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APRIL 1995 #44

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AMERICAN WOODWORKER

Issue No. 44 April 1995

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DEPARTMENTS

FEATURES

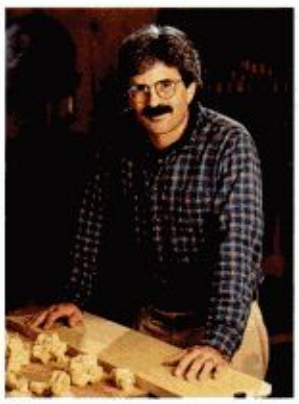
On the cover: *Welcome to our table. Designed by the AW staff, this new router table has features you won't find on any other.*

COVER PHOTO BY JOHN HAMEL

A RODALE PRESS PUBLICATION

A WORD FROM THE EDITOR

STRIKING A BALANCE



Routers have revolutionized woodworking over the past forty years. They have helped bring professional furniture-making capabilities to millions of people at an affordable cost. In the bargain, routers have spawned an industry devoted to improvements and accessories that make woodworking even more safe, convenient and accurate.

One of the most useful of these accessories is the router table, which turns the portable router into a precision stationary machine. When combined with today's sophisticated bits and cutters, the router table begins to assume the functions of a small shaper, further expanding the capacity of this remarkable tool.

Our latest version of the "ultimate" router table, which we showcase on page 30 of this issue, takes things even further. We made it a point to include all the features we couldn't find in any other single router table—storage, dust collection, noise abatement, portability, remote switching, and a handwheel-controlled bit raising mechanism—to make this the finest, most flexible router table we've seen. Many thanks to the AW staff—especially Fred Matlack and assistant editor Andy Rae—for their efforts in designing and building the table.

Now that the router table is a reality though, I can't help thinking how the router and other power tools can never entirely take the place of hand tools and manual skills, at least for me. While I'm a firm believer that power tools are essential for efficiency in the shop, I've always been a little bit bored by the mechanical precision of operations that I've jigged up to the point of mindlessness. Sure, you get predictable results, but there's something missing.

The missing ingredient is the human touch—that subtle, almost intangible ingredient that distinguishes the finest workmanship. I crave those slight surface imperfections that tell me a hand plane has been there. I look for those little chiseled corners where a router bit couldn't possibly have been. I delight in chamfers that taper gracefully, with a life and spirit you can't get from a carbide cutter. When I'm building something myself, I need to be more personally involved with the process—to use my eyes and hands to create my own vision of beauty—to add the nuances that make the piece distinctly mine.

Even in my professional woodworking business, where time is money, I do as much hand work as possible where it really makes a difference. For instance, I've found that hand-planing a board doesn't take a whole lot longer than stroke-sanding it, but the differences in clarity and character are profound. I believe that once you get beyond the mere mechanics of constructing something, you're just beginning to enter the realm of personal expression. For me, this is where the real joy of woodworking begins.

Ellis Walentine
Executive editor

PLAY IT SAFE

Woodworking can be dangerous. Safety equipment such as guards, hold-downs, goggles, dust masks and hearing protection can greatly reduce your risk of injury. But even the best guard won't make up for poor judgment. Use common sense and caution in the workshop. If a procedure feels dangerous, don't try it, no matter how many other folks work that way. Figure out an alternative that feels safe. Your safety is your responsibility.

AMERICAN WOODWORKER

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LETTERS

AMERICAN WOODWORKER Online

I just heard the news about AMERICAN WOODWORKER becoming available through America Online. I'm glad you're taking the steps to bring quality woodworking to the electronic world. For more than 30 years I've been a hobbyist woodworker while pursuing a career in computers. The ability to interface with others who share this interest is exciting and should build a strong bond among woodworkers who have access to e-mail. Welcome aboard the e-mail express!

Mike Tussy
Aussiegone@aol.com
Wylie, TX

Words on the Workbench

Frank Perry's workbench (AW #42) is a wonderful piece of craftsmanship. I especially like the inlaid measuring tape and outlet strip, which I'm retrofitting on my own bench. However, there are three aspects of his design which you should consider if you plan to build it.

First, although there is nothing wrong with a "nontraditional" top, careful selection of materials is important. Most building-center-grade plywoods are prone to voids in their inner laminations. One unfortunate hammer blow could create a significant hole instead of merely a ding. Consequently, the top layer of the benchtop should be constructed from void-free plywood (such as Baltic birch) or perhaps MDF with plastic laminate.

I also believe that, over the long run, round dog holes will prove less than satisfactory. Vertical pegs won't stay vertical under pressure. If you're going to put the effort into building a high-quality workbench, the time taken to incorporate conventional (square, angled) dog holes will be well spent. Mr. Perry's design could easily be modified to accommodate a traditional dog-hole system.

Last, either Mr. Perry is left-handed or one of the two photographs accompanying the article is backwards. For a right-handed woodworker, the tail vise should be on the right side of the benchtop.

Al Kozakiewicz
Niskayuna, NY

Frank Perry is indeed a lefty, but the photo on page 33 is also indeed backwards. Good catch!—Eds.

Frank Perry's workbench is a wonderful and thoughtful item. Frank was inspired by the benches in our shop, where he received an intensive half-year of disability vocational training after an injury ended his truck-driving career. Frank added many details and ideas that are lacking in our spartan benches. We are very proud of his progress and skills.

John and Carolyn Grew-Sheridan
Grew-Sheridan Studio
San Francisco, CA

More on Avoiding Blowback

In Issue #42's "Q&A," Tony Viccaro asked about reducing blowback when spraying casework. I like Andy Rae's suggestion to finish the carcase and its back separately, then install the back; but this isn't always possible.

From my experience as a professional finisher, here are a few more tips. First of all, use a booth if it's at all possible. Even a jerry-built version with an explosion-proof fan poked through the wall will help to confine overspray while pulling the finish away from the sprayer.

Second, use a fan behind you. This will encourage the overspray to keep moving away from you. When I'm spraying boxes or carcases, I spray my passes and immediately trigger the gun to blow just air into the box while I position myself to the side so I don't block this air movement.

An HVLP sprayer helps to some extent, but it's a pretty negligible difference when spraying into an enclosed space. Above all—and even with a superior ventilation setup—don't work without a respirator and eye protection. Many of the toxic components used in finishes enter the mucous membranes.

Pat O'Daly
El Verano, CA

Dado Correction

In our Buyer's Guide to carbide stack dado sets (AW #42), the chart specifications for CMT's 108-240X dado set were incorrect. This set has six chipper blades (not four, as listed in the chart), with four (not two) teeth per chipper.

Machine-Made Edges

I'll have to agree with Lonnie Bird in his reply to William Velich ("Letters," AW #42). While the hand plane might have been the tool of choice when attacking a crooked edge in the 19th century (and earlier), in light of contemporary technology, the generally preferred method calls for the jointer. To tout the hand plane as superior simply because one has an expertise with that tool is self-congratulatory and atavistic.

I've used jointers to straighten crooked edges for the past 35 years and I've taught my students to do the same. Jointers are efficient and accurate. Depending on the length of the board, we've used either powerful stationary machines or the lighter-duty portable variety. Lonnie Bird's instruction coincides with my own.

Bernie Maas
Professor of Art
Edinboro Univ. of PA

STAY IN TOUCH! ***If you have comments, corrections or news to share, we want to hear from you.***

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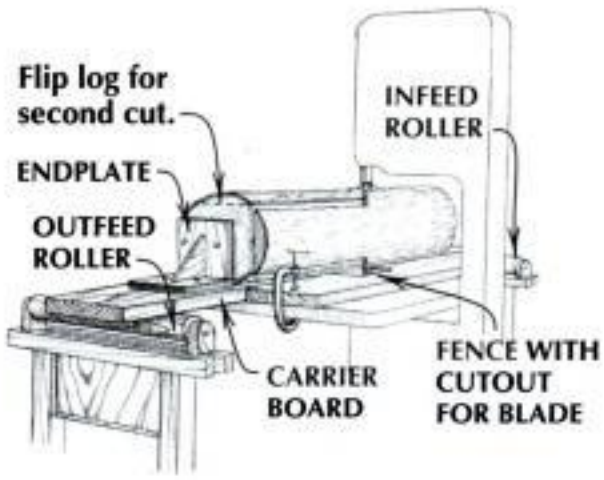
Q&A

Milling Logs on a Bandsaw

Q I have some 10-in.-dia. logs I would like to saw into boards. I'm interested in buying a bandsaw that would do this sort of resawing as well as general-purpose shop work. Any recommendations, short of buying an expensive, heavy-duty resaw-type bandsaw?

Richard Schneiderman
Raleigh, NC

A For this type of resawing and general-purpose work, I recommend a bandsaw with a 2-HP motor and at least a 12-in. height-of-cut capacity (also called resaw capacity). (See AW's 1995 Tool Buyer's Guide for specifications and prices on bandsaws.) Some manufacturers offer attachments to increase height-of-cut capacity, so shop around.



Some advice on milling logs on a bandsaw: Use a 1-in.-wide, 2-tpi blade. Secure the log to a sturdy, straight-edged carrier board like the one shown in the drawing. Fasten end plates to the log and the carrier board as shown in the drawing. The log needs to overhang the carrier board edge by a little more than the desired thickness of the slab you plan to cut. To guide the edge of the carrier board, make a fence with a blade cutout, adjust it for saw-blade drift and clamp it to the table. You'll also need sturdy infeed and outfeed tables to support the carrier board.

Make your first cut, then remount the log with its flat side down (against the carrier board) to make the second cut. With two adjacent flat surfaces, you can remove the log from the carrying board and simply use the fence for conventional resawing.

Jeffry Lohr
J.D. Lohr Woodworking
Schwenksville, PA

Making Radius-Bottom Planes

Q I'd like to make a wooden hand plane with a 30-in.-radius concave bottom—the curve running lengthwise. What's the best method to make this type of plane?

Richard Wise
San Antonio, TX

A Since a radius-bottom plane is used for only one specific purpose, it hangs useless on the wall most of the time. Rather than labor over wall ornaments, I've modified old "clunker" wooden or metal planes for my purposes. (See photo.) I recommend modifying a metal plane since you can easily replace its attached sole with one of a different radius.

To make a curved sole for a metal plane, lay out the radius on a block of maple 1/4 in. wider than the plane bottom and 25 percent longer. (You'll trim this later.) Cut the radius on a well-tuned bandsaw with a sharp blade and then rip the sole from the block, leaving about 3/16 in. of thickness at the narrowest point. Clean up the saw marks with a scraper.

The plane iron will have to slide far enough down the frog to project through the wood sole. On the plane shown in the photo, this required removing the metal webbing directly in front of the iron. To do this, I drilled closely spaced holes in the metal and chipped out what remained with a nail set. I finished up with a coarse file and a hand grinder equipped for sharpening chain saws.

Clamp the sole to the plane, positioning its thinnest section where you will need to cut the throat opening for the plane iron. Trace the plane's outline and throat opening onto the sole, and drill holes for four machine screws: You'll need a pair of screws near the front of the plane, and another pair near the back. Remove the sole and cut it to length. Then tap the holes in the plane and countersink those in the wood sole.

Laying out and cutting the throat opening in the sole is finicky work. The rear of this opening should line up with the rear of the opening in the plane, and it needs to be cut at a 45° angle. I use a combination square to extend my throat layout lines around to the curved side of the sole, taking the 45° slope into account.

Then I chisel out the opening in small increments, repeatedly refitting the sole on the plane to check the slope and size of the opening. Opposite the sloped surface, the front edge of the slot should be vertical. Keep the opening as narrow as possible. The aim is to start out with a minimum clearance in front of the cutting edge—you can enlarge this as necessary once you put your radius-bottom plane to work.

Customized for curves. *Planemaker Cecil Pierce modified a "clunker" Stanley No. 4 plane to accept interchangeable wooden soles of various radii. The old wooden plane at right was shaped to a dedicated 14-in. radius.*

You can trim the sides of the wood sole flush with the plane in front of and behind the throat opening. But leave the extra width at the throat opening for strength.

Cecil Pierce
Planemaker
Southport, ME

Q&A

Jammin' in Negril

Q Ever since I bought my Elu 3338 router in 1988, bits have been sticking in the collet. To remove the bit, I have to take off the nut and tap the collet and bit loose with a plastic mallet. What's the problem? My other routers don't do this.

Amir Fahzad
Negril, Jamaica

A I had the same problem with my own Elu 3338 router until I learned the "trick" to installing the collet properly. There's a snap ring inside the nut that's designed to pull the collet and bit loose when the nut is backed off. For this to work properly, the collet and nut must be "snapped" together *before* you insert them in the router's collet socket. Don't place the collet into its socket first and then thread on the nut; this just jams the collet and makes the bit stick.

David Sloan
AW Editor and publisher
Emmaus, PA

Gas Appliances in the Shop

Q I want to set up shop in my basement, but I'm concerned about wood dust explosions since the space is tight and I have a gas furnace and water heater in the same room. Should I put filters on the appliances?

Pat Konstenius
Pelkie, MI

A A cloud of wood dust concentrated enough to be combustible would likely be ignited by a tool motor or power switch before it ever reached your appliances. So there is not a high degree of concern in this regard.

A more likely result of dust in the shop is a shortened life for your gas appliances. Dust can foul the ignition system, and when it burns in the gas flame, it upsets proper gas combustion and produces excessive carbon monoxide (CO). The wood dust residue collects on the flue passages, heat exchanger, and ignition system.

Fortunately, most of the excess CO (a poisonous gas) will vent to the outside via the flue. Over time, however, dust residues can impede venting and increase the likelihood of CO entering the house. Residues on the heat exchanger accelerate its corrosion.

As for filtering the appliance air intake, any filter fine enough to restrict

WHERE TO FIND IT

Rust-preventative paper is available from Highland Hardware, 1045 N. Highland Ave., Atlanta, GA 30306, (800) 241-6748.
Leather strops are available from Lee Valley Tools, Box 6295, Stn. J, Ottawa, Ontario, Canada K2A 1T4, (800) 267-8767.
Speaker fabric is available from AcousTex, One Garfield Circle, Burlington, MA 01803, (617) 229-2100.

dust particles would impede the necessary draft to the burner.

One solution would be to vent the appliance air intake to the outside, thus providing a source of dust-free air for combustion. Consult your heating contractor for specific advice. If you're not able to vent to the outside, at least make sure to arrange for an annual appliance inspection and service.

Philip S. Runge
Utilization and Engineering Services
American Gas Association

Getting the Bugs Out

Q I recently purchased an antique maple table, and I plan to restore it. The table was stored in a barn and has a number of 1/16-in.-dia. holes in the legs. Who were the critters that caused the damage, and how can I make sure they're dead?

George Weaver
Mill Hall, PA

A The culprits are most likely *Anobiid* powder-post beetles, which lay their eggs on unfinished wood surfaces or in tiny cracks in moist wood. The larvae bore through the wood as they grow and eventually emerge from it leaving the holes that you see. The entire life cycle can take one to three years, depending on the moisture content and food value of the wood. A 15- to 30-percent moisture content is best for these bugs; sapwood is their preferred diet.

The table could have been infested when stored in the damp barn, but the damage also might have been from an earlier infestation that died out. To check for current activity, look for light-colored powder deposits and new emergence holes, particularly in spring and early summer.

If you find an active infestation, you have several options. Unfortunately, a surface application of insecticide won't penetrate enough to kill the larvae. But if you are disassembling the table for restoration, you can kill the insects with the aid of your oven or freezer. Heating the wood to 180°F for two hours will do the job in wood up to 1 in. thick; use longer times for thicker material. Alternatively, if the wood has been kept at temperatures warmer than 50°F for a while, you can put it in a freezer. The sudden exposure to cold will kill insects that aren't gradually acclimated to it.

Professional fumigation is warranted in cases of severe infestation of valuable items, but it's expensive.

Leslie Ferge
Biological Technician
Forest Products Laboratory
Madison, WI

Got a woodworking question for the experts?
Send it to: "Q&A," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098.

offcuts

DESIGN IS FOR THE BIRDS

Birds were the beneficiaries in The Wharton Esherick Museum's "Of Thee I Sing" competition. The birdhouse bonanza was organized last summer to encourage creative sculpture by pros and amateurs alike.

Entries ranged from "found" pieces to sleek architectural designs. Some were even inspired by Esherick's own work.

Cash prizes were given for first, second and third places. First prize went to Jack Larimore for "Swallow House With Death Wish Worm."

The 1995 competition theme is sculpted bowls. For an application, send a stamped, self-addressed envelope to: The Wharton Esherick Museum, Box 595, Paoli, PA 19301.

"William Tell," by H.K. Peters, Jr.

"Swallow House With Death Wish Worm," by Jack Larimore.

"Mahogany Bird House," by Robert March.

ONLINE WITH THE FOREST INDUSTRY

ForestNet is a new online computer service for the forest products industry. Users worldwide can exchange information on product markets, lumber prices, industry news and related topics.

ForestNet puts you in contact with forest managers, lumberyards, woodland users, loggers, importers, exporters and more. There is also a database for new and used equipment.

MS-DOS, Windows and Macintosh versions are available. For more information, write: ForestNet, Box 10911, Eugene, OR 97440. Call: (800) 364-0628, or e-mail: info@forestnet.com

SUMMER TURNING PROGRAM

The Wood Turning Center in Philadelphia is establishing a summer residency program for five turners and one scholar/critic/photographer. The first International Turning Exchange (ITE) will be held at the George School in Newtown, PA, in July 1995.

The Wood Turning Center will arrange housing for residents, and all participants will receive a stipend.

In return, ITE residents will teach beginning turning classes to George School day-camp students. They will also participate in a weekend turning symposium.

For more information, write: Wood Turning Center, Box 25706, Philadelphia, PA 19144. Or call: (215) 844-2188.

THE ORIGINAL 49-PIECE WOODEN TOOL SET

For the last 12 years, Michael Stangler has been mastering his woodcarving skills by reproducing tools from different types of wood.

At first, reproducing a tool was just an exercise in woodcarving. But after creating five or six tools, Stangler was having so much fun, he decided to create a whole set of wooden tools. Stangler's original 49-piece wooden tool set is made from 40 different types of wood, including African ebony, Australian bottle brush, bubinga and Japanese boxwood.

Whimsy in wood. *Michael Stangler's hand-carved tool box holds a set of 49 wooden replicas of common tools.*

And of course, Stangler couldn't store his special tools in just any tool box. His hand-carved reproduction of an old strongbox features three drawers for storage and intricate inlaid designs on the side and front panels.

