of the little details, it does make sense. I'd also recommend that manufacturers consider the dual-laser option on the table saw, so you know which side is waste.

Circular Saws

This one I like and I'm glad to see it. Granted, I'm a woodworker, and the circular saw is more of a construction tool. But I use one on many occasions to get sheets of plywood down to a manageable size for my table saw. And I've never been able to use the silly notch in the base plate to align the blade accurately with my cut line. Maybe I'm not leaning far enough to one side or the other, but I'm always missing the mark by 1/8" or so.

By adding a simple laser to the front end of a circular saw, suddenly I *know* where that blade is going to cut. And that's an empowering feeling! Could it be better? Sure! Give me dual-laser lines so I'm sure to cut on the right side of my line.

CIRCULAR SAW

just a GIMMICK . . .

This is the side of the street where marketing has taken the driver's seat and reason has been bound with duct tape and tossed in the trunk. Just because you can put a laser on a tool doesn't mean you should.

Jigsaws

Don't get me wrong, I love a jigsaw. I don't know what I'd do without one. But I need one so that I can cut curved and circular patterns in wood. There's no portable power tool that can, as efficiently, cut out a reindeer for the front yard or the scrollwork for a hutch.

But these projects make my point for me; They're curved. Sure, you can try to cut a straight line with a jigsaw, but it's likely to look more like an undulation than an underline. So what good is shining a crease-straight laser line on the board if the saw isn't capable of following it anyway?

Chalk one up for the marketing team in this category. Sure they'll sell a bunch of them, but they're better off putting a light on the front of the jigsaw (which they have, thank you) than a laser.

Scrollsaws

Ack! If a jigsaw isn't an appropriate use for a laser, how in the world is a scrollsaw even conscionable? A straight line is the opposite of what this saw is designed to cut! And unlike a jigsaw, scrollsaws use thin enough blades that you can actually track a decent straight line, even if it is only 1" long.

And even if you're a woodworker who uses your scrollsaw for straight work, why do you need a laser to follow the line? It's right there on the board in front of you where the blade is touching it.

Putting a laser on a scrollsaw is redundant at best and just silly in our opinion.

Band Saws

Putting a laser on a band saw is a debatable concept as to whether it's a useful idea, but I think I'll argue against it.

While band saws are capable of cutting a straight line, and they do get used for that purpose, there are physical forces involved that make it unlikely to be useful to add a laser.

Because band saw blades have a "drift" tendency (the blade pulls at an angle making it necessary to angle the board on the table to make a straight cut), it's hard to even orient a rip fence on a band saw to make a straight cut. Some fences adjust for the drift of the blade and any laser would have to have the same capability.

Even if you can adjust the laser for drift every time you change the blade, it sounds like a lot more work than it's worth. It's a nice try, but no, it's a gimmick.

Drills

I sat through a manufacturer's demonstration on adding a laser to a corded drill. The thing looked like a tumor stuck on the top of the drill and I spent a few minutes trying to figure out why this was a good thing to add to a drill. They spent more than a few minutes trying to convince me it was a good idea. I still don't get it.

The drill/laser essentially throws two perpendicular lines ending at the drill point. Company officials argued that it would allow you "square" projects, and assist in horizontal and vertical drilling.

It would be one thing if the laser would indicate if the drill is being held in a perpendicular attitude to the work surface. This would be quite helpful. Unfortunately that's not what the drill's laser did.

Nope, I'm not buying it. Figure out how to make the laser show perpendicular accuracy and I'll move it out of the gimmick column.

Conclusion

While I can't guess how many more tools will arrive on the market with lasers attached, I'm willing to predict that many of them won't last through the first sales season.

I'm also willing to predict that the tools that do make sense will stick around. It's your job to control those shopping urges until you consider the applications for a new laser tool. If you need a laser just to own a laser, buy a laser pointer ... they're cheaper. **PW**

SCROLLSAW

The NEWEST TOOLS from the Las Vegas AWFS Show

Once a year the woodworking tool manufacturers roll out their newest and brightest offerings for the press and the public. This year's showcase event was the Association of Woodworking and Furnishings Suppliers' (AWFS) show in Las Vegas.

We had the chance to look at some great tools and machinery, and even kick the tires on a few of them. Unfortunately not all of these tools and accessories are ready for market yet, so we (and you) will have to wait a little longer to find out how they perform in a shop.

In fact, sometimes a tool will briefly pop up its head at one of these shows and then disappear to be redesigned, so if all these tools aren't available by the end of the year, that's sometimes the reason why.

But we can share our excitement about a few of the most impressive tools and machines that were on display this year. Hope this whets your tool-buying appetite! *— David Thiel, senior editor*

Despite Rising Materials Costs, Grizzly Claws Down its Prices

We spend a fair amount of time explaining to readers how it's possible for Grizzly Industrial (800-523-4777 or grizzly.com) to sell quality machines at a low price. It's cutting out the middle man and working closely with the manufacturer. But many woodworkers still don't believe the machines can be quality because of the affordable pricing. Now Grizzly's making it harder to convince everyone by cutting prices yet again.

What's most remarkable about this latest move from Grizzly is that it comes when many manufacturers have been squeezed by increases in the cost of raw materials (steel and iron) and rising energy costs. Somehow, Grizzly has managed to keep many prices steady and even introduce new machines at enviable prices. All should be available now, except for the lathe. (Look for it in January 2006.)

