Woodworker's Journal
Special Interest Publication
Summer 2008

WORKSHOP
PROJECTS AND TECHNIQUES

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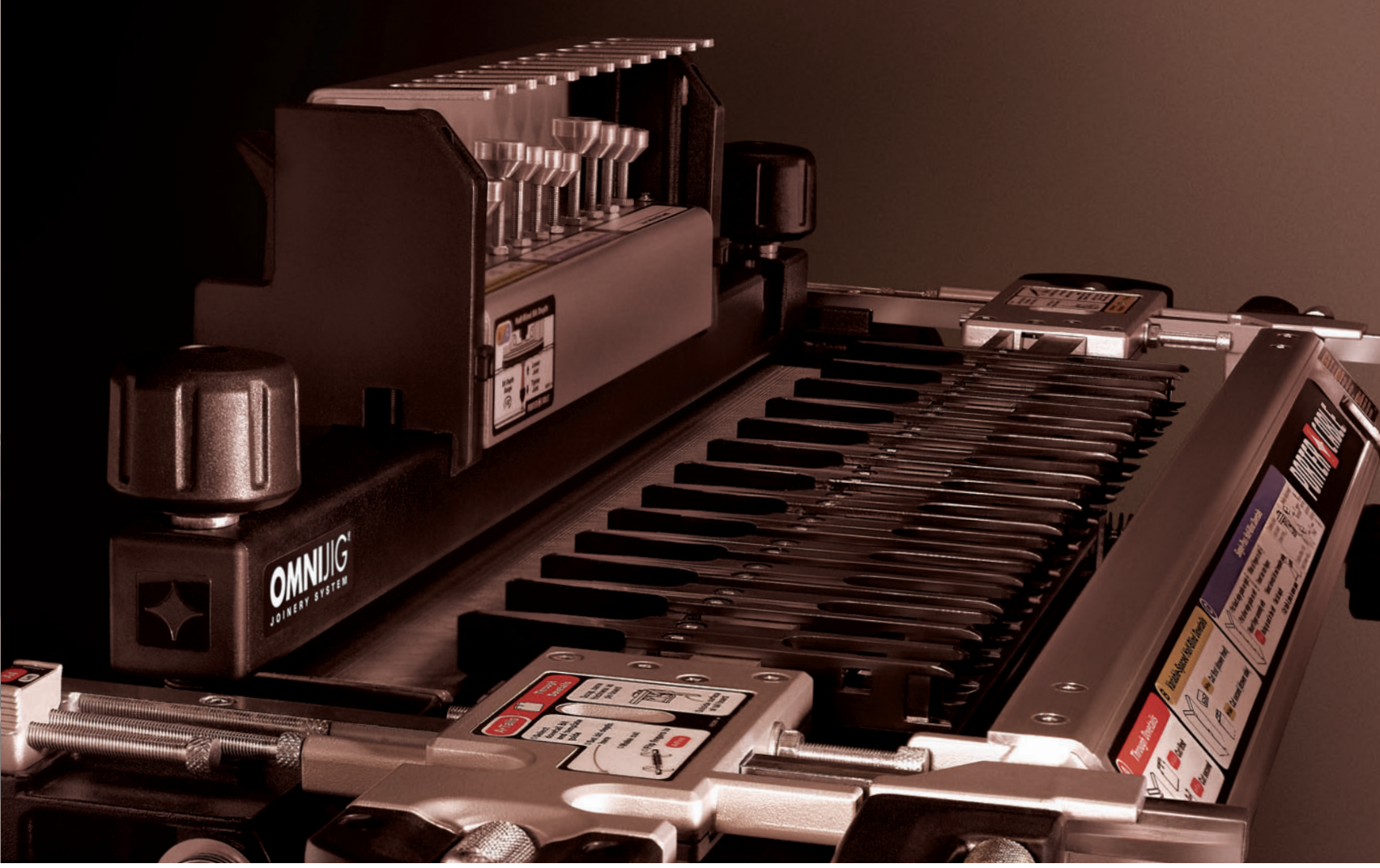

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Model 77240


Router bit depth gauges


Router stabilizer bar

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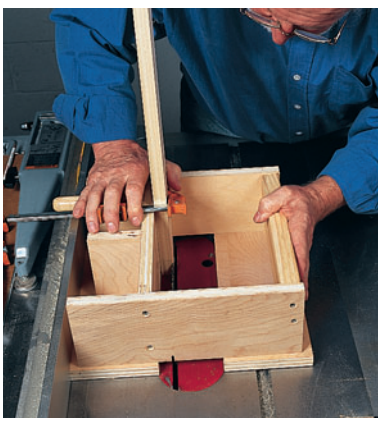

Introduction

Embrace Your Inner Shop Rat

As our presidential election approaches and party lines are being drawn in the sand, I can't help but notice some parallels with woodworking. We woodworkers are a collegial bunch, but even we seem to fall into a couple of general camps. Some of us focus on furniture while others make their shops the ongoing project. If you're of the second persuasion, your jigs have all the bells and whistles, there's always a new shop fixture in the works and you can never learn enough new techniques. Sound familiar? Then you're going to love this *Woodworker's Journal* Special Interest Publication. Special Projects Editor, Chris Marshall, has selected some dandy workshop projects and techniques from our archives and compiled them here.

In this issue, you can build Ian Kirby's custom workbench, sharpen your resawing skills and scrapers, add six snazzy jigs to your collection and get the low-down on why Sandor Nagyszalanczy thinks a shaper can beat a router table…plus lots more. Be sure to check out Chris' guide to 50 great tools and supplies. Hey, who among us can resist some new shop "stuff" when it's this good! Go ahead, embrace your inner shop rat. That'll get my vote any day.

Larry N. Stoiaken

Shop rat Linda Haus' article on Resawing Basics appears on page 28.

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Chris Marshall Special Projects Editor

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Alyssa Tauer Advertising Operations

Advertising Sales

J.F. Van Gilder Company
12740 Hillcrest Plaza Dr., Suite 120,
Dallas, Texas 75230

David Beckler david@jvgco.com
Terri Mathis terri@jvgco.com
Jim Van Gilder jim@jvgco.com
Phone: (972) 392-1892
Fax: (972) 392-1893

Subscription Inquiries

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50 Great Tools & Supplies for Your Shop

WHATEVER YOUR PROJECT MAY BE, HERE ARE 50 OF OUR FAVORITE PRODUCTS TO HELP GET THE JOB DONE.

By Chris Marshall

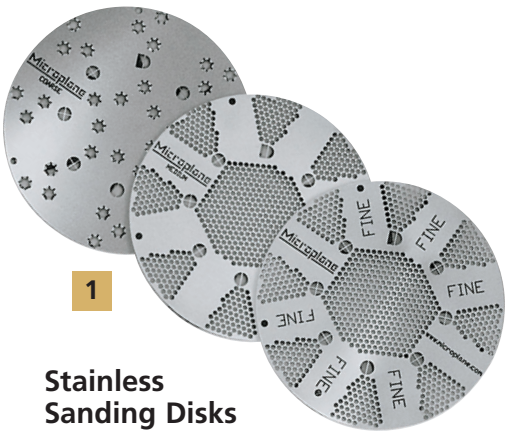
Every die-hard woodworker knows that woodworking takes "stuff." A well-equipped shop includes a workbench, power and hand tools, gaggles of bits and blades, fasteners, clamps, adhesives and finishing supplies, personal safety items, a shop vac and a dust collector. Then there are those incidental items you'll eventually need — knobs and doodads for jig-making, lubricants and cleaners, storage bins and organizers, a moisture meter, tune up and calibration tools, accessories to enhance current tools, books, DVDs and other reference materials ... you get the picture.

Sure, new tools and supplies can put a dent in the bank statement now and then, but their benefits can outweigh the cost. They really can help improve the accuracy and quality of your work, speed certain techniques along and ensure that you are protecting your health so you can enjoy this craft for a lifetime. The trick is knowing what to buy so you can shop wisely.

At *Woodworker's Journa*l we scour the trade shows and meet with suppliers to find the best new innovations for your hard-earned shop dollars. And, we're happy to report that there are lots of great new products worthy of your attention. There's no way we could compile them all in one article, but here are 50 of the best that caught our eye or made their way into our shops over the past year or so. If you didn't catch them on the pages of your print issues, here's a second look at the really good stuff!

6

Bits, Blades and Cutters



1

Stainless Sanding Disks

1 Microplane®'s 5" Sanding Disks ($9.95 to $13.95) are made from hardened stainless steel. Available in coarse, medium and fine grades to fit five- and eight-hole sanders. Microplane: 800-555-2767.

Delta's Premium Blade Line

2 Delta's premium-carbide woodworking saw blades ($45.99 to $149.99) have tooth geometries designed to produce smoother cuts than traditional blades. More than 30 models in all. Delta: 800-223-7278.

CMT Router Bit Cuts Tenons

3 CMT's Tenon Cutting Router Bit ($99.90) cuts tenons up to 1" long and from 3/16" to 3/8" thick on your router table. It uses four stackable slot cutters and a 1/2"-shank arbor that can be arranged in a variety of configurations to create the tenon size you need. CMT: 888-268-2487.

2

Cleaner Cuts with Four Cutters

4 Quadra-Cut™ router bits from Freud have four cutting edges rather than two: two upshear cutters remove most of the stock; two downshear cutters produce a clean edge on the final cut. They're available in several profiles; the bit above sells for $58. Freud: 800-472-7307.

3

4

Rockler 9-Piece Power Bore Drill Bit Set

5 Rockler Woodworking and Hardware's 9-Piece Power Bore Drill Bit Set has extra-deep flutes to clear chips more effectively, even on hardwoods. The set sells for $59.99. Rockler: 800-279-4441.

5

Stationary & Benchtop Tools

Delta X5 Drill Press

6 Delta's 20-950 X5 Drill Press ($749) has an industry-first twin-tilt table and mechanical variable speed, plus 6" of quill stroke. Delta: 800-223-7278.

RIKON 10-325 Deluxe Band Saw

7 Voted *Woodworker's Journal's* "Best Bet" last year, Rikon's 14" 10-325 Band Saw ($749) has a 1½ HP TEFC motor, ball-bearing blade guides and a tall resaw fence. It will resaw up to an impressive 13". Rikon: 877-884-5167.

Fully Loaded Bosch Saw

8 Bosch's 4100DG-09 10" Portable Table Saw ($679) features a digital rip fence and the Bosch Smart Guard system, which includes a blade guard and true riving knife. A Gravity-Rise™ wheelstand provides easy transport for either shop or jobsite use.

Roll on with Powermatic PM2000 Cabinet Saw

9 Integral casters, a cast-iron base, quick-release riving knife and improved dust collection are just a few of the impressive features on Powermatic's 10" PM2000 Table Saw ($2,300). Both 3 and 5 HP models are available with several fence and table extension options. Powermatic: 800-274-6848.

7

8

Regardless of your shop size or tool budget, power tool manufacturers are creating top-quality tools to suit all needs. The choices, industry wide, have never been better.

9

10

JET JJP-12 Planer/Jointer Combo Machine

10 Leave it to JET to design a machine that includes both a 12" planer and jointer. Changing over from one function to the other takes about a minute. The versatile JJP-12 ($1999.99) features a large extruded fence with centered controls for quick adjustments, a built-in dust chute and a powerful 3-horsepower induction motor that can handle the toughest lumber. JET: 800-274-6848..

Inflatable Sanding System Fits Any Shape

11 The Guinevere Total Sanding System ($285.95) from King Arthur Tools comes with inflatable rubber dome- and drum-shaped heads that conform to the shape of your work. A 1/2 HP, 300-watt motor powers the system's flexible shaft or fixed chuck. Sanding sleeves come in four grit sizes. King Arthur Tools: 800-942-1300.

11

Miniature Dust Collector

12 Steel City's 65115 Mini Dust Collector ($99) attaches to the 4" port of any machine in the shop: no need to lug around a cumbersome hose. Runs at 300 cfm, with a 30-micron bag. Steel City: 877-728-6651.

12

Strap-on Eye Protection

13 FullPro's SoundVision Eye Protection ($19.95) fastens over ear muffs with Velcro® straps to preserve the ear muff seals and ensure full hearing protection. FullPro: 888-873-8557.

Varathane's All-in-one Finish

14 Varathane®'s patent-pending Waterbased One-Step Stain and Polyurethane ($15.99 per quart) stains, seals and protects in one step, an industry first for interior wood. It's available in eight colors. Varathane: 800-553-8444.

Biscuits Connect and Clamp

15 Fixo Clamping Biscuits from Colonial Saw ($28.50) connect and clamp with one strike of a hammer. Curved ridges pull the work pieces together. Sold in packs of 80 in two sizes. Colonial Saw: 781-585-4364.

16

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16 Like to curl up with a good book on an occasional winter evening? *Woodworker's Journal* has just the sort of titles you're looking for. Check out the Woodworking Books section on our home page to find everything from Craftsman Furniture Projects to Jigs and Fixtures for the Table Saw and Router. ($17.95 to $19.95 each.)

Pro Tech NoiseBuster® Electronic Noise Canceling Earmuff

17 Specially engineered to protect your ears from loud noise generated by power tools. Pro Tech NoiseBuster® Earmuffs ($149) electronics create a noise wave that cancels damaging, low-frequency noise but won't mask speech or warning signals. It has a passive noise reduction rating of 26 decibels. A 3.5-mm audio jack allows you to listen to your favorite music from a portable audio player at safe volume levels without distortion or over-amplification. The unit is powered by a single AA battery for up to 65 hours of use. Pro Tech: 800-468-8371.

Reusing Old Timber

18 By reclaiming old beams, rafters and flooring, East Teak Fine Hardwoods now offers Forest Stewardship Council certified, 100 percent recycled and reclaimed teak and rosewood timber. Prices start at about $20 per board foot. East Teak Hardwoods: 800-338-5636.

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3 Types of Dowel Joints

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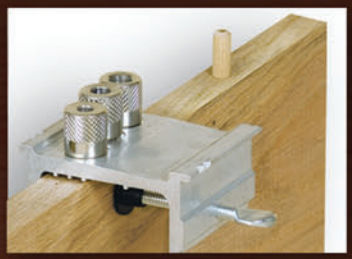
- Right Angle
- Edge-to-Surface



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Edge-to-surface joint

Edge-to-edge joint

Right angle joint

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Workshop Accessories

Leigh Super Jigs

19 Leigh Industries' 12", 18" and 24" Super Jigs ($199 to $329) can make through, half-blind and sliding dovetails in fixed or variable patterns. Leigh Industries: 800-663-8932.

Triton Superjaws Workbench

20 The SJA200 Triton Superjaws Workbench ($200) lets you operate the top clamping action with your foot. Jaws adjust from 0" to 37". Triton: 888-874-8661.

Wixey Digital Angle Gauge

21 Determine saw setup angles in seconds with digital precision. Gauge attaches with a magnet to tool tables and fences. Price is $39.99 from Rockler: 800-279-4441.

Cove-Cutting Table Saw Jig

22 Cut coves on your table saw without juggling all those fences and clamps! Jig ($79.99) accepts stock up to 7" wide and 1½" thick. Rockler: 800-279-4441.

Dremel Multi-Vise

23 The unique Dremel Multi-Vise ($34.99) is three tools in one — a portable vise, a rotary tool holder and a bar clamp. Dremel: 800-437-3635.

Accuspray 23 Series HVLP Sprayer

24 The 23 Series HVLP sprayer ($700) is a lightweight, all-in-one, three-stage sprayer that was a *Woodworker's Journal* "Best Bet" winner last year. Accuspray: 800-618-6860.

Work Sharp WS3000

25 The Work Sharp WS3000 ($199) will sharpen all your tools using glass wheels affixed with PSA abrasive. It adjusts to multiple bevel angles. WorkSharp: 800-597-6170.

Oneida Dust Deputy

26 Turn your shop vac into a mini-cyclone with the Oneida Dust Deputy ($199). Includes a steel cyclone and 10-gallon drum. Oneida Air Systems: 800-732-4065.

Incra Miter 3000SE Miter Gauge

27 A "Best Bet" winner, Incra's 3000SE ($223) uses twin rack-and-pinion systems to set miter angles to within 1/2 degree. Comes with fence and flip stop. Incra: 972-242-9975.

JessEm Rout-R-Lift FX

28 The Rout-R-Lift FX ($180) retrofits on several popular routers and features tool-free motor removal. JessEm: 866-272-7492.

E•Z Jointer Clamp Kit

29 Turn your table saw into a straight-line ripping machine with the E•Z Jointer Clamp ($19.75). General Tools: 800-697-8665.

Router Base is Three-Axis Mill

30 Micro Fence's Three Axis Mill ($399.95) transforms your router motor into a precision milling machine. Gain thousandths-of-an-inch depth control for all your plunge routing needs. Micro Fence: 800-480-6427.

Woodline Panel Master

31 The Panel Master system from Woodline USA ($119) makes routing raised panels safe and easy. A Woodline Blue Max 360 clamp holds the templates in place, and handles offer precise control of routing operations. Woodline USA: 800-472-6950.

Prazi ChestMate Dovetail Jig

32 Rout through dovetails in panels of any size with Prazi's inexpensive, sturdy Chestmate Dovetail Jig ($99). Prazi: 800-262-0211.

Carter Products Blade Tensioner

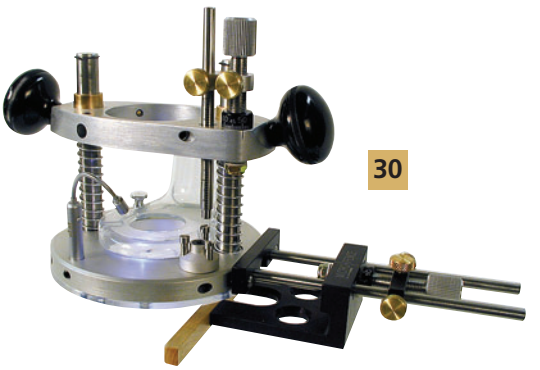
33 Carter Products' ratcheting knob ($49.95) replaces the blade tension knob on most 14" band saws, making for fatigue-free blade tensioning. Carter Products: 888-622-7837.

Noden Adjust-A-Bench

34 Create the correct work height for you with Noden's variable-height Adjust-A-Bench ($800 to $920 plus shipping). Noden: 609-882-3300.

Micro-Adjust any Rip Fence

35 Add finer precision to your table saw's rip fence with a Magnetic Micro Adjuster ($29.99). It mounts to any flat metal fence rail with rare earth magnets: Rockler: 800-279-4441.



Workshop Accessories

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Kreg Jig K3 Master System

36 You'll assemble pocket hole joints like a pro with the Kreg Jig® K3 Master System ($149.99). It includes the drilling jig, clamp, stepped bit, dust shroud material support attachment and screws. Kreg: 800-447-8638.

Install Loose Tenons with Rockler's BeadLOCK Pro Kit

37 Create sturdy loose-tenon joinery in minutes with only a hand drill and a BeadLOCK jig. The Pro Joinery Kit ($119.99) comes with everything you need to get started. Rockler: 800-279-4441.

Magswitch Universal Featherboards

38 A pair of rare-earth magnets attach these Magswitch Featherboards ($55) to any steel or iron tool table, and they release easily with knobs. Rockler: 800-279-4441.

Rockler's EZ-Clutch™ Quick Release System

39 EZ-Clutch™ ($1.99) eliminates pinched or sticky clutch plates when you're trying to release the tailstocks on standard bar or pipe clamps. Rockler: 800-279-4441.

Portable Power Tools

371K Compact Belt Sander from Porter-Cable

40 The first belt sander of its — small — size. The 371K's weight is listed at five pounds, and the belt size is 2½" x 14". With a 500 maximum-wattage output motor, it produces a belt speed of 1,100 surface feet per minute. Porter-Cable's 317K sells for $119. Porter-Cable: 800-848-5175.

Makita 7.2-volt TD020DSEW Impact Screw Driver

41 With lithium-ion technology, Makita's 7.2-volt TD020DSEW Impact Screw Driver Kit ($109) provides a 1.1-pound, 10" tool with 177 inch-pounds of torque. That's impressive for such a tiny tool! Makita: 800-462-5482.

Craftsman's Feature-packed Router Line

42 Craftsman's professional line of routers ($79.99 to $119.99 for a combo kit) includes 9.5- and 11-amp, fixed- and plunge-base models, all with LED worklights, dual full-view windows, above-the-table height adjustment and more. Craftsman: 800-377-7414.

Hand Tools

Grex P635 23-Gauge Headless Pinner

43 The Grex model P635 nail gun ($219) will drive headless pin nails — perfect for the tiniest moldings — from 3/8" to 1⅜" long. A *Woodworker's Journal* "Best Bet" tool last year. Grex: 626-289-7618.

Ryobi P600 Laminate Trimmer

44 Ryobi's 18-volt P600 Laminate Trimmer® ($50) will handle all your trim routing tasks without a power cord. Ryobi: 800-525-2579.

Festool DF500 Domino Joiner

45 Festool's Domino Joiner ($700) cuts cylindrical slots for four sizes of beech Domino tenons quickly and accurately. Rockler: 800-279-4441.

Bosch PR20EVSNK Trim Router

46 Variable speed, soft start and loads of power make the Bosch PR20EVSNK Colt ($199) an excellent trim router and one of 2007's "Best Bet" tools. Bosch: 877-267-2499.

Veritas Sliding Square

47 Veritas replaces the usual narrow rule with a square plate on its Sliding Square ($31.50). Graduations on both the end and edges allow for two-axis measuring. Veritas/Lee Valley: 800-267-8735.

Rockler Sure-Foot Clamps

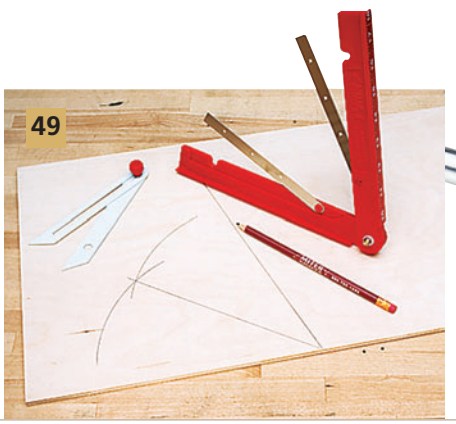
48 A taller clamp and broader base give you more "knuckle clearance" and make these clamps exceptionally stable. Available in both pipe and bar styles ($11.99 to $39.99). Rockler: 800-279-4441.

Arnott Tools Miter Divider

49 Arnott Tools' Miter Divider ($19.99) uses pivoting arms to easily dial in cuts of any angle, not just a "true" 45°. It's also handy for bisecting angles. Arnott: 800-798-1499.

Two-position Shoulder Plane

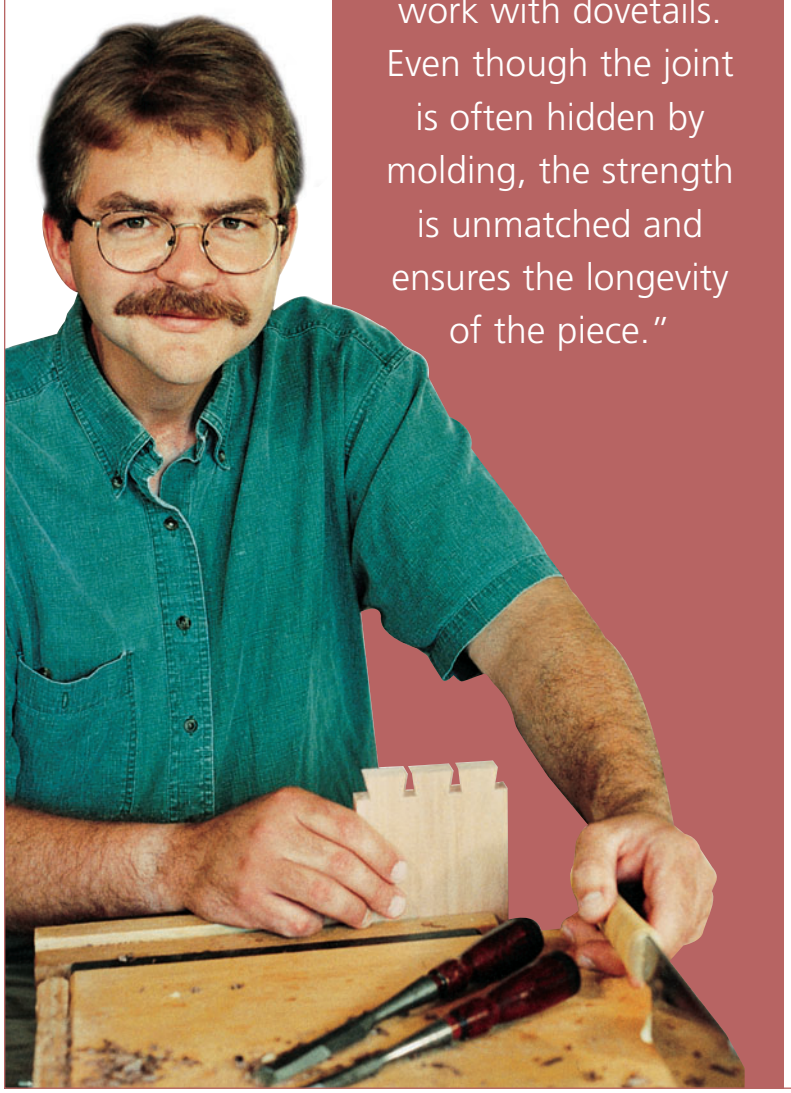
50 Bridge City Tool Works' HP-7 Shoulder Plane ($589) works just as well, either upright or on its side, with its two adjustment wheels recessed into the body. An ideal tool for cleaning up tenons and rabbets. Bridge City Tool Works: 800-253-3332.



Four Methods of Casework Joinery

ONCE YOU ELIMINATE THE FRILLS FROM A COMPLICATED CASEWORK PROJECT, BUILDING IT BECOMES A SIMPLE MATTER OF CONSTRUCTING A SERIES OF BOXES.

By Lonnie Bird



"I always construct large furniture casework with dovetails. Even though the joint is often hidden by molding, the strength is unmatched and ensures the longevity of the piece."

Have you ever wanted to build a chest of drawers or dressing table but just weren't sure how to begin? Perhaps you saw a photo of a china cabinet in a magazine and you wanted to reproduce it but felt it was beyond your reach. Although large-scale casework projects can seem somewhat intimidating, building them is really nothing more than constructing boxes. Once you gain an understanding of the methods involved, construction becomes much easier.

Drawers, which are also boxes, are fit within the casework and slide on wooden rails or runners. Doors are often added as well to keep the contents of the chest hidden from view, although sometimes doors have glass panes, or "lights" specifically for displaying the contents of the case. The challenge when constructing any casework is to keep it square. As I'm sure you can imagine, it's much easier to fit doors, drawers and molding to a box with 90° corners than to a trapezoid or a parallelogram. But that becomes easy, too, once you realize that parallel sides of the box must be exactly the same length.

Over the centuries, cabinetmakers have developed a number of ways to construct casework, and each method has its own advantages. By understanding the various methods of construction, you can design your own casework to suit your needs. Once you've constructed the case or box, you can add feet, moldings, doors and other details to give your design distinction.

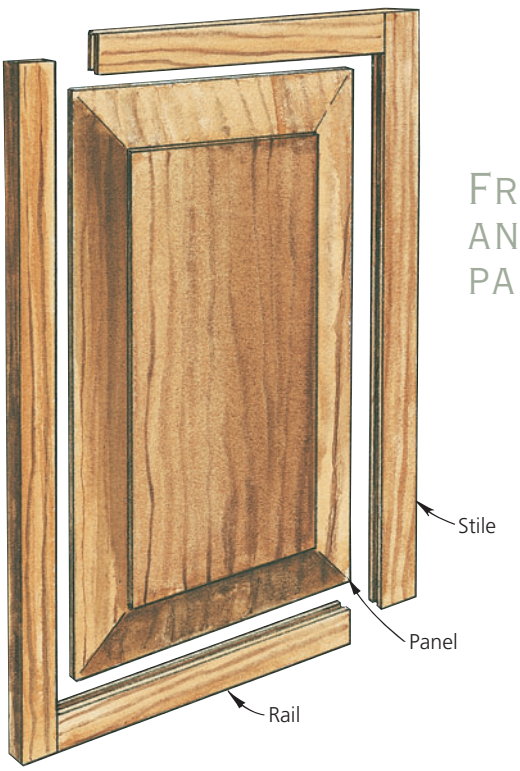
For the purpose of discussion, I've divided casework into four separate categories: frame-and-panel, post-and-rail, box construction and face frame. Although these categories work well for getting a grasp of case construction, cabinetmaking is too diverse to always fit neatly into categories. Sometimes you'll find it necessary to combine construction techniques from two or more types.

Frame-and-panel case sides, even complicated ones with tombstone panels (as shown here), are still just wood panels surrounded by stiles and rails.

Frame-and-panel

Frame-and-panel casework is simply a series of wood panels surrounded by a stile and rail framework. The paneled framework is joined at the corners to create a box. Probably the most familiar example of this timeless design is the roll-top desk. Mass-produced in large numbers around 100 years ago, the rolltop desk was once a common sight in America's offices. These massive oak desks featured a large, spacious writing surface supported by a pair of chest of drawers. The space between the chests provided a knee-hole. A frame-and-panel assembly covered the knee hole at the back of the desk to provide a finished appearance.