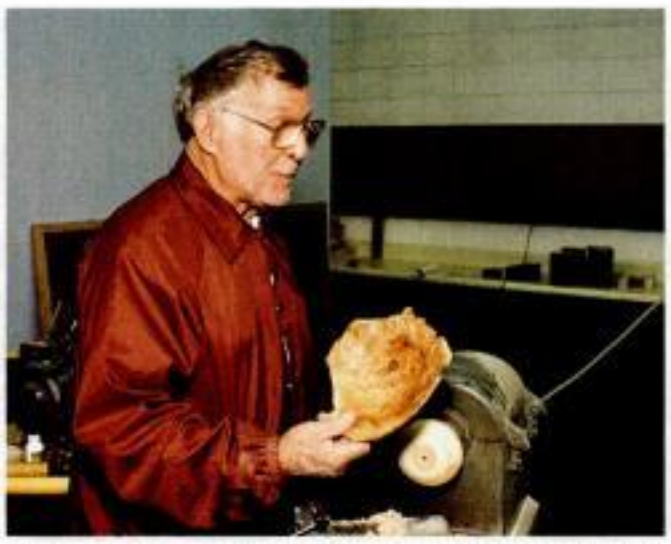
Stangler has also made some smaller sets of wooden tools and sold them to friends. However, he notes, "I carve the tools for my own enjoyment. I'm interested in experimenting with different woods and mastering new skills and techniques."

Why settle for metal? *A pair of pliers and a screwdriver are just two of the wooden replicas in Stangler's set.*

OSOLNIK TRIBUTE RAISES $75,000

Last October more than 225 woodturners came to the Smoky Mountains for a conference honoring renowned turner Rude Osolnik and his wife Daphne. The benefit took place at the Arrowmont School for Arts and Crafts in Gatlinburg, TN.

All proceeds from the event went to establish a special Osolnik student scholarship fund.



A good turn. *Rude Osolnik demonstrates his turning technique at a benefit conference in his honor.*

PHOTO BY ERNIE CONOVER

The turning conference opened in the school's Sandra Blain Gallery with a dramatic display of two important woodturning collections. Robyn and John Horn of Little Rock, AR, graciously donated more than 100 turned pieces from their private collection. The balance of the exhibit was a retrospective display of Rude's turnings from the 1950s to the present.

Along with three days of demonstrations, the highlight of the event was Friday night's auction and the lively "roast" of Rude that preceded it. Next, to celebrate his upcoming birthday, there was an 80-candle wooden cake turned by the demonstrators the night before. Then came Rude's personal donation to the cause: $5,000 to kick off the scholarship fund and another $5,000 toward construction of the new wood studio at the school. And finally, primed with emotion, turners bought exhibit turnings at a feverish pitch that netted a total of $33,000. Grand total for the weekend: $75,000.

—David Ellsworth

TRADE NEWS: FAREWELL TO WATCO; SHOPSMITH REORGANIZES

End of the trail for WATCO.

According to Minwax president R.W. Harrison, the company has stopped production and discontinued the sale of WATCO finishing products.

Harrison cited marketing difficulties as the reason for WATCO's demise. "Many of our dealers were reluctant to add another line of stain because it was coming from Minwax...they didn't know all that much about WATCO."

Harrison said Minwax has decided to focus its efforts on the core Minwax line. He noted, "We knew this would create a hardship for those loyal WATCO users....It was not an easy decision."

Shopsmith Inc., maker of the Mark V combination machine, has sold off or closed all but one of its retail stores in the U.S. and Canada because of "declining results."

Shopsmith CFO Bill Becker told AW the company is reorganizing to focus on "direct sales, traveling demonstration sales, and mail order." The Mark V and its accessories will remain available. To contact Shopsmith, call: (800) 543-7586.

Shopsmith is leaner and meaner after restructuring.

Jim's Corner

Offbeat Answers to Common Woodworking Questions

Overheard at the lumberyard:

Customer: "This wood has holes in it!"
Clerk: "Sir, those are knot holes."
Customer: "Well, if they're not holes, what are they?"

—Contributed by Jack Nimmo

Q: How much wood would a woodchuck chuck if a woodchuck could chuck wood?

A: Long-term federally funded studies at Indiana University (which is in Pennsylvania) and Miami University (which is in Ohio) show that the animal they're working with is very likely not a woodchuck at all, but some sort of marmot.

Jim Cummins is a contributing editor to AW.

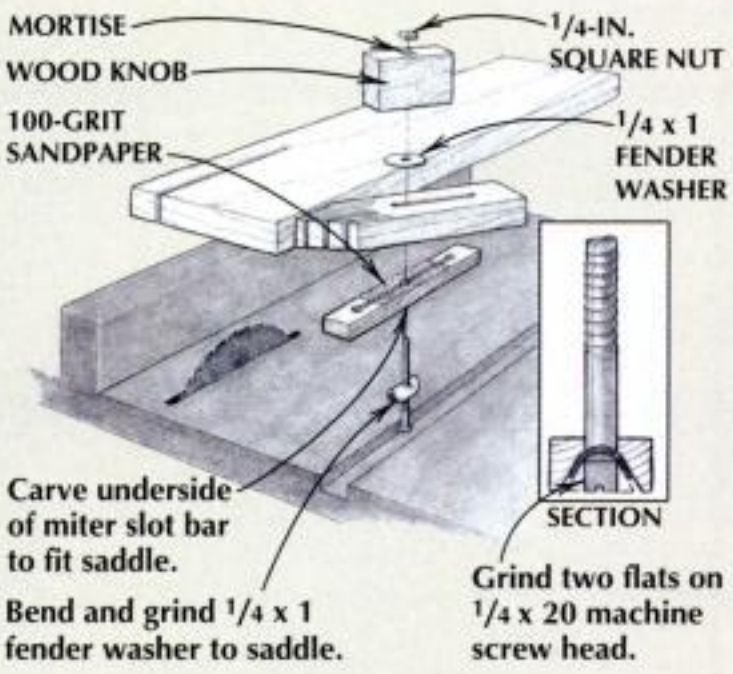
SEND US YOUR OFFCUTS!

If you have a news item, unusual story or opinion to share, send it to: "Offcuts," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098.

TECH TIPS

BEST TIP WINS $200

Know a better way of doing something? Designed a clever jig? Send your woodworking tips, along with a descriptive sketch or a snapshot, to: "Tech Tips," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098. We'll pay $50 for each tip we publish and $200 for the best tip of the issue.



Improved Feather Board

The miter-slot feather board by Jim Cummins (see AW #31, page 27) is a good idea but has some drawbacks: It's awkward to tighten and sometimes the screw turns with the wing nut. I settled this by grinding flats on the head of the screw, adding a saddle-shaped washer as shown and replacing the wing nut with a wood knob.

Frank Gregg
Dallas, TX

Extension Dogs

My Workmate bench still serves me well but is too narrow for some jobs. To solve this problem, I made four 8-in. extenders with dowels that fit in the predrilled

holes in the bench platform. With these extension dogs in place, I can hold panels up to twice the width of the bench.

Robert Graul
Alton, IL

Transferring Patterns

A quick way to transfer patterns from paper to wood is with a dressmaker's tracing wheel—available from fabric or sewing supply stores. Mounted on a handle, this miniature toothed wheel leaves small prick marks in the wood that are easily darkened with a pencil.

Jack Fleming
Poulsbo, WA

To Cap It All

Glue bottle caps are mighty elusive—on the bench one minute, gone the next. I now keep a stock of the conical plastic caps sold as "wire nuts" in the electrical supply section at hardware stores and home centers. Just pull the wire spiral out and you're in business. Incidentally, plastic mustard containers make excellent glue bottles.

Will Foxx
Little Rock, AR

Hole in One

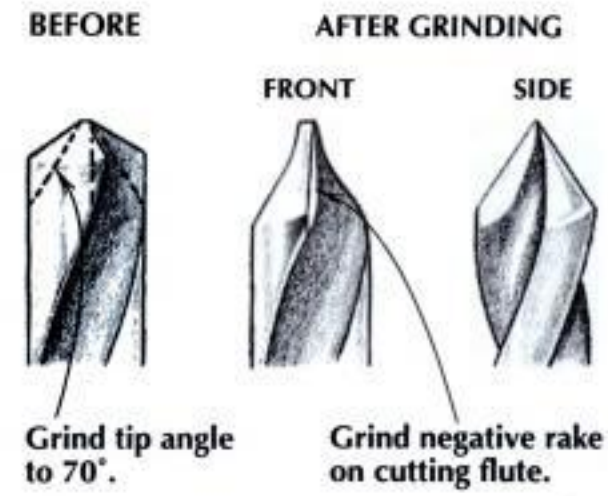
Golf balls make convenient handles for small files and rasps. Drill a hole most of the way through, using a bit about

three-fifths the diameter of the tang to be inserted. If the file's tang is too long, a hacksaw will make short work of it.

Paul Hamler
Snellville, GA

Bit of a New Twist

You can just about eliminate tearout when drilling through holes in wood by regrinding the tip of a regular twist bit. These modified bits are especially useful when you can't use a backing block—as

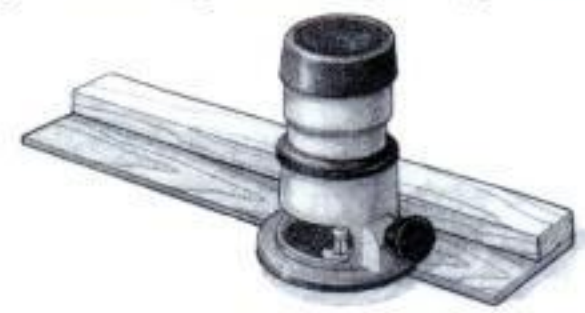


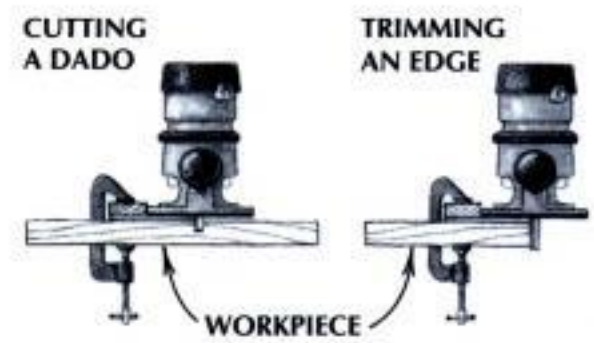
when drilling through round stretchers or legs, for example. I found it essential to grind flats on the inside, as shown, so the cutting action comes close to that of a scraper. Omit this step and the bit is liable to grab.

Bill McCarthy
Riegelsville, PA

Dado and Edge-Trimming Jig

With this simple jig I can use my router to trim an edge or cut a dado with great precision. I glue a straight-edged fence



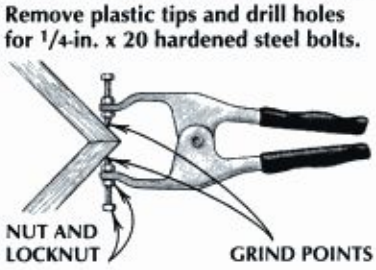


to a base of 1/4-in. plywood and then trim the "working" edge of the base with a straight bit in the router. Just remember to use the same straight bit each time you use the jig.

Yeung Chan
Millbrae, CA

Jiffy Miter Clamp #2

Starting with four regular spring-type clamps, I made a set of these miter clamps in about 30 minutes. Unlike



with Bert Herrick's clamp ("Tech Tips," AW #43), you can return my version to its original purpose by removing the screws and restoring the plastic tips. They do leave small punctures in the wood, but these are easily filled.

Jeff Hoffa
Renwick, WV

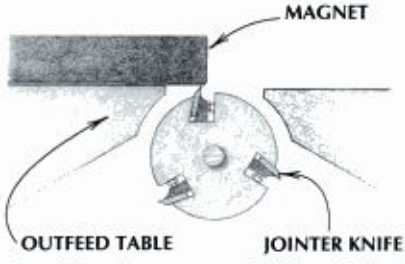
Cutting Wood Threads

When cutting wood threads with a thread box, try first soaking the stock to be threaded in linseed oil for 10 to 15 minutes. It makes for a cleaner cut and reduces moisture absorption that can cause the thread to jam.

Robert Maclaren
Harpster, OH

Setting Knives by Magnet

For years I've set the knives in my vintage jointer using a couple of magnets salvaged from two large stereo speakers. I set the magnets on the jointer's out-



feed table, where it can hold each knife by its sharp edge. Be sure to run a strip of electrical tape across the contact area so you don't dull the knife.

Joseph Kosnosky
Friedens, PA

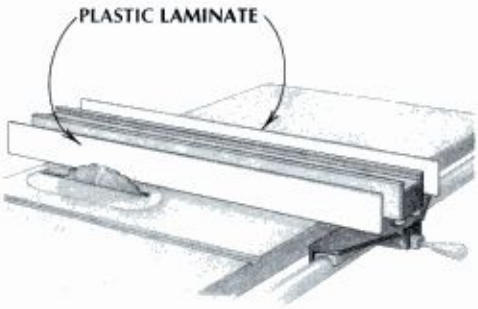
Hand-Sanding Blocks

I make my own sanding blocks by gluing sheet cork (spray adhesive works best) to 3/4-in. birch plywood. This gives me a hard surface on one side and a soft one on the other. After cutting the plywood into pieces of a convenient size, I soften the edges with sandpaper. Cut them into smaller blocks and they make handy clamping pads.

K. Kelzer
Freeland, WA

Facing the Fence

Some aluminum fences have a nasty habit of leaving black smears when you run a piece of wood through the saw. To solve this problem, I attached pieces of plastic laminate with spray adhesive to



both sides of the fence. A bonus is that friction is reduced and the laminate is easily replaced should it be grazed by the moving blade.

Daniel Haubert
Framington Hills, MI

A Tip From the Turnpike

When laminating small pieces of wood we had trouble with slippage—clamping pressure caused them to skid. Now we put a few grains of coarse sand on one glue-coated surface before assembly. Crushed quartz works best because the grains are more angular than beach sand.

Charlie and Kathleen Malcolmson
Colorado Springs, CO

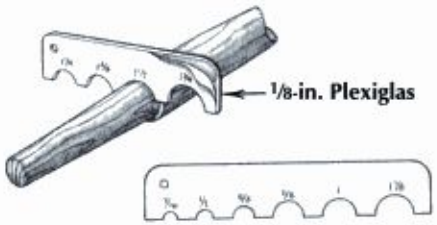
Stop Pinching Handles

If you have iron handles in your face vise you know that they're not just noisy; they can also give your finger a nasty pinch. Just slip a rubber O-ring over each end of the handle and you've tamed it for good. Wooden handles also are greatly improved by a couple of O-rings: The end caps lose their maddening habit of popping off and dropping the handle.

Andy Rae
Lenhartsville, PA

Shop-Made Lathe Gauge

I make Windsor chairs and needed a quick way to check the diameters of legs and stretchers while the parts were still on the lathe. So, I made a half-template.

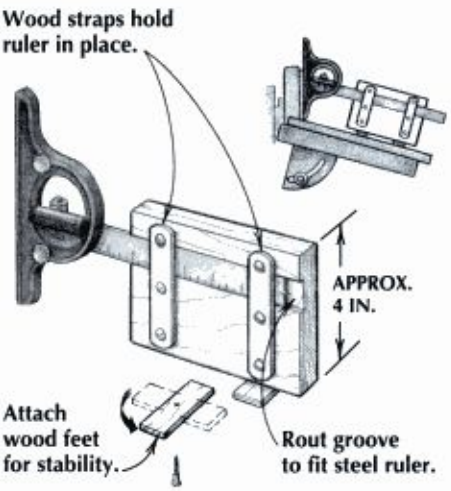


I drew the necessary profiles full-size on paper, then I folded the paper in half, tore it along the line and used spray adhesive to stick this half-pattern to 1/8-in. Plexiglas. (Plexiglas is thin enough to fit in the slot made by a parting tool.) I cut out the half-circles on a scroll saw and smoothed the edges with a spindle sander.

Sean Landers
Ayer, MA

Getting the Right Angle

The protractor built into the table support of a bandsaw or disc sander gives only an approximation of the angle of tilt. Needing greater precision, we adapted a machinist's protractor by



adding a hardwood block as shown. This tool, called a "revolving turret protractor head," is made by Starrett. It's available through mail-order suppliers.

Edward Bartunek
Frank Bates
Hiram, OH

Revolutionary Router Table

Innovative Features Set a New Standard in Router Table Design

by the staff of AMERICAN WOODWORKER

Benchtop or floor model. *Our new router table works in either mode. The benchtop base unit is designed to fit into the floor stand (above), or it can be used on its own with the tabletop and fence (right).*

Routers have revolutionized woodworking, making it possible to remove stock in many ways with great precision. But to get the most from your router, you need a router table. A router table lets you use your router like a small shaper to form profiles, rabbets, grooves, and even dovetails with safety and control.

Our first router table design, published more than two years ago, became one of our most popular projects. (See AW #24.) But since then, the standards for router table performance have gotten higher. Many companies now manufacture router tables, and the number of specialized router-table accessories has increased dramatically.

This time around, we took a fresh approach to give woodworkers more precision, flexibility and convenience than ever before.

A Component Approach

Our design gives you plenty of choices because it's based on components that can be combined in different ways. Depending on your needs, you can build the benchtop version and not miss out on any major features. Or, if a freestanding work station is more to your taste, you can add the stand, with or without its lower storage drawers. (See photos, left.)

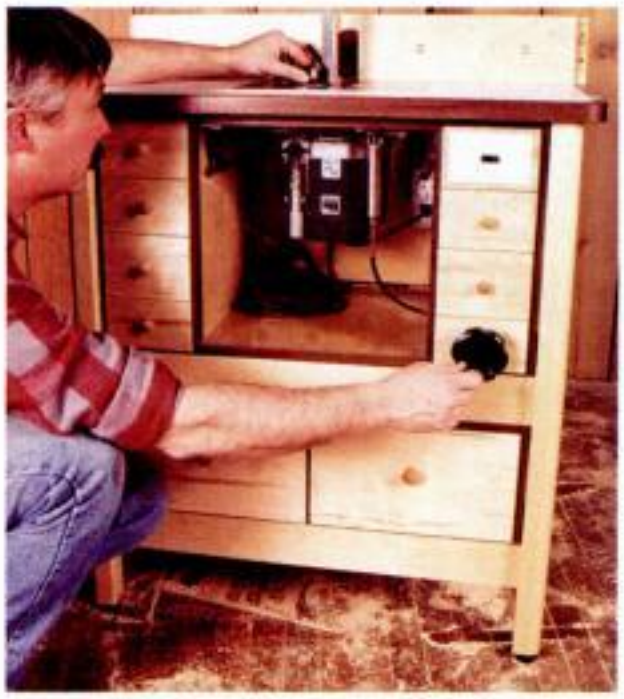
If you already own one or more router-table accessories, chances are you can adapt them to work with our design. You could also buy some of the parts rather than build them. We designed the benchtop base and stand to fit most manufactured tops and fences. And you won't have problems adding positioning jigs, feather boards and other aftermarket accessories.