- 10" x 84" Spiral Cutterhead Jointer (G0480) – 3-horsepower motor, top-mount switch, four-knife cutterhead and handwheels for $1,895.
- 8" x 75" Jointer (G0586) – 2-hp motor, top-mount switch, four-knife cutterhead and hand wheels for $625.
- 6" x 46" Mobile Jointer (G0452) – 1-hp motor, pedestal-mounted switch, three-knife cutterhead and an integral mobile base for just $325.
- 15" Mobile Planer (G0453) – 3-hp, undermount motor, cast-iron infeed and outfeed tables, integral mobile base and two speed feeds (16 and 30 fpm) for $750.
- Heavy-Duty Wood Lathe (G0456) – 2-hp electronic variable-speed motor with digital readout, 43" between centers and a 20" swing over the bed, built-in 12" disc sander for $1,395.
- 14" Industrial Band Saw (G0457) – 2-hp motor, cast-iron wheels, 10" resaw capacity, steel storage cabinet and dual-height resaw fence for $795. *— DT*

Powermatic Rethinks Mortisers, Builds a Retro Table Saw

The WMH Tool Group (Powermatic and Jet) outdid themselves this year, offering the widest range of new products. Two available this fall from Powermatic (800-274-6848 or powermatic.com) made us take notice.

Being carefully billed as "not a replacement" for the venerable Model 66 cabinet saw, the new PM2000 10" Cabinet Saw has many features that will make a 66-user happy.

The new left-tilt saw will be available with either a 3-hp or 5-hp motor, a full cabinet, beefy trunnion design (though different than the trunnion design on the 66) and a quality Accu-Fence system that is much like the beloved Biesemeyer system.

But the newest features are what really caught our eye. The saw has a fully integrated mobile base that disappears when not needed. It's operated by one of the handwheels used for moving the saw's arbor (very cool). The blade guard is a significant improvement, too. It moves up and down with the arbor like a European-style guard. At the show, Powermatic was not showing the saw with a European-style riving knife, however, which we would like to see. A riving knife would allow through cuts while protecting against kickback. Stay tuned to see how the market responds.

Other nice tweaks include a large cast-iron table, an arbor lock that allows one-wrench blade changing and a shrouded blade for improved dust collection. Add a slick retro design and the 3-hp PM2000 with a 50" fence is expected to retail for about $2,299 and should be available in early November.

And this isn't the only new table saw from Powermatic. Look for even more info later.

Powermatic has also upgraded its bench mortiser (Model 701) to address many of the shortcomings of mortisers on the market today. The hold-down on the 701, always a weak spot on many other benchtop machines, looks like a winner. Hold-downs rarely actually hold anything down for long. They tend to work loose and come up off their post after a few mortises. Other problems with hold-downs include the fact that they never seem to be able to work well with narrow stock or really tall stock. The 701's hold-down is an L-shaped fork that can be turned upside down to handle narrow stuff. And, most importantly, it has a large hand-tightened threaded nut on top that keeps the hold-down locked down.

Another nice feature that you've never seen before is a built-in spacer that allows you to set the tool's chisel the proper distance away from the auger bit. Usually you have to use a dime to set the spacing, or guess, or just burn up your bit. The 701 has two little integrated spacers that slide in and out to help set the chisel quickly and properly.

We also liked the stop on the machine. Some, but not all machines, have a stop that tends to slip, usually ending up in you boring

a nice mortise in your machine's table. The 701's stop rides on the same dovetailed channel that the head moves on. We put all our weight on it and couldn't make it slip.

The machine is powered by a ¾-hp, 1,725 rpm motor, has a reversible handle for use on the left side or right side of the machine, a rack-and-pinion fence for quick adjustments and a nice tool holder that will even accommodate your machine's sharpening cones. Look for it to price at $399.

— DT and Christopher Schwarz

JessEm Mast-R-Slide 7500

This is an accessory we've been waiting years for someone to make – a sliding table that attaches to a standard table saw without extension legs and an engineering degree.

JessEm Tool Co.'s (866-272-7492 or jessem.com) new sliding table (available now) is sized to help with many of the crosscutting applications on a table saw that a miter gauge – even a quality aftermarket model – can't handle. Yes, there have been sliding tables available for years, but they required a single location for the saw because every time you moved things, the leg system needed to be readjusted to match. Other systems that avoided the floor problem included a guide bar that extended into the operator's area that added, shall we say, a hazard.

The Mast-R-Slide offers three positions for its crosscut fence. The middle position is designed for mitered cuts. The front and rear positions allow the user to crosscut up to a 36"-wide panel that's secured either at the front or back.

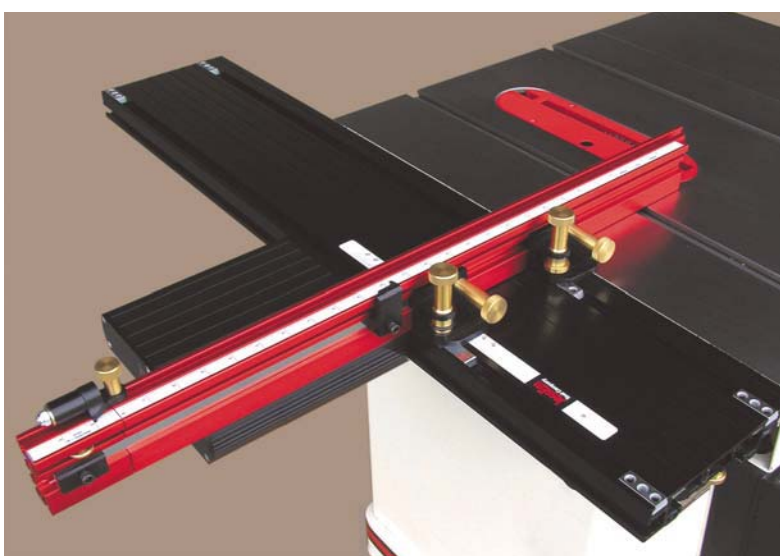
The fence telescopes out to handle long stock, with a closed capacity of 28" and an extended position that will cut a maximum length of 48" using the included flip-stop – excellent! Many sliding tables and aftermarket miter gauges are either too short to be useful or too long for everyday operations. The JessEm has the best of both worlds: long enough for daily use and the ability to get longer when you need it.

Even more important, the design of the fence locks in at 90° to the blade and stays there, even after you remove and replace the fence. One of our major long-running frustrations with sliding tables is the constant testing and retesting required whenever you re-attach the fence after removing it for ripping operations.