Positioned on top of the writing surface was another paneled framework, which housed a series of small drawers, pigeonholes and other storage areas. The inside edges of the framework were grooved to



FRAME-AND-PANEL

Stiles and rails joined at their corners form a frame, which is filled with a flat or raised panel.

Post-and-rail is the best case construction method when your case is going to be elevated off the floor. The posts serve as legs and are typically tapered, turned or carved, as in the example above, to embellish the overall appearance.

provide a track for the canvas-backed tambour, which rolled down to secure and hide the contents. Although the rolltop desk is an elaborate example of casework, not all frame-and-panel furniture is that complex. In fact, it can be as simple as a chest with a hinged lid, like the one shown on page 19.

Construction: Successful frame-and-panel casework begins with well proportioned panels. Rectangular panels look best; panels that are square (or close to square) tend to look boxy and somewhat clumsy. To proportion panels for a pleasing effect, I use simple mathematical systems. Ratios of whole numbers derived from the Fibonacci series have universal appeal. The series of numbers begins by adding 1 plus 1; then the sum is then added to the previous number to derive the next number in the series.

The proportion reflected in this sequence is akin to the Golden Rectangle. First discovered by the Ancient Greeks, the Golden Rectangle has been used to develop proportions for everything from architecture to credit cards. The ratio, 1 to 1.618, is also a foolproof method for sizing panels in frame-and-panel casework.

The framework surrounding the panels is typical-

ly assembled with mortise and tenon joints. The inside edges of the frame members can be left square or "stuck" with a simple molding profile that is mitered or coped at the corners. The panels can be raised or beveled along the edges or simply left flat.

Once assembled, four sub-assemblies of framework are joined at the corners to create a box. Although a simple butt joint has sufficient strength, adding a tongue and groove joint at the corners helps with alignment during assembly and glue up. The assembled box is usually supported by bracket feet or some other type of short base to lift the box off of the floor. After assembly of the casework, doors, drawers and lids are added.

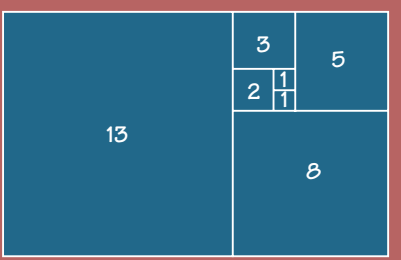
Post-and-rail

Another time-tested method of case construction is known as post-and-rail — sometimes referred to as leg-and-rail. Post-and-rail construction is a good choice when the case is positioned high off the floor. Dressing tables, tall chests and sideboards are just a few examples of furniture that use this type of construction. The posts are used as legs to elevate the case and are usually embellished to eliminate the plain, square look; a tapered leg is a simple, yet elegant option. Other versions include turning or compound curves such as cabriole legs.

Construction: Typically with post-and-rail, a set of matching posts are joined with wide boards to create a box. This construction method is very similar to the methods used to join tables and beds. The posts are mortised to accept tenons, which are cut on the ends of the case sides. Often, four posts are used, but if the case is very wide, as with a sideboard, additional pairs of legs may be added for more support. At the case front, a framework of rectangular openings is

Right Sized Rectangles

The Fibonacci Series is figured by adding the successive number to the number that precedes it. The rate of successive terms goes 1, 1, 2, 3, 5, 8, 13, 21 and so on.



created to allow the fitting and installation of doors and drawers. The top rail of the framework is usually turned on edge to create a broad surface for dovetail joinery. A single, wide dovetail is sawn on the end of the top rail. This fits into a corresponding dovetailed socket on the top of the leg post. Lower rails are joined to the legs with double tenons. Doubling the tenons creates twice the surface area for glue and significantly adds to the strength and rigidity of the case. Vertical frame members — stiles — are either dovetailed or tenoned into the horizontal rails. The back of a typical case is also a thick, wide board or several boards glued together with several tenons cut on the ends that fit within mortises in the legs. Dividing the wide joint into a series of smaller ones strengthens the leg mortises and helps avoid splitting of the case sides during seasonal changes in humidity.

Box Method

The box method is the technique that you probably used the first time you built a small cabinet, tool chest or jewelry box. As the name implies, four planks are simply joined at the corners to create a box. It's undoubtedly the least complicated method — and one of the most widely used. Because of its flexibility, the box method can be used for a variety of designs and furniture styles. The completed case could rest low to the floor on bracket feet or be positioned at eye level on a post-and-rail base.

Although the basic design of this construction method is quite simple, it functions well within complex furniture designs. The slant front desk, for example, has an upper corner cut at an angle that supports a hinged lid. The lid folds down to form a writing surface and expose an elaborate arrangement of pigeonholes, drawers, doors and hidden compartments. The entire assembly rests on bracket feet that lift it a few inches off the floor and raise the writing surface to a comfortable height for working.

Construction: Construction of the box method can be as simple as butt joints and nails — or as complex as half-blind dovetails. When deciding which joint to use at the corners, I consider the material, the overall size of the box and how it will be used. I'll often fasten the corners of diminutive boxes with glue and nails. Afterward, I'll cover the entire box with a figured veneer to decorate the box and hide the simple construction.

I always construct large furniture casework with dovetails. Even though the joint is often hidden by molding, the strength is unmatched and ensures the longevity of the piece. Splined miters are also a good choice for small, decorative boxes that won't be subjected to a great deal of stress. An added advantage with miters is they allow the wood grain to flow in a continuous pattern around all four sides.

If the case is to have drawers, the dividers and partitions can easily be joined with a sliding dovetail that fits snugly within a mating socket in the case side. Drawer runners are typically joined with mortises and tenons to the front and back dividers, creating a strong, rigid framework for drawer support.

Backs on these cases are "let in" to a rabbet that is cut along the back, inside edges of the box. The back is usually made up of a series of random width boards nailed to the rabbet in the case. The edges of the backboards are also rabbeted to allow each board to overlap the next. A quirk bead may also be shaped along the edges to dress up the backboards and hide the seasonal wood movement that occurs between them. The finest casework of this type sometimes has a frame-and-panel back. Although consider-

POST-AND-RAIL

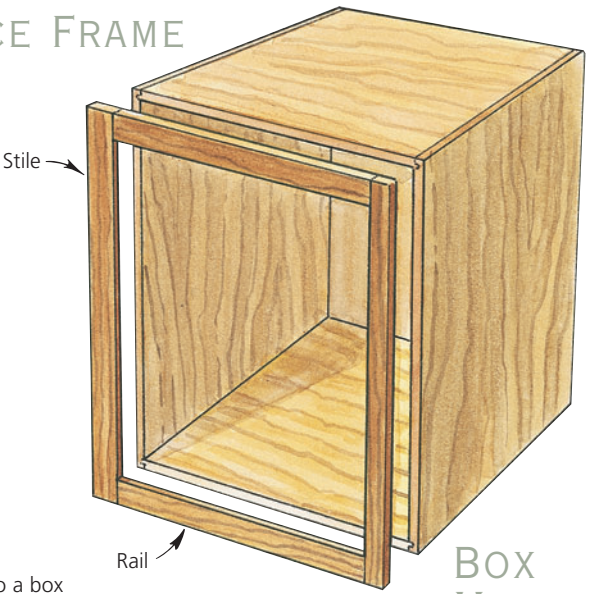
When you start thinking of furniture in terms of its most basic forms, even complex pieces become easier to understand.

ably more work, the rigid framework adds both strength and stiffness to the case, and the frame-and-panel design provides a more finished appearance, especially if the casework will be viewed from all sides.

Adding a Face Frame

Still another method of casework construction is to attach a face frame to the box in the previous example. Our old friends, stiles and rails, return to create the face frame. The assembled frame is then glued (and occasionally nailed as well) to the front edges of the box.

Adding a face frame to a box gives the box greater stiffness and resistance to racking. It's also a good option for casework with doors. The face frame "frames" the doors visually, and the stiles provide a place to mount hinges. The top rail of the face frame often is sized wider than the stiles and bottom rail to provide an area for application of a crown molding.



Adding a face frame to a box stiffens it and creates resistance to racking. It's a good option for casework with doors, as it frames the doors visually and the stiles provide a place to mount the hinges.

Adding a Few Embellishments

Once you've settled on a method of case construction, you can choose to "dress it up" or "dress it down." Plain furniture styles, such as Shaker and Arts & Crafts, use simple lines, such as straight or tapered legs, subtle curves and sparse moldings. In contrast, period furniture styles use compound curves, elaborate gooseneck moldings and perhaps some carving.

Other Casework Variations

Some forms of casework don't seem to fit into any particular category. For example, corner cabinets don't really have sides; they're simply a face frame with canted corners. The back edges of the corner are rabbeted to accept the backboards.

Most examples of tall furniture casework are built in two or more sections. For example, a period tall chest has a post-and-rail lower case that supports a dovetailed box upper case. This design combines the best of both casework methods: the lower case is visually lifted from the floor and supported by cabriole legs; the strong, yet simple, box construction of the upper case is straightforward in construction and is easily fitted with partitions, dividers and drawers.

Still another unusual example is the tall case clock, sometimes referred to as a grandfather clock. Its tall, elongated case is really three separate boxes stacked upon one another. The base and middle section, or waist, are simple face-frame boxes. In contrast, the hood that frames the dial and houses the works, is an elaborate mix of construction methods.

Installing Heavy-duty Drawer Slides

WANT DRAWERS THAT GLIDE IN AND OUT LIKE THEY'RE FLOATING ON AIR? MOUNT THEM ON HEAVY-DUTY DRAWER SLIDES.

By Rob Johnstone

Slide Ratings

Slides that run on ball bearings will always outlast and out-perform slides that rely on friction between two metal surfaces.

Light-duty slides handle loads up to 75 pounds, while a medium-duty rating extends the limit to 120 pounds. Anything over 120 pounds gets a heavy-duty rating.

Light-duty slides are usually limited to 3/4 extension (meaning they extend 3/4 of their length). Your favorite kitchen utensils always seem to find their way to the backs of these drawers, out of reach.

There are drawer slides for every application. From tiny pencil drawer slides to computer keyboard slides, on up to massive 60"-long slides developed to support more than 500 pounds of tools!

A quality set of drawer slides will last the life of a drawer, and they're easy to install with a few basic shop tools.

Installation Basics

Most of the furniture we build will still be in daily service when our grandchildren retire. Viewed in that light, the cost of upgrading from standard to heavy-duty drawer slides isn't such a big deal. But the benefits sure are. A slide rated for 300 to 500 pounds will operate beautifully for a drawer full of heavy books or documents, but it also will endure many more decades of use than a slide rated for light use (say, 50 pounds).

Installing them is a snap. Begin by building your drawers so they're exactly 1" narrower than the opening. (Check the specifications that come with your drawer slides: there are a few versions that use metric measurements.) This allows 1/2" on either side of the drawer, which is exactly the right clearance for the slide to operate properly. More than 1/2" means the slide operation will be sloppy: it may even derail. With less than 1/2", the slide will quickly bind.

Most slides are screwed in place along the bottom edge of the drawer side. To locate the matching receivers inside the cabinet, use a paper template (usually included with the slides) or an aftermarket plastic template (available for most brands of slides), as shown in the photo sequence at right. In either case, follow the individual manufacturer's instructions.

Build the drawers 1" narrower than the opening, allowing 1/2" on either side of the drawer box. Some imported metric slides may require slightly different allowances, so check the specific instructions first.

If there's more than one drawer in an opening, space them so the bottom drawer has enough clearance to slide properly, then divide the remaining area equally among the drawers.

The slide receivers must be mounted truly perpendicular to their openings. Lining up the screw holes is best done with a template (inset), or by aligning the slide with pencil marks drawn along a square. If the slides aren't absolutely parallel, your drawer will never glide properly.

With the receivers installed in the cabinet, use the slides as templates to locate screw holes in the wooden drawer sides. Screw the slides to the drawers and slip the drawers into the cabinet. That's all there is to it!

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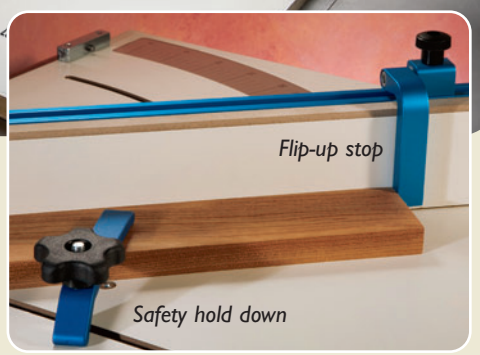

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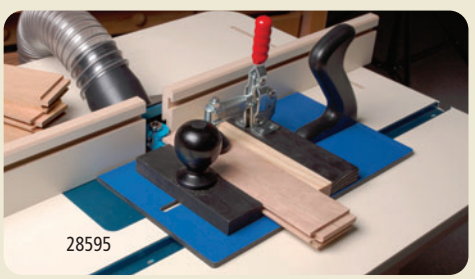

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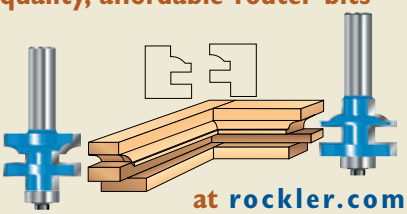

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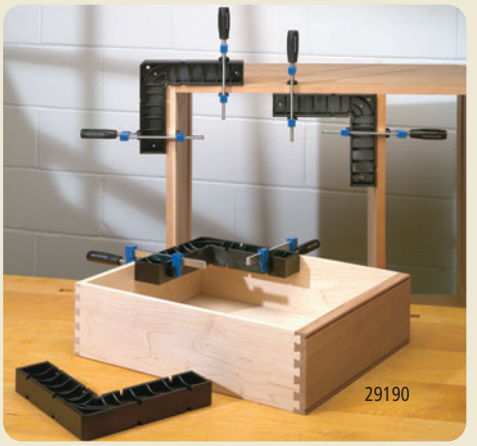

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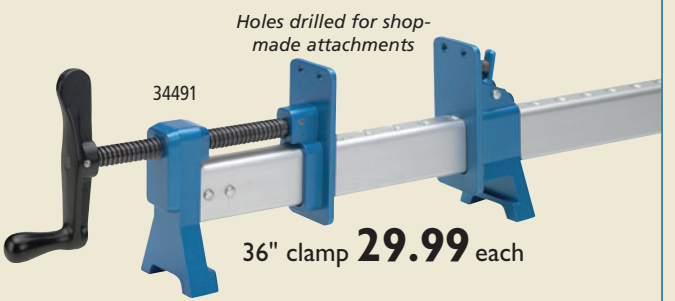

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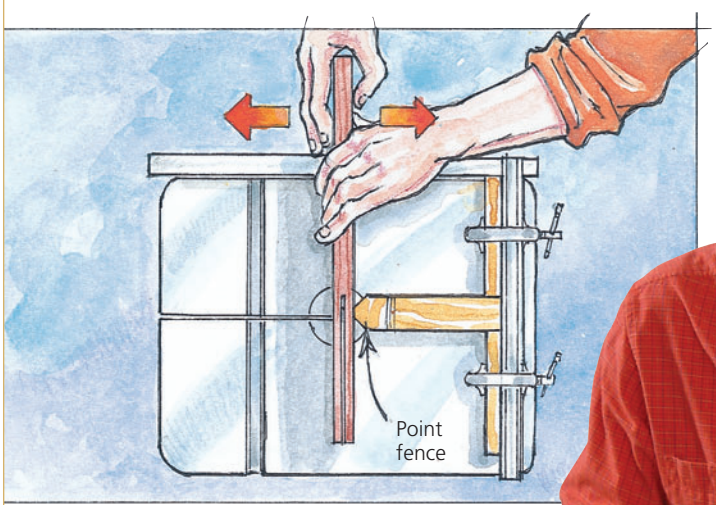
Resawing: Basic Hows and Whys

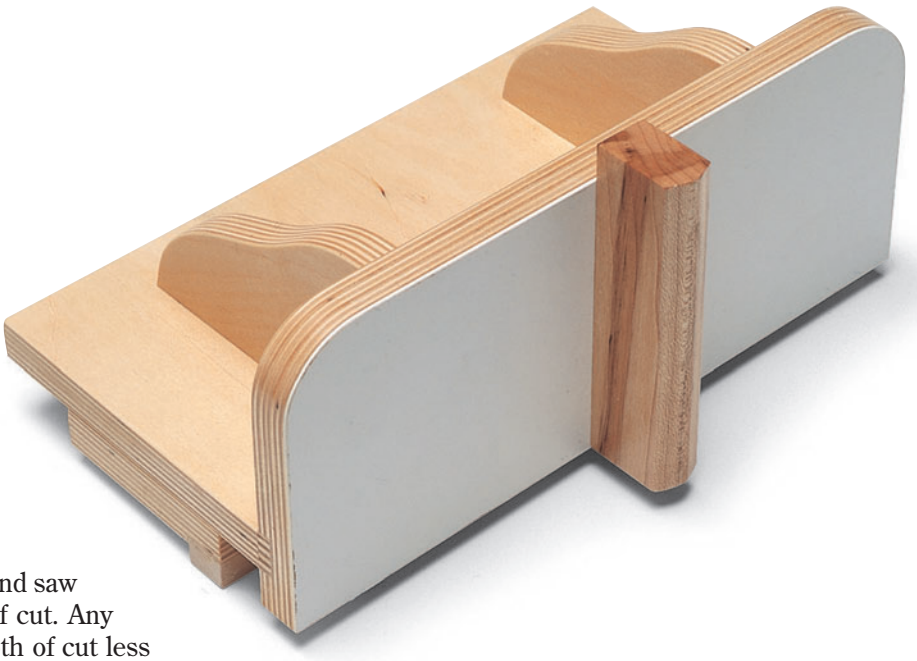
LUMBER SURE ISN'T GETTING ANY CHEAPER. WHEN YOU NEED A THIN SLICE, TURN TO YOUR BAND SAW AND A WIDE BLADE. IF YOU'VE NEVER RESAWN BEFORE, HERE'S WHAT YOU NEED TO KNOW.

BY LINDA HAUS



Blade drift is a constant concern of resawers. A proper saw blade coupled with a point fence are the first steps towards accuracy. Then, as you cut, make gradual left and right adjustments as shown above.

So you can use a band saw to slice thin pieces of wood from bigger pieces of wood … what's the benefit? Why not buy your wood sliced thin to begin with, or just plane or sand it to thickness? Here are five good reasons: First, you'll get the best use out of expensive or beautifully figured wood. Second, you'll be able to create book-matched, slip-matched or swing-matched panels. Third, you'll



have a method to efficiently use salvaged or reclaimed lumber of large dimension. Fourth, you will be able to create your own lumber from a tree — or even from firewood! And fifth, when you get good at it, you can begin to make your own handmade plywood (see *tint box*, next page).

Equipment Makes a Difference

To get started with resawing, you'll need a band saw of sufficient power and with a large depth of cut. Any saw with a motor smaller than 1 HP and depth of cut less than 10" will limit your effectiveness. (A typical 14" band saw has about a 6" maximum cut, so you'd be limited to a 12" wide book-matched panel or less.)

We also recommend using a point fence of some sort (see *photos* at right). By having a single point to register the cut (placed adjacent to the cutting edge of the saw blade), you will be able to swing your stock left or right to correct for blade drift. You might be able to get away with using a standard fence once in a while, but if you're trying to slice off a 1/4" piece of expensive hardwood, and your blade drifts toward the fence, you are powerless to correct it.

Speaking of saw blades, the rule of thumb for resawing is "the wider the better." Wider blades, 3/4" and larger, cut straighter, which is the goal. Also, fewer and larger teeth per inch make for better resawing.

The question readers ask is, "Can you resaw using a narrow band saw blade?" The answer is, sometimes, yes. If your band saw is well tuned and the wood is acceptably dry and without internal stresses, a narrow blade can work. More often than not, however, an ordinary 1/4" or 3/8" blade will only lead to more wandering in the cut. It's not designed for a heavy-duty task such as resawing.

When it comes to resawing blades, think wide and dentally challenged. Fewer teeth per inch allow the blade to remove sawdust more effectively. And if you are slicing through a 10" or 12" board, you can imagine how much waste that makes. Wider blades track better and cut straighter; exactly what you want when resawing. If your machine will accept a 3/4"- or even 1"-wide blade, you'll have the ideal width for resawing. These wide blades can be costly, but for routine resawing they're really the way to go. Even if you don't opt for an expensive "specialty" resaw blade, stick with at least a 1/2" open-toothed blade to enhance your resawing activity.

A point fence, like the adjustable shop-made version above, is the key to being able to adjust for blade drift as you resaw. This example fits into the saw table miter slot.

Resawing by the Numbers

Here's a step-by-step primer on resawing:

1. Square up and surface two faces of your lumber. While it's possible to resaw rough-cut lumber, your work will be more accurate and easier to control if you first prepare the stock.
2. Use a point fence. You can easily make or buy one. Many of the larger band saws come standard with a viable point fence.

Handmade Plywood

Creating your own plywood gives you total control of a project's appearance and wood species. The core material on the lid of this display box, for example, is actually plywood, but it appears to be a piece of solid wood. The way to accomplish this is to use successive sheets of resawn veneer, sandwiched around the inner plywood core. Then, wrap the edges with hardwood strips of the same wood species. Resawing give you the flexibility of creating custom veneered plywood from any wood species you desire. This capability expands your plywood surface options immensely and allows you to create custom veneers that match the rest of your project perfectly. It's an economical and efficient way to make the most of your lumber and design possibilities.

By resawing hardwood to create custom plywood, all the surfaces of this project appear to be made of solid wood. It's a great illusion and savvy design approach.

3. Set the fence to the thickness of the stock you require. Be sure to accommodate the saw kerf in your planning. For example, it's impossible to get three 1/4"-thick pieces of stock from a 3/4" piece of wood. The two saw kerfs eat up close to 1/8" of wood.
4. Adjust the upper saw guide to the width of the board you are resawing, plus about 1/4".
5. It is a good idea to scribe a line the width of the slice you are removing on the visible edge of the board. This will help you keep the saw blade exactly where you want it during the cut.
6. Feed the wood through the cut using a slow, steady feed rate. If the saw motor starts to labor, slow the cut down even more so the blade doesn't stall. Use a push stick to finish the cut to keep your fingers clear of the blade.
7. If you are making multiple resaw cuts in a piece of lumber, decide whether you need to run the sawn face of the stock over your jointer or not before beginning the next resaw pass.
8. Use a planer with a slave board to remove the saw cuts from the faces of the resawn slabs. Don't run stock thinner than 1/4" through your planer without a slave, or it could get caught in the feed rollers and shatter. Or use a sander to smooth the slab.

When choosing resawing blades, think wide and dentally challenged, as with the wide blade at right. At a minimum, stick with a 1/2"- or 5/8"-wide, open-toothed blade, (middle). Thin blades (left) are really designed for cutting curves, not resawing.

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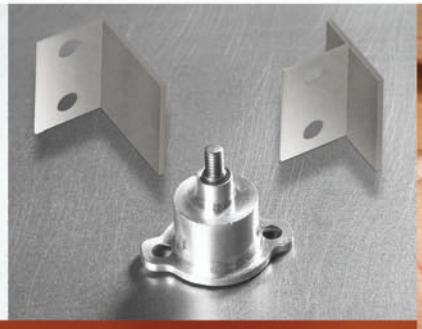

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Using a Shaper

ROUTER TABLES ARE MIRACULOUS, BUT SOMETIMES PROJECTS REQUIRE HEAVIER-DUTY MACHINERY. A SHAPER IS LIKE A ROUTER TABLE ON STERIODS. IT IS MADE FOR HANDLING LARGE CUTTERS AND BIG STOCK.

By Sandor Nagyszalanczy

There aren't many red-blooded woodworkers around who don't value the benefits of using a router table. Its versatility is legendary. But as miraculous as a router table is, there are times when a project requires heavier-duty machinery. That's when a shaper really shines: it's basically a router table on steroids, made for handling big stock. Shaper cutters come in a wide range of shapes and sizes and allow you to make moldings, create interlocking joinery for door and window frames and form a variety of other millwork profiles.

But if you already own a good router table, why would you want to add a shaper to your home shop? For starters, anything a router table can do, a shaper can do bigger and, often, better. A shaper's beefy induction motor and stout spindle can handle heavy cuts in thick stock that would be difficult or impossible on a router table. Better yet, a shaper's large-diam-

eter cutters are less apt to burn stock or leave chatter marks than comparable router bits are. Its larger cutting arc also makes a shaper cutter less apt to tear out woods with figured or interlocking grain. Factor in a shaper's reversible motor and versatile fence and you have a machine that is worthy of consideration for any size woodshop.

If you're new to the shaper, this article will help you understand its basic setup and use, for both straight and curved cutting, as well as the use of important accessories such as hold-downs and power feeds. Besides learning to do accurate and effective work on a shaper, following the methods presented here, as well as using appropriate guards, will help you work safely as well. Once you've become comfortable with using a shaper, you may wonder how you ever got along without one.

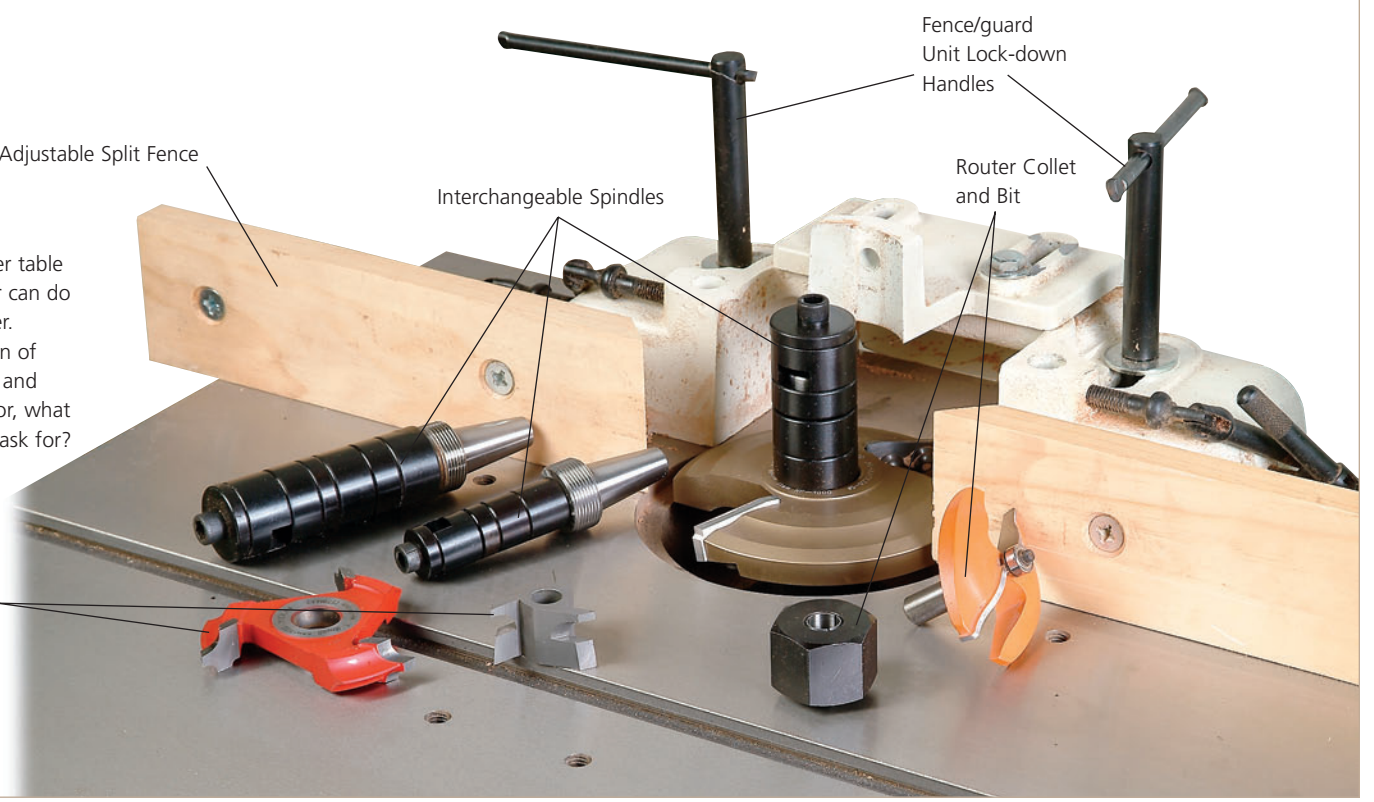
The hand wheel changes a shaper's spindle height, while controls inside the base change motor speed.

Shaper Anatomy

The heart of any shaper is a motor-driven shaft, called a "spindle," that protrudes vertically up through a flat tabletop. The height of the spindle is accurately adjustable via a convenient hand wheel on the tool's base. One or more shaper cutters may be mounted on the spindle at one time, held securely with a locknut. Some shapers have a built-in spindle lock, allowing you to change cutters with only one wrench.

While some light-duty shapers have universal motors that drive a 1/2" spindle directly, most shapers power spindles with a heavy-duty induction motor housed inside the base of the machine. Pulleys on the motor and spindle are connected with one or more drive belts, and most models offer at least two spindle speeds — slower for larger cutters and leisurely feed rates; faster for smaller cutters and rapid feeds — which require the belt be moved between pairs of pulleys. Also found on most models, a rotation reversing switch allows cutters to be used to cut in either direction.