A Full Menu of Features

We started with some fairly standard requirements, knowing that an exceptional router table would need to meet these exceptionally well:

- A dead-flat router tabletop and router base insert.
- A miter slot that's more accurate and longer-wearing than a simple groove routed in the tabletop.
- Precise and adjustable supports for the base insert to keep it perfectly flush with the table, and to accommodate inserts that may vary in thickness.
- A square, straight fence with an adjustable opening.

INNOVATIVE FEATURES

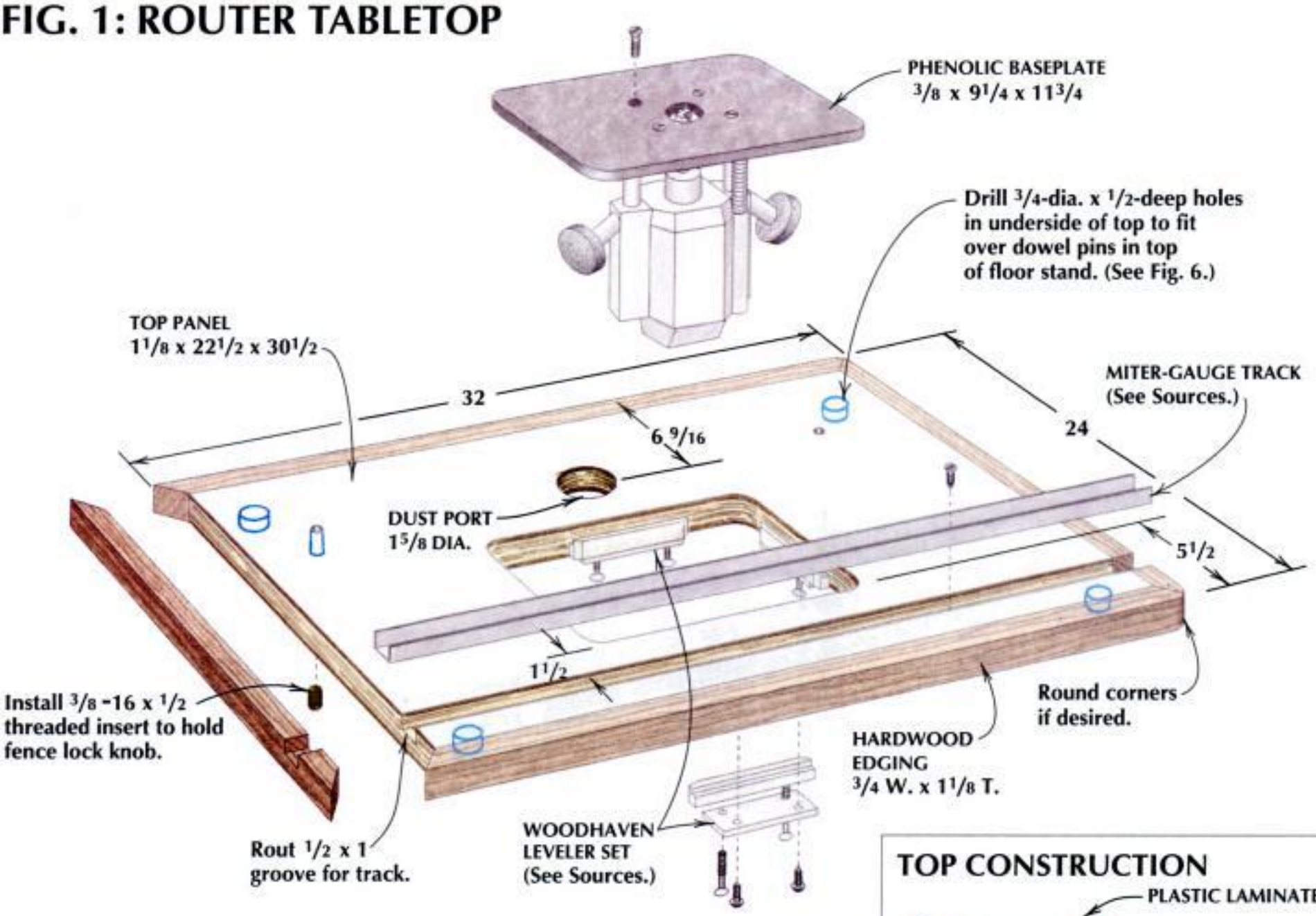


Hassle-free height adjustment. *No more groping under the table. Turn the handwheel to raise or lower the bit in precise increments.*

Super-efficient dust collection. *With just a single port at the back of the base, you can extract sawdust and chips from under and over the table.*

Quick conversion. *With the top removed, it's easy to slide the base out of its stand for benchtop or jobsite use.*

FIG. 1: ROUTER TABLETOP



TOP CONSTRUCTION

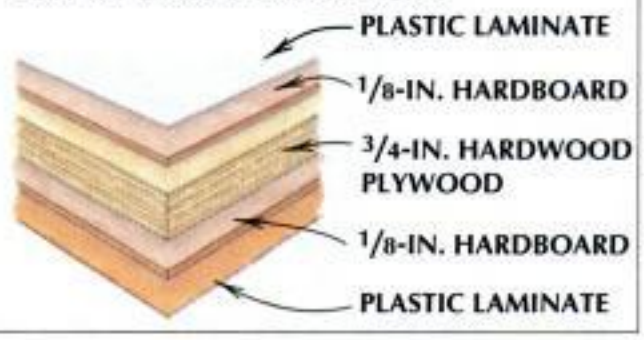
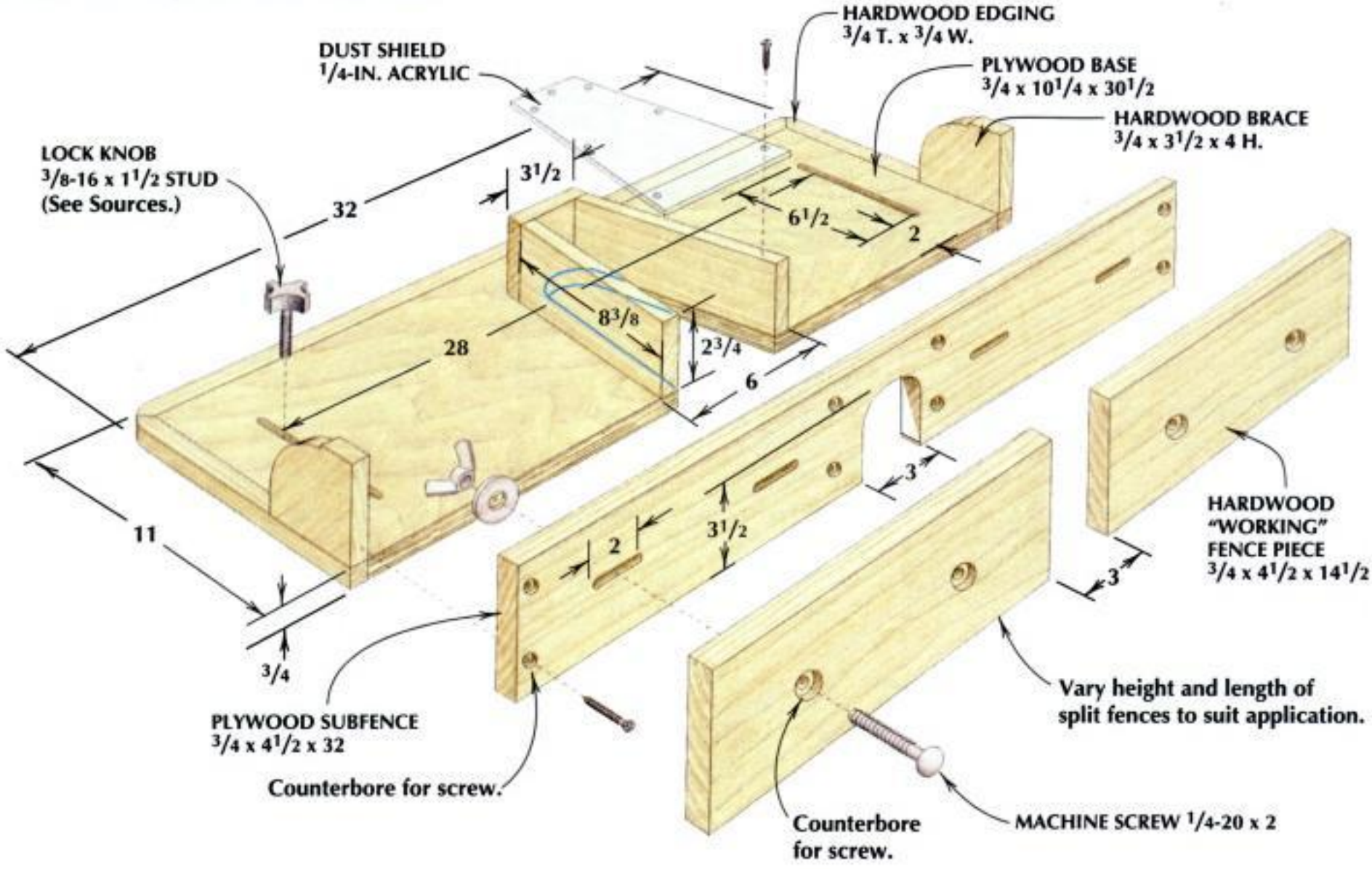


FIG. 2: ROUTER FENCE



•An accessible power switch for safe router operation.
•Ample storage space for bits, wrenches, bases, and other accessories.
•Compatibility with precision alignment jigs such as the Incra Jig and JoinTech.

You'll find all these features in this new router table. But to really push the envelope, we knew we'd have to take precision, convenience, and versatility to new levels. We did quite a bit of research and experimentation, and here are the innovations we came up with:

•External bit adjustment. If you're tired of groping under the router table to fine-tune the height of the bit, you'll appreciate the ease and precision of our externally mounted adjustment wheel. It's linked by a flexible shaft to the plunge router's depth-adjustment screw. This idea came from Zach Etheridge, of Highland Hardware in Atlanta.

•Super-efficient dust collection. Sawdust is extracted from above and below the table through a single exhaust port at the base's back. A clear acrylic door closes off the base's front to optimize your dust collector's pulling power.

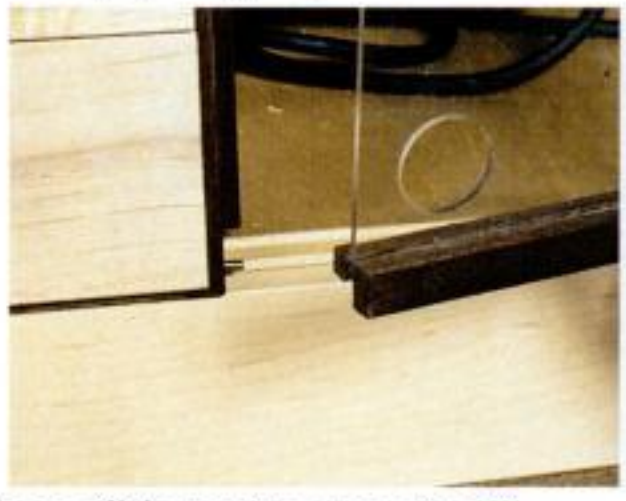
•One switch for all functions. A receptacle for the dust collector is wired to the router table's main power switch. Turning on the router automatically turns on your dust collector.

•Quiet routing. The door to the router compartment helps keep the lid on noise. This is the quietest router table you'll find anywhere.

•Benchtop or freestanding status. It's easy to convert this router table from a freestanding workstation to a portable benchtop or jobsite machine.

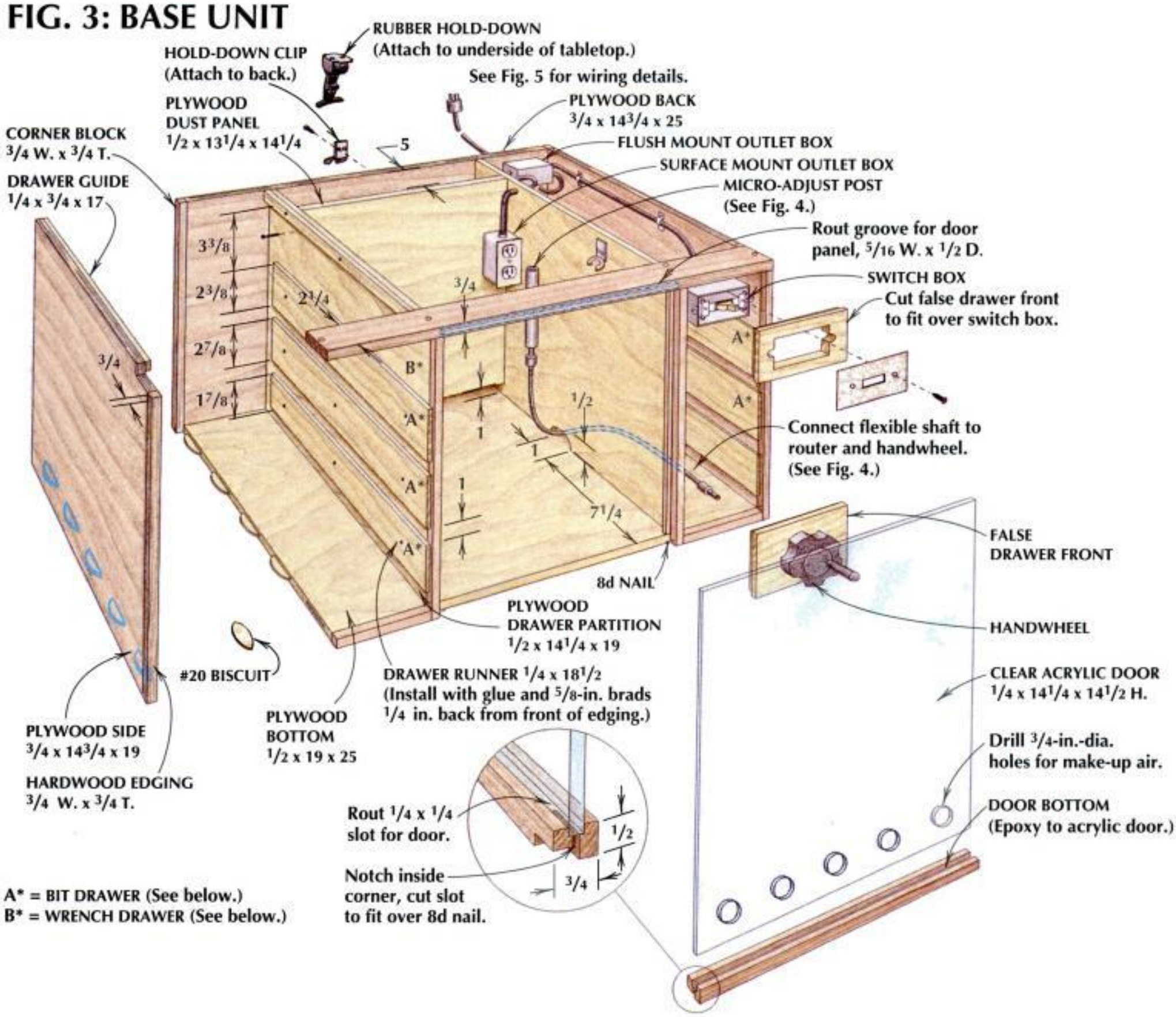
Our router table will hold just about any size or type of router, but you'll get the most out of it if you use a plunge router with a plunge lock that can remain in the *unlocked* position. This way you can rotate the handwheel to change bit height without reaching inside the table to hold the plunge lock open. (For more on plunge routers, see AW #33 and #41.)

We also recommend that you use a heavy-duty router (2 1/2 HP or more) and a 3/8-in.-thick phenolic baseplate to resist deflection from the weight of the router. The baseplate rests on leveler blocks which are screwed underneath the top. (See Fig. 1.)

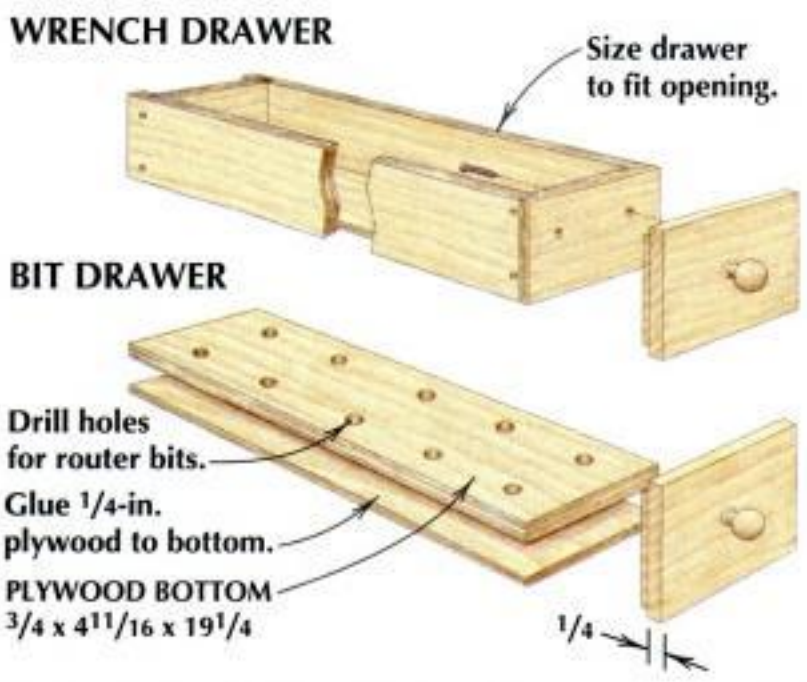


Easy access. *A clear plastic door panel closes off the router compartment, reducing noise and promoting dust collection. The top of the door fits into a groove (left) while the hardwood strip at the bottom of the door slips over two metal pins (right), so you can install and remove the door with ease.*