The JessEm solves this problem by offering fixed attachment points for the fence when it is in the forward and rear positions. Other sliding table units rely on a system where you pivot the fence and then rest it against a stop to square it to the blade. And the stop is not always reliable – hence the test cuts.

You may consider the $540 a little steep, but if you've ever wrestled with this problem you'll be more than willing to pay the price.

— DT

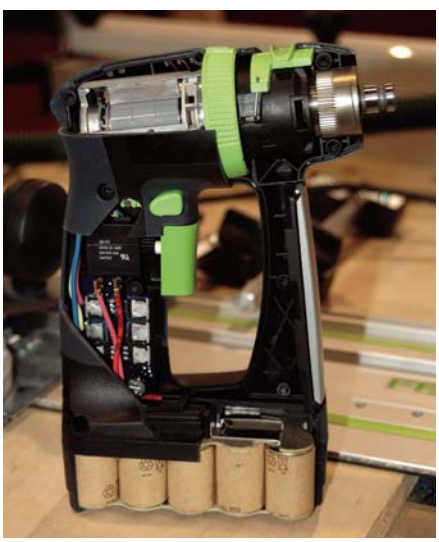


Festool Drill Designed for Forever

For many woodworkers, cordless drills are disposable. You buy one every few years (usually the one on sale) and use it until the batteries or the motor's brushes give out. But what if someone made a drill designed for a lifetime? We think Festool may have done just that.

Festool (888-337-8600 or festoolusa.com), has added a new lightweight 12-volt drill to its product line. Lightweight is good on its own – 3 lbs., 13.4 oz. with a 3.0 Amp hours (Ah) NiMh battery is better. And while the tool's stats and balance are nice, what's really amazing is what's inside. The motor that drives this little powerhouse is brushless. When engineers tested the drill's longevity they put it up against other premium drills. After about 60,000 screws, most of the other drills needed their brushes changed. After about 120,000 screws the other drills were pretty much cooked. But the Festool didn't show any signs of wear after 250,000 screws. Ditto for 500,000 screws. And when they opened up the motor after 750,000 screws, they still couldn't find signs of wear, according to Festool officials.

The drill uses the familiar Festool Centrotec chuck and the quality features we expect from Festool. The C12 is now available in three battery systems. The 1.3 Ah NiCad will price at $345; the 2.4 Ah NiCad prices at $365 and the 3.0 Ah NiMh goes for $395. That's an expensive drill, but if you spend $75 every couple years on a new drill anyway, the math might make sense. *— DT & CS*



New Freud Routers Include a Fixed-base Tool

For years Freud (800-334-4107 or freudtools.com) has been quietly offering a small selection of well-priced power tools for woodworkers. This year, however, the company has decided to make some noise by introducing a more complete line of routers that will, of course, accept all the Freud router bits.

The new line includes two new routers, a 3¼-hp, variable-speed plunge (the FT3000VCE, priced at $289) and a 2¼-hp, variable-speed fixed-base model (the FT1700, $189). Plus, Freud's redressed single-speed, 3¼-hp plunge router has been redesignated the FT2200VCE ($189).

The 15-amp FT3000VCE is the only plunge router of this size that offers through-the-base height adjustment of the bit, making it very handy for router-table work without the extra expense of a router lift. The tool also features variable speed with electronic feedback to maintain torque under load. The electronics include a soft-start feature that is a real benefit in a router of this size. Plus there's a rack-and-pinion plunge mechanism and a detachable dust-collection port.

The FT1700 fixed-base router offers through-the-base height adjustment for convenient router-table use. The tool also features variable speed and a spindle lock. (Release date: October 2006). —*DT*

Wood to Dye For ...

We're still coming up with ideas for what you would do with this product (in fact you can't buy it yet), but it's just such a fun and kooky idea we wanted to share it with you.

The company, TS Woods (tswoods.com), is named after Tom Frink and his son Shawn. Their business is adding color to living trees. The trees will accept color from the base of the tree to the tips of the leaves or needles. All the parts of the tree can be used and the process is nontoxic, colorfast and takes only a few weeks to complete on a live tree.

Tom colored his first aspen grove in 1964 and for the past 40 years the father and son pair have successfully colored more than 35 different varieties of trees.

The process introduces colored patterns and striations in the wood unlike what you'd get when dying the wood after the tree has been felled. It's pretty cool. —*DT*

And Even More COOL STUFF ...

Bosch BLUECORE Batteries

Bosch (877-267-2499 or boschtools.com) has added cooling rods to an upgraded battery line that pull heat away from the cells during charging. This offers a 50 percent increase in battery cycles. The new batteries are available in 9.6-, 12-, 14.4-, 18- and 24-volt platforms. The BLUECORE technology should be available on all Bosch tools by early 2006.

Kreg Pocket Jig Upgrade

Kreg (800-447-8638 or kregtool.com), has taken an already good product and improved it. The company's new K3 system now offers front-side clamping (no fumbling to lock pieces in place), an adjustable drilling system with milled-steel sleeves to allow unlimited material thickness and extend the life of the jig, a stop to make duplicate pieces easily without measuring each time, and dust collection to keep the jig clear of debris. The system is available now with both a mountable and portable guide block for $150 or with the mountable-only guide block for $80.

DeWalt's Revamped Miter Saws

DeWalt (800-433-9258 or dewalt.com) has reworked its line of 12" compound and sliding compound miters saws, improving accuracy and capacity. A redesigned and machined base fence support system keeps the fence square to the table and offers a 16" crosscut capability. Hard-wired lasers add accuracy without the need for batteries and can be operated without the blade spinning. The saws have just become available and range from $329 to $659. **PW** —*DT*

A School Built To Thrive and Last

A passion for creativity lies at the heart of this woodworking institution.

Peter Korn, executive director of the Center for Furniture Craftsmanship in Rockport, Maine, manages day-to-day operation of the school but also is a regular visitor to the classroom.