A shaper's cast-iron (or molded aluminum) tabletop has threaded holes for mounting an adjustable, removable fence unit to guide straight-edged workpieces past the cutter. Most fences include a centered port for attaching a 4" (or larger) dust collection hose — a good thing since shapers can produce bushels of chips



Anything a router table can do, a shaper can do bigger and better. With the addition of a versatile fence and a reversible motor, what more could you ask for?

Metal spacers help set up cutters correctly on the spindle, while a variety of throat plates accommodate the different diameter cutters.

and dust. Most shaper tables also have a standard 3/8"-deep, 3/4"-wide miter gauge slot, useful for guiding cross-grain cuts with either a standard miter gauge or custom jigs.

Spindle Sizes and Features

Different shaper models are distinguished by the size of their spindles. Common spindle sizes include 1/2", 3/4" or 1¼" diameter shafts. European shapers typically have 30mm spindles. Motor size is proportionately related to spindle size, and hence, the thicker the spindle, the higher the horsepower.

While professional cabinet shops need shapers with big 1¼" (or 30mm) spindles that can run the biggest cutters and take massive cuts, most small shops rarely need machines with that kind of capacity. A versatile design feature found on many modern shapers is interchangeable spindles that allow a single machine to handle spindles of several different diameters. For example, my 2 HP JET JW-34L shaper accepts 3/4" and 1" spindles (a 1/2" spindle is optional). The advantage of an interchangeable spindle is that you can use light-duty, small-bore cutters or heavy-duty, large-bore cutters on the same machine. For example, use a relatively inexpensive 1/2" bore cutter for a less demanding cut, say putting a 1/2" roundover on a tabletop edge (these cutters have smaller overall diameters, to allow shaping smaller-radius inside curves). Then, when you need to take a heavy cut, say to shape a large-profile raised panel, switch over to a 3/4" or 1" spindle that will handle larger-diameter cutters.

Interchangeable spindle machines also offer another bonus: Most such models accept collets that run regular router bits, so you can use your shaper as a super-beefy router table. This setup is best reserved for really big router bits, as most shapers aren't set up to run at a high enough rpm for small (1/2" diameter and smaller) bits.

Setting Up a Shaper

Because of the near infinite variety of shaper cutters (see *sidebar*, page 40), every time you set up a cut is going to be a little different. Some cutters are narrow, some wide; some are used individually, some are used in sets, with two or

You can work with a cutter either above or below the workpiece. Hold-downs keep the stock in place.

With the proper fence adjustment and a straight cutter, you can use your shaper for a horizontal jointer.

three different cutters mounted on the spindle at one time. The spacing between multiple cutters is adjusted with spacers — metal sleeves that slide over the spindle above and/or below the cutter. Each spindle comes with a set of spacers of various thicknesses. The idea is to remove or install spacers to accommodate the thickness of the cutter(s). Start with at least one spacer at the bottom of the spindle, and add enough spacers above the cutter so that a bit of the spindle's end threads are showing after the locknut is installed and tightened.

When multiple cutters are used at one time, spacers or shims may be inserted between cutters to set and fine-tune the distance between them. This is a crucial part of setting up cutters that create interlocking joints as well as cope-and-stick type cuts for cabinet door rails and stiles, as the exact spacing of bits affects the tightness of the resulting joint.

Most shaper tables have a number of concentric, throat insert plates that are added or removed to accommodate cutters of various diameters. When mounting a new cutter, always choose the insert with the smallest hole with enough clearance for the cutter to spin.

Cutting Direction and Spindle Rotation

Most cuts on a shaper are made with the cutter spinning counter-clockwise (as viewed from the top), with the workpiece fed by hand from right to left over the cutter. However, unlike a router that spins bits in only one direction, most shapers have an electric switch that reverses the rotation of the spindle, thus turning the cutter clockwise (since a cutter's knives cut in only one direction, it must be flipped over for clockwise rotation). With most cutters, this allows you to work with the cutter either above or below the workpiece, lending flexibility when tackling a variety of different shaping situations.

Although even a medium size shaper (1½ HP to 2 HP) has enough power to tackle most cuts in a single pass, it's usually better (and safer) to take two or more passes. This is especially important when using large cutters for raised panel or stile and rail joinery cuts. A rough cut on the first pass removes the bulk of the stock, and then a light finish cut on the second pass leaves a smooth final surface. Before shap-

ing good stock, it's important to take at least one trial cut on a piece of scrap wood to confirm that all cutter and fence settings are accurate.

Hold-downs and Featherboards

To get accurate shaper cuts with smooth, chatter-free surfaces — and for safety's sake — it's important to use hold-downs or featherboards to keep workpieces pressed firmly against both the fence and the worktable. Spring steel hold-downs come as standard accessories with most shapers, and they easily lock into special holes in the shaper's fence. These are best positioned so that they'll exert down force on the stock adjacent to the cutter (see top left *photo*, page 39). Hold-downs placed this way not only keep the stock from lifting, but also provide protection from the cutter. A pair of horizontally positioned hold-downs, mounted to the shaper's table, will press the stock against the fence on either side of the cutter.

Shaping Straight Edges

Like a router, a shaper can cut either straight- or curved-edged parts. Most straight work is done with the machine's standard fence in place. The split-style fence has two separate wood-covered faces that straddle the spindle and cutter. After a cutter is mounted, the halves are adjusted side to side to create an opening just big enough to clear the cutter. Fence faces are also adjustable front-to-back and are usually set parallel to one another for typical straight cuts. But they can also be set to different levels, like the infeed and outfeed tables of a jointer. With the infeed fence set farther back and the outfeed fence set to be flush with the outside cutting arc of a straight cutter, you can actually use the shaper as a horizontal jointer — very handy for putting a straight edge on boards and planks too big and cumbersome to feed over the jointer. Offsetting the shaper's fences is also useful when shaping operations require an entire edge to be removed — say when putting a full bullnose roundover on the edge of stair treads.

Narrow pieces, like stick cuts on the end of rail stock, require a miter gauge, a commercial crosscutting gauge with built-in fence or a shop-made sliding jig.

As useful as the standard fence is, there are many straight-edge shaping operations that will require the use of shop-made fences or jigs. A custom fence can, say, tilt the angle of the stock relative to the cutter to create unusual moldings or raised panels. In addition to straight cuts, custom fences and jigs can allow you to shape curved parts, such as stair railings.

Cross-grain Work

A shaper can cut across the grain as well as with it, although care must be taken to support the stock firmly during cutting. Wider workpieces, such as the ends of rectangular cabinet door panels, can be fed by hand using the shaper's fence as a guide. However, narrower workpieces must by aligned and guided with a miter gauge, crosscutting gauge or sliding jig. Such a gauge or jig is a must for making the "stick" cuts on

A Rainbow of Cutters

The versatility of a shaper is due to the incredibly wide range of cutters it will run. Cutters typically have two, three or four knives made from high-speed steel or carbide. Typically, you buy cutters to match your shaper's spindle, but you can employ a larger-bore cutter on a smaller spindle with bushings designed for the purpose. Since you can easily spend more on cutters than on the shaper itself, it's important to consider all your choices.

Straight cutters: Used for shaping rabbets, grooves and dadoes. Use a single, wide straight cutter or a stack of two or more narrower cutters to joint or trim stock.

Single-profile cutters: Available in ogees, roundovers, coves, beads, flutes, etc. You can use them individually, or in combination.

Insert-knife cutters accept interchangeable knife sets into one cutterhead.

Glue joint cutters: Single cutters and matched pairs used to create strong 90° or 45° wood-to-wood joints, including drawer lock, miter lock, tongue-and-groove, and finger joints.

cope-and-stick style window parts or frame and panel door rails.

Curved Shaping

You can shape both concave and convex curved edges on the shaper using a rub collar to guide the cut. Equivalent to using a pilot bearing on a router bit, a ball-bearing rub collar fits onto the shaper's spindle, either above or below the cutter, and it bears against the edge of the work as the cut is made. To help you start and stop a cut safely, install a starter pin in the tabletop. This small metal dowel provides support for the stock so you can start a cut without the cutter grabbing the work and chewing it up. A ring guard or spindle-mounted cutter guard should be mounted above the cutter to surround it and prevent accidental contact.

The rub collar method is ideal for rounding over the edge of a curved tabletop or raising the edge of an arch-topped panel for a stylish cabinet door. You can also use a rub collar for trimming multiple parts to an identical shape, using a straight cutter and a template. The template, cut from MDF or Masonite®, is temporarily attached to the surface of the work, which is precut slightly larger than its final size. The rub collar rides against the template as the work is trimmed to final shape.

A rub collar and starter pin can shape curves. (Guard removed here for clarity.)

A power feeder lets you "climb cut" stock — which you can't do by hand feeding.

Using a Power Feeder

If you've always been squeamish about using a shaper because you don't like the idea of getting your fingers too close to those big, meat-eating cutters (a healthy concern), you should definitely consider buying and using a power feeder. With its variable speed motor and grippy skateboard type urethane feed wheels, a power feeder smoothly guides stock past a cutter, while your hands remain out of harm's way.

Besides providing safety, there are other significant advantages to using a power feeder: First, the device feeds stock past the cutter at a steady rate of speed, assuring a smoother, clean cut. You can adjust the feed speed to suit the heaviness or lightness of the cut, the hardness or softness of the wood, etc. Second, a power feeder allows you to "climb cut" stock — feed it in the same direction as the cutter is rotating — something you cannot do with hand feeding. Climb cutting generally produces cleaner cuts, especially on highly figured woods, than feeding stock against cutter rotation. Since a power feeder will run in either direction, you can work with clockwise or counter-clockwise rotating cutters.

Multi-profile cutters (left) produce many shapes, while rail and stile cutters (right) assist in cope-and-stick joinery.

Rail and stile cutters: For making cope-and-stick joints for door and window frame construction. Available in single and two-cutter styles, these require careful setup and adjustment for tight, accurate joints.

Panel-raising cutters: Used for shaping the raised edges of panels, these single-profile cutters come in a variety of shapes (ogee, tapered, etc.) and in both vertical and horizontal styles. The latter can shape both straight and curved edges.

Multiple-profile cutters: These versatile cutters save the expense of buying dozens of different individual cutters.

A single multi-profile cutter shapes several different profiles. You simply set the height of the cutter to the area of the knife you want to use.

Insert-knife cutterheads: Another style of multiple-profile cutter with a single cutterhead that accepts interchangeable knife sets. You can buy sets designed for general shaping or specifically made for cope cutting or shaping raised panels.

Arts & Crafts Workbench

OUR AUTHOR'S BENCH WILL NOT ONLY PROVIDE A PROPER WORKSTATION, BUT ALSO ESSENTIAL FEEDBACK ON THE FLATNESS OF YOUR STOCK AND YOUR HAND PLANING TECHNIQUE.

BY IAN KIRBY

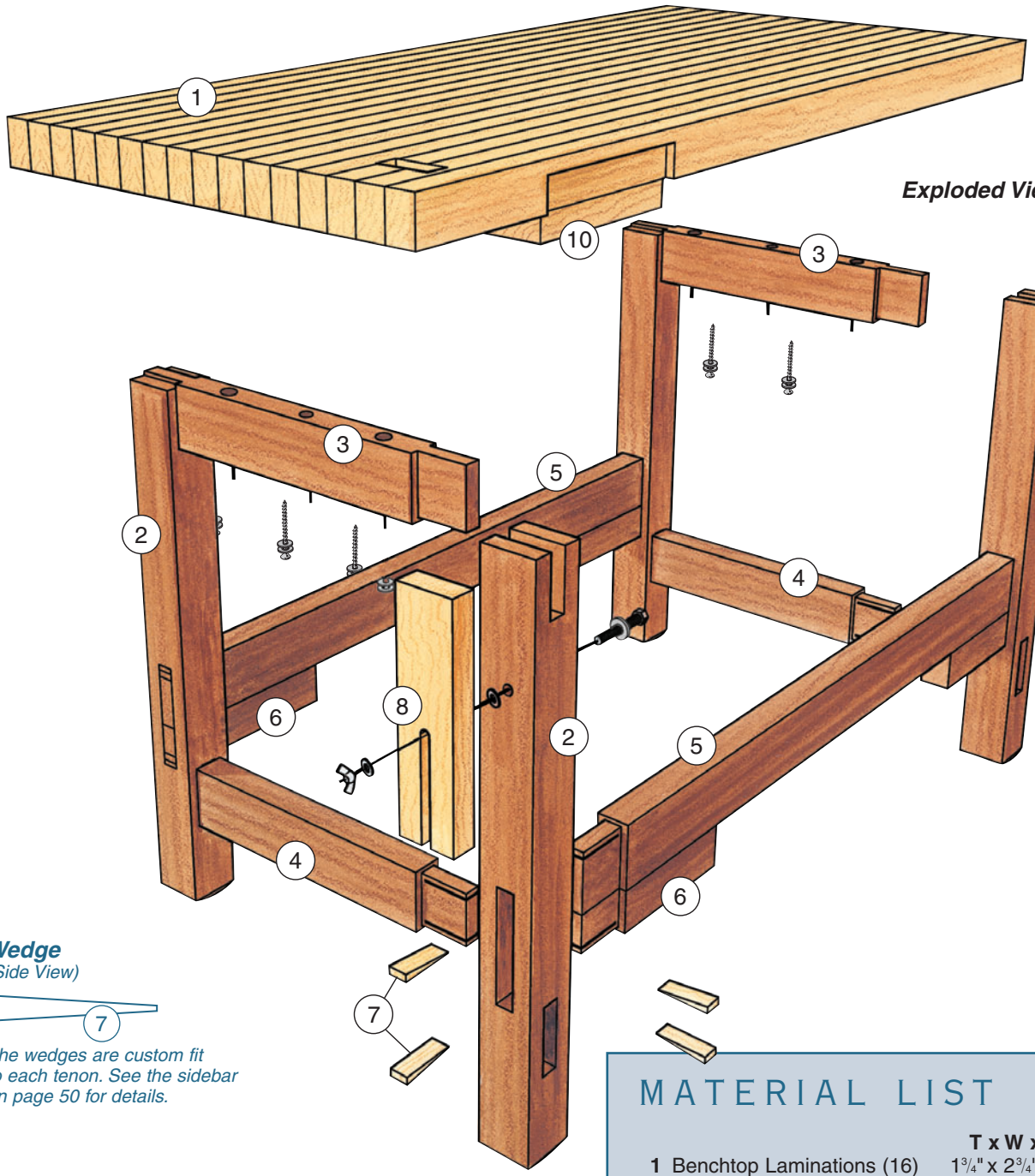
The workbench top is to the woodworker what a face plate is to the machinist — a surface used as a reference. In wood terms, it's a dead flat, hard surface. Its edges and ends are square. It won't sag under load. About every two or three years, any distortion due to movement, wear, or dings can be skimmed back to accuracy by planing. It needn't be babied like a piece of furniture, but you don't cut into it by chiseling, sawing or drilling. Apply oil to keep it clean and protected from spills. If you must use it for glue-ups, protect it from clamp heads and glue drips with a sheet of Masonite®.

Benchtop Characteristics

Well: Many contemporary benches offer a well as "a place to put your tools." My experience is that the tool you want ends up in the well under the board that you just carefully clamped into place to do the work that requires the tool! So, my bench has no well.

Structure: In the past, benchtops were made of two or three thick slabs of readily available quarter-sawn hardwood — maple in the U.S.,


EXIT

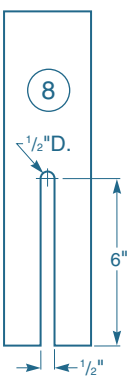


Exploded View

Wedge
(Side View)

The wedges are custom fit to each tenon. See the sidebar on page 50 for details.

Bench Stop
(Front View)

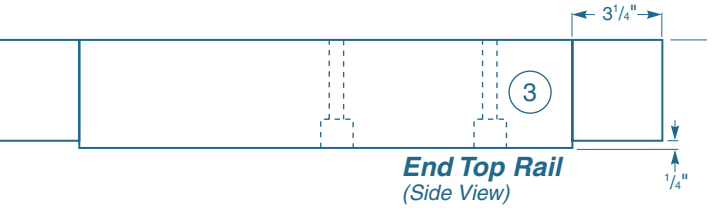


Mount the stop to the leg so the end is flush with the top of the workbench when the stop is at its lowest point.

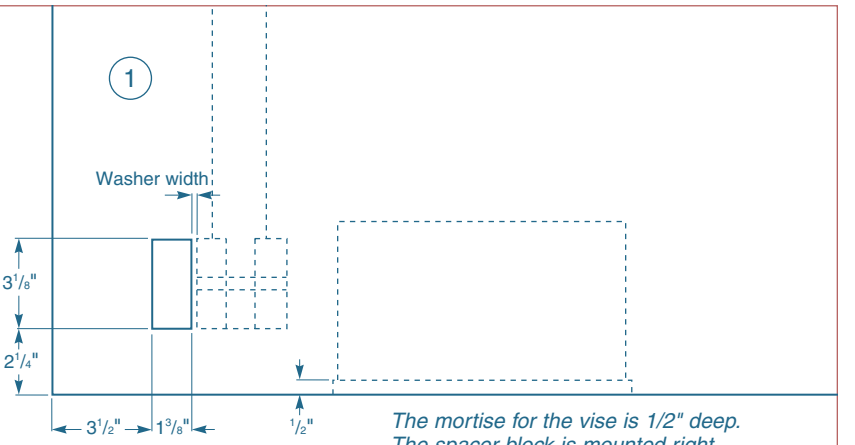
MATERIAL LIST

		T x W x L
1	Benchtop Laminations (16)	1¾" x 2¾" x 60"
2	Legs (4)	3⅛" x 3⅛" x 32¼"
3	End Top Rails* (2)	1⅞" x 3¾" x 23½"
4	End Bottom Rails* (2)	1⅞" x 3¾" x 23½"
5	Long Rails** (2)	1⅞" x 3¾" x 50"
6	Long Rail Blocks (4)	1⅞" x 2½" x 11⅜"
7	Wedges (16)	Cut to fit
8	Bench Stop (1)	1⅜" x 3⅛" x 12"
9	Vise Cheeks (2)	1" x 4¼" x 14"
10	Vise Spacer Block (1)	1½" x 5½" x 10"

**Distance between shoulders is 17".*
***Distance between shoulders is 43½".*
Note: Cut the rails slightly long and trim flush with legs after glue-up.



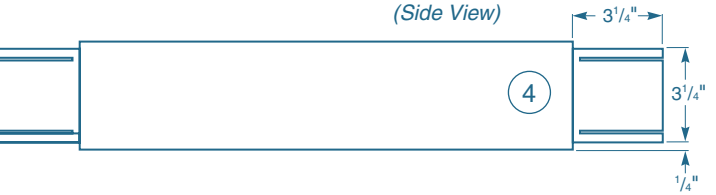
End Top Rail
(Side View)



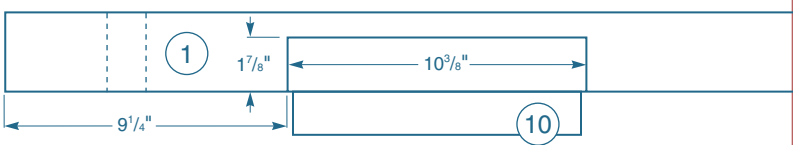
Workbench Top
(Top View)

The mortise for the vise is 1/2" deep. The spacer block is mounted right behind the mortise.

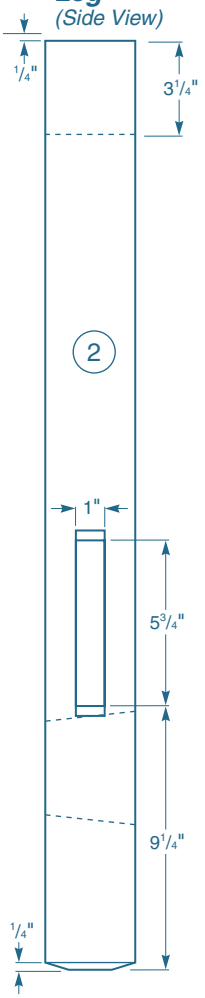
End Bottom Rail
(Side View)



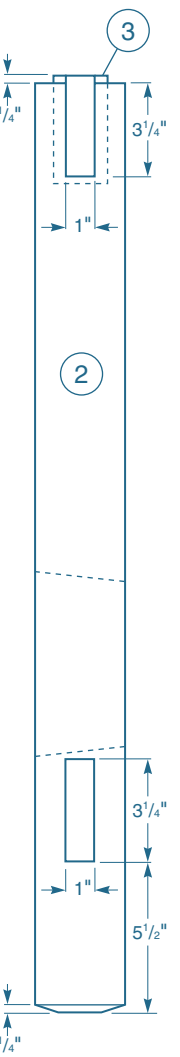
Workbench Top
(Side View)



Leg
(Side View)

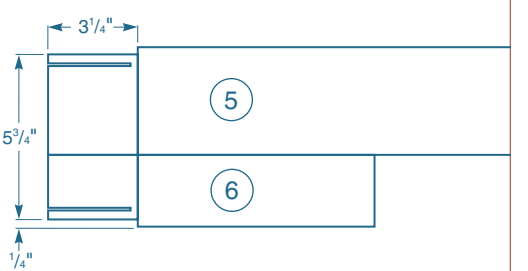


Bench Underframe Top Leg Joint Detail
(Front View)



Note that the end top rails are held 1/4" above the top plane of the legs.

Long Rail and Long Rail Block Assembly
(Side View)



beech in Europe. Both are light-colored woods, which reflect light very well, and thus greatly help when setting a plane or using a try square. Making fine visual adjustments over a dark bench is like working in a badly lit room. The days of big slabs are gone, so an excellent alternative is to laminate strips of flat-sawn material. Their combined edges then create a "quartersawn" surface. I used 8/4 flat-sawn soft maple that was 6" wide, sawn down the center, then planed and thicknessed to yield as big a section as possible. I managed 1¾" x 2¾".

"In the past, benchtops were made of two or three thick slabs of readily available quartersawn hardwood — maple in the U.S., beech in Europe."

Making the Top

Lay the strips out to choose the best color and grain pattern, then number them for an orderly glue-up. I used 16 strips to make a top 28" wide. Gluing this many strips together requires a flat, solid surface on which to work, such as an existing bench or sheet stock supported by battens and sawhorses. I used 11 bar clamps, augmented by upwards of a dozen fast-acting clamps to align the edges. I applied Titebond® II glue with a 3" paint roller. Pressing firmly to wet the surface, roll a light coat on each face. The squeeze-out should show as small beads, not drips. Between jobs, store the roller and tray in a plastic bag, folded over to make an airtight seal. How many strips you glue in one clamp-up depends on whether you work alone or with a helper. The real dividend of a helper is having someone at the other end of the board to lift and shift and at the other end of a clamp to attend to its positioning and other tasks. Working as two, you could begin with as many as six center strips. Working alone, begin with three center strips. Position five clamps equally spaced on the work surface. The remaining six clamps sit on top of the work, spaced between the bottom five. Using fast-acting clamps, align the surface of the laminates by keeping both heads of the clamp centered on the glue line. Also align the ends. After the first glue-up dries, add one strip to each side to allow ample time for precise alignments before the glue cures. By careful-

The top is flattened by cross-grain planing. Begin with a 6" to 9" band at one end and flatten band-by-band to the other end. The straightedge and winding strips are essential for accuracy, and the bench brush ensures cleanliness.

Cross-grain planing produces these typical "fold-up" shavings, which are thick in the middle and thin at the edges due to the curve in the plane blade that prevents plane marks. Clearly evident is the glue line that connects the two laminations.

ly managing the assembly this way, I needed to remove only 1/16" to flatten the top. It's possible to make three glue-ups a day: morning, noon and evening.

Flattening the Top

Make the top flat by planing across the grain. This may seem counterintuitive, but it's the best way to remove the slight but inevitable unevenness in the laminations. All woods plane well across the grain with minimal tearout. It's important to follow a planing pattern. Begin at one end and concentrate on a band 6" to 9" wide. Move to the next band as flattening occurs. After flattening the final band at the other end of the top, set the blade finer and start again. Use your straightedge from the very beginning and check every direction. Use a bench brush repeatedly to avoid planing over shavings. And keep the blade sharp. As the surface becomes more refined and the depth of cut is reduced, the shavings become like duck down and the planed surface is left very smooth. Don't sand the benchtop because the residual abrasive grit will dull your blade after only a few plane strokes when the occasional re-flattening is required.

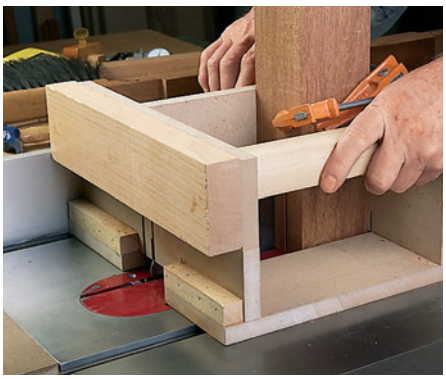
The top must be flat in length, flat in width and out of winding. Use a two-foot straightedge to check your flatten-

Locate the numbers so they are undisturbed when the joints are cut. The numbers read clockwise and are marked on the side where the long rails meet the legs. The arrows point to where the short rails meet the legs.

The rail numbers match the leg numbers. Top rails are marked on the top edge, bottom rails on the bottom edge.

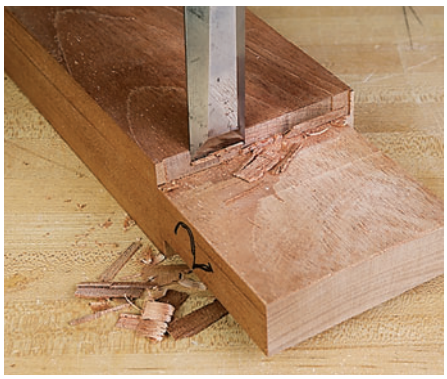
The author removed the waste in the leg's open mortise with a coping saw.

Glue the rail blocks to the long rails and clean up with a smoothing plane.



Clamp a rail square and upright in your tenoning jig. The jig guides the cut and keeps your hands safe during the operation.

A block clamped in place on the front of the jig positions the rail to cut the cosmetic shoulder and avoids sawing into the jig.



Slower is surer: knife the shoulder lines and clean up with a wide and sharp chisel.

ing progress at close intervals across the top. I also used a six-foot extruded aluminum level to assess the flatness of the overall length. Use winding strips end to end, middle to end, and across the top to make sure there is no twist.

The maple bench stop is a sliding fit through a hole in the top and is anchored to a leg of the underframe by a coach bolt. A wingnut on the bolt allows for easy locking of the stop at the desired height. You will need to chop the hole in the top to accommodate this feature.

Goals for the Underframe

The bench underframe must be sturdy enough to support the mass of the top and any of the work that goes on the top, and it must resist racking when it's moved or during bench operations such as planing. Almost any softwood or hardwood will fit the bill. The one shown here is made of mahogany and put together using through-wedged mortise and tenon joints and bridle joints. It calls for legs over 3" square with rails almost 2" thick.

The end frames are sized sufficiently inboard from the edges of the top so that fast-acting clamps can be used all around it. The deliberate absence of a long top rail allows long clamps to pass unimpeded under the top to hold assembled furniture parts firmly to the edge of the bench to be further worked on. The top itself provides the anti-racking benefits of a top rail when it is attached to the underframe.

Attaching the Top to the Underframe

For many years I insisted that the top and the vise be attached by machine bolt and nut. It meant lots of work boring accurate holes and fitting 10 neat plugs to cover the bolt heads. Then, many benches ago, I began using lag screws, and my confidence in their lifelong holding power remains firm. The top has six lag screws, one in the center of the end top rail and one as far to each edge of the end top rail as is practical. I used 3/8"-diameter lags that extend to within 1/2" of the benchtop surface. The center lags have a 3/8" clearance hole and the four outer ones have a 5/8" clearance hole to allow the top to move unhindered through its shrink and expand cycles.

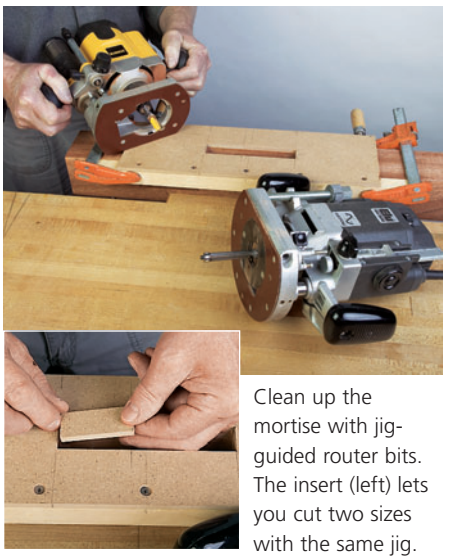
Mortise and Tenon Underframe

This underframe uses through mortise and tenon joinery — a typical furniture maker's joint — but on a big enough scale to qualify as post-and-beam construction. Because of its large size, the joint is cut with a mixture of hand and machine tools rather than hand tools alone. There are many ways to achieve the end result and each depends on the machines you have available. For example, provided you get the geometry of the joint correct, you may cut the tenons on a band saw, whereas I used a table saw.