FIG. 3: BASE UNIT



DRAWER CONSTRUCTION



BACK VIEW OF DRAWER FRONTS

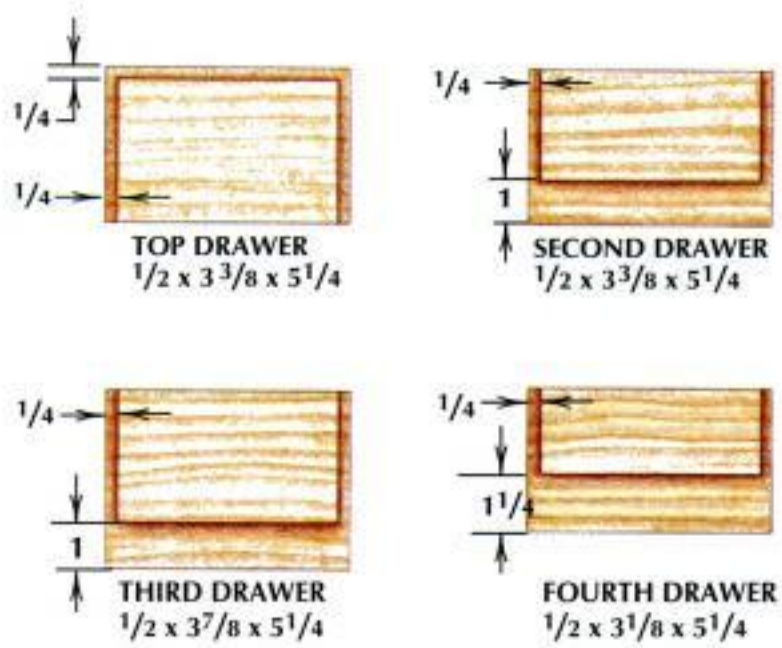
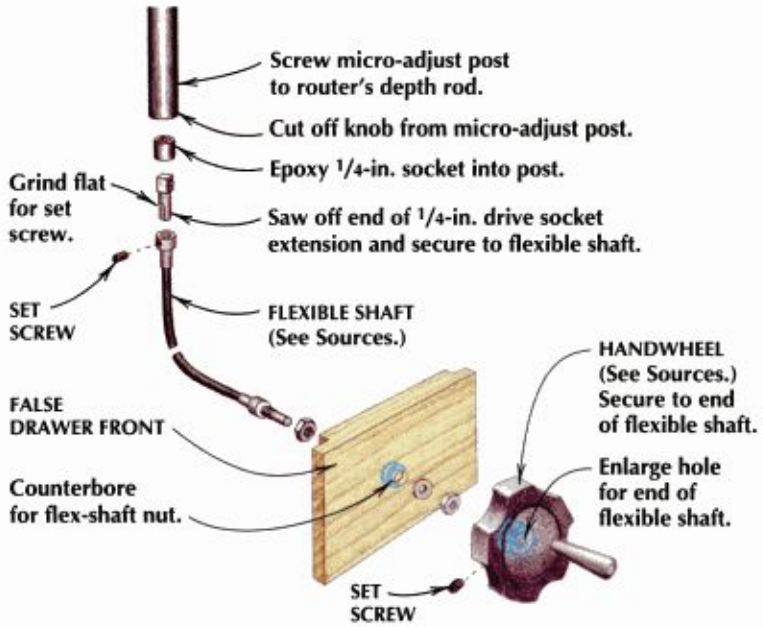


FIG. 4: BIT HEIGHT ADJUSTER DETAIL



Making the Tabletop

A piece of 3/4-in.-thick plywood forms the tabletop's core. The top gains its rigidity from laminations of 1/8-in.-thick hardboard and plastic laminate that are glued to both sides of the plywood core. (See Fig. 1.) Use yellow or white PVA glue to bond the hardboard to the plywood and contact cement to adhere the plastic laminate. Feel free to use less-expensive backer laminate (plastic laminate without the colored top layer) for the bottom surface. Trim the edges flush with the plywood, then cut and glue on the hardwood edging.

Next, rout a 1/2-in.-deep, 1-in.-wide groove in the top for the metal track. We used a Tru-Fit Miter Track to guide our tablesaw's standard 3/4-in.-wide miter-gauge bar. We chose this track because it adjusts to fit worn guide bars that may be slightly narrower than 3/4 in.

Now rout the opening for the router baseplate. We first made a router template from a piece of 1/4-in. hardboard, jigsawing and filing the template opening to fit the baseplate exactly. After tracing the template opening in the correct location on the tabletop (see Fig. 1), we cut a rough opening to within 1/8 in. of the line. Then we clamped the template to the tabletop and routed the finished opening with a pattern bit (a straight router bit with a bearing above the cutting edge), following the template and taking progressively deeper passes to rout through the table.

To hold our router baseplate flush with the table, we installed a set of Woodhaven plate levelers. These well-designed nylon blocks support the plate on all four sides and have screws for fine height adjustment. (For a more detailed description of how the levelers work, see page 76.)

If you're building the fence that goes with our router table (see Fig. 2), you can finish up the tabletop by drilling a 1 5/8-in.-dia. dust extraction hole as indicated in Fig. 1. When you hook up your dust collector or shop vacuum to the benchtop base unit, this hole will direct sawdust and chips down into the collection chamber.

Making the Fence

If you already own a router fence, you can probably use it with our table. However, our shop-made fence is designed to work with the router table's built-in dust-collection system. (See Fig. 2 and bottom drawing, opposite.) The split fence works much like a shaper's fence: The two "working" pieces can move closer together or further apart when you change cutter sizes. The two-part fence design also lets you use the table to joint the edge of stock by shimming the outfeed fence. And it's easy to replace the split fence if it gets chewed up, or if you need to use a different sized fence.

After you make the fence, drill holes in the tabletop for the threaded inserts that hold the fence lock knobs. (See Fig. 2.) You can also use these knobs and inserts to attach Incra or JoinTech jigs.

Making the Base Unit

The base unit (see Fig. 3) forms the core of our router table. All the features you want are here in a portable package that can stow away easily or be transported to a jobsite. To make the benchtop unit into a floor model, simply build the stand. (See Fig. 6.)

To create a sturdy yet lightweight benchtop unit, we built the base from hardwood plywood. Make sure your router will fit inside the router compartment, with a minimum of 4 in. between the end of the router's height-adjustment screw and the bottom of the cabinet. If the inside of the router compartment isn't wide enough for your router, or if you plan to use a different base-

FIG. 5: WIRING DIAGRAM

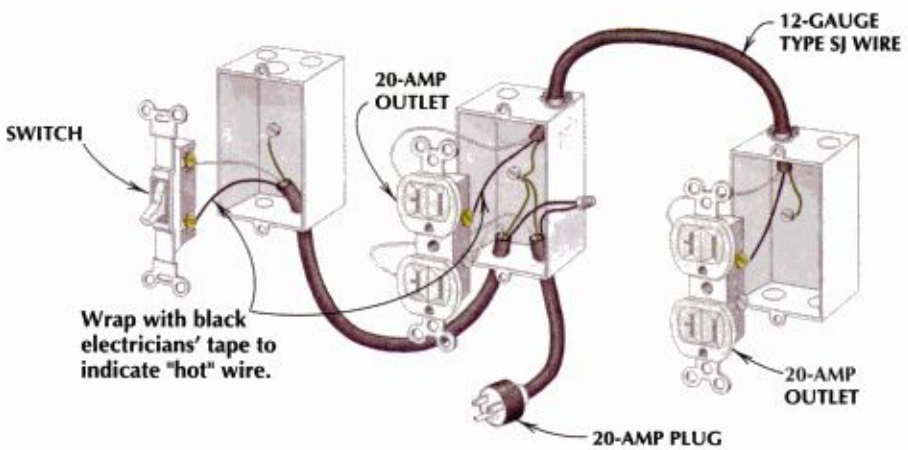
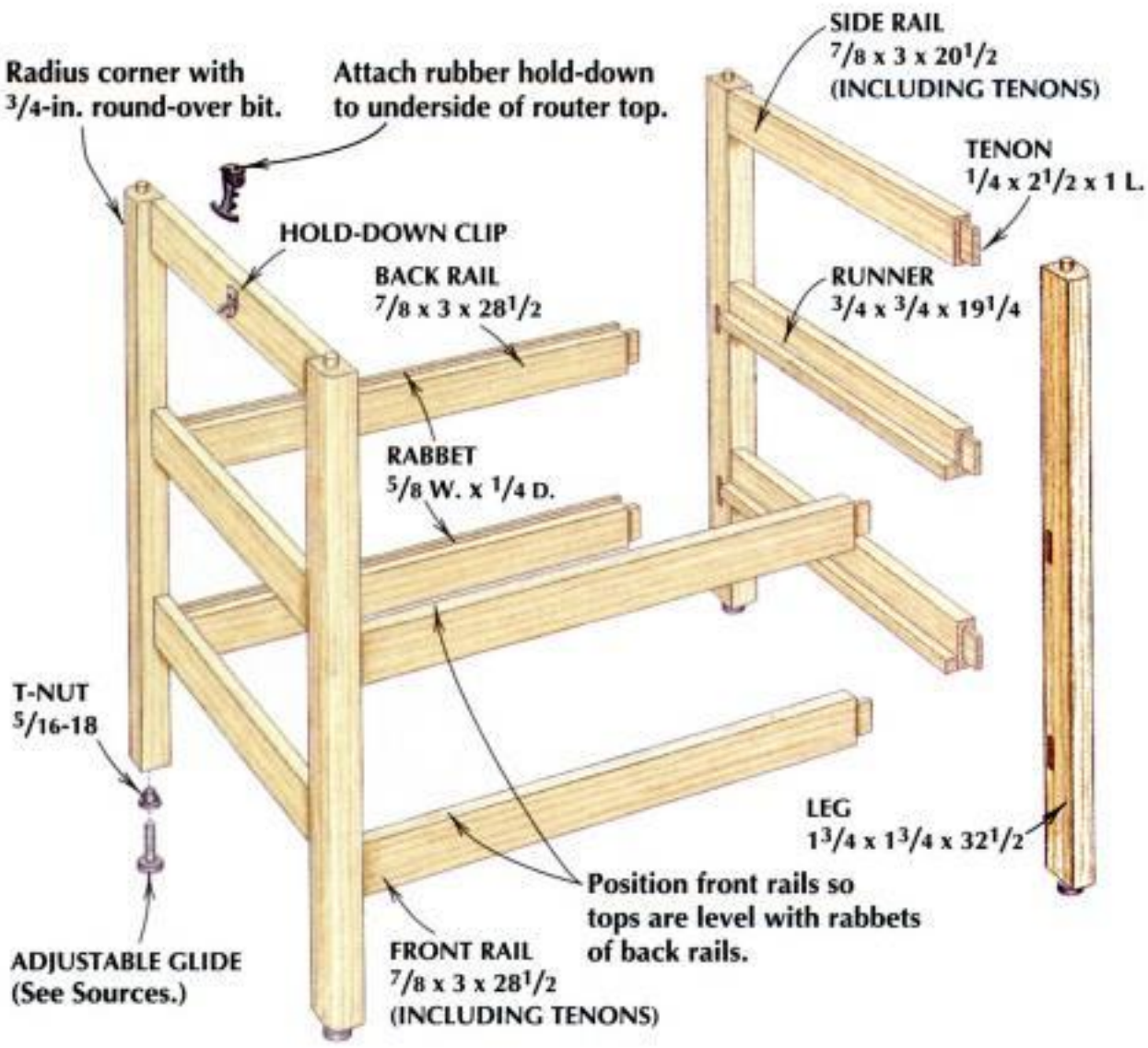
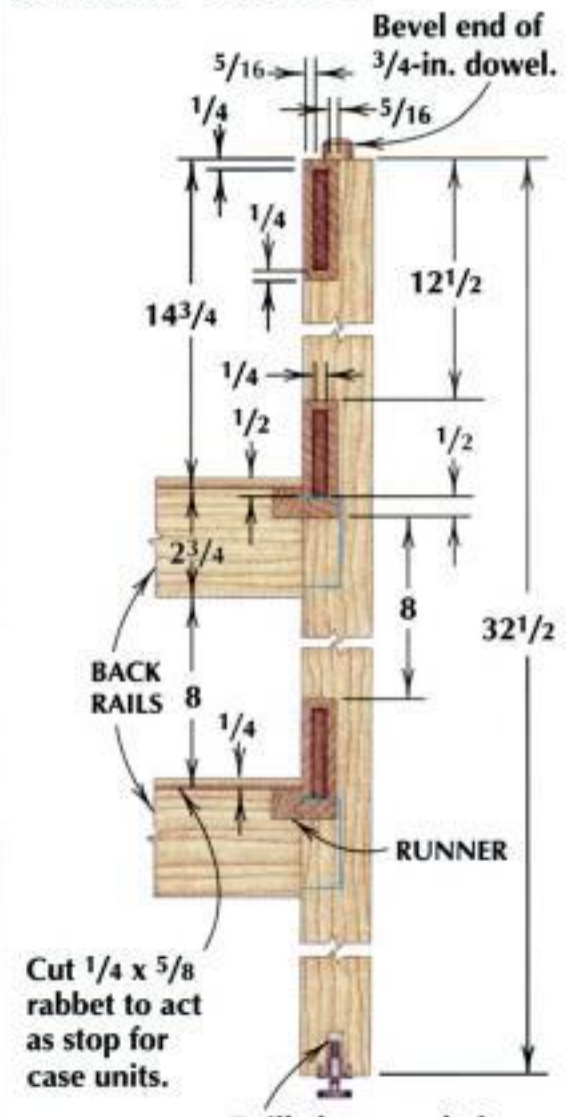


FIG. 6: FLOOR STAND



JOINERY LAYOUT



plate, you may have to change the interior dimensions by moving the drawer partitions and/or the dust panel.

Bit and wrench storage—The narrow drawers that flank the center opening in the base are perfect for storing router bits, wrenches, collets and other small accessories. Size the holes in the bit drawers to fit the shank diameters of your bits.

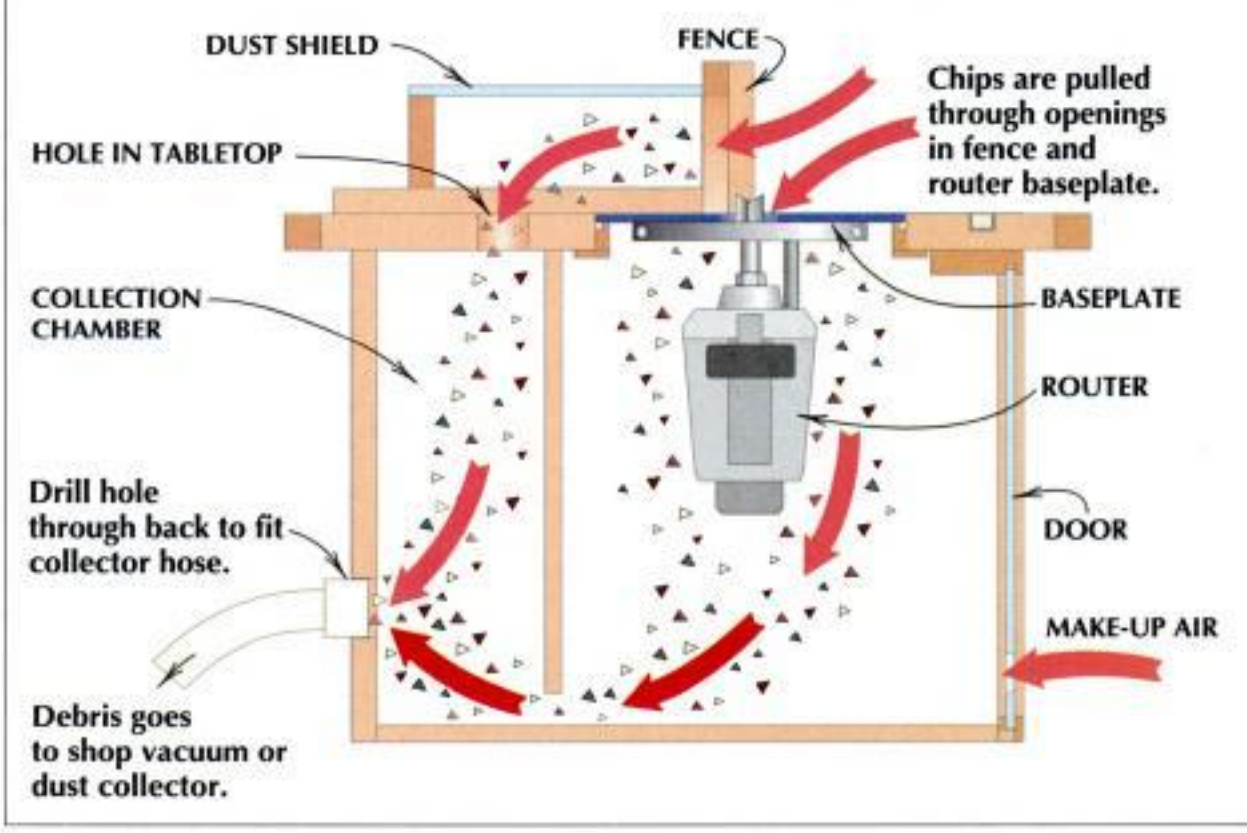
Flex-shaft height adjustment—The key to the handwheel adjusting mechanism for bit height is a flexible shaft that turns inside its own stationary housing. We couldn't find the type of shaft we needed from any mail-order source, so we had one made by a company that specializes in flexible shafts for industry.

One end of the flex-shaft is connected to a handwheel. At the other end of the shaft we installed a cut-off 1/4-in. drive socket extension with a ball detent. The extension snaps into a 1/4-in. drive socket. We recommend a drive socket that has small dimples on the inside of the drive end (available at Sears) for positive locking onto the extension. We epoxied the socket into the open end of a Woodhaven micro-adjustment knob that has its handle cut off. The opposite end of the knob screws onto the plunge router's threaded rod. (See Fig. 4.) This arrangement allows you to disengage the flex-shaft easily when you need to remove the router from the table.

Dust collection—Chips and dust are collected from two areas on the router table: the fence and the router compartment. A hole drilled in the top directs debris into the collection chamber in the base unit. To access the dust chamber, drill a hole through the back of the base whose diameter matches that of your shop vacuum or dust-collector hose.

The removable acrylic door seals off

HOW THE DUST COLLECTION WORKS



the router compartment to improve suction. Drill holes at the bottom of the door for make-up air so chips don't settle at the front of the compartment.

Power switching—As shown in Fig. 3, the benchtop base unit contains two outlet boxes, or receptacles. One receptacle is mounted inside the router compartment; the other is installed in the back of the base. Both boxes are wired to the main switch box at the front of the unit, so you can turn the router and the dust collector on and off at the same time. (See Fig. 5.)

Attaching the tabletop—Engaged against matching clips, three rubber hold-downs secure the top to the base. Screw one clip to the base back as shown in Fig. 3, then fasten its rubber hold-down to the underside of the table. Install the remaining pair of clips on opposite sides of the router compartment and fasten their hold-downs to the top of the table.

Making the Floor Stand

Our stand is designed to hold the tabletop on its own, or it can hold the entire benchtop unit. The stand also has room for its own set of drawers. (See photos, page 30.)