It's 3 p.m. on a February afternoon when Peter Korn gathers a class at the Center for Furniture Craftsmanship around his workbench and launches into a 90-minute lecture on dovetailing. His students are in the first few days of a 12-week course and they're just settling in. Korn is disarmingly at ease as he unravels the mysteries of this fundamental-but-all-important woodworking joint. By the time the students are finished, they'll have the foundation for what Korn hopes will be a new way of looking at the world of woodworking.

We're in the Workshop Building, a 4,200-square-foot shop that includes a bench room, classroom and a machine room. It's one of four separate buildings clustered on an 11½-acre parcel land parcel near the Oyster River in Rockport, Maine. Nearby are three others: the Satterlee Building, devoted to students in the Center's Nine-month Comprehensive program; the Gallery Building, which houses administrative offices, a library and a high-ceilinged gallery; and the 5,400-square-foot Thomas Miller Jackson Building for woodturning and a Studio Fellowship Program. The buildings are low, clapboard structures connected by graveled paths that in winter are just tromped-down snow. The workshops have been designed with a quintessential New England austerity and painted a classic barn red. In all, there are 17,500 square feet of studio and gallery space devoted to one thing: creativity.

"Most people, when they design a building or a campus, think about what it looks like to the person driving in," Korn says, "but our first criterion was what it's like for a student in the classroom. So we oriented all the buildings down toward the meadow and the river, and when you drive up to the school you're driving into the backs of the buildings with all the parking. We discounted the visitor's experience but we really enhanced the student's experience."

It's a level of detail that seems characteristic of the school's approach. Korn is clearly the mastermind here, but this furniture maker-turned-educator will be the first person to tell you the Center for Furniture Craftsmanship is not about him. The school is a non-profit institution with an active board of directors.

by Scott Gibson

Scott Gibson, author of "The Workshop," (Taunton Press) is a writer and woodworker in Steep Falls, Maine.

Korn limits his teaching to basic woodworking, and while he works for the board as the school's executive director, he is no longer the owner. And that's just the way he likes it.

Courses for Every Skill Level

Korn has overseen a steady expansion of both shop space and course offerings, but it all began modestly. After six years as the woodworking program director at Anderson Ranch, an arts center and school outside Aspen, Colo., Korn wanted to start his own school, one founded on a different philosophical bent. After several scouting trips to Maine, Korn bought a farmhouse not too far from the school's current location, and in 1993 he began teaching classes in a shop behind the house.

It was a tough beginning for the school, Korn says. He taught a total of nine two-week courses to six students at a time. Korn rented out three of the house's four bedrooms to students. "That's how we made ends meet," he says. "That only lasted one year."

By the following year, he had rented a larger space in West Rockport and brought in others to help him teach. Class size expanded from six to a dozen. By the next year, Korn had invited such furniture luminaries as James

Krenov and Alan Peters to come in and run their own courses. Then came the move to the school's current location and construction of the original workshop building. By 1999, the Center had become nonprofit and two years later it embarked on a $2.4 million fund-raising effort that led to the construction of three new buildings. Shop spaces are comfortable and well-lit. There are separate bench and machine rooms, and the shops are well stocked with professional-quality tools. There's plenty of elbow room for students.

Korn continues to teach a basic woodworking course, but there are others to share the load: two full-time administrators and two full-time instructors. That doesn't include the many outside instructors who come in to teach specific courses. The school runs 29 one- and two-week courses annually that this year will handle about 300 students in all. Topics run all the way from "Really Basic Woodworking," to design, sculptural furniture, veneering, hand-tool skills, turning, finishing and carving. The instructor list is a "Who's Who" of contemporary furniture makers: Jere Osgood, Kevin Rodel, Ted Blachly, Garrett Hack, John Fox, Jacques Vesery, Stephen Gleasner, Chris Pye and many others of the same caliber.

In addition, the school runs three 12-week courses per year for a dozen students at a time plus a single Nine-month Comprehensive program designed for 15 students. The Center also has separate facilities for its Studio Fellowship program, aimed at giving more established furniture makers, turners and carvers

Here you can see the grounds of the Center for Furniture Craftsmanship (above), the Messler Gallery (left) and the Fine Woodworking Library (below).

Photo by the author

an "encouraging, stimulating environment for the exploration of new work." The Fellows stay anywhere from a month to a year. They have around-the-clock access to the free studio space as well as faculty members who act as mentors. In return, they help maintain the Center and pitch in to teach classes.

Short courses run June through October, so winter months are somewhat quieter. But the overlapping nature of the Center's schedule means there is a diversity of students and work, just about all the time. On this day, students who have just started their 12-week program are learning basic skills. But in the next building over, students in the nine-month program are turning out work in a variety of disciplines under the direction of full-time instructor David Upfill-Brown. One student is cutting half-blind dovetails for drawers in a small cabinet while another assembles the interlocking bent-laminated pieces of a small table. Machine rooms offer table saws, shapers, planers and jointers, spindle and disc sanders, mortising machines – in short, anything they need to turn out top-quality work. Maintaining machines is part of the curriculum.

Korn is no longer in the boarding house business, either. Students rent cottages, apartments and houses in the area while they attend classes. In winter, that's not much of a problem – Maine's Midcoast region, while beautiful at any time of the year, is not much of a tourist destination when the weather turns cold.

Photo by the author

Above is the bench room for students in the Nine-month Comprehensive program.

But in summer, students are competing with the tourists and summer people who clog the region's roads and snap up available rentals. Somehow, they manage.

A Furniture Maker Turns Teacher

Korn's background proved pivotal in deciding what kind of school he wanted to start. A history major at the University of Pennsylvania in Philadelphia, Korn couldn't wait to get out of school ("wherever real life was, I was sure it wasn't in college") and ended up as a carpenter on Nantucket Island. He might have stayed in the business had he not built a cradle for someone, his first piece of furniture. "It was like Paul on the road to Damascus," he says. "It just changed my life. There was nothing else that I thought about for years after but making furniture."