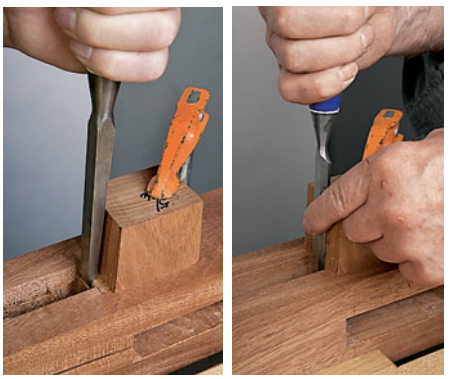
Making the Underframe

Start off by marking out each joint as though it were to be made by hand. I had to dodge some growth defects in the mahogany stock, so the first thing to do once the parts are milled is to decide on the layout (which parts go where) and mark each part clearly. I

Use a 7/8" spade bit on center to leave 1/16" of waste on each mortise wall.



Clean up the mortise with jig-guided router bits. The insert (left) lets you cut two sizes with the same jig.



Put the leg in the vise on a support block and chop out the bulk of the waste using a mortise chisel (above left). Then complete the cut (above right) by pressing a sharp bench chisel tight against the face of the angled guide block.

used numbers and arrows made large with a felt pen. The numbers and arrows tell you the inside faces, which is important to know when you cut the slopes on the ends of the mortises to accommodate the wedges. None of the marks are planed or sanded off after assembly, but they will be hidden. They were also recorded on paper as a backup.

Mark out the joints with a marking knife, try square and mortise gauge. The top joint doesn't have a unique name. It's a variation on a bridle joint that is often called an "open mortise and tenon" here in the States. The top edge of the rail sits proud of the top end of the leg by 1/4" to avoid the following problem: If the leg and rail are made flush and shrinkage in the rail occurs after the top rail is attached, the ends of the legs would be proud of the rail. The shrunken rail would then pull the top into a cupped or curved state. The bottom edge of the joint has a 1/4" cosmetic shoulder. I coined the word "cosmetic" because its main purpose is to hide shrinkage and to cover any less-than-perfect edge you may have made on the bridle opening. Both parts of the joint can be cut on the table saw.

Cutting the Leg and Rail Joints

I cut the leg mortises first using a shop-made tenoning jig. In each case, the rectangular peg and the rectangular hole are centered, so after you cut one side, turn the part around and cut the other side. This procedure can only produce cuts that are correct and alike if the parts have exactly the same thickness. That's why careful preparation of your stock is so important. Clean up the bottom of the joint with a chisel. Cut from each side shoulder line to leave a mound in the middle. Once you have established both shoulder lines, remove the mound by horizontal paring. My jig is guided by the fence and advanced by hand, safely distant from the saw blade. The rip fence controls the setting. To affect a slight adjustment when setting up the cut, I slacken the fence locking handle, then lightly tap the fence with a hammer. Because the saw is set at full height, it would cut deeply into the jig, so I glued on the thick bridge pieces front and back to stiffen its structure. Because the rail thickness differs from the leg thickness, you must change the settings. However, the tenon is centered on the rail, so this setting stays unchanged. Turn the workpiece around to make the second cut. The tenon should fit tight. Offer the uncut rail to the completed leg part of the joint and assess how close you need to be to the mortise gauge line. Set the blade only 1/2" high. Set the work in the tenoning jig so the cut will err on the rich side. Saw both faces. Clamp the work in the miter gauge and set the blade to the correct height to remove the newly cut face. Now test the 1/2" stub tenon against the mortise. If the tenon is too rich, release the fence lock handle halfway, adjust the fence with hammer taps, and re-test.

Because the rail is too wide to fit inside the tenoning jig, it's mounted instead on the outside at the front. Although you can cut shoulder lines directly from the saw, getting consistent results on every piece is risky business. I take the slower but surer route: knife shoulder lines, saw within a 1/16" and clean up with a wide chisel.

Making the Mortise and Tenon Joints

The normal order of cutting a mortise and tenon by hand or machine is to cut the mortise first, because it's easier to

Making the Wedges

Place a wide maple board, 4" long, on support blocks in the vise and plane across the grain to dimension.

The next step is to check the fit of the wedge blank in your mortise.

Clamp the blank to the miter gauge fence set at the correct angle, and saw a wedge with a 3/32" blunt end. You need a second miter fence set to 90° to saw a second wedge.

When testing the wedge for fit, don't drive it home! You should be able to see that the length and slope will correctly fit the kerf and opening.

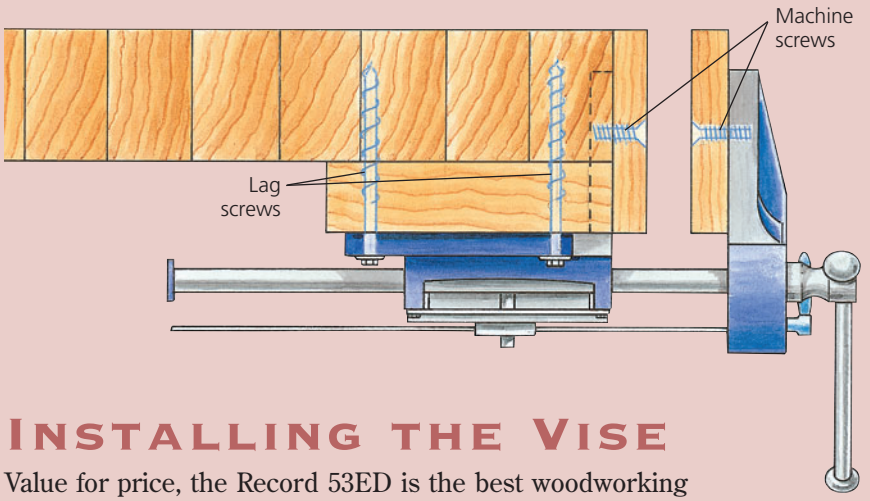
A successful mortise and tenon glue-up requires thorough wetting of all surfaces. I use a small paint roller for the tenon and a paddle for the mortise. Dry-clamp every assembly (below) to confirm joint accuracy and the presence of all necessary clamps and protection blocks.

adjust the tenon thickness to match the mortise width than vice versa.

Cutting the tenons on the bottom end rail employs the same jig and technique as cutting the tenon on the bridle joint, with the difference that there is a cosmetic shoulder on all edges and saw kerfs for the wedges.

Making the Mortises

Only the final walls of the mortise are cut with a router. Why? To avoid the excess dust that routers create. The answer is to remove as much waste as possible by drilling. Your first bit choice would likely be a Forstner. However, not being good at removing its own waste, Forstners tend to choke and burn. I recommend a spade bit. It makes a very clean hole, even in very hard wood — but it does have its foibles. The trouble comes when you stop drilling to withdraw the bit. Being rarely concentric, the emerging bit can quickly make a mess of a clean hole, along with an alarming amount of vibration and noise. The solution is to clamp the work for each new hole, drill deep enough until the point just breaks through the bottom face, switch off the machine with the bit at the bottom of the hole, and then withdraw the bit when it stops. Result: a perfect hole. By clamping the workpiece, the hand that would normally hold it is free to safely hit the "Off" switch while the hand on the drill press handle holds the bit at full depth.



The author identifies the Record 53ED vise as a great value and a versatile tool. In order to mount the vise to Ian's workbench, you'll need to form a mortise and add a spacer.

Installing the Vise

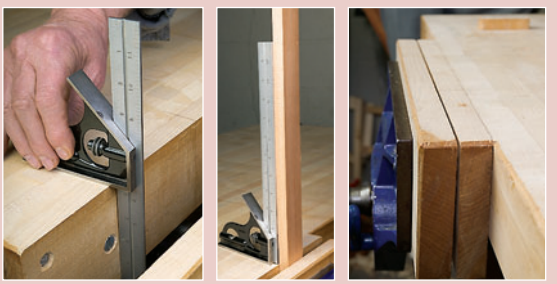
Value for price, the Record 53ED is the best woodworking tool investment I know of. The jaws of Model 53ED are 10½" wide and open to 13". Remove the metal dog that is intended for use when the vise is mounted at the end of a benchtop with a series of lengthwise dog holes. English hand tool woodworkers did not clamp work this way. Using the vise dog on a side-mounted vise against an opposing dog could split the benchtop in two. The metal jaws each have two 1/4" holes so that wood cheeks can be bolted in place. Later models no longer come with threaded holes, so you will need to thread your own with a 5/16" x 20 tap. The cheeks are then drilled and countersunk to accept 5/16" x 1¼" flat-head machine screws. A quick-release trigger disengages the screw so that work can be held in one hand while the vise is quickly adjusted. The trigger turns a bar that lifts a half nut in the fixed jaw casting. The half nut is held in place by a metal plate fixed to the casting with two 1/4" bolts. Lock them down tight when you get the vise, and that is about all that you will ever have to do other than keeping the bars and buttress thread clean and lightly oiled.

Because the jaw is deeper than the bench is thick, you must fill the gap with a spacer block. The block must be thick enough to leave a gap of up to 1/8" between the top edge of the fixed jaw and the mortise it sits in. If you make the top edge tight, the spacer block could compress enough when you tighten the lag screws to break out the strip of benchtop above the fixed jaw. The side edges of the jaw should fit tightly in the mortise.

Hang the vise 9" to 10" from the working end of the top and so it is clear of the underframe. You can mark out and cut the jaw mortise by hand or you can use a router, 1/2"-diameter pattern bit and a pattern jig. Clamp the jig into position, locating the opening with a batten screwed to the back of the jig that puts it 5/8" from the top edge of the bench. Stand the top on edge. Prepare eight spacer strips 1/4" x 1/4" x 20" and stand them all on edge against the fence at the top of the jig. Set the router bit to full depth and ride the router base against the strips to make a cut 1/4" wide. Remove a strip each time you make a cut. On the final pass the pattern bit bearing rides against the jig.

Begin the vise installation by clamping the pattern jig for routing the vise mortise in place to the benchtop.

Hang the vise with the top turned upside-down. (The mounting bolts are on an older bench, before I began using lag screws.)



Make the fixed cheek square with the benchtop (left). A clamped workpiece should be square (center) with the top and vise cheeks parallel (right).

Hold the vise in place with clamps and blocks. The jaws are thinner at the top edge than the bottom. You want the metal face flush with the bench or a whisker below. To compensate for the casting variance, plane the spacer block at an angle so the vise tilts toward the back lag screws. Once the vise is hung, make and attach the wood cheeks, preferably of quartersawn maple or cherry. The lower edges sit 1/2" above the guide bars. Note that the jaws toe in at the top to compensate for the flex in the casting when the vise is under load. As the jaws are tightened, the clamping force is evenly distributed from top to bottom rather than being concentrated where the screw is located. The jaws should also come together parallel so that the clamping force is evenly distributed side to side. Again, you may have to plane the cheeks to adjust for any distortion in the casting. The toe-in need only be a maximum of 1/8".

The next step is to remove the fluted walls. Use a 1"-wide chisel, being careful not to cut beyond the outer edges of the holes.

The remaining waste is removed by two router bits: a pattern bit (guide bearing on the shank) and a trim bit (guide bearing on the tip). The jig is an exact rectangle cut into 1/4" MDF. Clamp the jig in place and clean up the sides of the mortise with the 1"-long pattern bit. Turn the leg over, clamp the jig from the same face and rout again. Remove the jig, set the trim bit to depth and clean out the waste remaining in the center.

Knife the lines for the wedge openings on the outer faces of the legs. I decided to wedge out the longer rail joint 5/16" and the end rail joint 1/4". By drawing both joints full-size you can determine the gradient and make guide blocks (see *photos*, page 49) to direct the chisels in cutting the slopes. Whenever paring or chopping a workpiece held in a vise, rest it on support blocks that sit on the vise guide bars. This frees you from tightening the vise to resist downward pressure from paring cuts and mallet blows, and the work is easily returned to level and height after checking.

Making the Tenons

The bottom rail tenons are made in the same way as the "open tenons." Begin by offering the tenon piece to the newly cut mortise and decide how close you should cut to the mortise gauge line. Make a 1/2" or so depth of cut, saw some temporary shoulders, and test this stub tenon in the mortise. Adjust the cut as necessary and cut the finish tenons: faces, shoulders and cosmetic shoulders. Next, saw the kerfs for the wedges. Use a 3/32" blade set 1/4" from the edge and ending 1/4" short of the shoulder line. (The wedge kerfs are made using the same jig setup that was used for the cosmetic shoulders.) The long rail tenon is too heavy and too tall to stand upright in the tenoning jig. Use a 3/4" dado head and make multiple passes across each face. Clamp the work to your miter fence and make a trial cut from both sides about 5/8" from the end. Check this stub tenon in a mortise, adjust the blade height as necessary and complete the cut. The cosmetic shoulders and the wedge kerfs are made by sawing down the tenon as in ripping, then cleaning up the curved-out bottom with a back saw or narrow chisel.

Final Details

Sawing the Leg Ends: Form a standing pad so that the the leg ends won't break out at the edges when the bench is dragged.

Holes for the Lag Screws: I used 4½" lag screws to hold the top to the underframe. Drill 1⅛" counterbore holes in the top end rail for the heads. The two center clearance holes are 3/8" and the four outside clearance holes are 5/8" to allow the top to shrink and expand.

Assembling the End Frames

Once the end frame parts are made and ready to assemble, finish the rails and the inside faces of the legs. I used an oil finish. Finishing at this early stage allows glue squeeze-out to dry on the shoulder line. Clear it away with a sharp chisel and the result is a clean, clear surface and joint line. Begin by clamping the end frame dry. This obliges you to get all the necessary clamps and protection blocks in place. No matter how long-winded the dry clamp-up seems, it's a vital step toward a successful glue-up. Put the parts together dry and check for square, twist and alignment. Then glue, clamp and drive in the wedges. Now that the end frames are complete, use the same steps to complete the underframe.

You'll need to mount the vise to the top, as described on page 51, before your work is done. Attach the bench stop to its leg and engage it as you mount the top to the underframe.

Clean up and oil all the unfinished areas, and you are ready to put this new and essential tool to work in your shop. If you've built it carefully, it will serve you well.

Close the shoulders using two bar clamps. Check that the top ends of the legs are as far apart as the distance between shoulders. Drive the two wedges, alternating the hammer blows. The hammer will bounce and the note changes when the wedge is firmly home. When the glue has cured, saw off the excess wedge and then clean the joint up with a plane.

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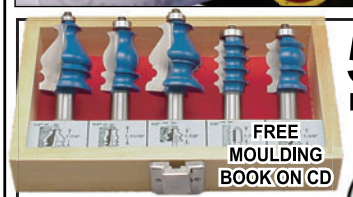

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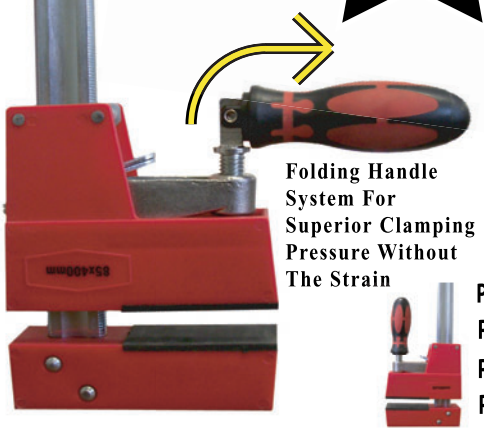

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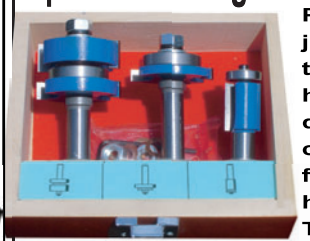

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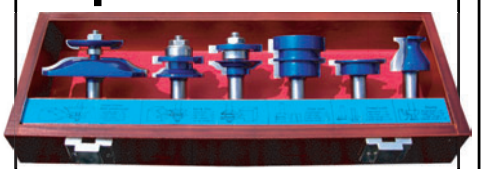

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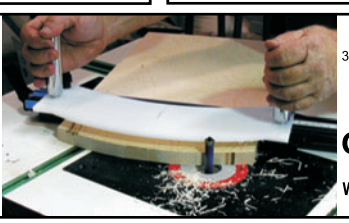

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Drum Sanding Station

TAKE THE CHORE OUT OF SANDING CURVES AND GIVE YOUR DRILL PRESS A FACELIFT WITH THIS VERSATILE SANDING STATION.

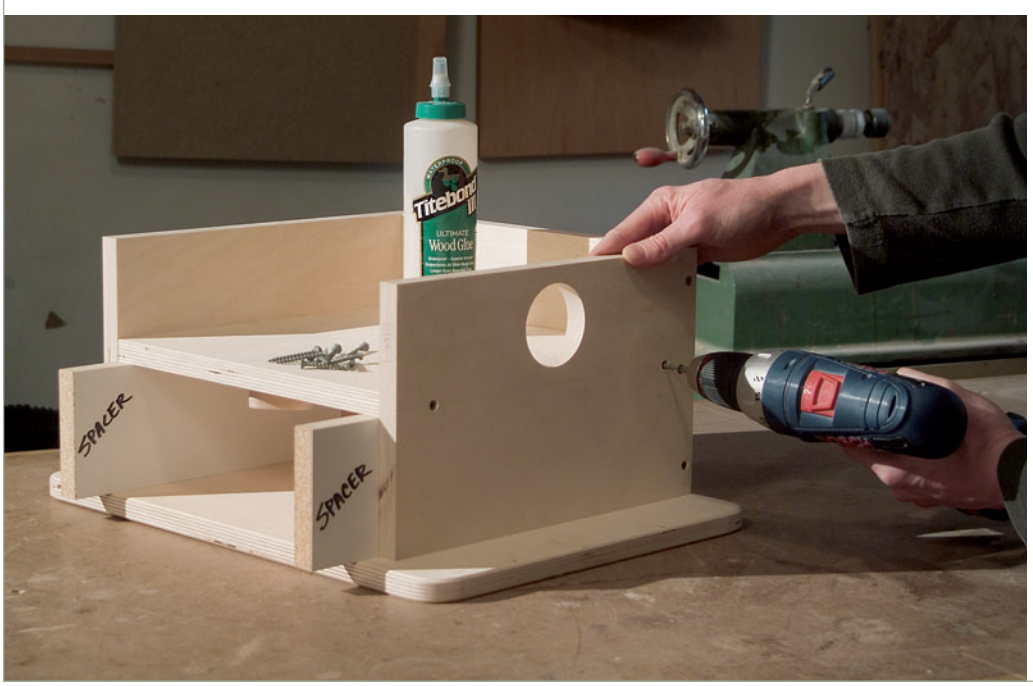
By Chris Marshall

Woodworking doesn't involve much drudgery, but I can think of three tedious chores: Scraping dried glue, cleaning pitch off saw blades and, of course, sanding. Concerning that last one, sanding curves is the worst type —especially when you have to do it by hand. If you're still wrapping sandpaper around dowels and sanding till your arm goes numb, it's time to convert your drill press into a drum sander.

There's a low-tech approach to drum sanding that I didn't adopt here. You could just chuck the sanding drum and lower it partially into a hole in a board clamped to your drill press table. That option didn't work for me. I needed a place to store all the different drum sizes and sanding sleeves that come with a drum sanding kit. I also needed to stash my Forstner bits, hole cutters and other drilling doodads, so a drawer seemed in order. Equally important, the sanding-drum-and-board approach doesn't keep dust at bay — and that's a real issue if you have lots of curves to clean up.

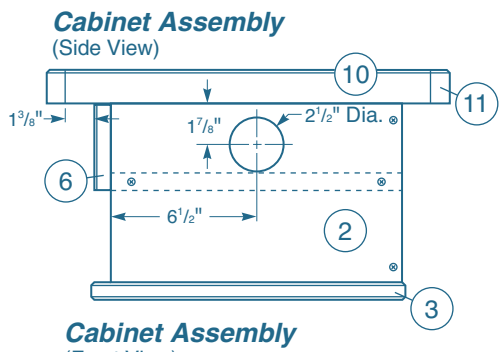
My sanding station satisfies all these needs. Essentially, it's a two-compartment cabinet with an oversized top and a base that clamps to your drill press. The top compartment serves as a dust extraction chamber with an adapter port that attaches to a 2½" -diameter shop vacuum hose. The lower compartment houses a storage drawer just big enough to hold a healthy collection of sanding sundries. Although I could have cut an oversize hole in the worktop to make room for the sanding drum, I installed a router table plate instead. Because it lifts off, it gives you plenty of access to the dust collection chamber whenever a sanding drum or drill bit accidentally slips down inside. Plus, most plates, including the Rockler aluminum router plate I use for my setup, come with interchangeable inserts. Just bore one out to fit around each size of sanding drum you own.

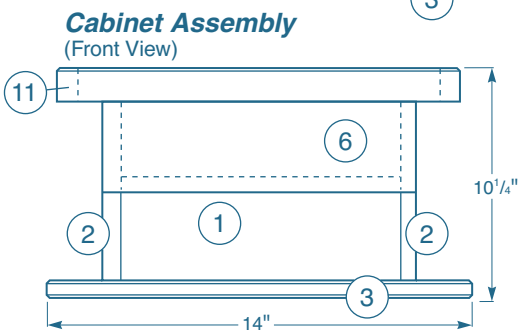
One other benefit to this project is that you can use it for either sanding or routine drilling. I never take mine off the drill press. The worktop overhangs provide plenty of room for clamping a fence or drilling jigs in

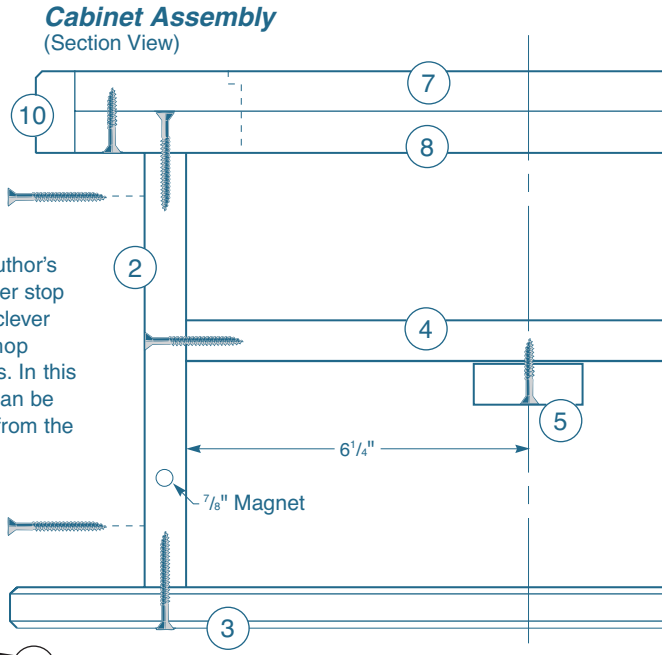


The author slips a pair of 4$\frac{1}{16}$"-wide spacers inside the cabinet to position the divider while installing it. The spacers ensure that the 4" drawer sides will slide smoothly.

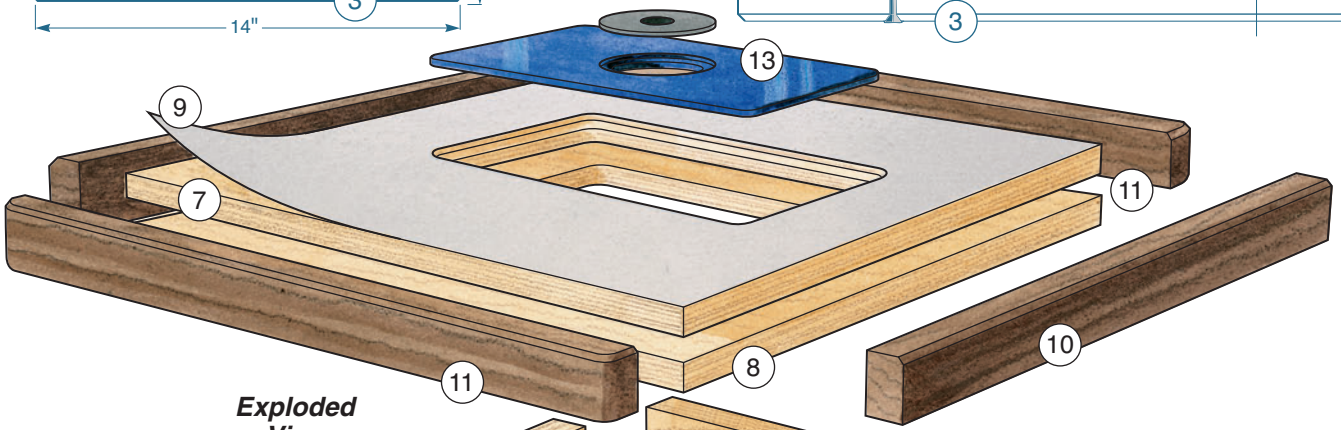

CRAFTSMAN
20-in. Drill Press
2HP



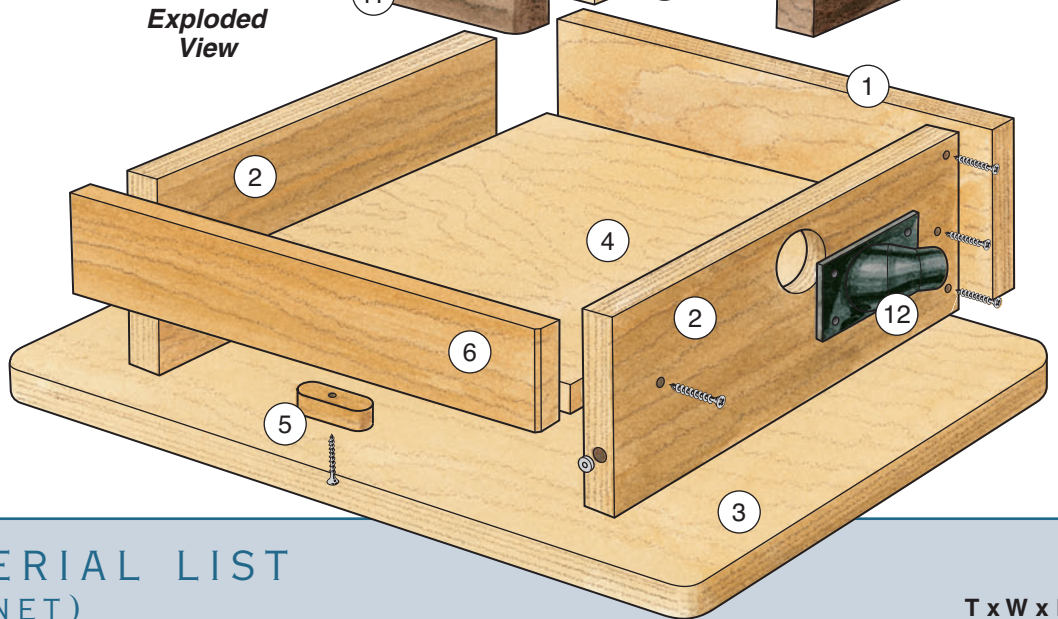




Note: The author's swiveling drawer stop (piece 5) is a clever solution for shop fixture drawers. In this application it can be mounted 3½" from the front edge.



Exploded View



MATERIAL LIST
(CABINET)

	T x W x L
1 Back (1)	3/4" x 8" x 12½"
2 Sides (2)	3/4" x 8" x 13"
3 Base (1)	3/4" x 14" x 19"
4 Divider (1)	3/4" x 12¼" x 12½"
5 Drawer Stop (1)	3/4" x 1" x 2"
6 Front Panel (1)	3/4" x 3⅞" x 14"

	T x W x L
7 Work Surface (1)	3/4" x 16½" x 16½"
8 Subtop (1)	3/4" x 16½" x 16½"
9 Plastic Laminate (1)	Larger than work surface
10 Side Edging (2)	3/4" x 1½" x 16½"
11 Front/back Edging (2)	3/4" x 1½" x 18"
12 Vacuum Port (1)	2½" Dia. opening
13 Router Table Insert Plate	1/4" x 8" x 11"

place. You should know that I've sized this project to suit my drill press's large table. If it's too big, as is, for your drill press table, just bolt a piece of plywood to your machine's table and clamp the station to that. Or, adjust the dimensions in the *Material List* on the facing page to make a smaller station.

Basic Building With Baltic Birch

Get construction underway by cutting the back, sides, base and divider (pieces 1 through 4) to size. I used Baltic birch plywood for these and most of the cabinet parts (the drawer front and front panel are solid birch). Round the corners of the base to keep it from scraping your thighs, and chamfer the back outside edges of the sides and the sharp edges of the base to minimize splintering. Bore a 2½"-diameter hole in one side piece to serve as the dust port access (see the *Drawings* to locate this hole position). Fasten the sides to the back with screws and glue, and tack the base to the carcass with a couple screws. You'll remove it later on, so no glue here.

To limit the travel of the drawer, I fashioned a swiveling stop (piece 5) that functions like a turnbuckle. As you can see in the *Drawings* on page 59, a notch in the drawer back allows the drawer to slide past the stop for removal when the stop faces front to back. Turning the stop sideways locks the drawer in the cabinet. Make the stop and install it on the divider with a single flathead wood screw. Drill the countersunk screw hole in the stop slightly oversized so the stop swivels easily on the screw. With the stop in place, fasten the divider to the carcass assembly. I used 4⅛"-wide spacers to hold the divider in place during installation (see *photo*, page 54). It needs to be positioned carefully so it will clear the top edges of the drawer. Wrap up the carcass assembly by cutting and nailing the front panel (piece 6) to the carcass.