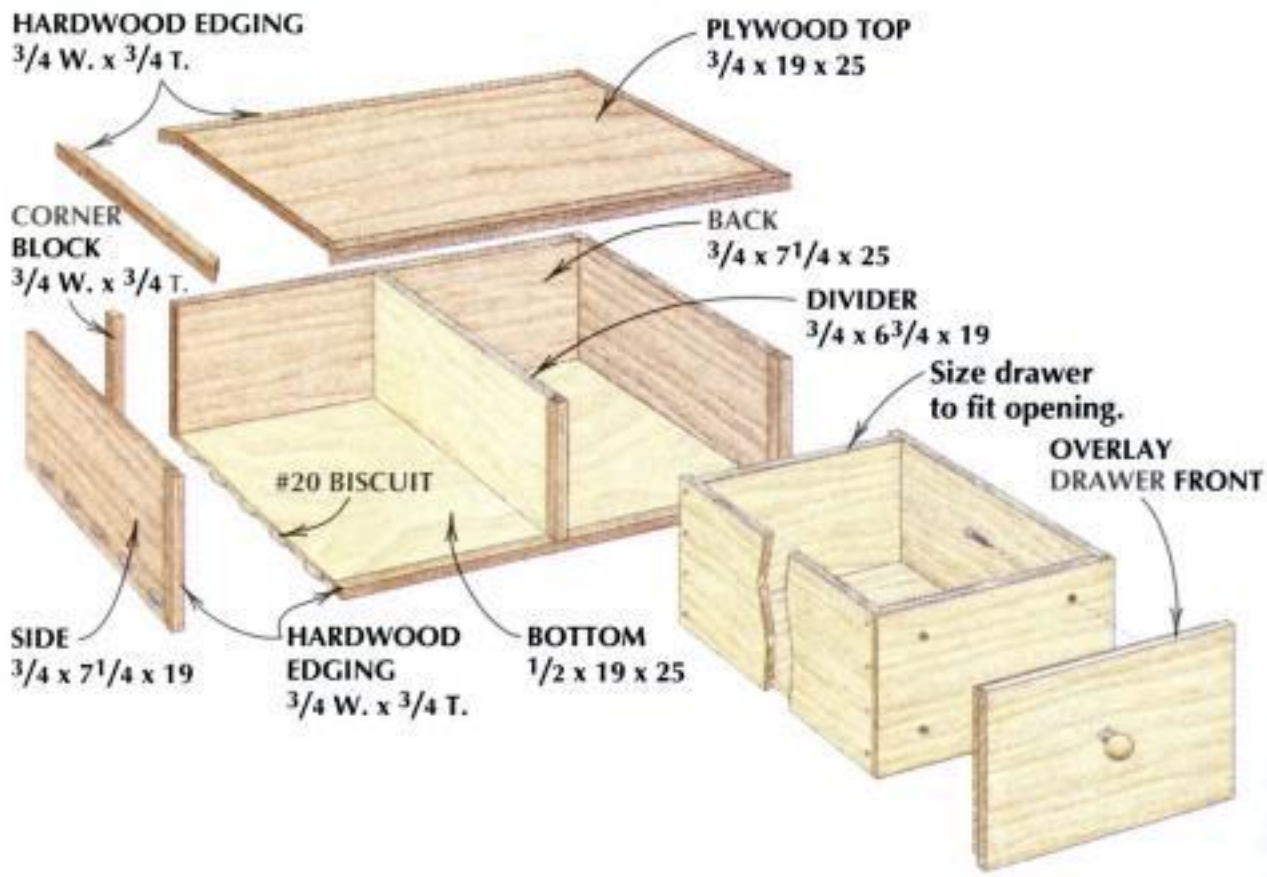
We made the basic frame using mortise-and-tenon joints for strength. (See Fig. 6.) Though our rails are 7/8 in. thick, feel free to substitute 3/4-in.-thick stock if that's what you have on hand.

Pins and holes—In the top of each leg, we drilled a 3/4-in.-dia., 1/2-in.-deep hole for a dowel pin that registers in a corresponding hole drilled in the underside of the tabletop. It's a good idea to bevel the top edges of the dowels. That way, they'll find the holes in the top when you go to position it on the stand. Two more rubber hold-downs secure the top to the stand.

Adjustable glides—To keep the stand steady on uneven floors, we screwed adjustable glides into T-nuts that were installed in the bottoms of the legs. Drill the holes for the T-nuts 2 in. deep so that the glide screws can adjust fully into the legs.

Lower storage unit—The optional drawer cabinet (see Fig. 7) converts the open area near the base of the stand into a useful storage space for larger items such as extra baseplates, feather boards, and edge guides. The cabinet holds a pair of drawers with overlay fronts. If you don't need drawers, you can lay a piece of plywood on the support rails to create a shelf. ▲

FIG. 7: DRAWER CABINET



SOURCES

Listed below are part numbers, prices and suppliers for the specialized hardware used to make this router table.

Baseplate:
Part #141, $29.99.
"Stay-Tru" plate levelers (set of 4):
Part #130, $14.99.
Micro-adjustment knob:
Specify type of plunge router. $11.99.
Available from
Woodhaven, 5323 W. Kimberly, Davenport, IA 52806, (800) 344-6657.

Tru-Fit miter track:
Part #67K11.07, $19.95.
Available from *Garrett Wade, 161 Ave. of the Americas, New York, NY 10013, (800) 221-2942.*

20-in. flexible shaft:
Part #AWW-20, $29.95 plus $5.00 shipping. No credit card orders; no phone calls, please.
Available from
S.S. White Technologies Inc., Dept. 31, 151 Old Brunswick Rd., Piscataway, NJ 08854.

Plastic lock knobs (2):
Part #DK-29 , $1.05 ea.
Handwheel: Part #KHN-20, $23.83. Request that wheel be drilled and tapped for set screw.
Rubber hold-downs (5):
Part #TC-336, $5.88 ea.

Adjustable glides (4):
Part #AG-50, $1.25 ea.
Available from *Reid Tool Supply Co., 2265 Black Creek Rd., Muskegon, MI 49444, (800) 253-0421.*

Wooden knobs (8 total—6 @ 3/4 in. dia., 2 @ 1 1/4 in. dia.):
Part #50L41, 3/4 dia., 10 for $2.95. Part #50L51, 1 1/4 dia., 10 for $4.95.
Available from
Woodcraft, 210 Wood County Industrial Park, Box 1686, Parkersburg, WV 26102, (800) 225-1153.

COMPLETE HARDWARE KIT

A hardware kit containing all the specialized hardware needed to build the AMERICAN WOODWORKER Router Table is available for $225 ($300 Canadian). (Price includes shipping and handling for U.S. and Canada delivery.)

To order by phone (Visa or MasterCard) call: **(610) 967-8315**

To order by mail, send check or money order to:
AMERICAN WOODWORKER
Router Table
33 E. Minor St.
Emmaus, PA 18098

Gluing Up

Take the Hassle Out of This Sticky Job

by Lonnie Bird

I remember it like a bad dream. I had just taken the clamps off a small table I had glued up the night before when I noticed that two of the legs weren't square to the stretchers. The cause: One stretcher was slightly longer than its mate, a problem I had overlooked before gluing up the table. Of course, this would have been easy to correct *before* gluing up; now I was faced with building a new base for my table.

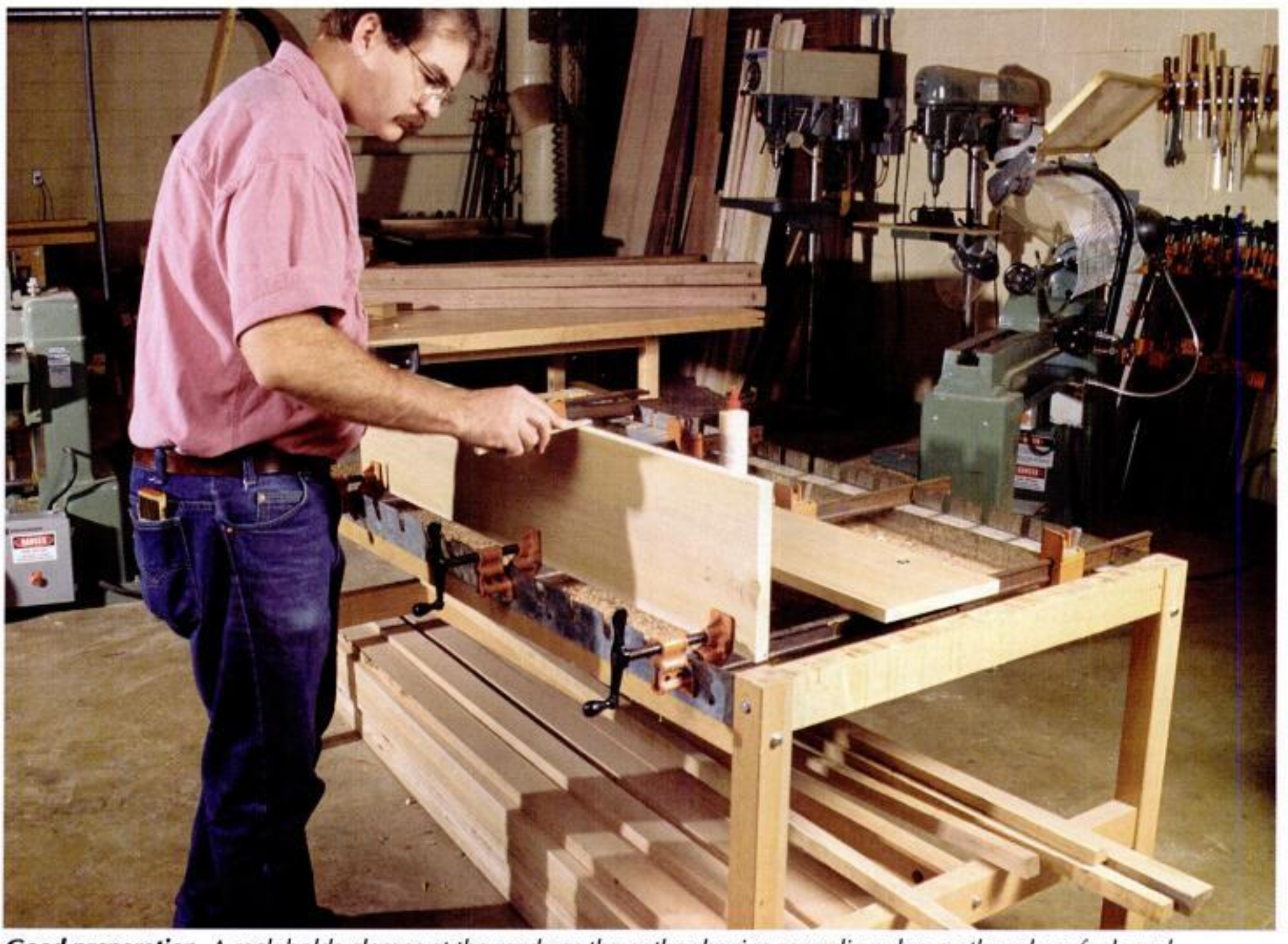
We all know that feeling once the glue is spread: There's no turning back. If everything doesn't go sweetly during glue-up, you might be saying goodbye to the project, or at least part of it.

So how do you glue up without panic? The most important ingredient in a successful glue-up is careful planning, but there are also specific techniques you can use to make gluing up go easier. In this article, I'll show you how to approach the "final hour" with confidence. First, let's look at some of the glues used in the shop and discuss how to pick the right one for the gluing job at hand.

Choose Your Glue

When you're choosing the best glue for a particular job, you'll have to take several factors into account: the complexity of the glue-up, the gaps you need to fill, the permanence of the joint, and moisture considerations. All woodworking glues are stronger than the wood itself. The most commonly used glues are yellow glue, white glue, plastic resin glue, epoxy and hide glue.

White and yellow glues are a good choice for most wood-to-wood joints. These polyvinyl acetate (PVA) glues are strong, safe and easy to use. I usually prefer yellow glue because it's a little stronger than white glue. I still use white glue occasionally because of its longer working time, a feature which can be critical when gluing up complex assemblies. Because glue is such an important—yet inexpensive—part of a project, be sure that it's fresh, not cur-



Good preparation. *A rack holds clamps at the ready as the author begins spreading glue on the edge of a board.*

dled or stringy. Most PVAs have a shelf life of one year and they must be kept from freezing.

Plastic resin glue and some types of epoxy have even longer working times than white glue. These adhesives have good to excellent water resistance, but they require accurate mixing. Plus, they're expensive.

Hot hide glue is another alternative to PVA glue that is preferred by many experienced craftsmen, especially for restoring antiques. Because it sets so quickly, hot hide glue doesn't require clamping. Liquid hide glue is a premixed variety, and while it isn't as strong as the hot version, this glue has a long open time. Joints glued with hide glue are easily disassembled later by applying heat and moisture. However, working with hide glue takes some experience and can be time consuming. (For more on glues, see AW #10 and #34.)

Over and under. *Alternating clamps on both sides of an edge-to-edge joint prevents the panel from cupping.*

Have Your Tools Ready

You only need a few tools for gluing up, but it's important to have them in order before you start spreading glue.

Glue spreaders—I use an assortment of low-tech devices for spreading glue. Short-nap paint rollers work well for applying an even coat of glue on large, flat surfaces as when veneering. Old credit cards and scrap pieces of plywood also do the trick. Small, tapered sticks are effective for coating dovetails or the walls of a mortise. Flux brushes, available at most hardware stores, home centers and plumbing suppliers, also do an excellent job of spreading glue in small spots. Trimming the ends of the bristles so they're about ½ in. long stiffens the brush for thicker glues.

Rules, squares and mallets—I keep several sizes of accurate squares handy for checking right angles, including a small machinist's square, a 12-in. combination square and a 24-in. steel framing square. For large work such as cases, I check for square by measuring diagonals with a folding rule. Comparing diagonal measurements is also a good way to check trapezoidal seat frames or other odd-angled assemblies for proper alignment. Remember to keep a wood or non-marring plastic mallet ready to coax parts into alignment.

Clamps—These tools are vital for most glue-ups, but figuring out which ones to use can be confusing, especially with the many new clamp designs on the market.

Bar or pipe clamps are a good choice for gluing large assemblies such as tabletops and casework. (See photo, above.) Wooden handscrews work well for smaller assemblies and for tapered or irregular parts, and their deep throats let you reach into the middle of wide work. Band clamps often work well for curved work and for multi-sided assemblies. A vacuum press is ideal for veneering. It's quick and convenient to use compared to the method of arranging numerous clamps and cauls. (For more on vacuum presses, see page 50.)

Clamping blocks and pads—For many glue-ups, you'll need to use wood scraps to aid in clamping, from small blocks to long sticks. Keep a supply on hand—you'll use them again and again. Also keep a stock of small wood pads to act as a cushion between the clamp jaw and the workpiece. You can also buy protective plastic pads to cover the jaws of most types of clamps. If your wood pads will come in contact with glue, rub a generous coat of paste wax on them before glue-up, or use waxed paper to isolate the workpiece from these parts.

Clamping fixtures—For production runs, repetitive glue-up work and assemblies that are difficult to clamp, it pays to fashion jigs or fixtures that aid in

Tight miters. *This shop-made jig pulls miters tight and square with pressure from a single handscrew clamp.*

Spread out the pressure. *A length of scrap placed between the clamps and the walnut edging helps distribute clamping pressure evenly. Glue squeeze-out is a good indicator of pressure distribution.*

aligning parts and positioning clamps. The picture-framing jig shown on the opposite page is a good example of a specialized jig for gluing up.

Glue-up bench—With any gluing operation, it's vital that you glue up the work and let it dry on a truly flat surface to avoid introducing a permanent twist into the assembly. A flat benchtop makes an ideal surface. A nonstick surface or a coat of paste wax will make removal of excess glue easier.

Get the Right Fit

For glue to hold two pieces of wood together, it's important for mating parts to fit correctly. For a strong bond, mating surfaces have to touch. Don't rely on glue to fill gaps.

In some joints, such as dovetails or mortise-and-tenon joints, the mating surfaces aren't subject to direct clamping pressure. To ensure a good bond, I aim for a small degree of friction between mating surfaces. Hand pressure should be enough to close the joint. If you have to pound the joint together, you risk splitting the wood or scraping your glue off the mating surfaces. Large joinery, such as a dovetailed case, may require light blows with a mallet to drive the parts together.

Glue surfaces should be cleanly cut. Avoid torn, burnt or burnished grain. A light pass with a hand plane produces an ideal glue surface. If you use a jointer for the final pass before gluing, push the stock slowly so any marks are closely spaced. It's OK to use sandpaper, but be careful not to round the surface. Whether glue surfaces are hand-planed, machined or sanded, they must be flat for maximum contact. They should also be free of dust. A blast of compressed air does an excellent job of "dusting off" the surface prior to glue-up.

Make a Dry Run

Ever since my table nightmare, I never glue up a complex assembly without making a dry run. A dry run is the *only* way to truly rehearse and troubleshoot an assembly by identifying and correcting problems before you begin to apply glue. It allows you to check whether the assembly is actually square and to determine the number and position of clamps that you'll need.

During my dry run, I look for joints that won't completely close. If an assembly is twisted, racked or bowed, I try to reposition my clamps to focus clamping pressure and overcome the problem. (See drawing, next page.) This is also the time to prepare all your clamping pads and blocks.

Use Clamping Blocks

Gaps in a joint often mean that clamping pressure isn't reaching that area. You can remedy this by adding scrap between the work and the clamp to spread out the pressure. (See drawing.)

Sometimes I glue small clamping blocks to the workpieces to give my clamps purchase. To prevent the blocks from becoming a permanent part of the assembly, I glue heavy paper (grocery bags work well) between the blocks and the workpiece, then I knock off the blocks after the glue has set and remove the paper with a scraper. You can also attach clamping blocks with a dab of hot glue from a glue gun, but if the position of the clamp produces sideways pressure on the block, the glue can fail. When you've finished clamping, pop off the blocks with a sharp rap from a hammer and pare away the cooled glue with a sharp chisel.

Gluing Subassemblies

Whenever possible, I divide a project into subassemblies. This simplifies the setup and gives me more time to position clamps and check for squareness and alignment *after* I've applied the glue. I think of all projects as having left and right sides, fronts and backs and so on. For example, when I'm building a chair, I glue up the front and back as separate sections. Once the glue has dried I glue the two sections together with the side rails and stretchers.

While most projects can be divided into smaller, more manageable sections, on occasion it's just not possible. In these situations, I use a glue with a longer working time. If the assembly is really large or complicated, I enlist the help of a friend.

Gluing Specific Types of Joints

With any type of glue-up, you'll need to know how much glue to use. The key is to remember that both surfaces of a joint must be wet to get a strong bond.