He bounced around, moving from Nantucket to Maryland to New York City to Long Island, then back to Philadelphia, all the while making furniture and all the while "being really, really, really poor." He started teaching furniture design part-time in Philadelphia and in 1981 ran the woodworking program at Anderson Ranch for the summer. He was offered the post full-time, but declined, in part because there was no heat in the woodshop. Korn stuck with furniture making. There was never enough work and in 1986, with heat now installed at Anderson Ranch, he accepted the oft-offered full-time post and moved to Colorado. "I was ready to give up my furniture-making career because unlike at the beginning, when I never thought about money, I was really tired of being poor," Korn says. He stayed for six years.

Photo by the author

Blair Hawley of Morris, Conn., works at a hollow-chisel mortiser in the well-equipped machine room for the Satterlee Building, home of the Nine-month Comprehensive program.

Korn discovered he liked running a woodworking school, and his life was blossoming in other ways. He volunteered for official writing duties at Anderson Ranch and then wrote a column about woodworking for the Chicago Tribune for a year. Later, he would publish two books about woodworking, one of which was recently re-released. But he was also beginning to part company with the Anderson Ranch approach and was nurturing plans to open his own school.

"Anderson Ranch is an incredible place," he tells me over lunch at a small café just up the road from the Center. "It really is amazing, but the focus out there from my point of view is on fine arts. In terms of a view of what's important, it seems like the real focus out there is what's on the current cutting edge of art, what's hot, what's trendy and certainly on what's non-traditional. As a person who's interested in building and teaching people how to build useful, beautiful, really well-made things, I found that I was under a certain amount of pressure."

Korn took his own path, believing that the creative process itself offered personal rewards that had nothing to do with what the rest of the world viewed as art and did not hinge on whether a woodworker was professional or amateur. "I felt like the type of work that myself or you or many people who design and build really excellent furniture make was disrespected as something not really quite worth doing. I think that when you choose to design and build a fine piece of furniture what you're doing at bottom is an act of self-exploration. You don't build it because you need a piece of furniture.

"What a creative fine furniture maker is doing is as much of an exploration of who they want to become and what a human being ought to be as what any creative fine artist is doing," he says. "It's just a different medium with different constraints. And believing that, I wanted to start a school that would honor the human value of designing and building fine furniture."

Photo by the author

Andrew Bradford of Bangor, Maine, a student in the Center's Nine-month Comprehensive program, works on a set of drawers at his bench in the Satterlee Building.

A School is More Than One Person

Korn will be 54 years old at the end of the year, and he seems to have no regrets about giving up sole control of the school he founded. For one thing, he's working only six days a week instead of seven. More important, turning non-profit has a number of advantages, not least among them a board of directors that Korn says brings energy, experience and knowledge to the table.

"I'm not indispensable, which has been my goal for a long time," Korn says. Back in the early days, Korn was the school. "If I had

died or left, the school would have closed. Now I don't own the school. There's a board of directors that has responsibility for it. They're committed to keeping it going. If I get hit by a bus, they'll hire a new director. We have enough permanent staff that all the knowledge of how to run the school is not in my head anymore."

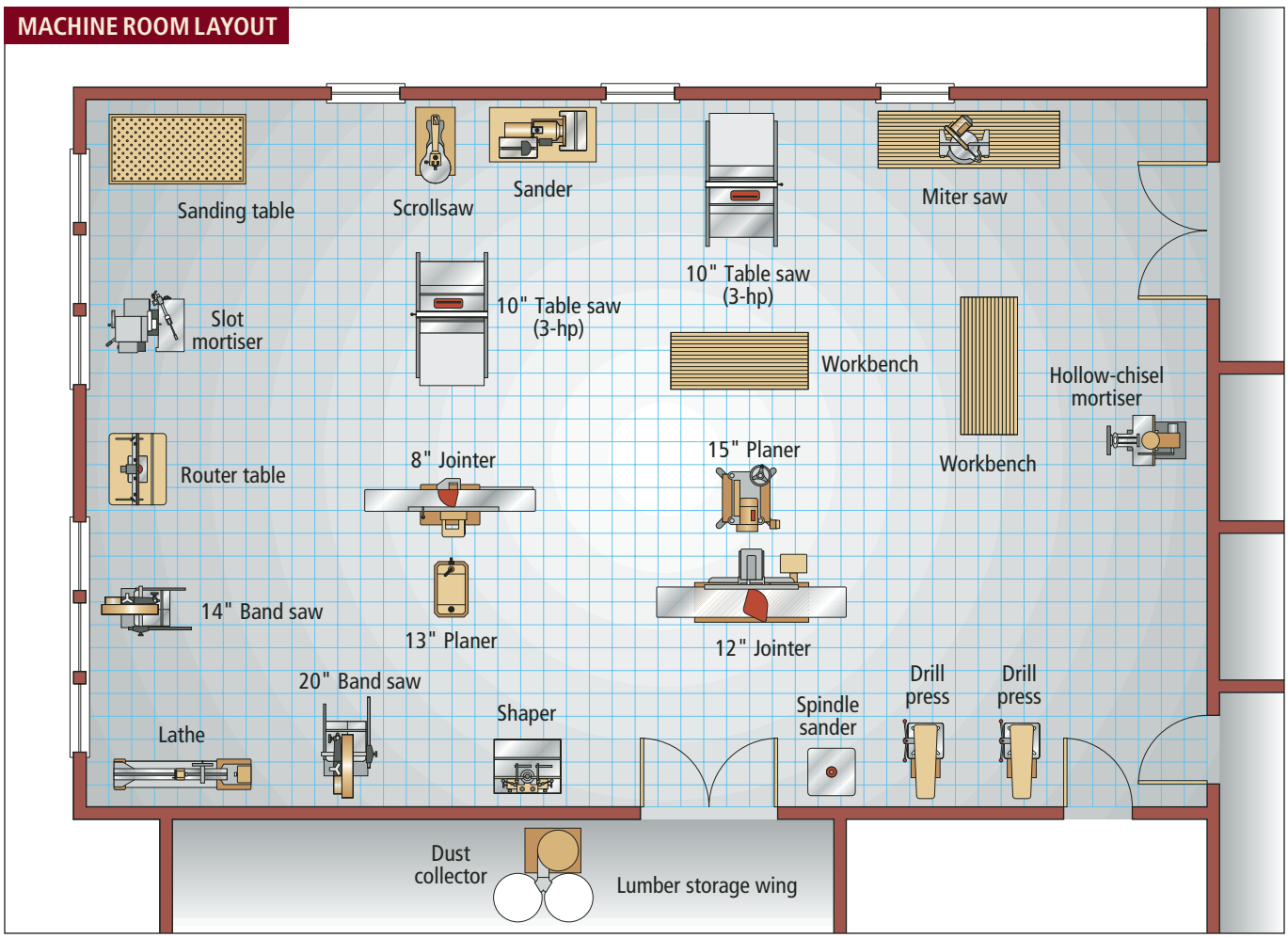
There are, he adds, other important advantages to being a non-profit organization. Fund raising has enabled the school to pay for its buildings and equipment with donations and also defrays a small portion of its annual overhead, so that it can provide a more affordable education, Korn says, which is not an opportunity that a privately owned school has. "Our bottom line is the quality of the education we provide," he says.