Preparing the Worktop

The worktop consists of a build-up of plastic laminate and two layers of plywood. Cut the work surface and subtop to size (pieces 7 and 8), making sure the proportions match. Apply a few dabs of hot melt or ordinary wood glue to the center of these panels, confining the glue to about a 4" area. Sandwich the panels and fasten them together with four screws, one at each corner. Apply an oversized piece of plastic laminate (piece 9) to the worktop with contact cement, and trim it to size with a router (see *photo*, below). Once that's done, wrap up by marking the worktop to locate the router insert plate.

The author trims the laminate flush with a piloted flush trim bit, holding the workpiece in place on an anti-slip mat.

Apply plastic laminate to the worktop with contact adhesive and press it flat. The author opted for a board wrapped in a towel instead of a J-roller for this job.

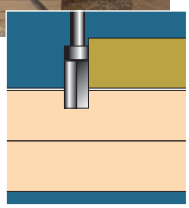
Drum Sanding Station Supplies

The following supplies are available from Woodworker's Journal to complete this project (Note: prices subject to change):

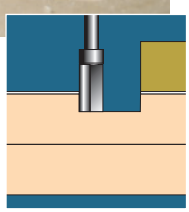
Standard Plate Installation Template #26505	$9.99
8" x 11" Blank Plate #35863*	$49.99
Insert (with no openings) #35200	$8.99
1/2" Pattern Bit #33536	$15.99
1½" Face Grain Knob #61692	$2.69
Universal Dust Port #92031	$5.89
25 pc. Drum Sanding Kit #20859	$18.99
Non-slip Router Mat #58960	$8.79

**The blank plate comes with 2 inserts (a blank and a 1½").*

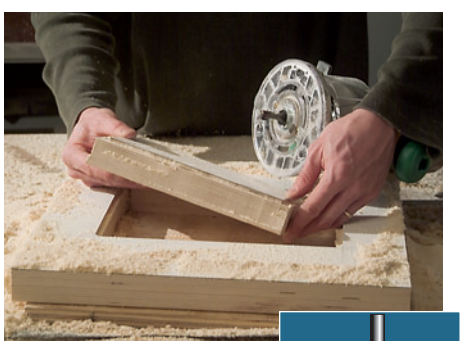
Please call 800-610-0883 and mention code WB034.

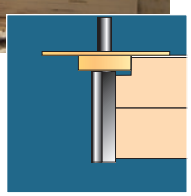


Using a template and a bearing-guided pattern bit (bearing on top), the author cuts a 1/4" deep groove to form the lip for the plate.



With the first step completed, the author uses the same bit to widen the groove to 1¼", taking multiple passes.





Remove the template, switch to a rub collar and a 1/2" straight bit and remove the waste in the middle, forming a lip for the plate.

Routing the Insert Plate Recess

I recommend using an MDF template to rout a perfectly sized recess for the router plate. You'll find the template, plate and other items you'll need in the supplies box, above. It's worth the extra investment, especially if you also plan to build a new router table someday and reuse the template. For this project, I used the template and a piloted pattern bit to rout the router plate lip that holds it flush to the worktop (see top *photo* and *illustration* on this page). Hold the template in place for routing with double-sided tape.

Step-by-Step Routing

Once this cut is complete, use the same bit to widen the cut to about 1¼". (See middle *photo* and *illustration* at left.) To remove the inner waste area, remove the template, install a 1" O.D. rub collar on your router, and switch to a long 1/2"-diameter straight or spiral upcut bit. The offset between the rub collar and bit establishes the 1/4" width of the router plate lip. Make a series of progressively deeper passes to rout all the way down through the worktop and subtop and remove the waste (see bottom *photo* and *illustration* at left).

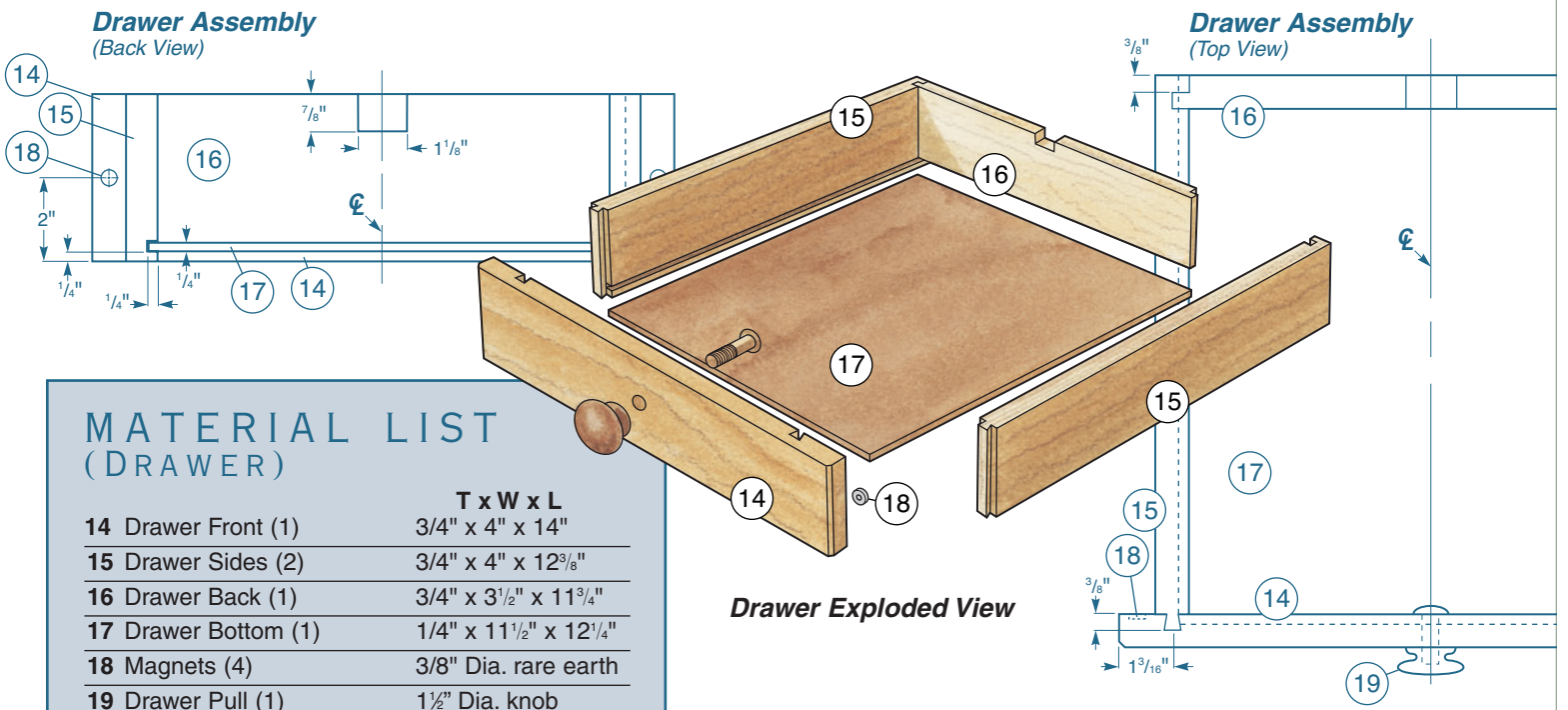
Installing the Worktop

Once you've cut the router plate recess into the work surface and subtop, remove the screws that hold these parts together and attach the subtop to the cabinet with screws. Unscrew and remove the base. Then line up the work surface and subtop, and reattach these parts with glue and screws. Install the base permanently with more screws and glue. Position the worktop in place, wrapping it with hardwood edging (pieces 10 and 11). Round the outer corners of the edging and chamfer the top edges.

Making the Drawer

There are no surprises in the drawer construction. The front joints are sliding dovetails and the rear joints are rabbet-and-dadoes. The biggest challenge is sizing the drawer width to leave just enough slip space so it slides in the cabinet without binding but doesn't feel sloppy. Start by cutting the drawer front and sides (pieces 14 and 15) to shape. Before you make the front joints, determine the precise drawer width by clamping a drawer side to each inside wall of the cabinet. Slip a scrap of plastic laminate in between the cabinet sides and drawer sides to serve as a spacer. With everything clamped, set the drawer front in position and mark the locations of the drawer sides on it. Lay out and cut these sliding dovetail joints with a 3/8" dovetail bit on the router table (see *sidebar*, next page).

With the front drawer joints cut, confirm the length of the drawer back (piece 16) and cut it to size. Make the notch in the drawer back for clearing the drawer stop. Cut the rabbet-and-dado joints to join the drawer back and



MATERIAL LIST (DRAWER)

	T x W x L
14 Drawer Front (1)	3/4" x 4" x 14"
15 Drawer Sides (2)	3/4" x 4" x 12 3/8"
16 Drawer Back (1)	3/4" x 3 1/2" x 11 3/4"
17 Drawer Bottom (1)	1/4" x 11 1/2" x 12 1/4"
18 Magnets (4)	3/8" Dia. rare earth
19 Drawer Pull (1)	1½" Dia. knob

sides, then dry-assemble the drawer box and check its fit in the cabinet. Once it slides in and out satisfactorily, disassemble the parts and rout slots for the drawer bottom (piece 17). Chamfer the front outer ends of the drawer front.

I used four 3/8"-diameter rare earth magnets (pieces 18) to hold the drawer closed. Install one pair in the back face of the drawer front at the overlaps and a second pair in the cabinet sides where they meet the drawer. Drill shallow holes with a Forstner bit, add a drop of epoxy in each and press the magnets into place (make sure to check for correct polarity between each pair first). Now glue up and clamp the drawer box joints, and check the drawer for square by measuring the diagonals. When the glue cures, slide the drawer bottom in dry and tack it to the drawer back. Complete the drawer by installing the pull (piece 19).

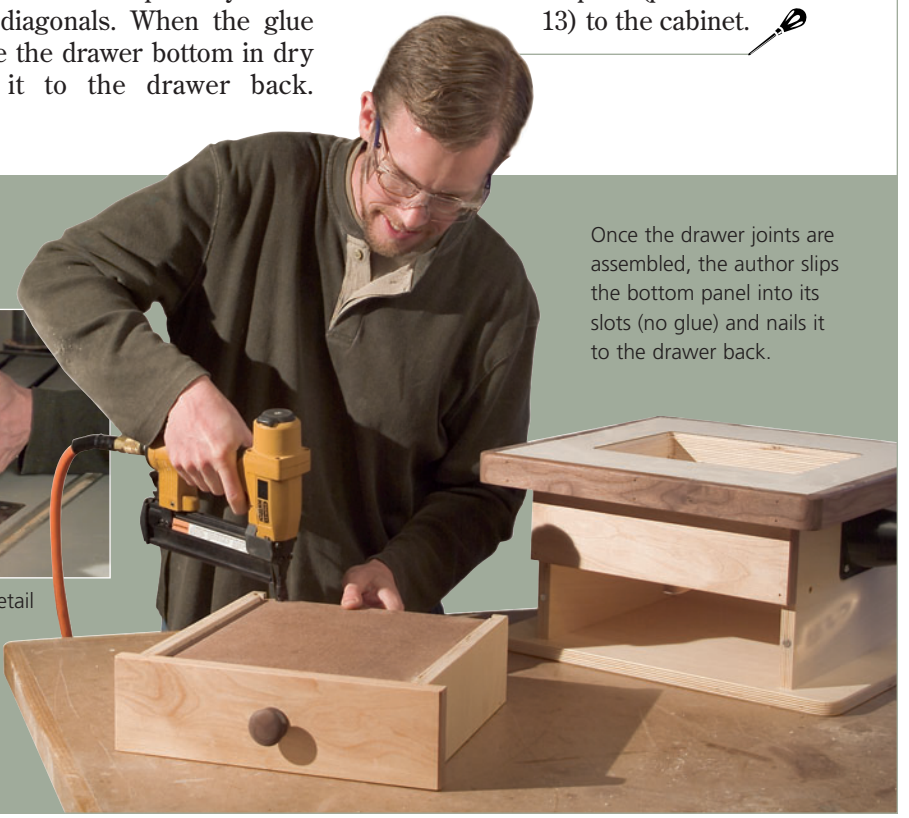
Finishing Up

All that stands between you and a proper drum roll is to apply a coat of finish and add the vacuum port and insert plate (pieces 12 and 13) to the cabinet.

MECHANICAL JOINTS FOR ADDED STRENGTH

Rout 3/8" dovetail slots in the back of the drawer front on the router table. The author used a backup board instead of a miter gauge to steady the workpiece for these two cuts.

Complete the sliding dovetail joints for the drawer by forming pins on the sides. The author used a backup board here to prevent rocking.



Once the drawer joints are assembled, the author slips the bottom panel into its slots (no glue) and nails it to the drawer back.

Handcrafting a Joiner's Mallet

EVERY WOODWORKER SHOULD HAVE A PERSONALIZED MALLET FOR CARVING AND CHISELING TASKS. BUILD YOUR OWN SO THE HANDLE FITS YOUR PALM LIKE A GLOVE. IT'S A JOY TO MAKE AND TO USE.

By Chris Inman

A woodworker's mallet is a very personal tool. We learn their subtleties of weight and balance so that the slightest tap can accomplish just what we need from a chisel or carving gouge. After many years of service, with a handle darkened by sweat and glue and the scars of time, your mallet will begin to feel like an extension of your hand.

Mallets purchased from a store do everything you expect of them in a practical way, but they lack an undefinable quality that's so evident in a handmade tool. Given the years of service that a mallet provides, the time it takes to make one is well worth the effort.

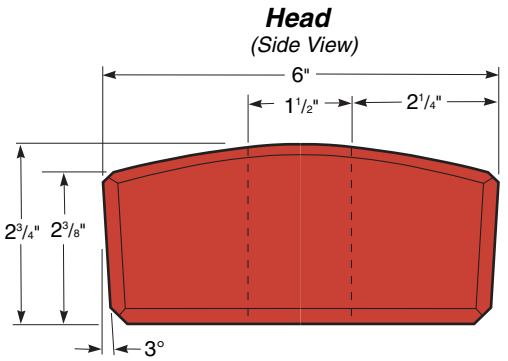
Among domestic wood species, maple is the best choice for a mallet. It's both hard and dense, so it withstands repeated blows against chisel handles. Many exotic species are even harder than maple, so they also work well for this application. Padauk, for example, is hard and stable and, because of its beauty, makes an excellent accent wood.

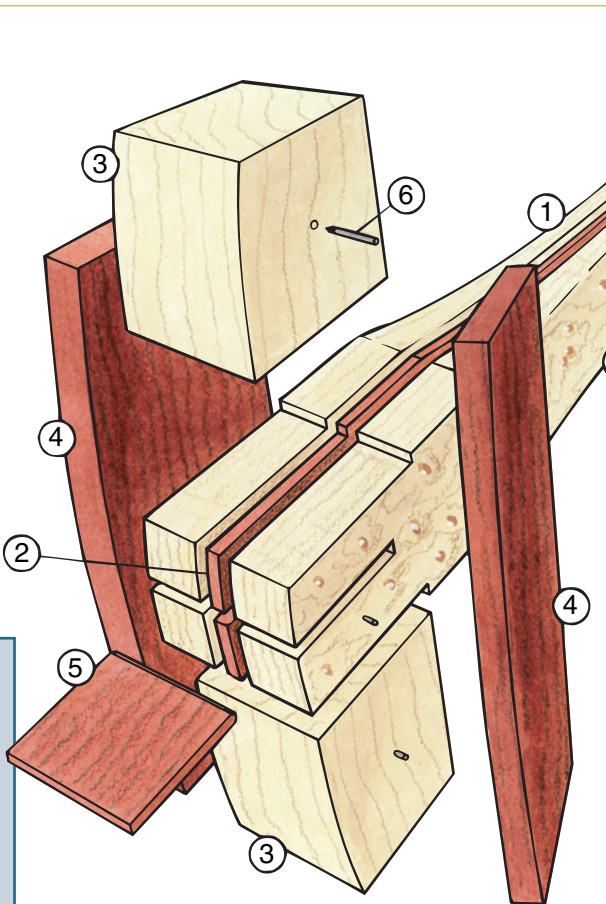
The mallet's head (pieces 3 and 4) is built around the end of the handle (pieces 1 and 2). Laminating the mallet in this way is much easier than trying to mortise a hole completely through the head, and it still results in a strong assembly.

To make the handle, glue the pieces of maple (pieces 1) to each side of the padauk strip (piece 2). If you have a little bird's eye maple around, use it to really make this a special piece. Padauk, as with many exotics, is an oily wood and sometimes doesn't bond well with yellow glue or hide glue. Therefore, just to be on the safe side, use epoxy to prevent any possibility of delamination due to oil in the padauk. Another advantage of epoxy is that it remains somewhat flexible after it dries, giving the mallet more resiliency when delivering a heavy blow (glues that are brittle will crack with this kind of shock).

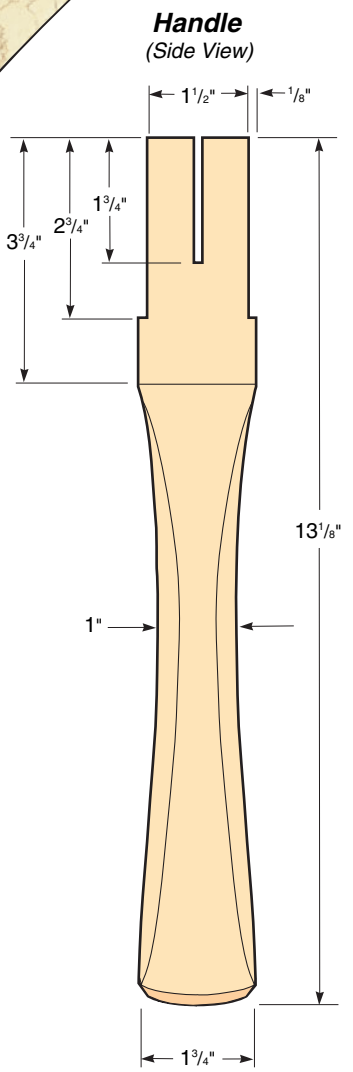
A comfortable handle is the key to a successful mallet. To reduce tearout while spokeshaving, work from the high points to the low.

Once the glue dries, rip the handle to a width of 1¾", then lay out the handle pattern shown on the next page. Next, cut a shoulder 2¾" from the top end of the handle to positively position the two





Mallet Exploded View



MATERIAL LIST

		T x W x L
1	Maple Handle (2)	3/4" x 2" x 13⅛"
2	Padauk Strip (1)	1/8" x 2" x 13⅛"
3	Maple Cores (2)	1⅝" x 2¾" x 2¼"
4	Padauk Faces (2)	1/2" x 3" x 6"
5	Padauk Wedge (1)	1/8" x 1⅝" x 2"
6	Brads (6)	#17 - 1/2"

core pieces (pieces 3) of the head during the final glue up. To do this, raise your table saw blade to 1/8", clamp a setup block to the rip fence and position it 2¾" from the far side of the blade. Pass the handle over the blade a number of times to cut the shoulder and complete the tenon. Clean up the saw marks on the tenon with a sharp 1" chisel, then use a band saw to cut the wedge kerf and shape the handle. Take a few strokes with a spokeshave to chamfer the grip until it fits comfortably in your hand.

Now, from maple stock that's the same thickness as the handle, cut two 2¾"-wide by 2¼"-long pieces for the mallet head's core (pieces 3). Cut the outside edge of each piece (the striking faces of the mallet) at a 3° angle.

The padauk faces (pieces 4) measure 2¾" wide by 6" long and have ends cut at a 3° angle to match the core. From padauk scrap, also cut a 2"-long by 1⅝"-wide by 1/8"-thick piece for the wedge (piece 5). Belt-sand one end of the wedge to a blunt point so it will enter the kerf easily.

Assembling the mallet is a sloppy task given all the glue that's involved, especially when the pieces begin sliding around. But you can prevent the sliding by driving three small brads just slightly into each padauk face and then, using a wire cutter, cutting off the brad 1/8" above the surface. Press the core pieces and the handle into position on top of one padauk face, then press the second face on the other side of the head. The nails will indent the wood, preventing the pieces from slipping around when the glue is added.

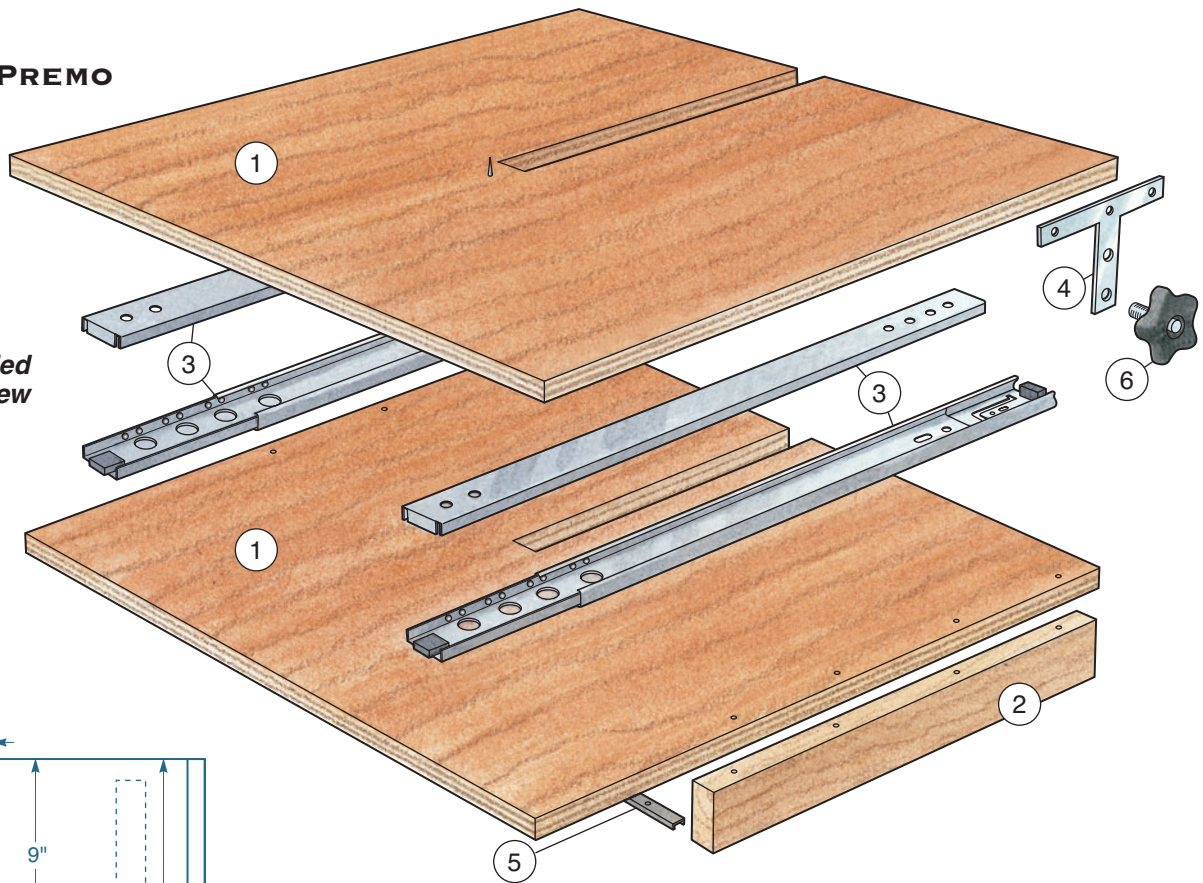
Now disassemble the mallet, spread epoxy on all the joining surfaces, and clamp the pieces back together. Be sure to adjust one clamp to lightly hold the maple core sections against the handle, but be careful not to clamp too tightly or you won't be able to insert the wedge. Put a little epoxy on the pointed end of the wedge and drive it into the top of the handle. You'll have plenty of squeeze-out, so have a few rags ready for cleaning up the excess glue.

The next day, belt-sand the pieces in the head lamination flush and scrape off any glue residue. Band-saw the curved top on the head and sand this cut smooth. Now use a block plane to chamfer all the long grain edges of the head and a chisel to chamfer the cross-grain edges. Chamfer the end of the handle, too. Use a palm sander with 100-grit paper to remove belt sander marks and ease all the corners. Once you're satisfied with the feel of the tool, apply two coats of a penetrating oil finish and you're ready to go to work. Pounding never felt so good.

Sliding, Circle-cutting Band Saw Jig

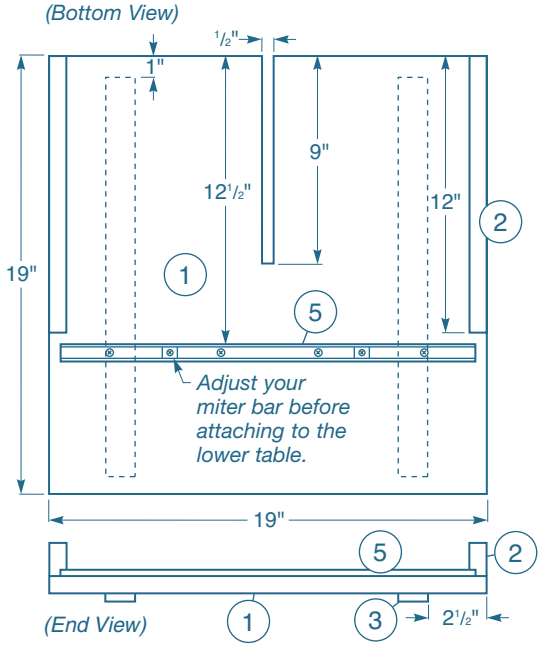
OUR AUTHOR'S CLEVER USE OF DRAWER SLIDES SOUPS UP THE CLASSIC CIRCLE-CUTTING JIG. IT WILL FORM CIRCLES UP TO 30" OR MORE IN DIAMETER WITH EASE.

BY JOHN G. PREMO



Exploded View

Lower Fixed Table
(Bottom View)



Jig Supplies

*The following supplies are available from **Woodworker's Journal** to complete this project (Note: prices subject to change):*

Full-extension Drawer Slides (1 Pair) #32490 . . . .$16.99

Star Knob* #23838 . . . .$1.09 ea.
**Two required.*

Adjustable Miter Bar #21982 . . . . . .$15.99

*Please call **800-610-0883** — mention code WB035*

MATERIAL LIST

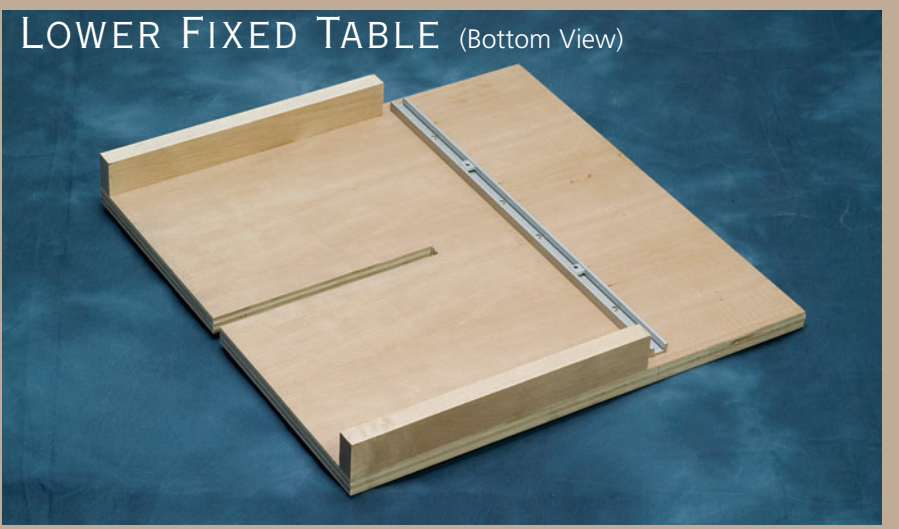
		T x W x L
1	Upper and Lower Tables (2)	3/4" x 19" x 19"
2	Sides (2)	3/4" x 1 1/2" x 12"
3	Full-extension Drawer Slides (2)	18"
4	T-shaped Mending Plates (2)	1/16" x 3 1/2" x 4"
5	Adjustable Miter Bar (1)	18"
6	Star Knobs (2)	1" Stud x 1/4"

As you can see in the *photos* at right, there's nothing too tricky about the construction of this jig. I used quality 3/4" material for the fixed and sliding tables (pieces 1) and clear stock for the sides (pieces 2). Using the dimensions in the *Material List* will keep you in pretty good shape with most of the band saws out there, but I suggest you measure yours carefully to determine if any minor adjustments are necessary. After cutting the tables to overall size, use your dado blade to make the band saw blade slot down the middle of each one, and clean up these cuts with a chisel.