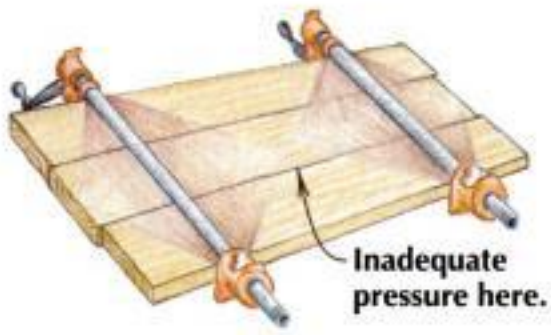
Simple subassemblies. *Instead of gluing up a table all at once, the author breaks the project into smaller subassemblies that are easier to clamp square and flat. Here he checks the legs for flatness with a straightedge.*

AVOIDING COMMON CLAMPING PROBLEMS

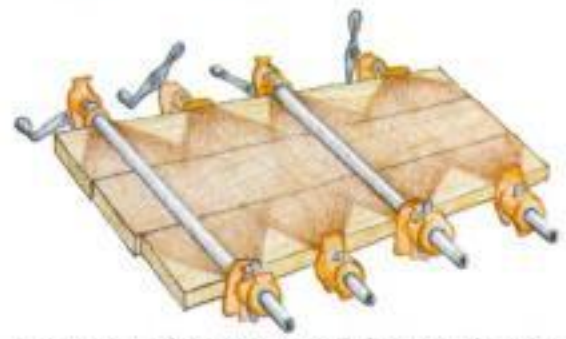
EDGE-TO-EDGE GLUING

PROBLEMS: Cupping from overtightening or from uneven pressure when clamps are placed only on one side of the panel...

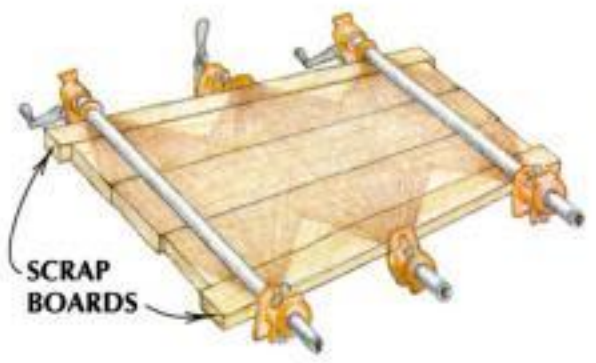
...and insufficient clamping pressure at glue lines.



SOLUTIONS: Equalize clamping pressure by alternating clamps on both sides of panel. Decrease spacing between clamps to increase pressure...

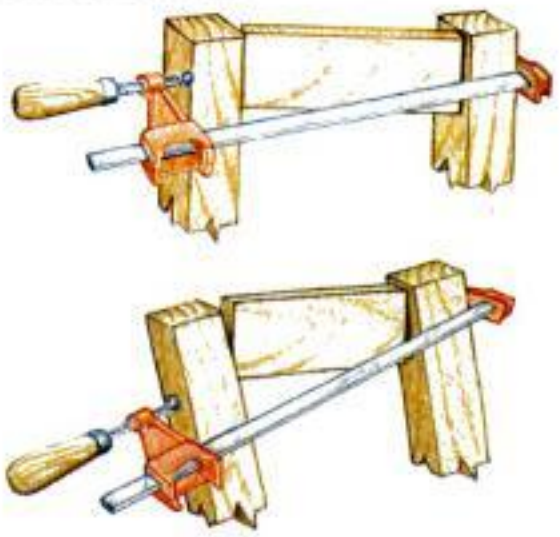


...or use wide scrap and fewer clamps to distribute pressure over wider area.

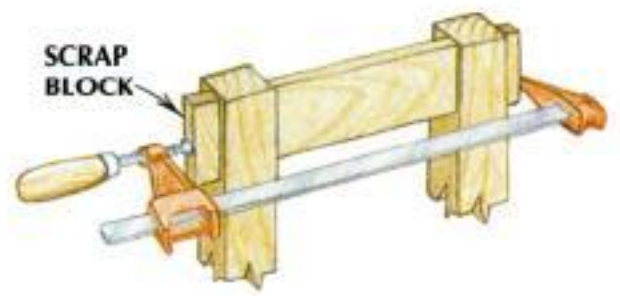


LEG-AND-RAIL ASSEMBLY

PROBLEM: Twisted or racked legs can result when clamping pressure isn't centered on rail.

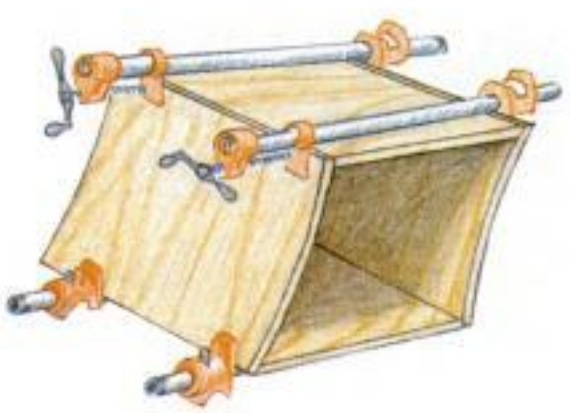


SOLUTION: Align blocks with joints and position clamp to apply pressure along joint centerline.

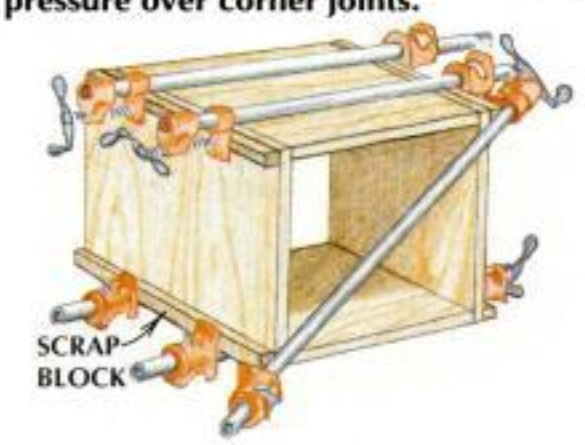


KEEPING CARCASES SQUARE

PROBLEM: Racking is hard to prevent when gluing up carcases and other large assemblies. Clamp jaws that reach beyond corner joints can cause sides to bow inward.



SOLUTION: Loosen clamps, then clamp across longest diagonal until diagonal measurements match. Avoid bowed sides by using blocks to focus clamping pressure over corner joints.



A dry or "starved" joint won't hold adequately. On the other hand, a slight amount of glue squeeze-out is good insurance, but anything more is both messy and wasteful.

Edge-to-edge joints are commonly used for producing broad, flat surfaces such as tabletops. When I'm arranging my stock, I don't bother with alternating the annular rings. Instead, I arrange boards for the best color and grain match. Edge-to-edge joints between two long-grain boards are stronger than the wood itself, so you don't need dowels or biscuits for strength.

To prevent the panel from bowing up or down under clamping pressure, I alternate the clamps under and over the workpiece. (See top photo, page 38.) Space the clamps so clamping pressure will be spread evenly over the entire glued area—a clamp every 6 to 12 in. is usually adequate, depending on the width of the boards you're gluing up. Narrow stock may require more clamps. You can use fewer clamps by inserting wide pieces of scrap between the work and the clamps to spread clamping pressure over a broader area. (See drawing.)

Remember that you need only enough clamping pressure to close the joint. Too much pressure can crush the fibers and cause internal stresses in the wood. After the glue cures, these stresses remain in the assembly and can eventually loosen joints. Also, too much force only serves to squeeze most of the glue out of the joint and weaken it. Once I've spread the glue, I start applying clamping pressure at the center and work toward each end. While clamping, I align the faces of the boards as I go, by lifting or pushing down on the boards at their ends.

In leg-and-rail construction you're usually dealing with offset surfaces, where a thin rail joins a thicker leg. To avoid twisting or racking the joint, it's important to apply pressure directly in line with the joint, centered on the width and the thickness of the rail. (See drawing.) After I clamp the joint, I use a straightedge to make sure that the inside surfaces of the legs are in the same plane. Then I check for square by measuring the diagonals on the outside corners. If the legs on your particular project don't have outside tapers, you can measure across the top and the bottom of the assembly. When the measurements are identical, you know the assembly is square.

GLUING UP DOVETAILS

Good brushwork. *With the corner joints partially assembled, Bird uses a flux brush to coat the dovetail pins with glue.*

Notched blocks. *Positioned at the corners, notched clamping blocks allow the pins to protrude but ensure that the tails are clamped tightly.*

Measuring for square. *Once the case is clamped, Bird uses a folding rule to check for square by comparing diagonal measurements.*

When gluing frame-and-panel assemblies, don't let the glue squeeze out into the panel grooves. If the side edges of the panel become glued to the stiles, the panel may split when it starts to shrink in response to changes in humidity. The best defense is to use just enough glue and to spread it carefully in the mortises and on the tenons. Another method is to *pre-finish* the edges of the panel so that wayward glue won't adhere. Pre-finishing panels is advisable anyhow. It keeps an unfinished tongue from showing if the panel shrinks.

Gluing large casework means working quickly so the joints can be drawn up tight before the glue seizes. I like to use white glue in this situation because it doesn't grab quite as fast as yellow glue.

As soon as the case is clamped, I check for square by measuring both diagonals across the case's top opening. If there's a discrepancy between the two measurements, the error will be half the difference. To correct it, loosen the clamps slightly, then clamp from corner to corner across the longer distance and recheck for square.

Large dovetailed boxes can benefit from special clamping treatment. (See photos, above.) Small dovetailed drawers are best glued up without clamps. I just apply the glue, tap the parts together with a mallet, then check for square.

Gluing up miter joints can be difficult because miters have a tendency to slip when clamped. Specialized miter clamps can solve this problem. Or if you're assembling a mitered frame, you can spline the joints, then use a band clamp to pull the frame together.

When gluing small box miters, a few pieces of masking tape provide enough clamping power. (See photos, below.)

Since miters are essentially end-grain joints, it's a good idea to *size* the grain first by wiping on a light coat of the glue you'll be using. Wait a minute or two, then recoat the joint with fresh glue and clamp the parts together.

Cleaning Up

Opinions vary on the issue of removing glue squeeze-out. Some woodworkers like to use a damp rag to wipe the excess glue from an assembly as soon as any squeeze-out appears. But with this approach, it's easy to accidentally smear excess glue into the wood surface around the joint. Glue spots and smears are invisible on bare wood, but they show up dramatically when the finish is applied. On the other hand, if you remove the glue after it's fully cured, it will likely take small pieces of wood along with it.

My approach for handling squeeze-out is to allow the glue to dry until it reaches a rubbery state, which usually takes anywhere from 30 minutes to 1½ hours for yellow glue; then I peel it off. I've even dedicated one of my hand scrapers to glue removal. Some craftsmen use a sharp paring chisel to slice away the excess glue. ▲

LONNIE BIRD
is a contributing editor to AW. He teaches furniture making at the University of Rio Grande, Ohio.

Taping it tight. *To glue up a small box with mitered corners, Bird lays the mitered sides end-to-end onto the sticky side of masking tape. Then he applies glue, folds the sides together and draws the miters tight with the tape.*

Making Wooden Handscrews

These Hard-Working Traditional Clamps Are Easy and Inexpensive to Make

by Mike Dunbar

Wood holding wood. *These shop-made clamps have no steel jaws to mar the work; they can be used for a variety of clamping assignments.*

When I started working wood professionally more than two decades ago, I bought many of my tools secondhand, including a number of wooden hand-screw clamps (commonly called handscrews). I soon grew to appreciate the usefulness of these simple tools. (See photo, above.) Unlike commercially available, steel-thread handscrews, wooden ones can't be adjusted to a wide range of angles. But all-wood handscrews are much less prone to slippage, thanks to wood's resilience. When you tighten the rear screw, it bows slightly, creating a spring effect. If the clamped workpiece shifts slightly, the bow compensates to maintain pressure.

Today, antique wooden handscrews are coveted by woodworkers and tool collectors, and they cost more than I'm willing to pay. But with a little wood and a tap-and-die set, you can duplicate these classic clamps in your own shop.

Matched tap-and-die sets come in several sizes for cutting threads in different diameters. I got mine from Conover Woodcraft (Box 418, 7785 Mentor Ave., Mentor, OH 44060, 800-433-5221). The tap cuts threads in a predrilled hole. The die, or *threadbox*, cuts threads in wooden rods or dowels. The two tools will cost you around $60, but the set pays for itself if you make several clamps.

An all-wood handscrew consists of only four parts: two jaws and two screws. (See drawing, opposite.) Make the jaws of a diffuse-porous wood such as maple, birch, or cherry. For the screws, use a strong, resilent, ring-porous wood such as hickory, ash, or oak.

I find that handscrews with 11-in.-long jaws and 16-in.-long screws are suitable for most jobs, but you can make these clamps in different sizes to suit your needs. The throat depth should be about half of the jaw's length. To determine the screw length, add to your desired opening capacity one handle's length plus the total thickness of both jaws. Refer to the chart on the facing page to match screw diameter and spacing with jaw size.

Making the Screws

I like to make handscrews in batches rather than one at a time. Cut your turning blanks for the screws from straight-grained stock. The handle diameter determines the thickness of your turning blanks. (See chart).

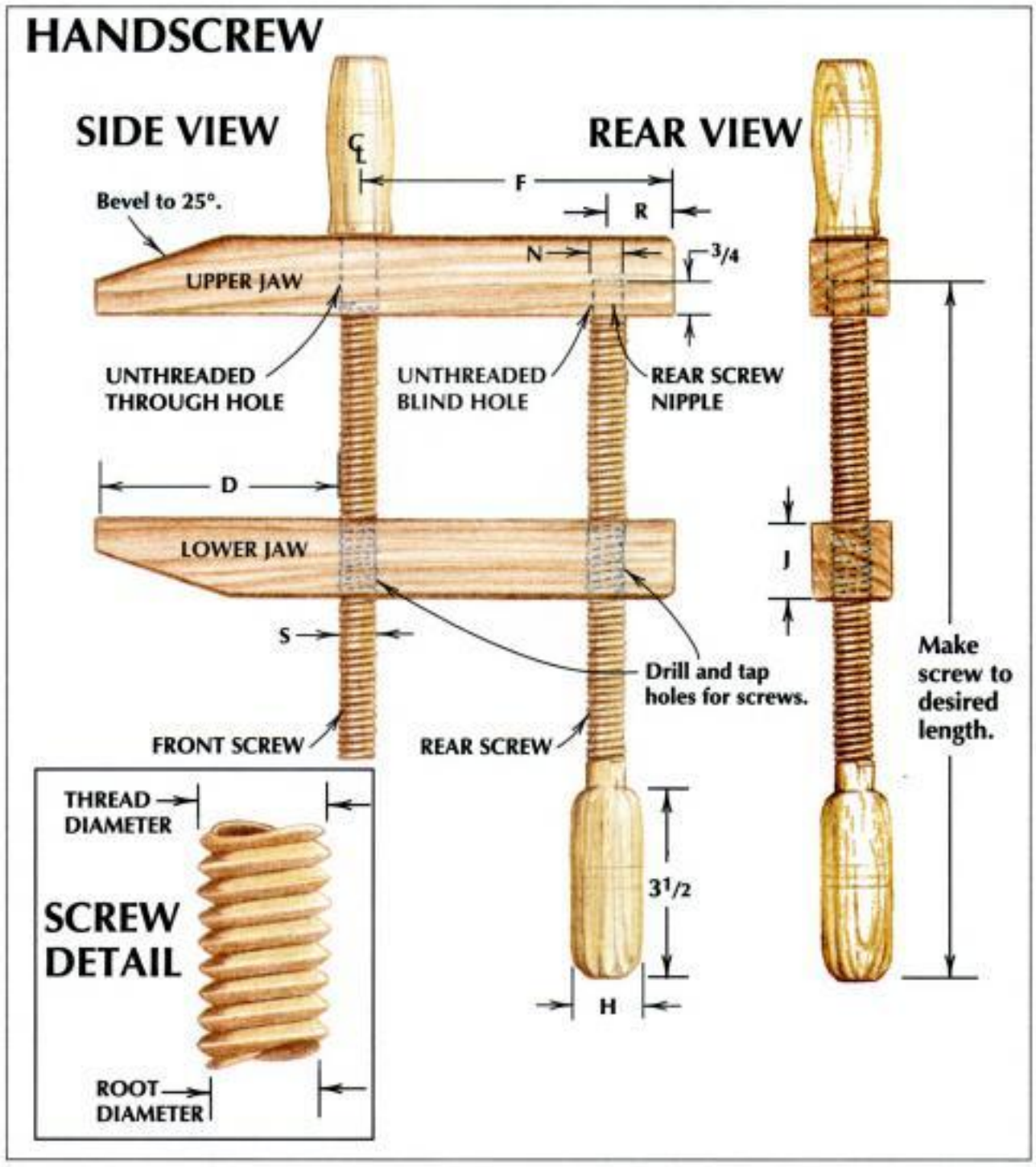
Note that the front and rear screw blanks, or *rods*, are turned differently. On the rear rod, the end opposite the handle has a smaller diameter than the screw thread. This nipple fits in a blind hole in the upper jaw. On the front rod, the handle should have a square shoulder where it meets the jaw. (See drawing.)

Turn your screw rods accurately: Too small a diameter and the screw will slop around in the jaw; too big, and the die simply won't fit on it. Before you begin threading the rods, coat each one liberally with a 50/50 mixture of boiled linseed oil and mineral spirits. This lubrication makes for easier cutting action and also prevents excessive wear on the die's cutting edge.

Clamp the rod in a vise, set the die on the rod and turn it clockwise while pushing down. When you feel the tool

Threading the rod. *Once the thread is started, Dunbar removes the screw handle from the vise and completes the thread by turning the die.*

Tapping the jaw. *Holding the tap vertical, Dunbar starts the thread with firm downward pressure.*



start to track easily, you can remove the rod from the vise to complete the threading. (See top photo, above.)

Making the Jaws

Cut the jaws from straight-grained stock and lay out the hole centers on each jaw. Both holes in the lower jaw require threading. To determine the "root" diameter for these holes, refer to the directions provided with your tap.

After drilling the holes, brush some oil into each hole to be threaded. Dip the tap into the oil and insert the tap's pilot, or unthreaded lead, into the hole. Holding the tap vertically, turn it clockwise with a firm downward pressure to start the thread. (See bottom photo, left.) After a few turns, the tap will become clogged with chips. Back it out, clear the chips and relubricate the hole and tap. Repeat this process until the hole is threaded all the way through.