For more information about the Center for Furniture Craftsmanship, visit woodschool.org or call 207-594-5611. **PW**

Photo by the author

The machine room at the Satterlee Building houses just about anything you'd need to make furniture, from a 20" band saw and a 5-horsepower shaper to drill presses and a 12" jointer.

MACHINE ROOM LAYOUT



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Building Glazed Doors

Most cope-and-stick bits can produce frames that will house glass as well as wood panels. Here's how to do it.

Photos by the author

The same bits and techniques used for frame-and-panel doors can also be used to make glazed door assemblies. Special bits and bit sets broaden the spectrum from single-pane to divided-light applications.

Here at chez Hylton, our kitchen cabinetry includes a mix of raised-panel doors and glazed doors. Most things are hidden, but some handmade pottery, a few family heirlooms and lots of knickknacks are displayed behind glass. We don't actually use these things a lot, but we like to see them all the time.

The ambitious hobby woodworker, hankering to redo the kitchen cabinetry or to build custom cabinetry for the family room, might want this mix of paneled and glazed doors. But how do you actually do it? The cope-and-stick bits discussed in our August 2005 issue produce a 1/4"-wide groove suitable for a panel, but that's too wide for glass.

A cursory scan of bit catalogs suggests that bits scaled for window sashes are readily available, but not for cabinetry. Cabinetry-scale sets are available, but they tend to be special-application cutters. The explanation is that you can use most cope-and-stick sets to produce frames that will house glass rather than wooden panels. The bit manufacturers just don't document how you do it, but I will.

At the same time, I want to tell you about the capabilities of those special-application cutters. All work in the same fundamental way, like cope-and-stick bits, but some actually help you produce frames with mortise-and-tenon joinery.

Using Cabinetry Cope-and-stick Bits

To transform a cope-and-stick joint for a wooden panel into one that will accommodate a pane of glass, you need a rabbet instead of a groove. A simple alteration to the cope bit and an extra step – at the table saw – make this easy to accomplish.

To replace the groove-sized stub tenon with a rabbet-filling block, you just remove the slot cutter from the coping bit. You can do this with most two-bit sets and with bits that are reversible assemblies.

Loosen and remove the arbor nut from the bit, and pull off the slotter. It's easy to do with the bit secured in the router collet, so you can keep the bit from turning when you attack the arbor nut with your wrench. Use a sleeve-type spacer or stack of washers to take up the vacated space on the arbor and replace the nut. Leave the bearing in place. And that's all it takes.

A couple additional notes here: You have to have an "assembled" bit, meaning one with a slot cutter and bearing that are held on a stem with a hex-shaped arbor nut. If you have a solid bit that has cutting edges that inseparably combine the profile and the slotter, you are out of luck. The same is true if you have a stacked bit with both coping and sticking cutters on a single shank.

The spacer you add must have an inside diameter matching the stem and an outside diameter that is the same as or smaller than the bit's pilot bearing. It can be a steel or bronze bushing, a nylon sleeve, or a stack of washers – so long as it fits the stem, is smaller than the bearing, and fills the gap between the bearing and the end of the threads on the stem.

Set the modified cope bit in your router

by Bill Hylton

Bill is the author of several books about furniture construction and router operations. His most recent book is "Bill Hylton's Power Tool Joinery" (Popular Woodworking Books).

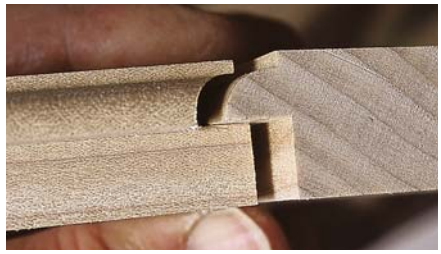
table, adjust the height, position the fence and cope those rails. The cut will be nothing more than the negative of the profile – no stub tenon.

The sticking cuts are made with the standard bit – no alterations needed. Set the bit and fence, then make the cuts. After these cuts are completed, go to the table saw and rip the back shoulder from the panel groove, transforming it into a rabbet. Be careful not to make the rabbet deeper than the groove. You won't get a tight joint.

Assembly follows. To secure the glass, you can use glazing compound or slender wooden strips that you glue in place or fasten with brads. The upshot is that the same bits you use for frame and raised-panel cabinetry work can be your primary cutters for frame and glass pane cabinetry work.

To adapt your cope-and-stick set, remove the slot cutter from the cope bit. You may need to use small washers or a sleeve-type spacer to fill a gap between the bearing and the threads on the arbor. Amana provides a flush-trimming cutter with its cope-and-stick sets for just this purpose.

Machine the rails and stiles with the sticking bit unaltered. Then rip each piece on the table saw to open the panel groove, transforming it into a rabbet that will accept glass.



The mating pieces fit together nicely. The sticking profile nestles into the cope, and the butt of the rail seats tight against the shoulder of the rabbet.