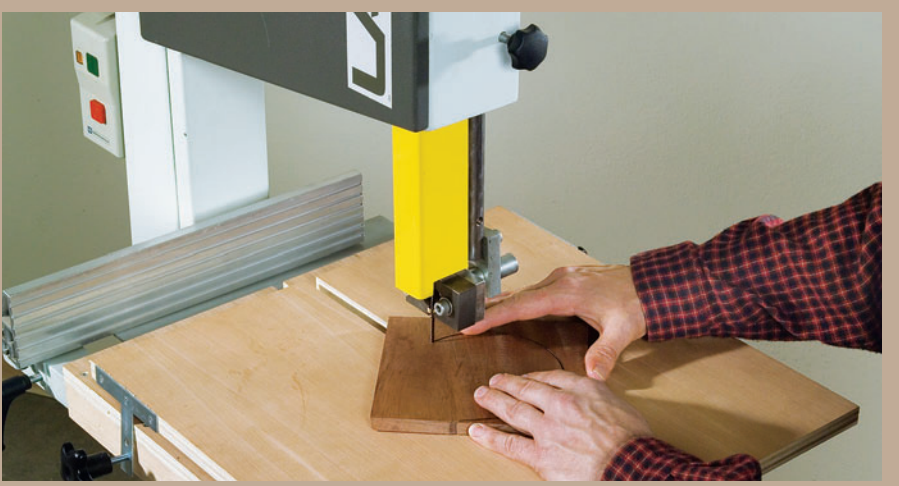
Now, screw the sides in place on the bottom table, testing the fit on your band saw table to make sure it's snug. Install the slides (pieces 3) and the mending plates (pieces 4), as shown in the *Elevation Drawings* at left. With those pieces put together, place the jig on your band saw and slide it into position to find the exact location for the adjustable miter bar (piece 5) on the bottom of the base.

I drilled and tapped threaded holes in each of my mending plates to accept the star knobs (pieces 6). Before assembling your jig, drive a 1" brad up through the bottom of the upper table to serve as your pivot point, as shown in the *Exploded View* at left. The brad needs to be aligned to the front of the saw blade. When you're ready to make your first circle, the radius will be the distance from the blade to the pivot point. This jig can produce circles of surprisingly large diameters. When fully extended, it is sometimes necessary to use clamps to fasten the back of the fixed table to the band saw table to prevent it from tipping.

The upper sliding table gets half of the slide, the "T" plates and the star knobs. The author drilled and tapped holes in the mending plates to accommodate the star knob threads.



The lower fixed table gets the sides and the adjustable miter bar. Both of these pieces must be custom fit to ensure that the fixed table fits over your band saw table perfectly.



In practice, a small nail is driven up through the bottom of the sliding table. That pivot point and the sliding nature of this jig will allow you to create a full range of circle sizes.

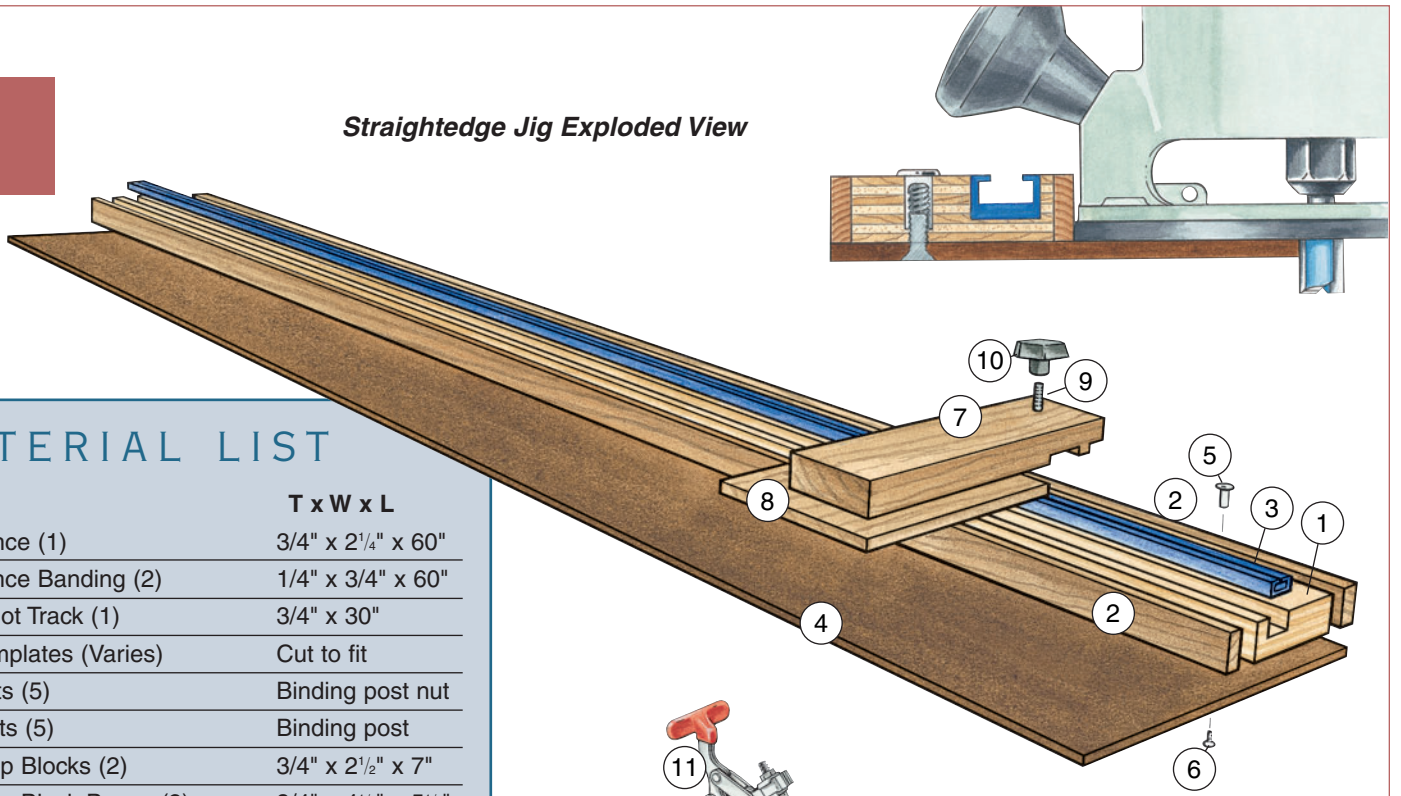
Straightedge Jig

THIS VERSATILE STRAIGHTEDGE JIG TRIMS PLYWOOD, BUT IT ALSO BREEZES THROUGH RABBETS, DADOES AND GROOVES. IT'S A "MUST-BUILD" FOR YOUR SHOP.

By Rick White

Here's a slick jig to have handy whenever you need to straighten a rough edge or plow a groove. It's actually a multi-use straightedge, designed to custom-fit to your portable router. The router runs along its fence, and that guides a straight bit along a hardboard template attached to the bottom of the fence. Whenever you need to make a cut, just line up the edge of the template with your trim line on the workpiece. You'll never have to go through the old measure-and-clamp routine again. The jig also performs a bonus task on the table saw — more on that later.

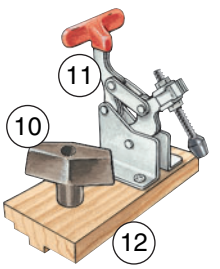
The heart of the jig is a straight, jointed plywood fence (piece 1). Seal this along its two



Straightedge Jig Exploded View

MATERIAL LIST

		T x W x L
1	Fence (1)	3/4" x 2 1/4" x 60"
2	Fence Banding (2)	1/4" x 3/4" x 60"
3	T-slot Track (1)	3/4" x 30"
4	Templates (Varies)	Cut to fit
5	Nuts (5)	Binding post nut
6	Bolts (5)	Binding post
7	Stop Blocks (2)	3/4" x 2 1/2" x 7"
8	Stop Block Bases (2)	3/4" x 4 1/4" x 5 1/2"
9	T-bolts (4)	18 5/16" x 1 1/2"
10	T-knobs (4)	18 5/16" Plastic
11	Toggle Clamps (2)	Steel
12	Hold-down Bases (2)	3/4" x 1 3/4" x 4"



Hold-down Back Detail

ripped edges with strips of solid hardwood banding (pieces 2). Then plow a grove in the top to house an aluminum T-slot track (piece 2).

Cut one 1/4" hardboard template blank for each straight bit you own. Each of these templates (pieces 4) should be 7" wide to begin with. Attach the first template to the bottom of the jig with bolts and nuts (pieces 5 and 6), then install your largest-diameter straight bit in your portable router. Run the router along the fence so it trims the template to size. Use a permanent marker to note the bit size on the template, then chuck the next largest bit in the router. Bolt on a new template piece, and repeat the process until you have individual, marked templates for each of your commonly used bits.

If you stop building this jig right now, you can make any straight trim cut, through groove, rabbet or dado you need. To tackle stopped cuts, just add a pair of adjustable stops to limit the router's travel.

The adjustable stops are simply short lengths of stock (pieces 7), each of which is attached to a base (piece 8) with glue and clamps. These bases need to be a little wider than the stops, so they won't interfere with the router's travel (otherwise, the machine's handles might hit the stops). The wide bases also keep the stops aligned at 90° to the fence.

The stops are secured to the jig with T-bolts and knobs (pieces 9 and 10), which make them adjustable along the entire fence length.

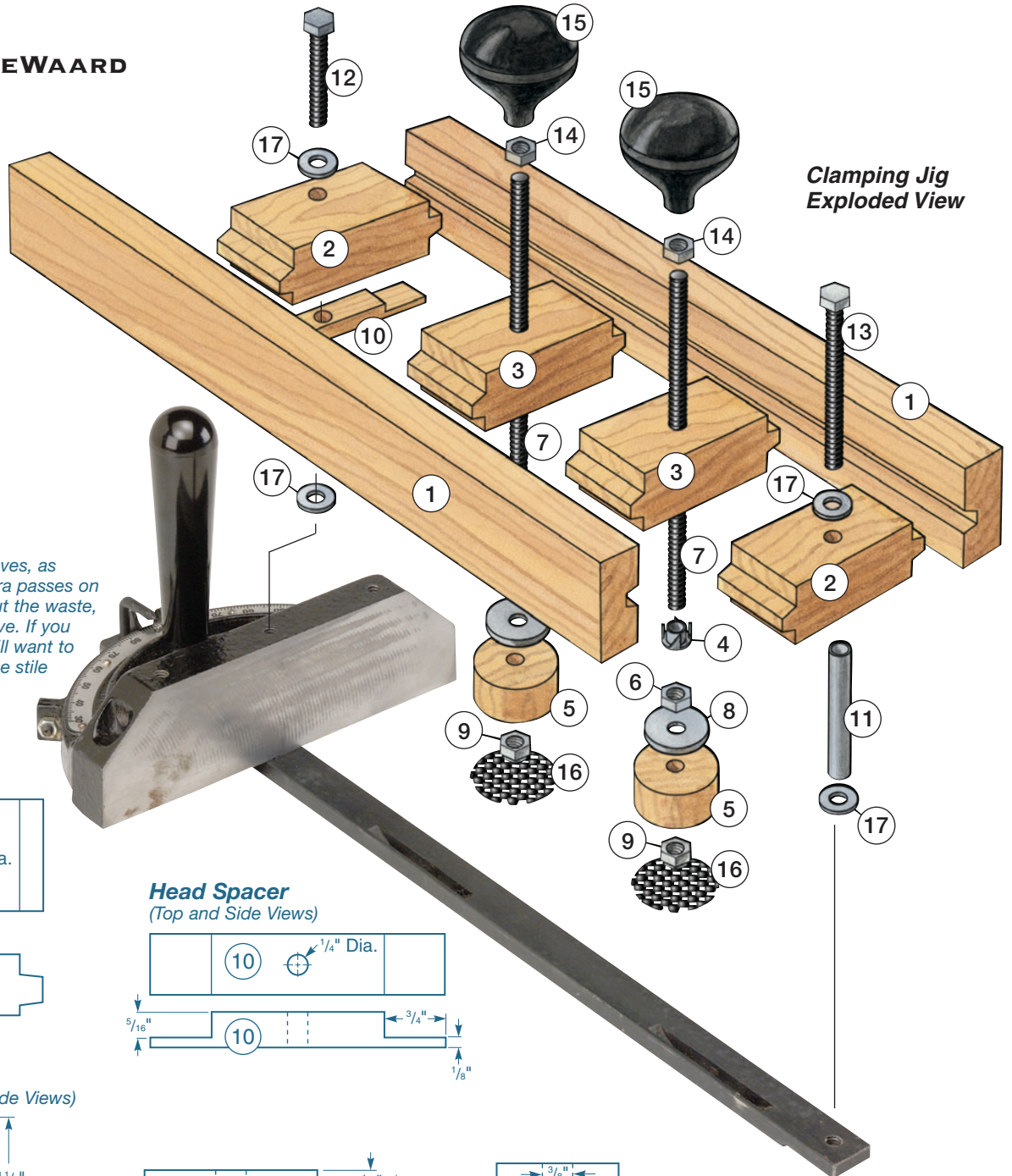
Earlier, we mentioned a bonus function of this jig, and here it is: By attaching a couple of toggle clamps (pieces 11) to a spare set of hold-down bases (pieces 12), you can use the jig to straighten the edges of rough boards. Clamp the stock to the jig and run the jig along your table saw fence to slice off the bad edge. Simple.

The hold-down option on this jig allows you to slice straight edges on rough stock without fear of binding or kickback.

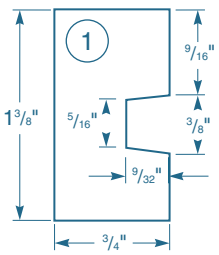
Miter Gauge Clamping Jig

OUTFIT YOUR MITER GAUGE WITH THIS JIG TO MAKE EXTREMELY ACCURATE AND SAFE ANGLE CUTS.

BY E. JOHN DEWAARD

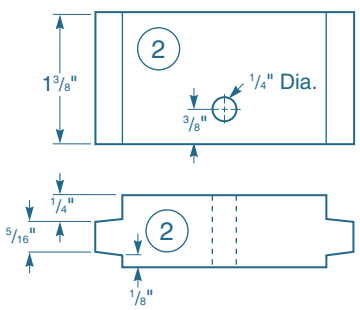


Rail
(Side View)



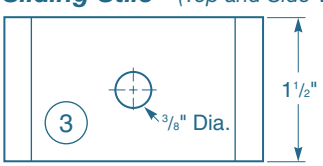
Note: *You can taper your grooves, as shown above, by taking two extra passes on the table saw before dadoing out the waste, or simply go with a square groove. If you do taper your groove walls, you'll want to slightly taper the shoulders of the stile tenons as well.*

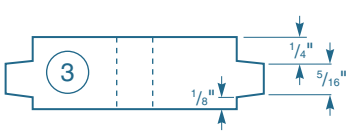
Fixed Stile
(Top/Side Views)

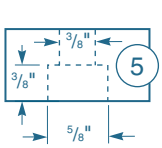


Head Spacer
(Top and Side Views)

Sliding Stile *(Top and Side Views)*







Clamp Pad
(Side View)

Here's the miter clamp jig in action. It eliminates creep and adds another level of safety, especially on cuts like the one shown above.

MATERIAL LIST

		T x W x L
1	Rails (2)	3/4" x 1 3/8" x 14"
2	Fixed Stiles (2)	3/4" x 1 3/8" x 2 3/4"
3	Sliding Stiles (2)	3/4" x 1 1/2" x 2 11/16"
4	T-nuts (2)	5/16" - 18
5	Clamp Pads (2)	3/4" x 1 3/4" Dia.
6	Upper Pad Nuts (2)	5/16" - #18
7	Clamp Bolts (2)	5/16" - #18 x 5"
8	Pad Fender Washers (2)	5/16" I.D. x 1 1/4" O.D.
9	Lower Pad Locknuts (2)	5/16" - 18
10	Head Spacer (1)	3/4" x 7/16" x 3 5/8"
11	Toe Spacer (1)	3/8" x 2 5/8"
12	Head Bolt (1)	1/4" - 20 x 1 1/2"
13	Toe Bolt (1)	1/4" - 20 x 3 1/2"
14	Knob Stop Nuts (2)	5/16" - 18
15	Knobs (2)	5/16" - 18 x 2" Dia.
16	Pad Liners (2)	1 3/4" Dia.
17	Washers (4)	1/4" I.D.

By itself, a miter gauge offers limited accuracy for cutting angles. You've probably discovered how difficult it can be to hold workpieces tightly against the gauge's short fence without them creeping out of position as you push the cut through. This clamping jig will help solve your angle-cutting problems, because it applies pressure against the miter bar to hold workpieces securely.

Start building this jig by ripping a 30" length of hardwood for the rails (pieces 1) to the dimensions shown in the Material List above. Plow a groove with slightly angled walls in one of the wider faces (it takes three passes on the table saw) and then crosscut the rails to length.

Make the fixed stiles (pieces 2) and sliding stiles (pieces 3) from a single 1 x 8 board crosscut to 2¾" long. Mill a tongue on each end to the dimensions shown in the *Drawing*: a tenoning jig on the table saw works well for this. (Taper the tenon sides slightly so they'll slide even easier.) Rip the board to produce two fixed and two sliding stiles, then trim a hair off each end of the sliding stiles. This will allow them to move in the rail grooves. If they still bind, trim their shoulders slightly with a block plane or sanding block. Be sure to label all four parts to avoid confusion.

Using diagonal lines, find the center of each sliding stile and bore a 3/8" through hole, using your drill press. Slip 5/16", #18 T-nuts (pieces 4) into the bottom of each hole and hammer them flush.

Assemble the jig body by gluing one fixed stile between the rails and clamping it, then add the sliding stiles and glue. Clamp the second fixed stile in place at the other end. Set the assembly aside to cure while you make the clamp pads (pieces 5).

Forming the Clamp Pads with a Hole Saw

With a 1¾" hole saw chucked in the drill press, select the slowest speed and drill halfway into a piece of 1 x 3. Make sure the saw's 3/8" guide bit slightly penetrates the bottom face. Replace the saw with a 5/8" Forstner bit, increase the speed and drill 3/8" deep to counterbore the earlier hole. Now flip the 1 x 3 and re-chuck the hole saw. Free the clamp pad by drilling through, using the hole produced by your first cut as a guide. Follow the same sequence for the second pad.

Drilling a Hole in Your Miter Gauge

Disassemble your miter gauge and turn the head over to locate the pivot hole. Transfer the center of this hole to the top of the head and chuck a #7 drill in your press. Drill and tap the hole with a 1/4 x #20 tap, and clean off the new threads.

Complete the clamping pad subassemblies next. Begin by running upper pad nuts (pieces 6) up each of the clamp

bolts (pieces 7). Add fender washers (pieces 8), the clamp pad and the lower pad Nyloc® nuts (pieces 9). Tighten it until the rod is flush with the opening, then tighten the top nuts until the washers are trapped.

Joining the Bar

Bore a 1/4" hole in the fixed stile nearest to the head of the miter gauge, at the location shown in the *Drawings*. Then, using the bar from the miter gauge as a pattern, mark and drill a 1/4" hole for the toe bolt in the other fixed stile. Notch the head spacer (piece 10) as shown in the *Drawings,* and glue and clamp it to the bottom of the fixed stile, flush with the end. When the glue has set, drill down through the fixed stile to produce a through 1/4" hole. Next, chuck a 3/8" drill in your press and counterbore the bottom of the other fixed stile 1/4" deep. This will accommodate the toe spacer.

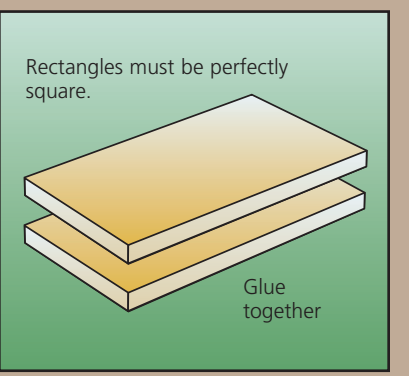
Reassemble your miter gauge, then cut the toe spacer (piece 11) to length (this will depend on your miter gauge). Fit the spacer into the counterbore on the fixed stile. Thread the clamp bolts into the T-nuts in the sliding stiles, and you're ready to attach the bridge to the miter gauge with the head and toe bolts (pieces 12 and 13). Run the knob stop nuts (pieces 14) down each clamp bolt, followed by the knobs (pieces 15). Tighten the knobs, then tighten the nuts back up against the knobs to lock them in place.

Apply epoxy to the bottom of each fender washer on your clamp pads and screw the pads down. The jig acts as a clamp here. When the epoxy has set, apply Loctite® to the three threads above the nuts. Use rubber cement to attach pieces of router pad (pieces 16) to the bottom of the pads.

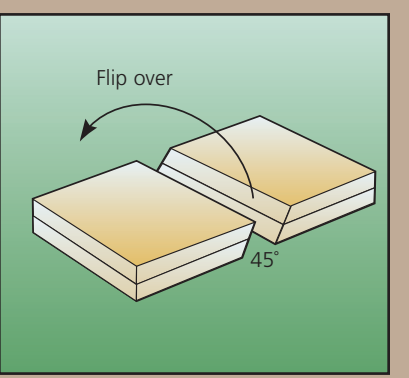
Finish the wooden parts on your new clamping jig with a few coats of wipe-on varnish and let it cure. Now your miter gauge will function more accurately and safely than ever.

A Simple Dovetail Key Jig

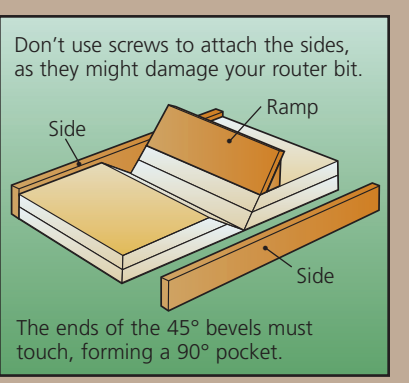
Dovetail keys add strength and beauty to an otherwise ordinary mitered corner. To make this handy jig, simply follow the three-step process shown at right. After the jig is constructed, determine where to set the fence on your router table in order to put the keyways exactly where you want them. But before you chuck your dovetail bit in the router, use a 1/4" straight bit to plow a groove in the jig (to remove waste material). Switch to your dovetail bit and remove the remaining material. Slide the jig along your router table fence to form perfect dovetail keyways.



Form two identical rectangles from 1/2" plywood or MDF. The blanks must be perfectly square. Glue and clamp the blanks together.



Set the blade of your table saw to exactly 45° and cut the glued-up blanks in two. Flip one piece over as shown above.

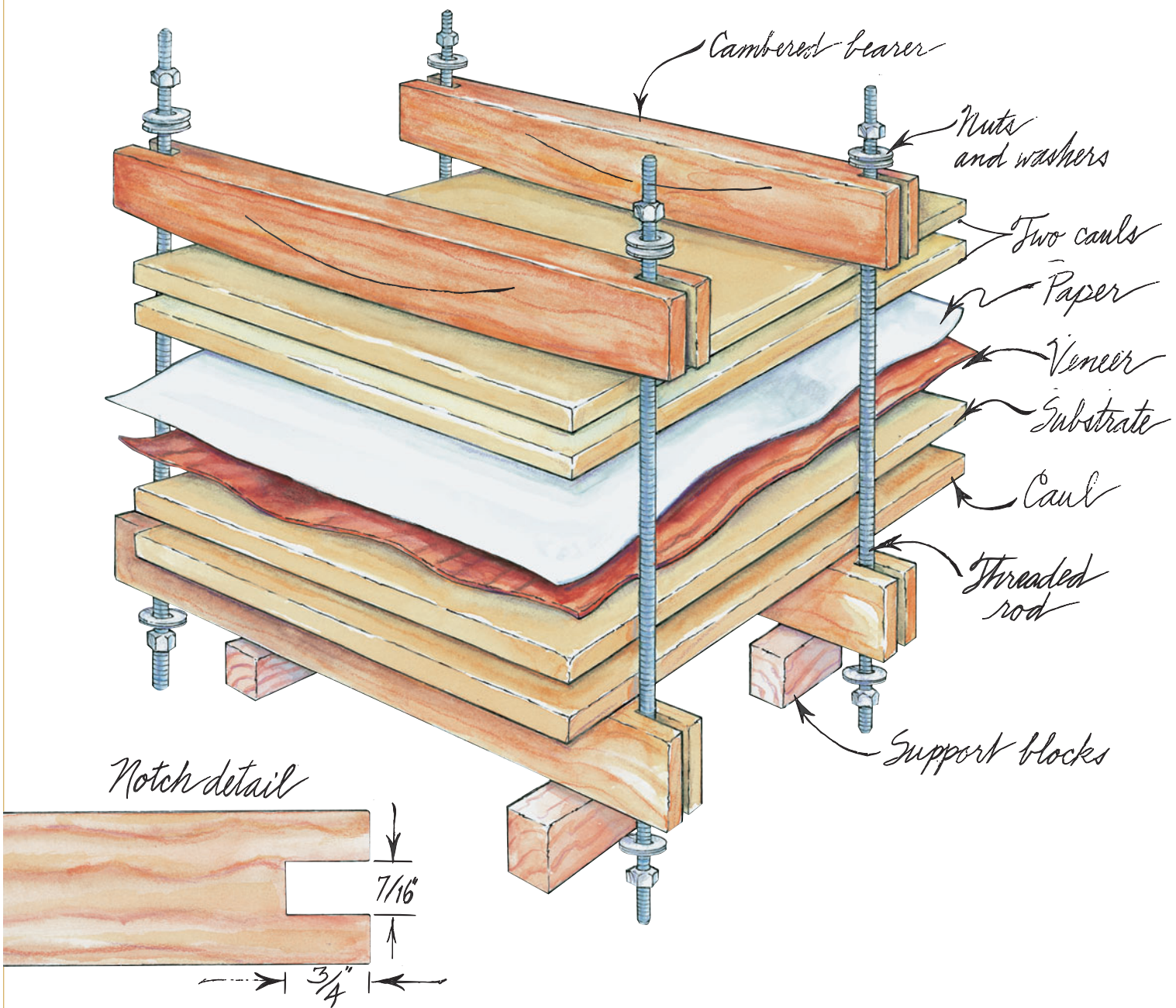


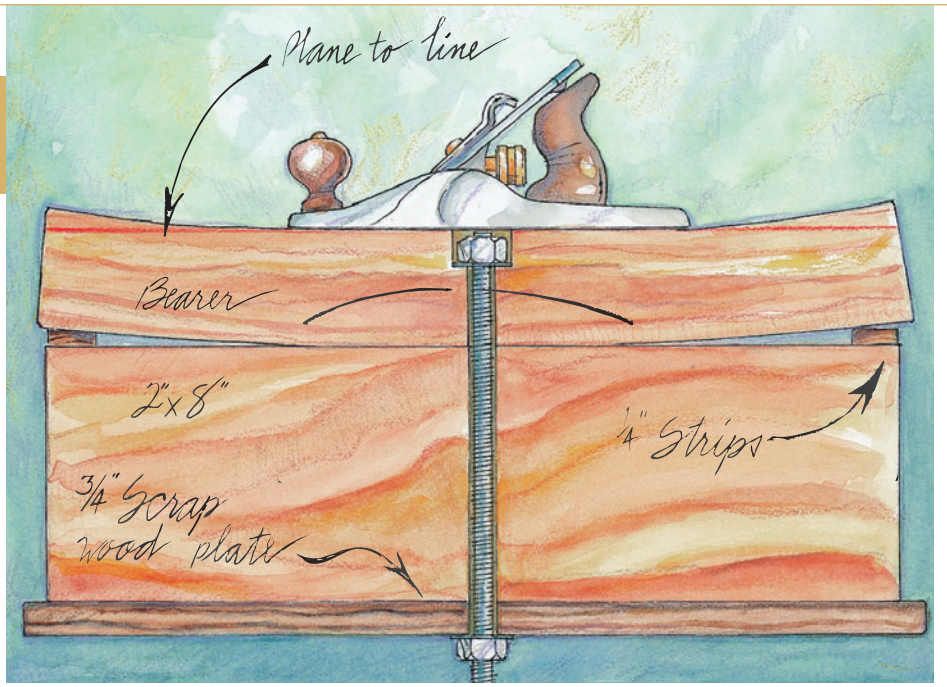
Cut jig sides from 1/2" hardwood and form a 45° ramp, too. Position the pieces as shown above and secure them with glue, but no screws or nails.

A Simple Veneer Press

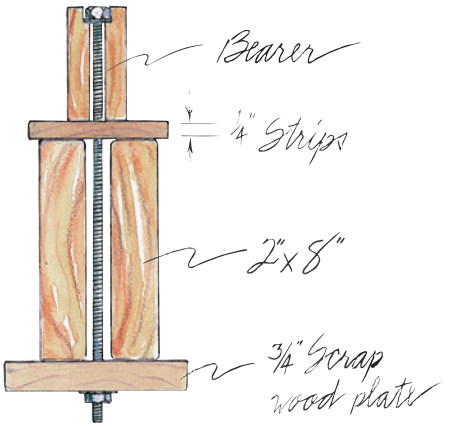
WOODWORKERS HAVE USED ALL SORTS OF UNORTHODOX WAYS TO FLATTEN VENEER, BUT A VENEER PRESS STILL WORKS BEST. HERE'S AN EFFECTIVE DESIGN YOU CAN BUILD ON THE CHEAP.

BY BRUCE KIEFFER





Make a stand out of the 2 x 8s for bending the first bearer. Stand them on top of the plate, then slip a threaded rod through the bearer, between the 2 x 8s and through the plate hole. Place the 1/4"-thick strips beneath the bearer, add the washers and tighten the nuts until the bearer touches the 2 x 8s.