After threading the holes, chamfer the jaws' edges with a hand plane and apply a coat of oil. To assemble the handscrew, hold the jaw faces together, insert the front screw through the upper jaw hole and thread it through the lower jaw hole until its handle bottoms out. Thread the rear screw through the lower jaw until the nipple sits in the hole in the upper jaw. Adjust your clamp by grasping the rear screw handle in your left hand and the front screw handle in your right hand. Crank your right hand in a clockwise motion to open the jaws; reverse the motion to close them. ▲

HANDSCREW SPECIFICATIONS

SIZE SPECIFICATIONS	JAW LENGTH (IN.) Small 6 to 8	Medium 9 to 12	Large 13 to 15
D = Throat depth	2 3/4 to 4 3/4	3 1/8 to 6 1/8	5 1/2 to 7 1/2
H = Handle dia.	1 1/8	1 1/4	1 1/4
S = Screw thread dia.	1/2	3/4	1
N = Rear screw nipple dia.	3/8	1/2	5/8
J = Jaw thickness & width	1 1/8 sq.	1 3/4 sq.	1 7/8 sq.
R = Rear screw ctr. to jaw end	7/8	1 1/4	1 1/4
F = Front screw ctr. to jaw end	3	5 1/2	7

MIKE DUNBAR *is a contributing editor to AW. He makes Windsor chairs and teaches chairmaking in New Hampshire.*

Kiera's Desk

Clean Lines Coexist With Intricate Detail in Walnut and Cherry

by Ron Layport

Old desks have always fascinated me. Whenever I approach a well-worn desk, I somehow feel intimately connected with those who used it long before I came upon it. Endowed with its own collection of private thoughts, important papers and quiet moments, a desk begins to take on a spirit of its own. Wear points at corners or around cubbyholes, an old three-cent stamp or an anonymous address long lost at the back of a drawer compartment—all remain as traces of history.

It was with these romantic notions in mind that I set out to design and build a desk for my daughter, Kiera. Knowing her fondness for dark wood tones, I chose to use walnut and cherry, aware that the passage of time would mellow the initial lightness of the cherry to a deep reddish-brown. (A father's lesson to a daughter on the value of time and patience.) The piece was a hit with Kiera, and with quite a few others, too.

In style and construction, this desk falls somewhere between Shaker simplicity and post-office pigeonhole. If there is a higher design concept beyond that, it would be the idea of "detail within detail." I wanted to create a piece that would have clean, simple lines, yet also present a pleasing hierarchy of intricate divisions within divisions.

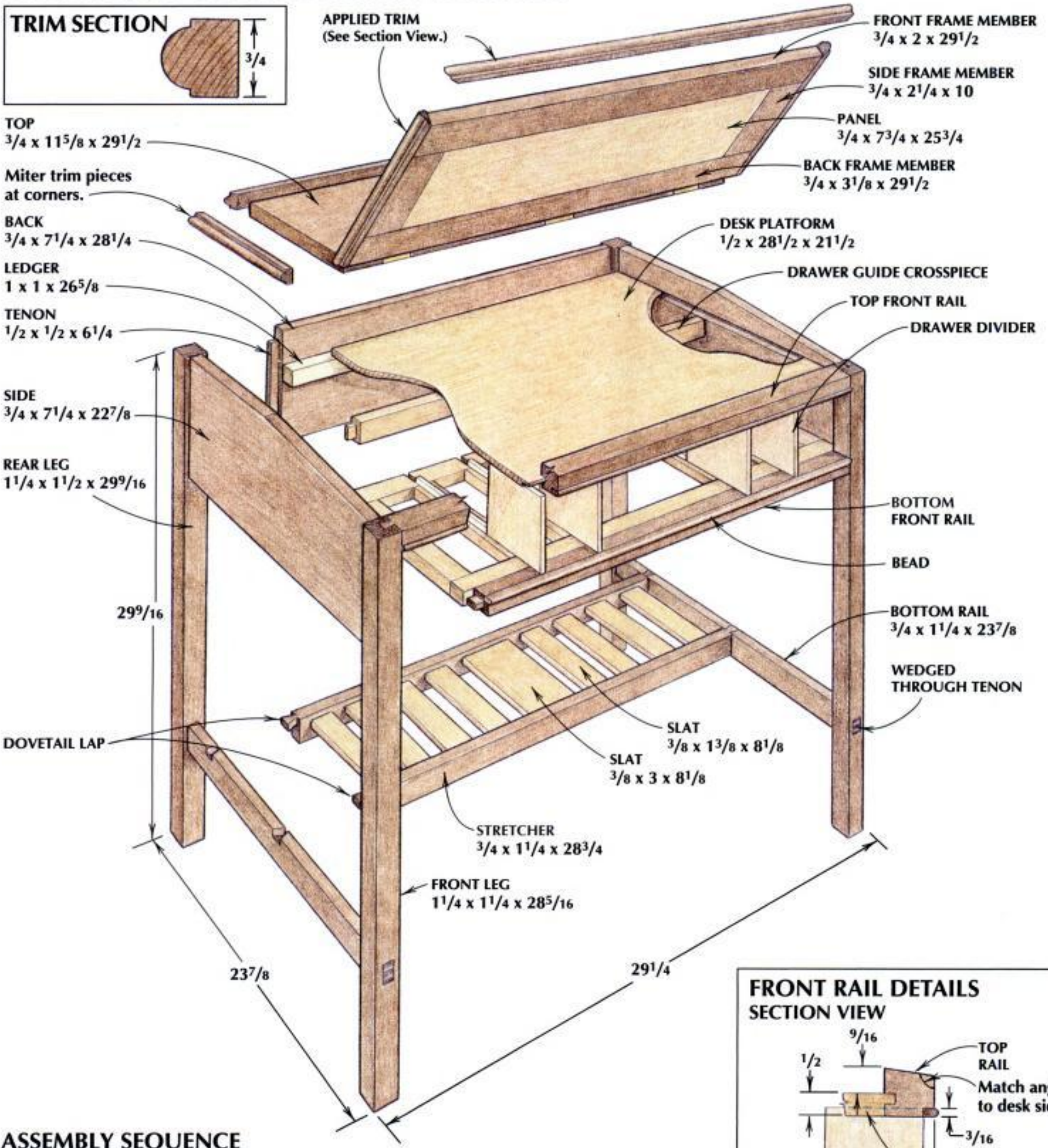
The base contains a slant-top desk and a set of drawers. A double stretcher-and-slat assembly ties the bottom rails together, providing stability as well as space for books, baskets, or very possibly one's tired feet. On top, a walnut carcase, or *bonnet*, with a pair of frame-and-panel drawers encases a symmetrical arrangement of compartments and three small drawers. Even the drawer knobs were subject to the detail-within-detail approach, with their walnut and maple inserts. (See sidebar, page 49.)

Building this piece gave me hours of pleasure in the shop. It offered a good mix of machine and hand work. Tenons were cut on the tablesaw, mortises and dovetails by hand. Because of the numerous stock thicknesses involved, I wouldn't attempt this project without my thickness planer. I design with my 13-in. Delta planer like some folks design with a computer. But in the final analysis, it's the feel of hand-worked edges and surfaces that make the project mine. That less-than-machine-perfect feel says, "One of a kind. Go ahead, touch."

The drawings on the following pages divide this project into distinct subassem-

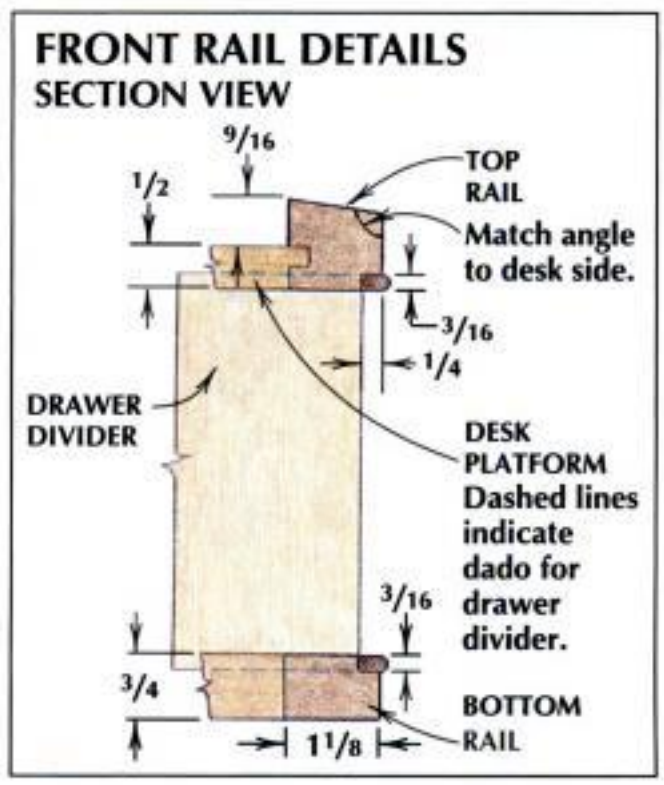
Detail within detail. *The author's desk has an upper cabinet of compartments above a base that contains a row of drawers and a slant top (above). Five years after its construction, the aged cherry shows the deep color the author envisioned when designing the piece (right).*

FIG. 1: BASE CONSTRUCTION DETAILS



ASSEMBLY SEQUENCE

1: Complete the two side subassemblies. Each consists of a rear leg, a front leg, a desk side, and a bottom rail.
2: Build the drawer guide assembly. (See Fig. 3.)
3: Join side subassemblies by installing the desk back, drawer guide assembly, desk platform and bottom front rail. Don't use glue when fitting the desk platform in the side dadoes.
4: Build and test-fit the stretcher-and-slat assembly. Cut dovetails in the stretcher ends, and matching recesses in the bottom rails. Dry fit the slats in the stretchers; glue stretchers to the bottom rails.
5: Cut the dovetail joints in the top front rail and in the tops of the front legs. Install the top front rail. Then slide the desk platform forward and glue its rabbeted front edge in the top rail's groove.
6: Make and install the beads in the front rails.
7: Build and install the desktop and slant top.
8: Make the drawers.



blies. For the two most involved parts of the desk—the base and the upper compartments—I've written up assembly sequences that go with particular drawings. (See Fig. 1 and Fig. 4.) In the text that follows, I'll explain my approach to creating this piece and describe the key details in its construction.

Designing as You Build

I've always been at a loss for words when describing how I approach furniture design and construction. My best efforts usually fall along the lines of "design by discovery, one stick at a time"—in other words, trial and error. More recently, I've heard this called empirical construction. Whatever the label, this approach allows for a good deal of design freedom in the midst of the construction process. It's the opposite of production woodworking, and the only way I know of getting the proportions, details and spirit of the piece just right.

When you build empirically, nearly every completed part or subassembly provides an opportunity to refine the dimensions or details for subsequent parts. For example, I didn't finalize the design of the stretcher-and-slat assembly until it came time to build and install it. Only then did I experiment with slat sizes, spacings, and stretcher positions.

Building the Base

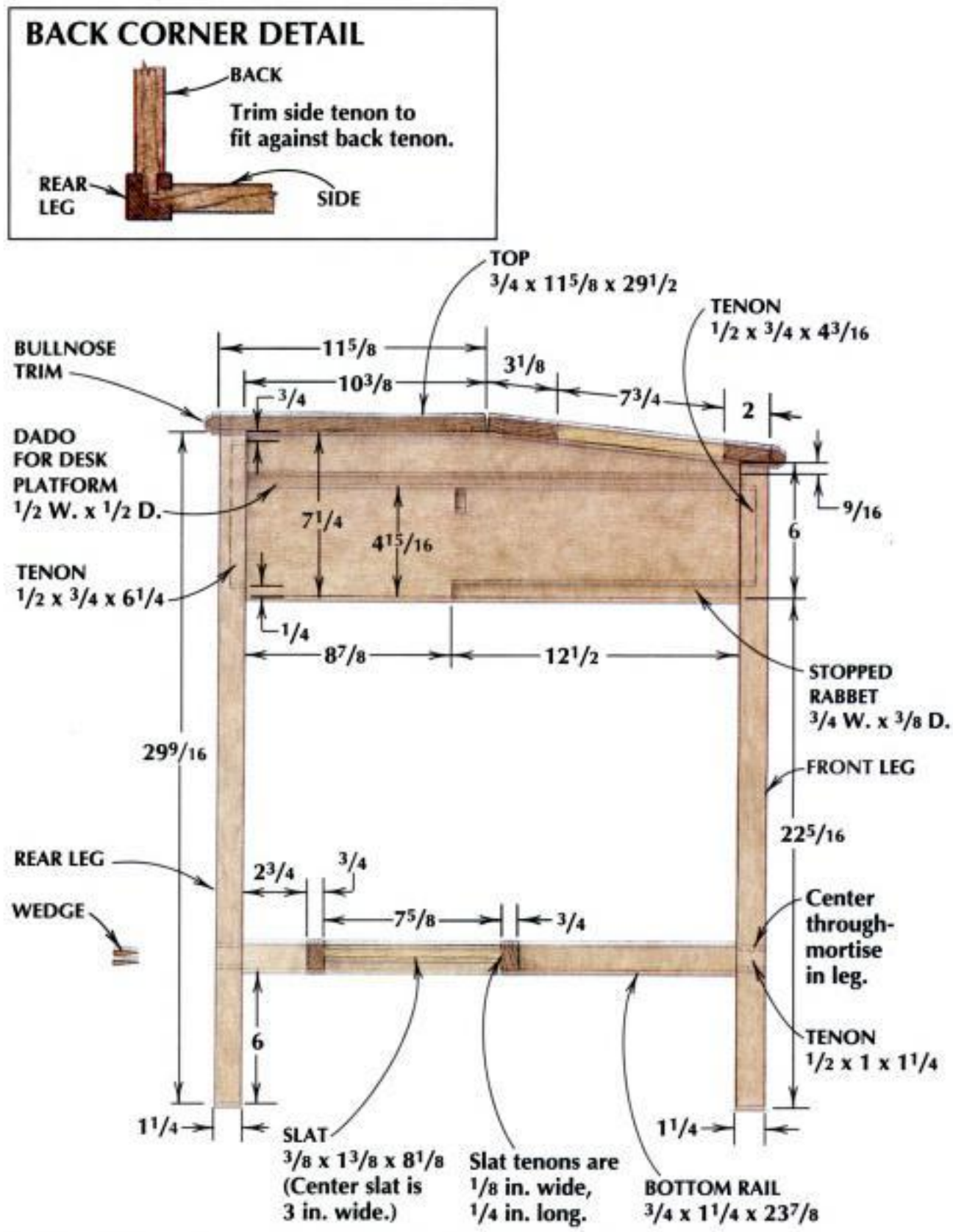
The lower half of this project is a desk in its own right. There's a row of five drawers at the front, a slant top that swings up to reveal a platform, and a single broad drawer that closes beneath the fixed top. (See photo, right.)

Major construction details and dimensions are shown in Fig. 1. For layout information, refer to Fig. 2. There are a few important details to remember when laying out the base joinery. First, note that the bottom rails join the legs with wedged through tenons. These 3/4-in.-thick rails are centered on the 1 1/4-in.-square legs.

Up above, the desk sides, back and front rails are all held back 1/8 in. from the outsides of the legs. All these parts, save for the top front rail, are tenoned into the legs. The side tenons that fit into the rear legs will require trimming where they meet the back tenons. (See Back Corner Detail, Fig. 2.) I pinned each side-to-leg joint with a pair of 3/16-in.-dia. dowels.

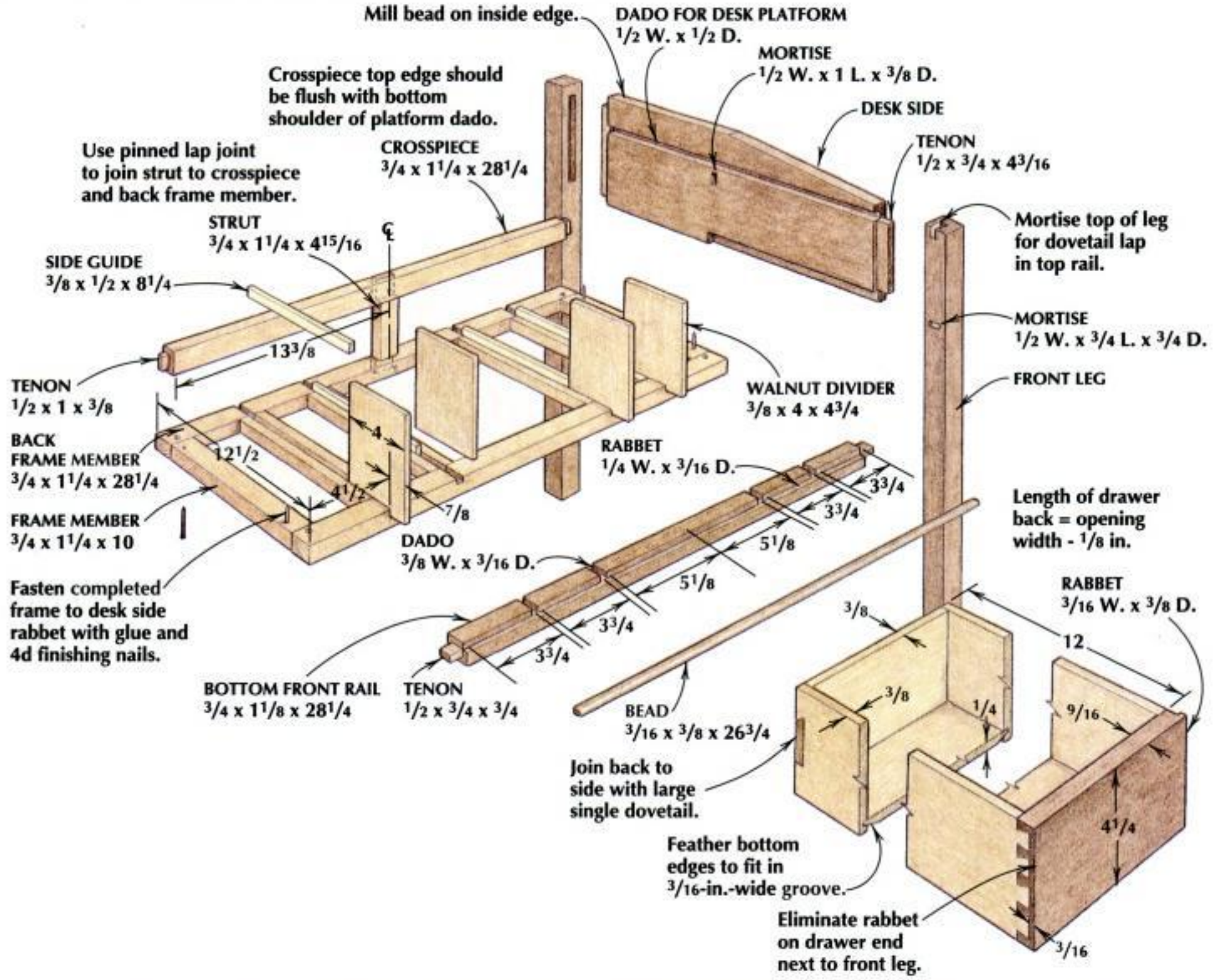
If you follow the assembly sequence described in Fig. 1, base construction

FIG. 2: BASE SIDE ELEVATION



Nooks and crannies. *Raising the slant top reveals the desk platform and a single broad drawer that fits beneath the desktop. The author's custom-made drawer knobs continue the interplay between light and dark that is expressed throughout the piece.*

FIG. 3: DRAWERS & DRAWER GUIDE ASSEMBLY



should go smoothly. The tricky part of the process is in joining the two side subassemblies together, since this means installing the desk back, the lower front rail, the desk compartment and the drawer guide subassembly. The frame of the drawer guide subassembly, shown in Fig. 3, effectively squares and reinforces the overall base assembly.