Dividing the Frame

If you want to divide the framed area, you can make the divider strips with the same bits. Though they are often called sash bars, the vertical divider is a mullion, the horizontal divider a muntin. If you halve the opening, either vertically or horizontally, the divider obviously will be full-length. But if you divide the space both vertically and horizontally, either the mullion or the muntin will need to be broken. The structure will be stronger if you segment the longer piece, but you can break up either one.

Because these parts are usually quite slender, you should adjust your procedures. Do as much work as you can with wide stock. And before you stick a sash bar that's been reduced to its final width, make yourself a custom pusher, as shown below. The pusher keeps your hands clear of the bit.

If you need two muntins and three mullions, for example, crosscut one wide blank for the muntins and one for the mullions. Cope the ends of these pieces and stick both long edges. Rip one mullion from the blank, then stick that blank's "new" edge. Rip the second and third mullions from that blank and the muntins from the muntin blank. Then use the pusher to hold the slender parts as you stick the second edge of each piece.

To assemble the divided frame, you apply glue to the coped muntin and mullion ends as well as the rail ends. Press the coped ends into the sticking on the stiles (and rails and mullions and muntins).

Even a simple frame can be vexing to glue up. Add mullions and muntins, and there are many more parts to hold in alignment. Having

Assembling a sash frame is easy. It's aligning the sash bars and keeping them square that's vexing. Assembly "panes," pieces of plywood or hardboard cut to the dimensions of the glass panes, are a boon here. As the frame is pieced together, set the panes in place. They keep the narrow sash bars in alignment, even as you apply clamps.

To stick the parallel edge of the sash bar, tuck it into a shop-made pusher. The pusher holds the strip in proper alignment throughout the cut, and it keeps your fingers away from the cutting zone.

a panel to keep the parts in basic alignment is a big help. Trying to assemble the frame around glass panes is hazardous, so make yourself temporary "panes" out of hardboard. Nip off the corners off these "panes" so they don't get glued to the frame.

Clamp the assembly until the glue sets. Apply a finish, install the glass and the unit is completed.

Making a divided glazed frame with modified cabinetry bits has two drawbacks: aesthetics and joinery strength. The latter is relatively easy to deal with by reinforcing the joints with dowels or loose tenons. The former you either accept or you switch to specialized cutters.

The aesthetic issue is the proportion of the sticking profile. When the assembly has a wood panel, half the frame thickness must be allocated to the panel groove, leaving only 3/8" for the profile depth. Moreover, the convention with cope-and-stick cutters is to have the profile width match the panel groove depth, which is 3/8". This looks fine, even when the assembly is divided with intermediate rails and a mullion. And when it frames a single glass pane, it looks fine.

Freud's divided-light bit set simplifies cutting the profile and rabbets for cabinetry frames on both rails and stiles, muntins and mullions. But the cut configurations force you into mortise-and-tenon joinery that makes the frame stronger. Without cutting mortises for the stub tenons formed in the cope cut, you can't join the cope and the stick.

But divide the frame for several panes, and the visual appeal fades. The mullions and muntins are too wide. Bear in mind that aesthetics is pretty individual, and you may be perfectly happy with what you get.

Reinforcing the Joints

Glass is heavy, and a door with a half-dozen or more panes needs to be assembled with strong, enduring joinery.

One solution is to reinforce the joints with dowels, or mortises and loose tenons. In some circumstances, dowels can be added to a joint after it has been glued and assembled. Drill through the edge of the stile into the joint, then drive a dowel into the hole.

Introducing mortise-and-loose-tenon joints to the construction is manageable if you have a plunge router, an edge guide, and a suitable workholder. Back in our April 2004 issue, I explained how I rout mortises for loose tenons, and that system works well in this application. Before making the frame as outlined above, rout mortises in both the rails and stiles. Plane down scraps of the working stock to make loose tenons. You can reinforce the sash-bar joinery with dowels. Use the router mortising setup to bore holes for the dowels. Having these joints not only strengthens the frame, it makes it easier to assemble.

A few bit manufacturers have bits intended specifically for divided-light frames. The bits are designed to integrate traditional mortise-and-tenon joinery with cope-and-stick profiling (see photo above).

Freud's set has two bits. The cope bit produces a 3/16"-long stub tenon at the same time that it forms the cope. In that, it's just like a cabinetry cope cutter. But the sticking cutter doesn't plow a groove to accommodate the stub tenons. You have to cut mortises for them. In addition, you must trim the tenons by hand unless you are content to have them match the full width of the rail or sash bar.

My experience is that it's best to make the router cuts with the bits first. The sticking cut leaves a flat between the profile and the rabbet, making it easy to align the mortises. Lay out the extents of each mortise and cut them with a hollow-chisel mortiser. Finally, trim the stub tenons to fit.

CMT's set, designed by Lonnie Bird, has three bits: an inverted-head cope cutter, a beading bit to produce the sticking profile, and a regular rabbeting bit. The big advantage with this system is that you can make tenons longer than 3/16". This gives you stronger joints everywhere except between mullions and muntins. But there are operational differences that make this a more time-consuming system.