The best solution for flattening veneer is to use a veneer press. Here's a simple one that's cheap and easy to build. The heart of the design is a set of curved, or cambered, bearers. They distribute pressure evenly onto the veneer with the help of three cauls. Our design incorporates a method for curving the bearers so they provide continuous contact along their full length. All the measurements given here will create a press that accommodates panels up to 24" wide. If you change the dimensions, add 4" for supporting the hardware.

To begin, select a 2" x 8" x 8' piece of knot-free Douglas fir. Crosscut the board into three 24"-long sections. Select the best piece and rip it in half for making your first bearer. Mill the halves down to 1¼" x 2½", then mark the edge on one piece at its center and drill a 1"-diameter x 1/2"-deep counterbore and a 3/8" pilot hole.

Now drill a 3/8"-diameter hole in the center of a 3/4"-thick scrapwood plate and set the other two sections of the 2 x 8 on the plate, as shown above.

Position two 1/4"-thick sticks on the 2 x 8s, and place the bearer on the sticks. Slip a 12" piece of threaded rod through the hole, and tighten nuts on both ends of the threaded rod with a socket wrench. Stop tightening when the bearer touches the 2 x 8s, and use a straightedge to draw a line near the top of the bearer showing the low point of the curve.

Release the bearer from the threaded rod and band-saw just outside the line, then return the bearer to the fixture, tighten the nut and hand-plane the edge right to the line. Since the camber is so subtle, draw a large curved line on the side of the bearer to indicate the correct edge.

Take the assembly apart, then rip and mill the other 2 x 8s like you did the first one. Trace the shape of the first bearer onto each of the other pieces and band-saw them close to the finished profile. Now screw the first bearer to the others and rout identical curves using a long flush-cutting laminate bit. Cut 7/16"-wide by 3/4"-deep notches in both ends of each bearer, and nail support blocks to half of the bearers to raise the press off your workbench. Generally, you'll want a pair of bearers pressing on your veneer every four to six inches, so be sure to make enough for your anticipated needs.

USING YOUR VENEER PRESS

Before spreading any glue, try a dry run to familiarize yourself with the mechanics of the press. Set it up on a level surface, spacing the bottom bearers evenly. Now lay down the cauls, substrate, veneer and paper, as shown in the *drawing* on the facing page. Add the top bearers and the hardware, then begin tightening the bearer nearest to the center of the panel. Tighten one end about 3/4 of the way, then completely tighten the other end. Return to the first end to finish tightening the nut. Work your way through the other bearers to the ends of the press.

Use a small roller to spread glue evenly on the substrate. To avoid excessive curling, don't put glue directly on the veneer.

Place the veneer on the substrate, then lay newspaper down to keep excess glue from bonding the cauls to the veneer.

Tighten the nuts with a box wrench until you see a consistent bead of glue squeeze-out along the edges of the panel.

Two Quick, Strong Jig-made Joints

JOINTS DON'T HAVE TO BE ELABORATE TO BE STURDY. POCKET SCREWS AND DOWELS MAY BE THE IDEAL SOLUTION WHEN YOU NEED IT DONE FAST AND FINAL.

BY CHRIS MARSHALL

Dowels that span a butt joint like this one add important mechanical strength, and they disappear once the joint is glued and clamped. An inexpensive jig ensures proper alignment and good results.

Hand-cut dovetails, tusk tenons and other "fancy" joints are wonderful options to master for your projects, but let's face it: there are only so many hours on a Saturday afternoon. In some cases, a quick, efficient jig-made joint can bring satisfying conclusion to a project, especially if you've still got some grass to mow or the bass are biting. That's when pocket screws or dowel joints can really come to the rescue.

Skip the Glue with Pocket Screws

Pocket screw joints are as sturdy as they are easy to make. You use a drilling jig and stepped bit to bore steeply pitched, counterbored holes in one joint member. Then, drive a couple self-tapping screws into these holes to draw the joint together. The result is a surprisingly strong, reinforced miter or butt joint that requires no glue. Once the screws are driven home, you're finished.

Pocket screws are the fastest way I know of to build face frames, and with a little creativity you can use them for most casework joinery — assembling backs to sides, building shelf panels from narrower stock, attaching edge banding or toe kicks, fastening hang strips … the list goes on. Pocket screws are also great for other furniture applications, such as joining legs and aprons, sneaking screws into tight spots or closing picture frame miters.

It's easy to get started making pocket hole joints, but you'll need to buy a jig. Pocket hole jig designs vary some, but all of them have steel sleeves to guide the drill bit correctly. Jig kits typically come with the stepped drill bit, a long driver bit and a stop collar.

Interlocking, Hidden Dowel Joints

Dowels may not be as fashionable as pocket screws these days, but they're still good options when you don't want to see oval holes with screws buried in them. Dowels can be ideal for situations where a joint must be both strong and fastener-free. They're also helpful for keeping joint parts aligned during glue-up, especially when you're clamping odd-angle joints. Adding dowels to a cross-grain butt joint creates a mechanical connection where

Pocket screws are fast, sturdy and simple to make with a drilling jig. By drilling steeply-pitched counterbores in one joint member, you can drive self-tapping screws into the other without pilot holes. Best of all, you won't believe how strong a pair of countersunk screws can be!

glue alone could fail.

There's a trick to making successful dowel joints: you need a jig that registers parts precisely. If dowel holes are even slightly askew, the joint parts will be thrown out of alignment or worse, the joint won't fit together at all … big hassles either way. Here's where a simple jig can save time and frustration. A good doweling jig will clamp securely to your workpiece and provide index marks to indicate exactly where the dowel will go. Just draw or knife a thin layout mark across the joint at the index mark, and registering the drill bit will be easy.

Doweling jigs may have more than one drilling configuration. In terms of versatility, the more ways you can clamp and drill, the better. Some styles, such as the one shown below, allow you to thread the bushings into the side of the jig for drilling holes in edge or end grain as well as into the end or inside pocket for drilling face-grain holes. Interchangeable drill bushings for 1/4", 5/16" or 3/8" drill bits are also handy jig features.

Once the holes are drilled, carry out a dry assembly first, then apply glue, slip in the dowels and clamp. That's it!

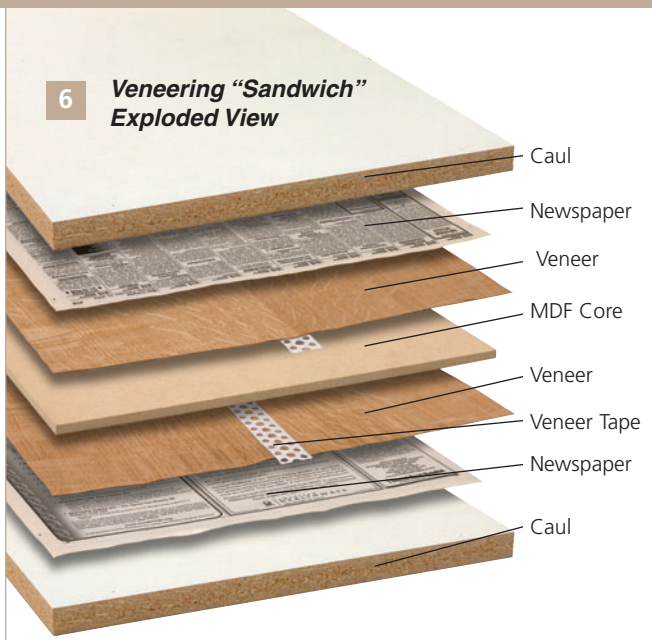
If you need to build a "blind" joint, buy a set of steel dowel points to make registration less of a headache. Just drill holes for one side of the joint using your jig, insert the correct dowel points and press the parts together to prick centerpoints on the mating piece. Drill the matching holes using these depressions as markers.

Pocket hole and dowel joints won't suit every task, and sometimes you'll simply want to build more intricate joints. But, when quick and easy are the goal, these joints can really deliver.

Dowel drilling jigs have hardened steel bushings to keep your drill bit tracking properly. A jig with repositionable bushings, like the once shown at left, expands your options for drilling either end-grain or face grain so you're covered for most applications.

Seven Steps to Veneering Success

By Bruce Kieffer



6 *Veneering "Sandwich" Exploded View*

Making your own veneered panels adds a new dimension to your woodworking design capabilities, and it's fun to do. The woodworking techniques used for veneering are similar to those used with solid wood. Sawing, jointing, gluing, clamping, trimming and sanding are all familiar woodworking tasks. In this case, narrow sheets of veneer are edge joined to make wider sheets that are then applied to a substrate (the core the veneer is glued to). I prefer MDF for my substrates since it's smooth, flat and very stable. I find it easiest to use wood glue, cauls (flat panels that spread the clamp pressure) and clamps. Or you can build and use the simple veneer press shown on page 70. For small veneered panels like these, I use slow-setting yellow glue. Getting the glue on fast enough is always a challenge, so glue up one panel at a time, and ask for some help if you can.

You must make "balanced" panels (a core with veneer on both faces in this case), and you need to put both pieces of veneer on the core at the same time. Oversize the veneer pieces so you can cut them to their finished sizes after the veneers are glued to the substrates.


1

STEP 1: Use a veneer saw and straightedge to cut the proportions of the veneer sheets slightly oversize (cut the substrates oversize, too). Cut to their finished sizes after the veneers are glued to their substrates.


2

STEP 2: I use my jointer and a jig to joint the edges of the veneer sheets.


3

STEP 3: Lay the veneer sheets face up, pull the book-matched edges together and temporarily join the sheets with masking tape.

STEP 4: Flip the joined sheets over and apply a piece of gummed backed veneer tape down the joint. Lay a scrap flat panel over the taped sheet so it dries flat. Remove the masking tape.

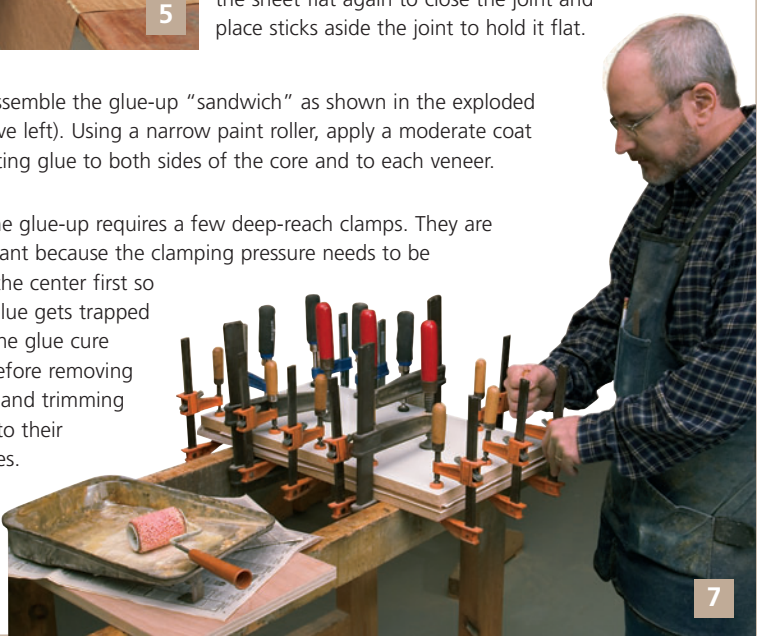

4


5

STEP 5: Lay the sheet with the tape side down over the edge of your table. Open and glue the joint. Lay the sheet flat again to close the joint and place sticks aside the joint to hold it flat.

STEP 6: Assemble the glue-up "sandwich" as shown in the exploded photo (above left). Using a narrow paint roller, apply a moderate coat of slow-setting glue to both sides of the core and to each veneer.

STEP 7: The glue-up requires a few deep-reach clamps. They are very important because the clamping pressure needs to be applied to the center first so no excess glue gets trapped there. Let the glue cure 24 hours before removing the clamps and trimming the panels to their finished sizes.


7

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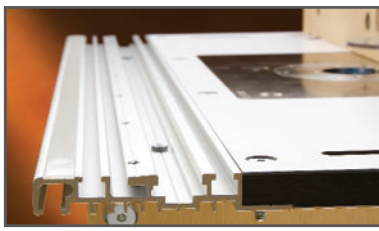

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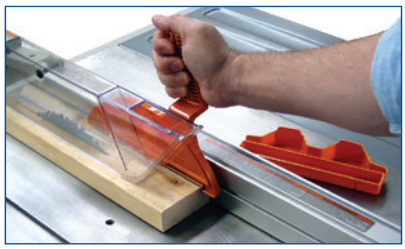

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Scraper Sharpening Basics

POLISHED-SMOOTH SURFACES ARE ONLY A CARD SCRAPER AWAY, BUT YOU HAVE TO SHARPEN IT PROPERLY FIRST. FOLLOW THIS PROVEN TECHNIQUE.

By Silas Kopf

When I got my first job in the woodworking world, I was handed a flat rectangle of steel and shown how to use it to shave off very fine ribbons of wood. The demonstration produced a clean surface ready for finish. It was so simple that it appeared almost magical. No adjustments like a plane. Just grab ahold and push the tool across the board. My initial experience with the scraper went well, until the edge got dull enough that it was no longer cutting neatly. I returned to the boss and asked how to get the thing sharp again. The accompanying lesson

looked like nothing was happening, but again the steel produced those fine shavings. At least until I tried to duplicate the sharpening.

The problem with sharpening the scraper is similar to the problem with sharpening so many woodworking tools. Things happen at the microscopic level, and you just can't see what is going on. You need an understanding of what is supposed to be happening to the edge of the tool. And a lot of it is the touch that is applied. I made many attempts to get a scraper sharp before I was able to try it and have it work like it did when the boss had done it. But finally, with success comes the revelation, "So, that's how you do it." The scraper has four corners, and these can all be made sharp. Therefore, it makes sense to do all four edges while you've got your files, stones and burnishers out on the workbench. The key to getting the scraper sharp is to get the edges filed perpendicular to the face.

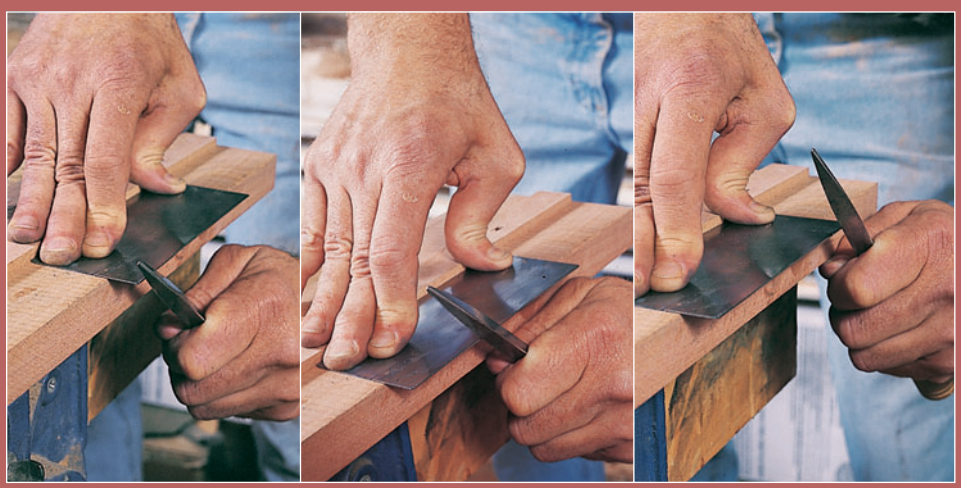
I demonstrate how to accomplish this task in the *photo* sequence shown below. First, use the mill file and stone to get your scraper clean, with all edges perpendicular. Once you're satisfied you've accomplished that, reach for a burnisher. Don't be afraid to use

START BY GETTING YOUR SCRAPER SQUARE

Clamp the scraper in a vise with an inch and a half of steel sticking out. Use a fine mill file to file the edge smooth. It's crucial to hold the file very close to perpendicular to get all the edges sharp. Place your fingers on the scraper blade's sides to help keep the angle steady (left). Next, take a stone and polish the face of the blade, as shown (center). This will remove any burr left from the filing. Now rub the stone on the filed edge of the blade (right), again making sure it's perpendicular to the face. This will clean up the file marks and leave the edge smooth.

Finish by creating your scraper's hook

Lay the scraper on a flat surface and hold your burnisher at a slight angle (about 5°) as you strop across the face of the scraper as shown in the photos above. Next, pull the burnisher along the edge to curl the steel back at an angle to the face of the blade (see photo sequence below). Tilt the burnisher about 85 degrees and hold it at an angle away from you. Start with the end of the burnisher touching the end of the scraper edge farthest from you. With a continuous motion, pull the burnisher toward you, drawing it up to its end as you finish the stroke. What you are attempting to do is curl the edge over. It becomes the cutting edge of the scraper. Repeat for the other three edges.



a fair amount of force and strop the burnisher back and forth (at about a 5° angle) on the flat side of the scraper about 15 or 20 times. What you're attempting to do is push that edge out from the flat plane. This step should make clear the importance of preparing the four edges so they are perpendicular: you will not be able to force an edge out of an obtuse angle. In the final set of passes you'll angle your burnisher to about 85° and, even though you can't see it happening, curl the edge over to create the scraper's cutting edge. After you've done one edge, flip the steel over; give all four edges the same treatment.

I use a burnisher with a triangular profile, and I personally like the way it feels. Other woodworkers I know get good results from a round profile. The key is that the tool needs to be made from a very hard steel to successfully push the scraper edge. It's also important for the burnisher to be smooth without any nicks or dings that would potentially catch on the scraper.

Using a Scraper

To use the scraper, hold the tool in your hands with your thumbs in the middle of the back. Bend the steel slightly so that only part of the scraper is in contact with the wood. Push forward, and you should see fine shavings coming off the tool. As parts of the edge get dull, you can shift your thumbs to the right or left to get more of the tool's sharp edge into play.

A scraper can also be used on shaped parts. It can be pulled or pushed. It can be used to clean up interior corners. And after you have mastered sharpening the straight scraper, try the same basic technique on a swan's neck scraper. Once you've got that sharpening technique down, a curved scraper will give you the added benefit of cleaning up nearly any non-flat surface that comes along.

What a simple tool a scraper is! You'll be impressed with the glass-smooth surfaces it leaves, and you'll probably find the process of peeling those shavings away to be quite enjoyable. Learn how to sharpen it properly, and you'll be well on your way to mastering this classic tool.

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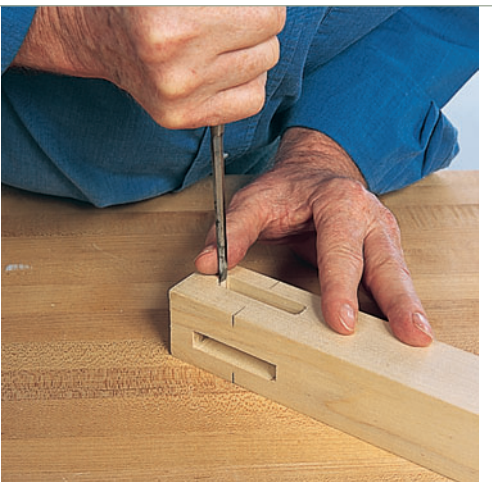
Machine Cutting Mortises and Tenons

NO ROOM IN YOUR SHOP OR BUDGET FOR DEDICATED MORTISE AND TENON MACHINERY? ALL YOU NEED IS A TABLE SAW, A PLUNGE ROUTER AND THE AUTHOR'S TWO SAFE, SIMPLE AND ECONOMICAL JIGS.

By Ian Kirby

Cutting a mortise and tenon joint using hand tools is straightforward. The required tools are few and the method allows only minor variations. Using machines to cut the joint opens the door to a wide variety of inventive and personalized methods. Inevitably the methods you choose will revolve around the machines you have available and the jigs you design and build. In industry you would use a CNC router or a double-ended tenoner and a mortising machine. "Form may follow function," but it's joined at the hip to economy. Since most small shops are equipped with a table saw and a plunge router, that's the economic base I started from to make the joint described here. I chose these particular jigs because they are safe to use, easy to build and are constructed of widely available and inexpensive materials.

Forming mortise and tenon joints with machines is both easier and more complicated than making them by hand. Master woodworker Ian Kirby walks you through his process.



The author prefers to square up the mortise ends to match the tenon. To do this, knife a line across the joint at each end (left), then set a chisel that's the width of the mortise in the knife line and pare vertically down (right).

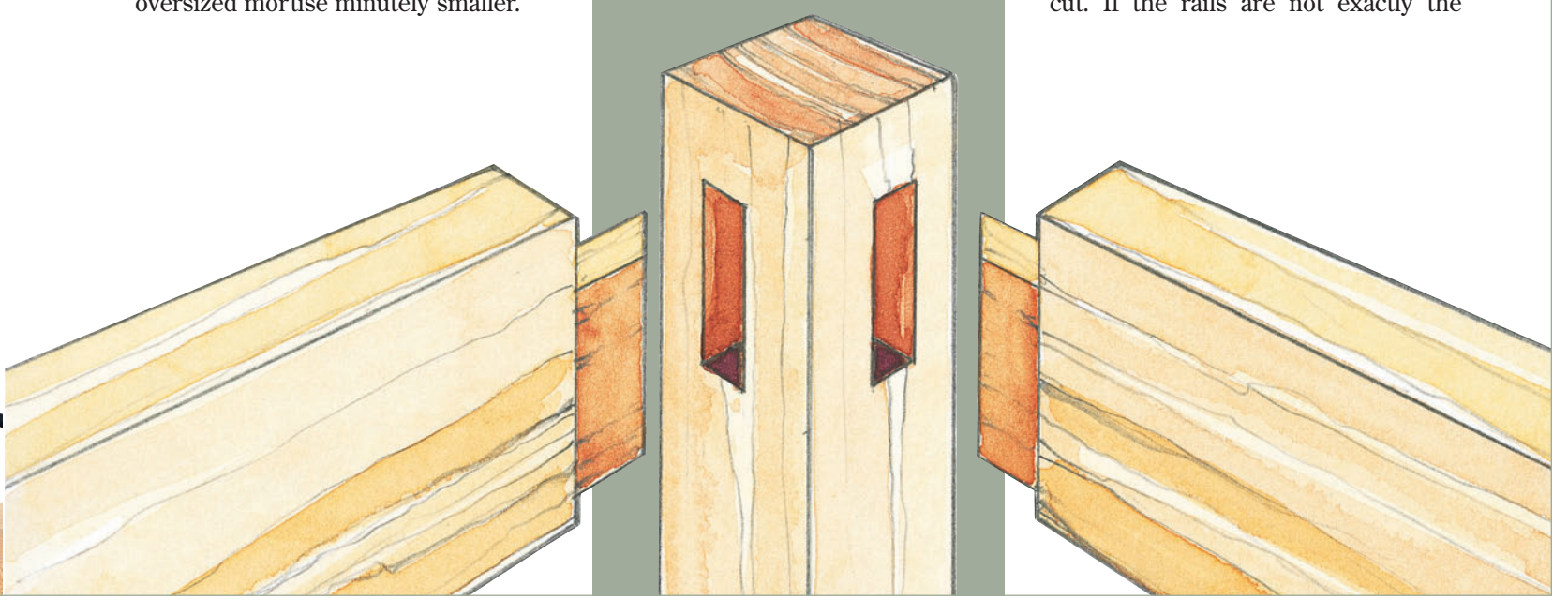
Similarities of Hand- and Machine-made

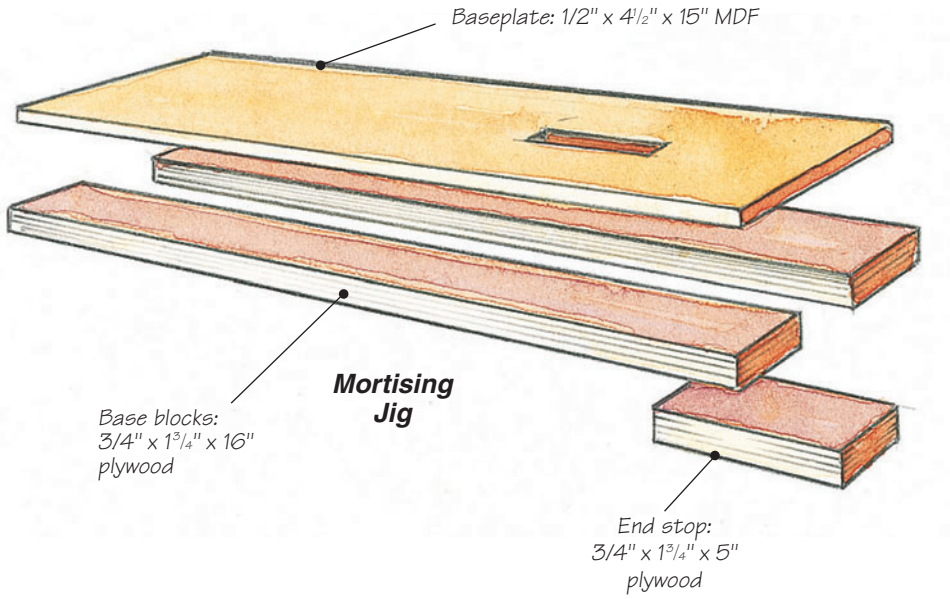
Regardless of how simple or sophisticated the equipment you use, the design of the joint, its dimensions, and the placement of its parts are the same for machine and hand methods. Also the same are the need for geometric accuracy, the alignment of tenon to rail and the alignment of mortise to stile. Since we're not using dedicated industrial machines, it's best to make the mortise first and fit the tenon to it as you would using hand tools. Most find that it's easier to adjust the size of a too-large tenon in small increments than it is to make an oversized mortise minutely smaller.

"Form may follow function" but it's joined at the hip to economy. Since most small shops are equipped with a table saw and a plunge router, that's the economic base I started from to make the joint described here.

Essential Requirements for Machine-made Joints

Successful machine-made joints require that similar parts be milled and prepared to exactly the same dimension and geometric accuracy. This is because the jig is made to accept only a workpiece with specific dimensions. Even if no jig is involved, all repetitive machine techniques require this exactitude. Assume for the purposes of this article that you are making a square table using four top rails tenoned into four legs. To cut the shoulders of the tenons, you put the end of the rail against a stop to position the rail ready for the shoulder cut. If the rails are not exactly the





same length, the distance between shoulders will differ and the table frame will not be square. In other words, accuracy of machining begins at the "Preparation of Stock" stage.

You need to know which side or edge of each furniture part is the inside and the outside and the upside and the downside. The simplest and best way to maintain order is to mark the face side and the face edge on each piece. Through this process you will get the best-looking faces on the outside and you will get the joints in the correct face. Machine-made joinery requires that you make a spare part for every run of necessary parts: in this case, a total of five rails and five legs, (or 41 rails and 41 legs, if you were making 10 tables). You use the spare part as much or as little as required to make the four necessary parts. Mark out the joint on the spare part and use it to check machine setups and cuts. No marks are required on the necessary parts, save for the face side and face edge marks that tell you how to place the workpiece correctly in the jig.

Exactitude with Screws

Router jigs can be no more accurate than their component parts. MDF and plywood are stable and easy to cut and join with screws, though only plywood can be screwed on edge. Screw joinery is best done in two separate drilling operations, one operation for each part.

Using a combination bit, drill clearance holes and countersinks in the baseplate. To ensure a flat mating surface, make small countersinks on the back side to remove the bulge or ragout typical of through holes. Clamp the baseplate to the base blocks. Where necessary, tap the parts into exact position with a hammer. Tighten the clamps. Drill a pilot hole for the screw threads in the base blocks. Drive the screws home and remove the clamps.

Drilling Out the Waste

A table saw makes sawdust, a planer makes chips, but a router cutter turns at such a high speed that it produces extremely fine particles that remain suspended in the air for hours. Apart from adding to the general uncleanliness of your shop, such particles are unkind to eyes, nose and lungs. An industrial CNC router is engineered to vacuum up the huge volume of fine dust it makes. Few small shops are equipped, however, to effectively collect the dust from a plunge router. My solution when mortising is to remove the bulk of the waste with a drill press, leaving the router to trim accurately to the line. Use a bit that's slightly narrower than the finished width of the mortise. If you don't have a drill press, a portable drill will work.

Set the first cut on the baseplate of your jig by aligning the outside of the saw blade with the aperture guideline.

Raise the saw blade through the baseplate (securely fastened by a hold-down clamped to the fence). The center line across the width of the aperture is aligned with the vertical line on the fence.

Remove the waste at each end of the aperture by vertical paring with a bench chisel. Now check for square.

Here are the finished baseplate and two guide blocks, separated by the mortise workpiece.

Clamp the workpiece to the bench and use a smaller bit than with a drill press to compensate for the loss of accuracy inherent in a hand-held tool.

Do You Square the Mortise or Round the Tenon?

The table saw leaves a square edge on the tenon and the router leaves a round end on the mortise. The accuracy of these two faces determines the vertical alignment of the rail to the leg. A gap would allow the rail to float up and down during assembly and possibly be glued in the wrong place.

I prefer to square the ends of the mortise because it's easier to mate two flat surfaces than two radiused ones. Square the mortise ends after the tenons are made so you can use one as a guide. Knife a line at each end across the joint to locate the chisel in the correct paring position. Pare with a bench chisel that's the width of the mortise or as near as you can get.

If you prefer to round the tenon, here are some tips to increase accuracy. If you use a 1/4" router bit, the tenon needs a 1/8" radius on each corner. Begin by finger-gauging a pencil line down the center of the tenon edge. This mark must remain as you radius the edges — it's your proof that you haven't inadvertently reduced the width of the tenon. A 6" flat mill file with a safe edge is the best tool for the job. The safe edge is smooth so you won't damage the tenon shoulder. The technique used by machinists to make a radiused edge may seem counter-intuitive at first, but it gives the best results. Hold the work in a vise. The stroke follows the path of a stunt pilot pulling his plane out of a dive.

Mortising Bits and Jigs

Simply stated, there are three tasks to accomplish.

- You have to choose the right bit for the job.

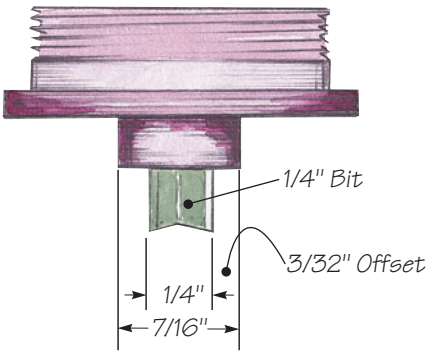
(Above) Drill setup for the first mortise. (Right) Drilling the adjacent mortise.

With the baseplate opening milled, attach the first base block and then add the second, using the leg as a spacer.

Continue using the leg as a guide to position the end stop, screw it in place and then set your router bit to the correct plunge depth.

A finely-cut mortise — the first result of careful jig assembly and machine technique.

Rub Collar



- You have to start and stop the router in the right place.
- You have to steer the right line between start and stop.

Choose a bit that is long enough to reach the bottom of the mortise. Either a spiral or straight bit is fine. If you use a bit with a diameter smaller than the finished width of the mortise, you will cut one face at a time (provided you drilled out the waste as recommended) and you can make practically any width of mortise using the same bit. The jig controls this dimension, not the bit size.

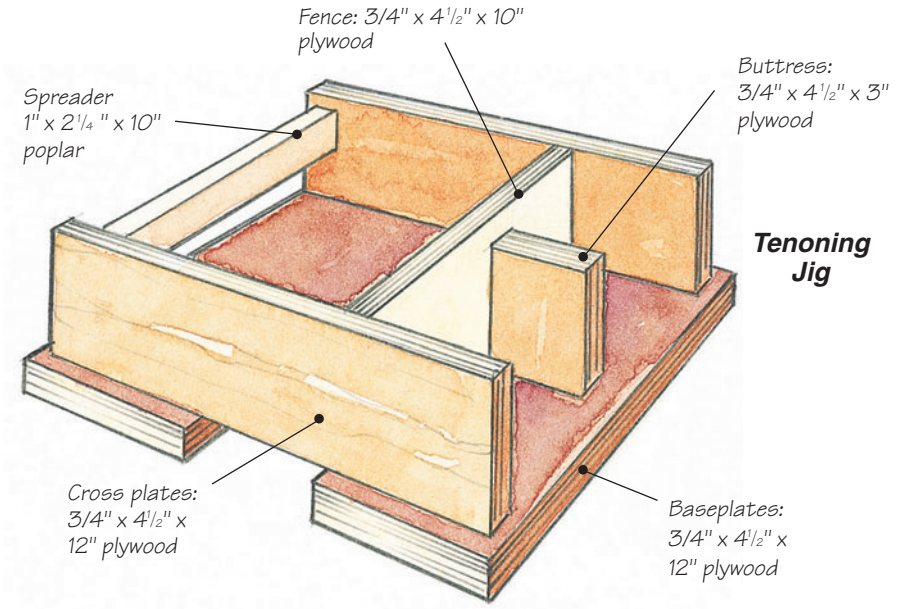
The jig must hold the work squarely and firmly. It must also be robust to withstand the bumping and pressure it gets from the router as it travels within the confines of its stop and start positions.

Designing and Building the Mortise Jig

Of the jigs I consider accurate and safe, the one shown on the facing page is among the best and it meets all the conditions just described. A minor downside is that it requires a guide collar, which you may not own. The upside is that a set of collars is not expensive and once added to your shop inventory, they will also add speed and accuracy to a range of woodworking operations.

Mortise Jig Components

The jig comprises a thin MDF baseplate with a hole cut out of it so you can plunge the mortise in the right place, two plywood base blocks and



one end stop.

The 1/2" MDF for the baseplate is plenty tough for the job, and its light color makes the layout lines easily visible. Since the flange on the guide collar is only 3/16" long, 1/4" Masonite would have done the job just as well. Plus, it would have given me an extra 1/4" of plunge depth had I needed it. The width of the baseplate is about 4" wide, just a bit wider than the router base to ensure that it sits and moves with stability.

Sizing and Marking the Aperture

The dimensions of the aperture are the dimensions of the mortise plus the "offset." The offset is the distance from the cutting circle of the bit to the outer edge of the flange of the guide collar (see *illustration*, previous page). In this case, the offset is 3/32", so the aperture is bigger on all four sides of the mortise by 3/32" of an inch.

Mark out the baseplate using a sharp pencil, and project the lines all the way round the boards — ends, edges and flip side. Begin with two center lines and mark the width and length of the aperture from them.

Cutting the Aperture

Cut the aperture with a table saw. The operation involves clamping the baseplate and raising the blade through it. The operation is normal and safe, provided you avoid shortcuts or any "hot dog" procedures.

With the blade set below the top of the table saw, begin by marking the table and the fence with a line that is the point where the blade first touches the baseplate as it rises. Next set the fence for the first cut: the line around the baseplate helps determine this setting. Hold the baseplate firmly centered over the blade by clamping a stout board to the fence. Switch on the table saw and raise the blade until it breaks the surface and cuts to the end lines. Chances are that your saw rises on an arc and the blade will reach one end before the other. Switch off the power, lower the blade, and move the baseplate forward or backward as required to finish the cut. Once both sides of the aperture are cut, remove the waste and square the ends with a sharp chisel. MDF cuts easily.

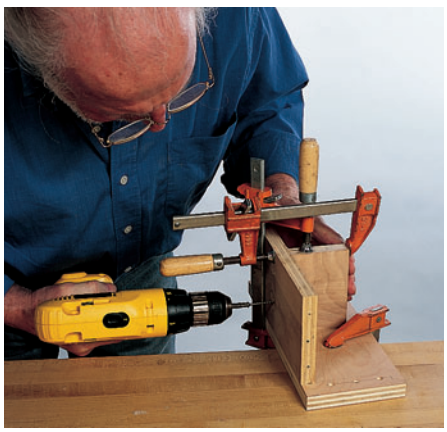
Base Blocks and End Stop

The base blocks should be long enough to hold the leg securely between them. Drill and countersink holes in the baseplate for the first block, then clamp it in place. Check that it's the right distance from the aperture and dead parallel with it. If necessary, tap it gently in place with a hammer. Drill pilot holes and fasten with screws.

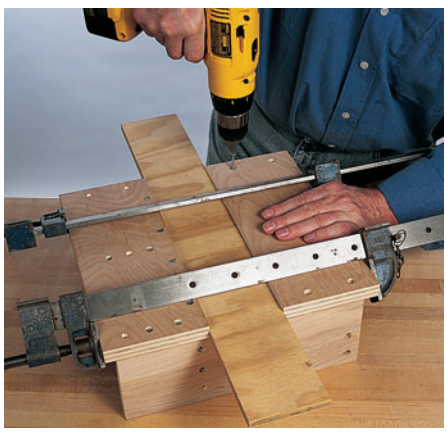
Attach the second base block to the baseplate, using the leg as a spacer. It should be a tight push-fit.

To determine the location of the end stop, center the baseplate over the marked out mortise on the spare part.

STEP 1 (not shown): Join the fence to the first baseplate. Overhang the baseplate by about 1/16" to ensure the baseplate doesn't interfere with the correct placement of the workpiece.
STEP 2 (above): Saw the back edge of the first baseplate parallel to the fence.



STEP 3: Attach the buttress to the middle of the fence baseplate assembly. Clamp it both ways — length and width — and to the bench.
STEPS 4 AND 5 (not shown): Clamp and screw the first and second cross plate. Use two clamps, length and width.



STEP 6: Clamp and screw the second baseplate and the spreader. Use a parallel scrap as a spacer for accuracy and an alignment aid.

Use the aperture and center line marks as guides. Clamp and screw the parts together.

Drilling Out the Waste

Use a drill bit that's about 1/16" smaller in diameter than the finished width of the tenon. Set up the drill press with a back fence that positions the bit in the center of the tenon on the marked-out spare leg. Next, position the leg as if to drill a hole at the bottom edge of the tenon and clamp an end stop against the top end of the leg. Move the leg as if to drill a hole at the top edge of the tenon. Now make a block that fits the gap between the stop block and leg's bottom edge. Set the drill bit depth and drill out the waste on one side of all five legs.

Cutting the Mortises

First, clamp the spare leg to the jig, then clamp the leg in the vise. Everything is now solidly held — the goal of every machine jig setup. With the bit set at the correct depth and the router at full plunge, you can cut the mortise easily because there is so little material to remove. Check the mortise for accuracy, then repeat the cut on the four necessary legs.

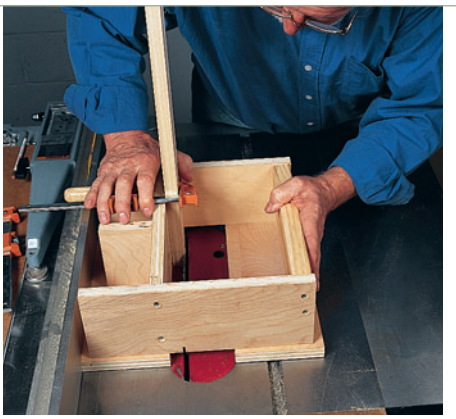
The stop block must be reversed to drill out the second mortise on the adjacent side.

Making a Tenon

A table saw, equipped with a properly designed and made jig, provides a safe and effective way to cut tenons. The jig, guided by the fence, holds the workpiece vertical while it is passed over the blade. Adjusting the fence allows the cut to be made at any point while adjusting the blade height determines tenon length. Use the miter fence to cut the shoulders.

Tenon Jig Components

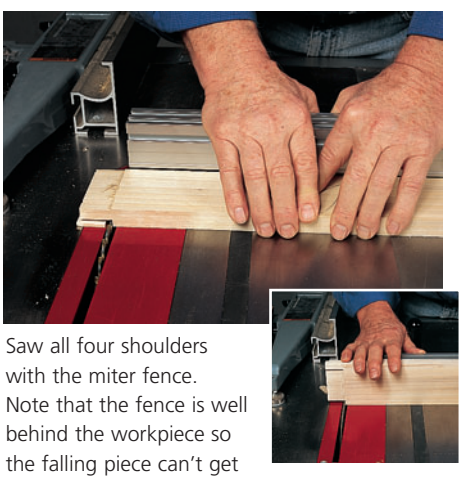
The jig comprises seven pieces. Six are 3/4" plywood, one is poplar, although ply could be used here, as well.



Set the blade to height and begin by cutting the inside tenon face on the spare rail.

Position the jig for the second face cut, using the spare rail. Make a test cut and check with a vernier caliper to confirm tenon thickness is correct.

Saw the tenon width and saw the cosmetic shoulder using the same blade height.



Saw all four shoulders with the miter fence. Note that the fence is well behind the workpiece so the falling piece can't get trapped between the blade and the fence.

All jig parts are cut square and held together with screws. MDF is unsuitable for this jig since its edges, unlike plywood edges, won't hold screws well.

Sawing the Tenon Faces

Mark out the tenon on the spare rail. Clamp the rail into the jig, making sure the rail is firmly seated in the jig and that the clamp head is firmly seated against the rail. Set the blade to height for cutting the tenon length. Adjust the table saw fence to cut the inside face of the tenon. Make the cut, then repeat it on the remaining four rails.

The second cut is critical because it determines the thickness of the tenon. Position the jig, make a test cut on the spare rail, and check with a vernier caliper. Make the full cut, then remove a part of the waste with a handsaw to expose enough tenon to be offered up to the mortise for a test fit. Repeat the full cut on the remaining rails.

Using the same blade height, test procedures and sequence of cuts, saw the tenons to width.

Sawing the Shoulders

The simplest way to saw the shoulders is with the miter fence. Use the saw fence to position the spare rail. The falling piece must not get trapped between the blade and the fence as it is cut off because it tends to take wing. To avoid this, slide the fence back out of the way, as you can with a Delta Unifence or Sawguide. If your fence won't slide, set it about a foot from the blade and use a spacer block to set the shoulder out the correct distance. With the shoulders cut the last step is to use your chop saw to miter the ends of the tenons.

Mortise and tenon joints offer excellent strength, and you'll surely turn to them repeatedly for your projects. With a couple accurate jigs, you can be assured of milling sound joints that will stand up to the test of time.

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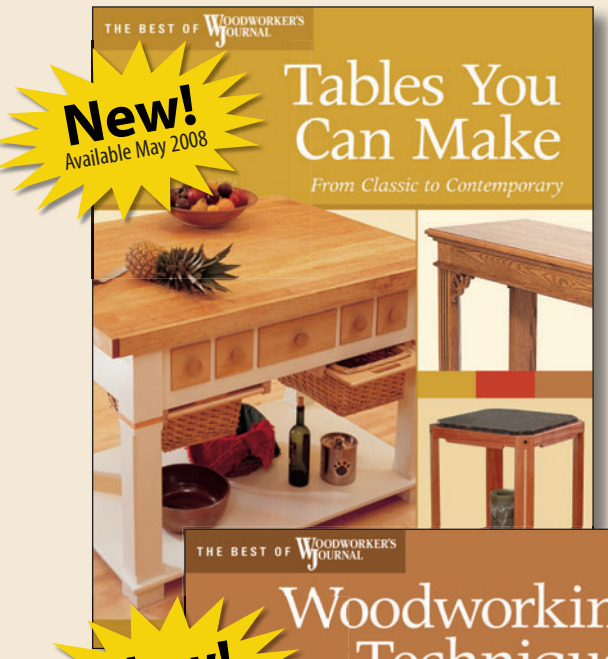

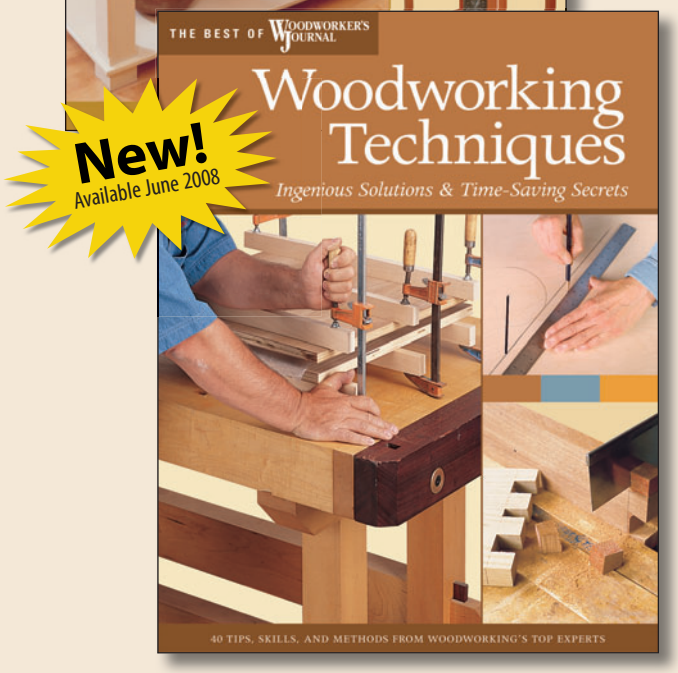

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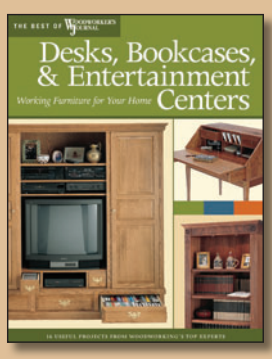

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Secrets for Popping the Grain

Showcase that figured stock to its full glory with our author's proven finishing tricks.

By Michael Dresdner

If you're like me, you'll choose the most stunning lumber you can find (and afford) for your projects, as much to display the wood as to show off your skills with it. When the time comes, you want to be sure the finish you apply helps showcase the wood's character, making the figure and grain even more pronounced.

Not all finishing techniques and materials are best for all situations. Here are some recommendations for your consideration.

Clear Coatings

Clear coatings can add richness and depth to wood, but some clear materials intensify figure much more than others. The key difference has to do with molecular weight. Low molecular weight liquids (made up of smaller molecules) penetrate more deeply into the wood, whereas high molecular weight molecules may sit on top of the wood. The better the penetration or "wetting," the more depth and shimmer they add.

Oils, Danish oil, and dewaxed shellac are low molecular weight liquids, and all three do a nice job of bringing out figure. I use boiled linseed oil or Watco® Natural, both of which not only wet nicely, but also add just a touch of amber color, which further delineates figure in light-colored wood. In the *photo* (above, right), quilted maple, plain walnut and curly koa were all treated with boiled linseed oil. As you can see, the oil made a significant difference in the depth and intensity in both flat grain and curly figured woods. Here's how I do it: Flood boiled linseed oil or Watco® onto the wood liberally. Make sure it stays wet for 10 or 15 minutes. If any areas of the wood absorb all the oil during that time, add more. After fifteen minutes, wipe off all the oil you can, then let it dry for two days before continuing with the next coats of finish. The process for shellac is much faster. Flood the shellac on liberally, then wipe it off immediately. Wait only two hours before finishing.

When freshly sanded, purpleheart has a grayish cast, but exposure to the air will bring back its dark color in a few days.

Top: Quilted maple. Lower left: plain walnut. Lower right: curly koa. The left side of each wood sample was sealed with waterbased polyurethane; the right side was treated with boiled linseed oil.

From left to right: walnut, maple, rosewood. Dyes mimic the sun's aging to bring golden highlights to walnut and rosewood and add subtle grain enhancement to figured maple.

Dyes

Color can also enhance the grain, both by adding bright highlights and by intensifying grain patterns. For each of the samples in the bottom right *photo*, facing page, I used dye to add character, but with a slightly different technique on each.

On the left, I took a rather plain piece of walnut, which sported an unfortunate grayish cast, and livened it up by flooding on and wiping off a fairly dilute yellow-orange dye. The result is the mellow warmth that sun aging eventually imparts to walnut. In the center, I used a weak, reddish-brown dye to bring out the curl in figured maple. After flooding the dye on and wiping it off, I waited until the wood dried, then sanded it well with 180-grit paper. Sanding removed the dye from all but the end grain that forms the curl figure, and it made the wood's pattern stand out without substantially altering the overall color.

The third sample is a bit different and more complicated. Over time, sunlight changes Indian rosewood from a dark purple to a much lighter blaze of golds, reds and dark contrasting grain lines. To mimic that effect, I first bleached the wood using two-part wood bleach. This process removes background color, but it leaves the dark lines intact. After the bleach dried, an amber dye brought out the bright highlights and deeper contrast.

Dry Brushing

Dry brushing, sometimes called "dirty brushing," is one of those rarely used coloring techniques that gives the finisher tremendous control of stain. Unlike the conventional staining process, which floods color all over the wood, dry brushing allows you to place color only where you want it, even in impossibly small areas such as a single wood pore.

In the *photo* at right, I am dry brushing an otherwise monochromatic piece of ash to add subtle definition only to the grain. Dry brushing works particularly well on woods with large pores, including mahogany, ash and oak, but will also add character to cherry, poplar and a host of other small-pore woods.

Start by mixing burnt umber or raw umber Japan color with a small amount of mineral spirits or naphtha to make a thick liquid, about the consistency of heavy cream. Place a dollop of stain on a piece of cardboard, and "load" only the tips of a China bristle brush by rubbing them gently through the stain on the cardboard until it is just shy of dry. You'll have a small amount of almost-dry stain clinging to the ends of your brush's bristles. If the brush is too wet, it will leave unsightly dark streaks on the wood, so practice this technique first on scrap.

With smooth, gentle passes, stroke the bristle tips over the wood. As each tiny bristle catches on a grain line, it will deposit a small spot of color, enhancing the grain without changing the overall color significantly. To make it a bit easier, sand the wood, then flood it with hot water to raise the grain. Don't sand after the wood dries so the slightly rough raised grain will pick up the color.

The small amount of almost-dry pigment clinging to the tips of my brush brings out the grain of this rather plain ash.

Oxidation

Purpleheart is a tree with deep purple heartwood; however, it has a curious quirk. When you machine or sand it, the wood loses its deep color and instead turns a drab grayish purple. In the lead photo, you can see the color difference in the small section I sanded.

Normally, we try to sand or machine as close to the time we apply finish as possible, since long exposure to air prior to coating causes adhesion problems; however, with purpleheart we make an exception. Exposure to oxygen in the air will restore the color of purpleheart in just a day or two, so wait until the color returns before you apply the finish. Don't expose it to sunlight, as that will cause the purple to fade.

When it's time to finish, choose a clear coating, but not amber or your piece will turn amber over time. Any yellow tint will turn purpleheart brown. Both blonde shellac and waterbased coatings are good choices, as neither will yellow over time.

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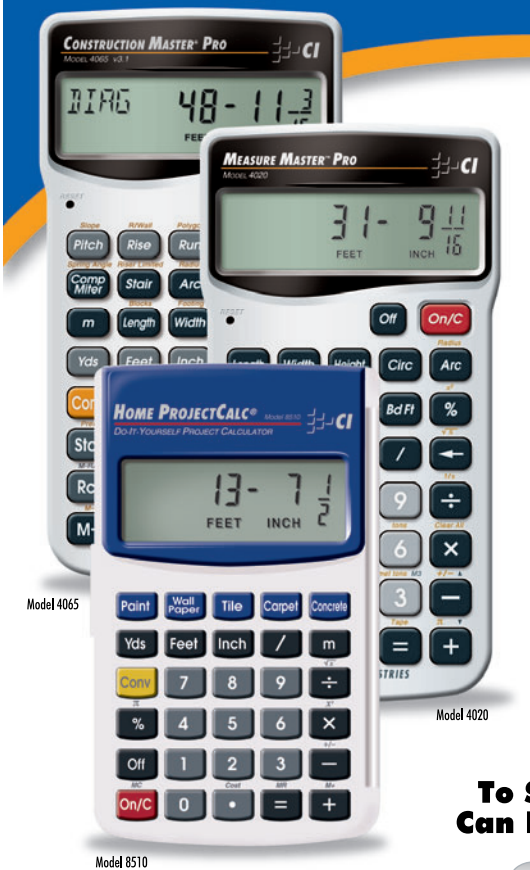

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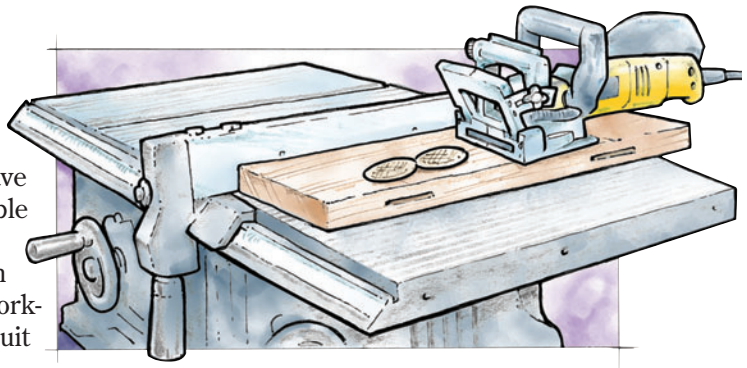
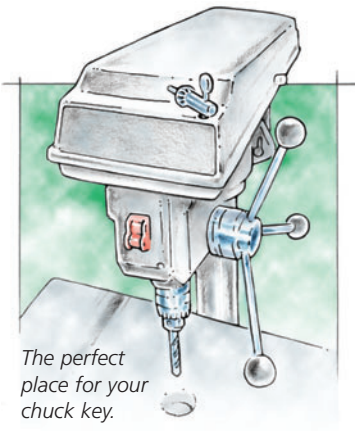
More Biscuits with that Rip Fence?



If your workbench doesn't have bench dogs, a table saw makes a great workstation for supporting workpieces when biscuit joining. The top provides a flat surface for the joiner base. Use the locked rip fence as a backboard behind the workpiece. It's sturdy and always at the ready!

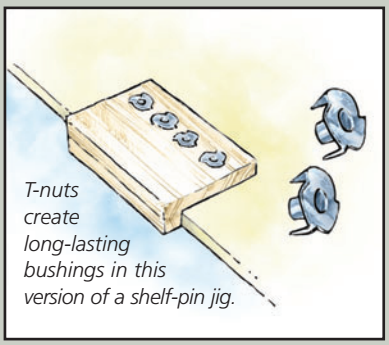
Simple Chuck Key Storage



The perfect place for your chuck key.

The most convenient place to store your drill press chuck key may be right in front of your nose. Just drill a hole through the top of your drill press pulley case cover near the front for storing the key. Make the hole the same size as the key's crossbar so it fits securely. Be sure to locate the hole with the key clear of the spinning pulleys. Then, get in the habit of returning the chuck key to its storage hole as soon as you're finished using it. You'll never misplace it again.

T-nut Shelf-Pin Jig

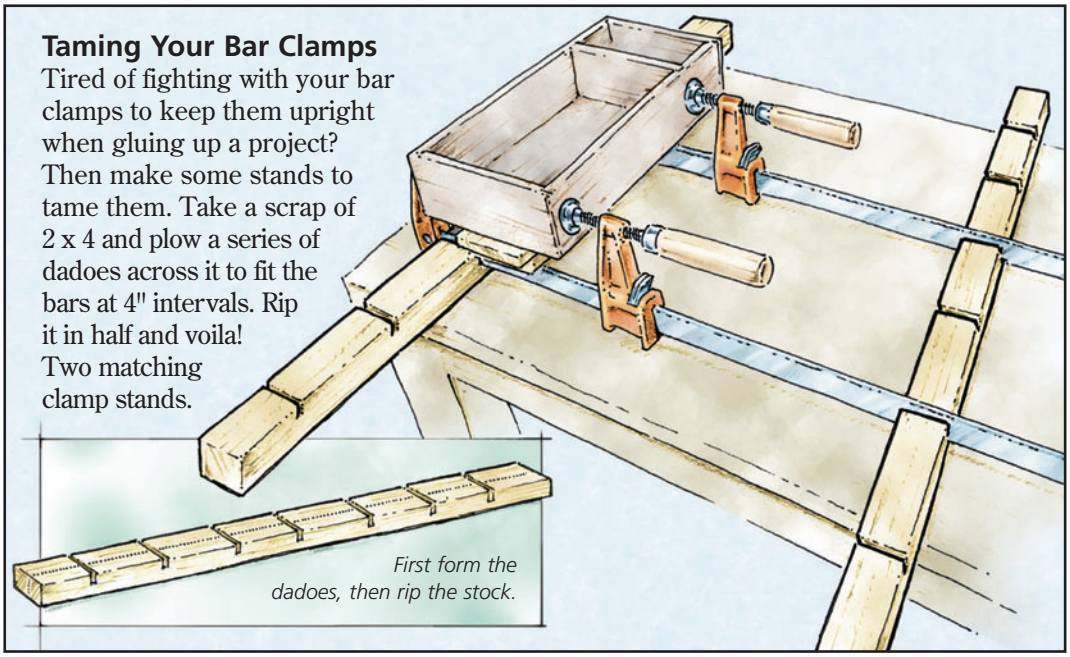


T-nuts create long-lasting bushings in this version of a shelf-pin jig.

Drilling evenly spaced shelf-pin holes in your cabinet projects is much easier with a shelf-pin jig. Make one from a couple of pieces of scrap: a large piece that forms the actual drilling jig and a second strip screwed underneath to serve as an edge guide. Insert 5/16" T-nuts into holes drilled in the jig to act like bushings for guiding the drill bit. Just pound them in and drill out the inner threads with a 1/4" twist bit. If you ever need to change the hole spacing, just tap out the bushings and insert them into new holes.

Taming Your Bar Clamps

Tired of fighting with your bar clamps to keep them upright when gluing up a project? Then make some stands to tame them. Take a scrap of 2 x 4 and plow a series of dadoes across it to fit the bars at 4" intervals. Rip it in half and voila! Two matching clamp stands.



First form the dadoes, then rip the stock.

Laundry Room Blade Cleaner

Laundry detergent is an effective alternative to pricey blade cleaners. Mix detergent with water in a shallow pan and soak the blade in it for a half hour. Scrub off the gunk, rinse and dry the blade. Be sure to coat it with a rust-inhibiting spray.

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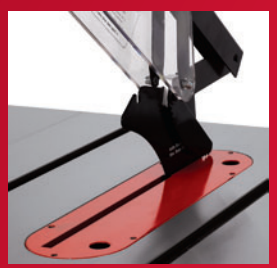

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If you've ever wondered what a tablesaw can really do, look no further. Introducing the new JET® 10" DELUXE XACTA® SAW. The quick release riving knife and integrated arbor lock keeps the operator safe and more efficient. The DELUXE XACTA® SAW offers an upgraded Poly-V belt drive system for smooth operation and optimal power transfer, a fully shrouded blade for highly efficient dust collection. The 26"x30" wings and deeper table gives you even more cast iron to work on. A built-in 12.5"x18"x4" storage drawer sealed from the cabinet keeps your necessities within arms reach, also includes an on-board fence and miter gauge storage. Go to jettools.com and your quality Jet dealer today and you'll find out why Jet products truly are Built Better to Build Better™

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