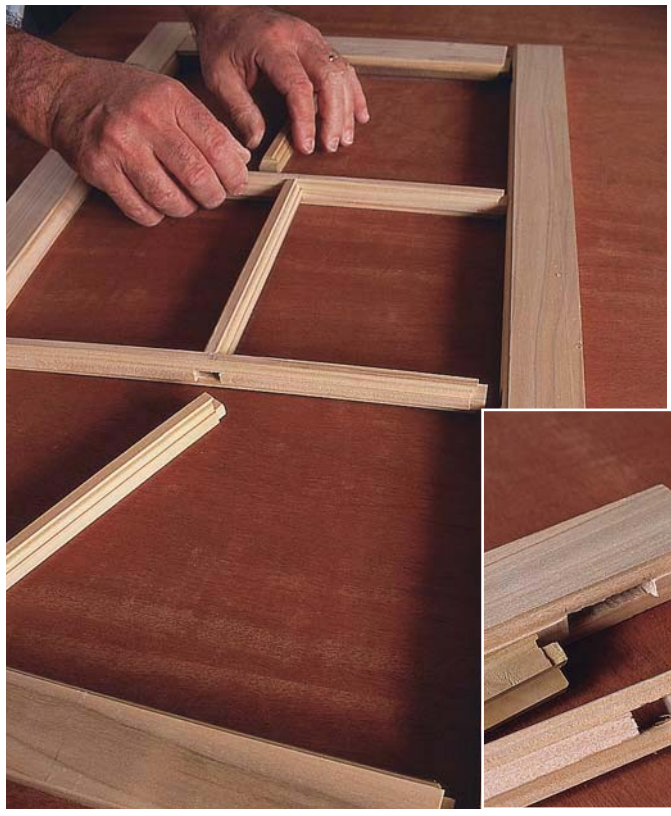
The expeditious approach is to rout the copes and the sticking on all the parts. The stub tenons formed by the cope cut extend from edge to edge, and the sticking cut doesn't shorten them. On the rails, trim them back with a chisel (left). Leave them full-width on the mullions and muntins. Use the tenons to lay out the mortises on the flat between the profile and the rabbet. Then cut the mortises with a hollow-chisel mortiser (right). The tenons are stubby, so cut the mortises only 1/4" deep.

After laying out and cutting the mortises and tenons, by whatever means you prefer, do the copes. You adjust the cope-bit height by raising it until it just skims the tenon. Instead of the standard router table fence, use a strip of ¼"-thick plywood with a bit cutout in the center as a fence. This low fence can guide the shoulder without obstructing the tenon. Position the fence, then cope the rails, and the muntin and mullion blanks.

Follow up this operation with the two-step sticking cuts, and you should be ready to assemble the frame.

An added benefit of either of these bit sets is that the profile is proportioned to the application. It is narrower than the sticking profile on standard cabinetry cope-and-stick cutters, and it is placed somewhat deeper on the stock. Thus muntins and mullions cut using the bits are narrow, and the assembled frame "looks right."

Unfortunately, if you want to orchestrate a project with both wood-paneled and glazed doors, you won't find companion cutters for making the wood-paneled doors. **PW**



One swell result of mortise-and-tenon joinery in a divided-light frame is that the many parts align positively during assembly. None of the skinny mullions and muntins slide out of position as you work, because their tenons are seated in mortises.

Human Moisture Meter

You, too, can determine moisture content simply by feeling a board.

Illustration by Pat Lewis

Murphy had never bought lumber from us before. He watched his boards carefully as they were loaded onto his truck.

"They look good," he said. He picked up a board and caressed the surface. "Yeah, this is really dry, about 7 percent. I can tell just by feeling it." The loaders smirked. Later they were rubbing boards, guessing moisture contents and laughing.

"It's true," I told them. "You can tell the moisture content by feel when you've handled enough lumber. I'll prove it." I picked up a board from an air-drying pile, hefted it and felt the surface. "I estimate 16 percent." I stuck the moisture meter in the board. It read 17½ percent. They quit laughing.

Since then I've performed an exhaustive scientific study on at least a half-dozen samples from 4/4 red oak to 16/4 basswood and found my accuracy to vary by 1 to 5 percent of the actual moisture content. That compares favorably with some cheap moisture meters. While I wouldn't adjust a kiln schedule based on the "feel" of the lumber, neither would I depend solely on a moisture meter.

Accurately guessing moisture content is a useful skill. Because lumber expands and contracts, knowing moisture content is critical to avoiding problems. Experience helps. I've handled more than a million board feet of lumber, dried hundreds of kiln loads and held thousands of kiln samples of known moisture content. While holding a sample and before a number magically pops into my head, I believe a number of factors subconsciously combine to form an estimate:

- Weight: During drying, a board can lose a third to half its weight. You can estimate weight pretty closely with practice.
- Distortion: Wood remains dimensionally stable as it dries until about 30 percent. Below 30 percent it begins to cup and twist. The more distortion, the drier the lumber.
- Temperature: As water evaporates, it absorbs heat. A damp board feels cooler.
- History: The longer a board dries, the lower the moisture content.
- Weather: The warmer and drier the air is, the faster wood dries. The cooler or damper the air is, the slower it dries. Below 40°, drying nearly stops.
- Brittleness: As lumber dries it hardens, stiffens and becomes more brittle. Kiln-dried lumber feels rougher or more abrasive than air dried because the fibers are stiffer.

A few months later, Eli came to pick up an order. He also wanted to know the moisture content of a piece of lumber he owned.

"Well, sure, I can stick the meter in it for you, but I can tell the moisture content just by feel," I said. It was a dumb thing to say. Suddenly random conversations stopped.

"I'd like to see that," Eli said, handing me the stock. I turned it over and hefted it. It felt heavier and looked darker than most walnut. Crotch or stump-figured wood is usually very dense.

"Beautiful figure here," I said, trying to stall and extract a bit more information.

"Pain to work with though." Eli's face looked like a poker player's.

"How long has it been drying?" I asked.

"I ain't saying nothing."

I hadn't planned to risk my reputation as a sane lumber dealer on my gift of divining moisture content. A number formed in my head. Finally I blurted out, "12 percent." I jabbed the meter pins into the stock.

The needle rested at 12 on the dot. Whether it was clairvoyance, mystic intuition or luck, Eli was impressed. I was relieved but not surprised. Twelve percent is pretty standard for any thoroughly air-dried lumber in this region.

That was my last public performance. I don't need people coming to me for palm readings, healing or to locate underground veins of water. But I wonder what other hidden gifts a person might possess. I think I'll try finding metal embedded in saw logs. **PW**

by Peter Sieling

Peter owns Garreson Lumber Co., a hardwood supplier in Bath, New York.

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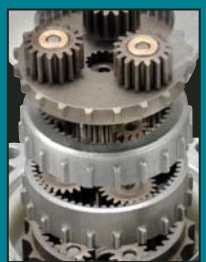

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