It's important not to glue the desk platform in the side dadoes. When the upper front rail is installed, slide the platform forward slightly and glue its rabbeted front edge to the groove in the upper front rail. (See Front Rail Details, Fig. 1.) To support the back edge of the desk platform after the base is put together, screw a ledger board against the back of the desk.

A note or two about the desk drawers: The fronts of the three center drawers are rabbeted on both sides to stop against the drawer dividers. The remaining two drawer fronts are rabbeted on one side only, since the opposite sides close against the front leg. (See Fig. 3.)

Building the Upper Cabinet

The upper cabinet, or bonnet, is a separate structure that rests on the top of the base, held in position by two 1/4-in.-dia. dowel pins that extend through the bottom of the upper cabinet and into the desktop. This cabinet has a solid walnut carcase with a pair of frame-and-panel doors and an interior made up of cherry dividers, crosspieces and three small, dovetailed drawers.

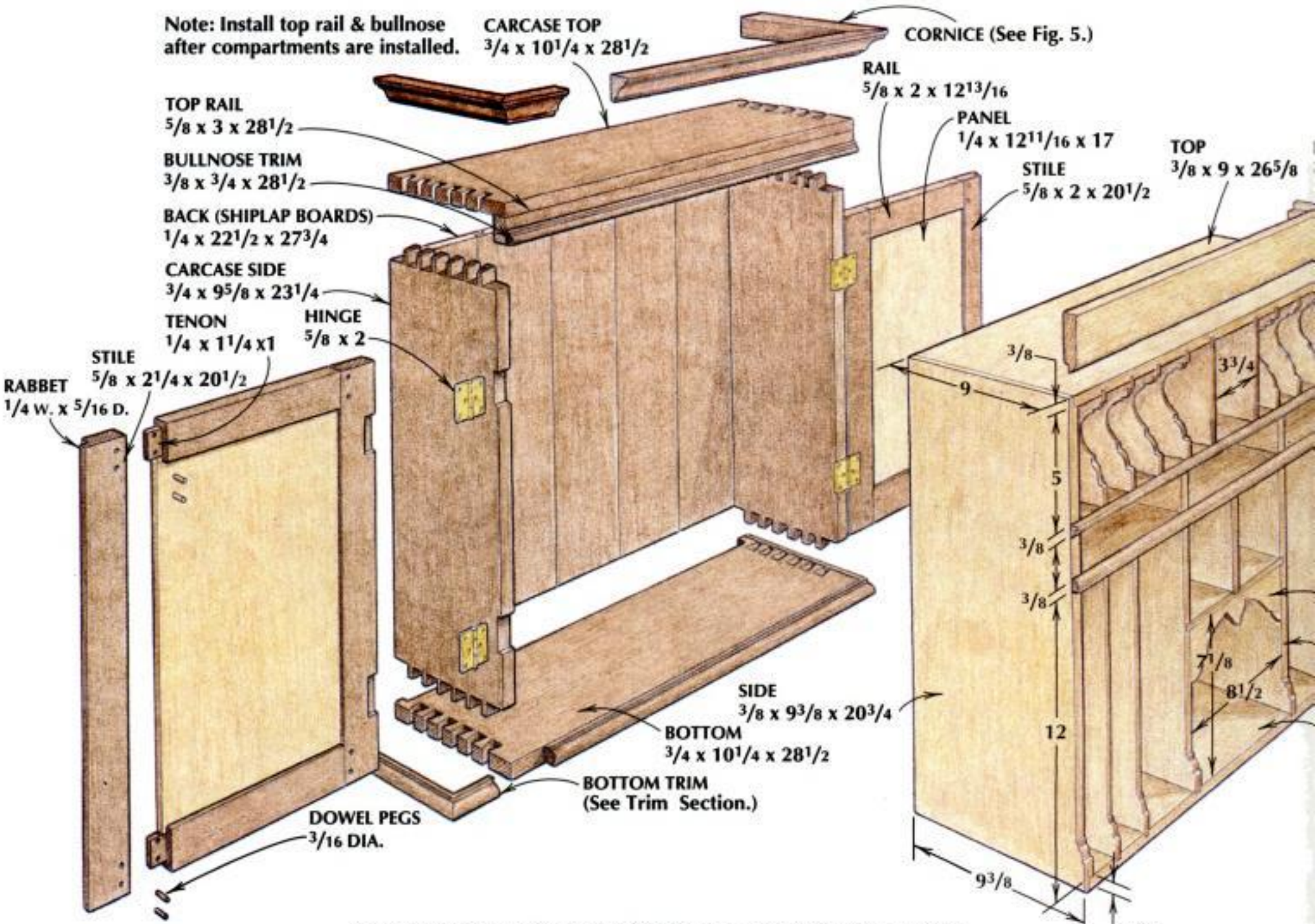
The first parts to cut and assemble are the sides, bottom, top and back. Stop short of making the doors and installing the carcase's top rail, bullnose trim and cornice. This work needs to wait until the inner compartments are done.

As shown in Fig. 4, I used hand-cut dovetails to join the carcase sides to the top and bottom. The 1/4-in.-thick walnut back is a series of lap-joined boards that fit in the rabbeted back edges of the sides, top and bottom.

Before you begin to work on the compartments, place the carcase on the desk, centered and with its back flush with the back edge of the desktop. Measure 1 1/2 in. in from the lower inside corners of the carcase, and drill two 1/4-in.-dia. holes through the carcase bottom and 3/8 in. into the desktop. These will be your registration holes for the dowel pins mentioned above.

Of course, you can compartmentalize the inside of the cabinet any way you want. My design looks complex, but it isn't difficult to construct if you follow the sequence outlined in Fig. 4. The construction sequence allows for what I call a "compression" fit. The sides are compressed against the inside of the cabinet by the top, bottom and upper cross-

FIG. 4: UPPER CABINET CONSTRUCTION



COMPARTMENT CONSTRUCTION SEQUENCE

1: Mill all parts to finished thickness and width, and to rough length.
2: Cut the two sides to finished length; cut their dadoes, rabbets and feet. Place the sides inside the carcase.
3: Cut the top, bottom and upper crosspiece to fit between the sides. Cut the dadoes in these parts and install them.
4: Cut the central dividers to fit between the bottom and the upper crosspiece. Cut their dadoes and feet, then install them.
5: Cut the three lower crosspieces to fit between the sides and central dividers, cut their dadoes, and install these pieces.
6: Cut and install the remaining dividers and crosspieces. Use glue blocks to install the ornate console.
7: Cut and install the two pieces of crosspiece trim, using 3/4-in. brads. Then glue the rabbeted header to the top.
8: Finish up by installing the cabinet's top rail, bullnose and cornice.

piece. The two central dividers support the lower and upper crosspieces as well as the twin compartments above the ornate console. Cut and fit these parts in the right order and you'll have scant need of glue.

To top off the compartments, I glued a rabbeted header to the the top front edge of the top piece. (See Fig. 5.) Then I cut and installed the carcase top rail and bullnose. The cornice went on last.

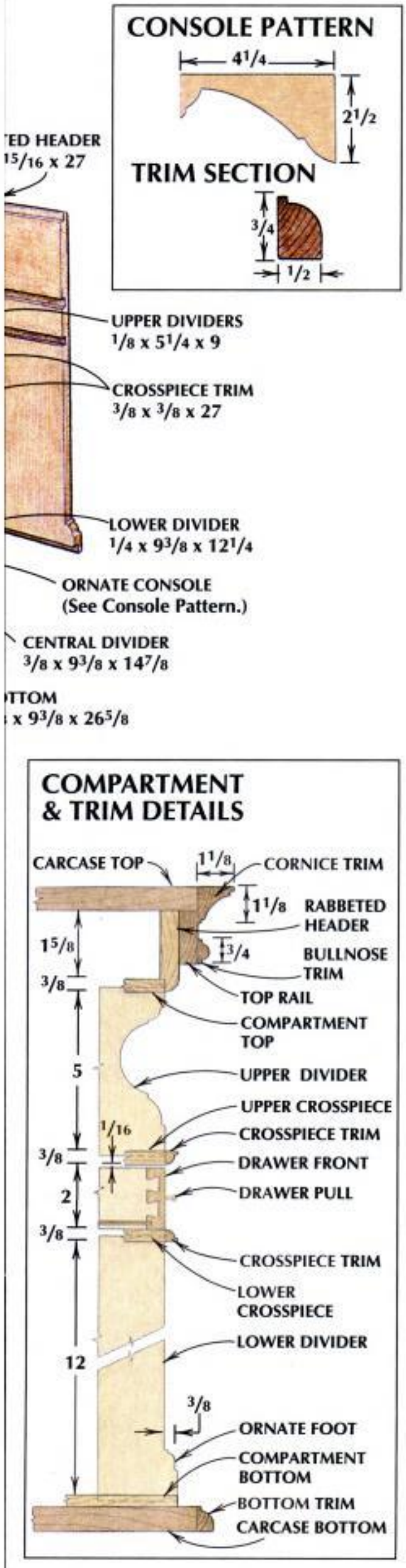
The upper compartment's frame-and-panel doors have pegged mortise-and-tenon joints. Each door's flat cherry panel is 1/4 in. thick, and floats in grooves milled in frame members. A simple 1/4-in. by 5/16-in. rabbet on each of the two center stiles allows the doors to overlap when they close. To show the same 2-in. stile width when the doors are closed, the center stile on the left door (where the rabbet faces out) needs to be 2 1/4 in. wide. After the doors are installed, you may need to drill a small recess on the inside of the left door to accommodate the end of the center drawer pull.

The Finishing Touch

Finishing off this desk was a joy for me. It's the part of the process where I'm most in tune with the personal value that I bring to the piece.

Hard edges over the entire piece were chamfered with a small block plane and chisel. Beads, round-overs and bullnoses were created with scratch stock that I fashioned using hand files and old tool steel. (For more on making a scratch stock, see AW #37.) For final shaping of my not-quite-symmetrical bullnoses, I used scrapers and a spokeshave that belonged to my grandfather. After going over flat surfaces with a hand scraper, I rubbed them out with 0000 steel wool. Finally, I finished this piece with two coats of hot linseed oil and two coats of tung oil. (See AW #36, page 48 for details on my oil finish.) ▲

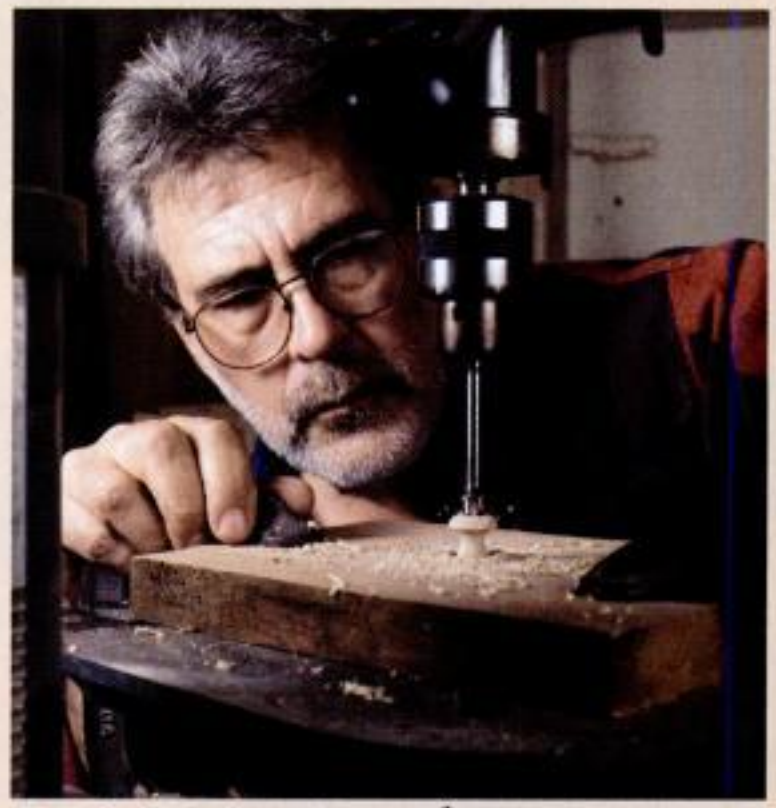
RON LAYPORT
is a self-taught furniture maker and a partner in a Pittsburgh-based ad agency.



MAKING "BULL'S-EYE" KNOBS

Use a Drill Press and Dowel Plugs to Transform a Store-Bought Knob

The small, concentric rings of alternating woods in the knobs for this desk are another expression of the "detail-within-detail" concept that I tried to maintain throughout the design. (See photo, page 46.) Though they look expensive, these custom-made knobs can be made quickly and easily. All you need is a drill press, some dowel rod and a supply of standard, store-bought knobs with round tenons.



First hole. *Layport bores a 1/2-in.-dia. hole in the top of the maple knob.*

Step 1: Clamp a flat piece of scrap stock to the drill-press table and drill an alignment hole, using a bit that matches the diameter of the knob's tenon.

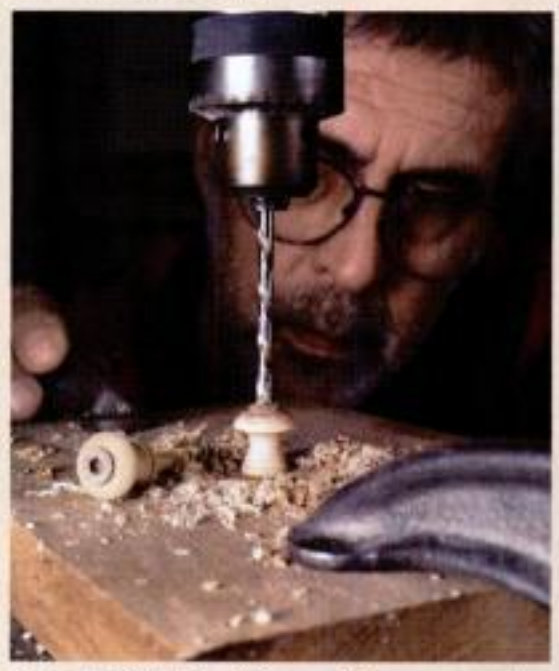
Step 2: Fit the knob in the hole. Then chuck a 1/2-in. Forstner bit in the drill press and bore into the top of the knob. The bit should leave a clean, centered hole about 5/8 in. deep. (Make sure not to weaken the knob by drilling too close to its waist.)

Step 3: Glue a 1/2-in.-dia. walnut plug in the hole, keeping the grain consistent with the knob. Trim and sand the plug so that it's about 1/16 in. proud of the knob, and curved to match its contour.

Step 4: With the knob in its alignment hole, bore a 3/16-in.-dia., 7/8-in.-deep hole in the walnut plug. Then glue in a 3/16-in.-dia. maple plug. Trim and sand this plug to a rounded button about 1/16 in. proud of the walnut surface.

Step 5: Chuck the knob in the drill press, adjust speed to around 800 rpm, and use a piece of steel wool (000 or finer) to smooth the concentric plugs. The heat caused by the friction will darken the maple and give the entire top of the knob a beautiful patina.

—R.L.



Second hole. *After gluing a walnut plug in the knob, Layport bores the hole for a 3/16-in.-dia. maple plug.*

Final spin. *With both plugs glued and trimmed, Layport chucks the knob in the drill press and smooths the bull's-eye with steel wool.*

Buyer's Guide to Vacuum Veneering

Let Atmospheric Pressure Put the Squeeze on Your Work with One of These Affordable, Easy-to-Use Systems

By Jeff Jewitt

In my cabinetmaking business, I've traditionally relied on solid wood for most of the pieces I make. But in the past several years, solid wood has become more costly and exotic species are difficult to find. I've seen some beautiful veneer work done by large shops, but the prospect of setting up a big screw-type press to produce veneered panels was daunting. Other veneering techniques have their drawbacks as well: I never quite got the hang of hammer-veneering and I don't trust the adhesive bond you get when veneering with contact cement.

Then I discovered vacuum-bag veneering. Vacuum-bag systems are simple, affordable and nearly foolproof. Even a first-time operator can clamp complex work such as curved panels. And when you're finished, the whole system can be packed up and stored in a small space.

A number of companies sell vacuum-bag veneering systems or "vacuum presses" ranging in price from under $200 to several thousand dollars. Specifications for 16 different systems for woodworkers are shown in the chart on page 53. For this Buyer's Guide, I tested 11 of these systems that are priced under $1,000. The systems I didn't test are constructed in the same way, but they differ in capacity. Before

Airing out. A vacuum veneer press makes quick work of clamping curves. Here the author smooths the vinyl bag around the form as the pump sucks out the air.

I get into the details of what I learned in my tests, let's take a look at how a vacuum press works.

Vacuum Pressing Demystified

There are three basic parts to a vacuum press: a vacuum pump, a vacuum bag and a gridded platen on which you place the work. Manufacturers supply pumps and bags in different capacities and combinations depending on your needs, but you have to make your own platen. This is done by cutting a grid of shallow (⅛-in.) saw kerfs into a piece of ¾-in. melamine or similar nonstick material. The kerfs provide air paths so the pump can evacuate all the air from the bag.

Using a vacuum press is easy. For flat work, prepare your substrate (core material) and veneer, then make a caul the same size as the veneer and lay it on top to protect the veneer. Spread your glue on the substrate, lay the veneer on the glued surface, position the caul and slide this "sandwich" onto the platen inside the bag. Seal the bag and turn on the vacuum pump.

From here, the laws of physics take over. As the air is evacuated from the bag, atmospheric pressure bears down on the bag and its contents like a giant clamp, pressing uniformly with a force of more than ¾ tons per square ft. It's stone simple. The uniform pressure prevents the veneer from slipping around, as it easily can in a conventional clamp-based veneer press. And the vacuum also promotes good adhesion by sucking the glue into the pores of the veneer and substrate.

Vacuum veneering isn't just for flat work. It's also great for curved glue-ups since there's no need to fabricate both male and female forms. The vacuum clamping process exerts even pressure, no matter how complex the curvature.

The manufacturers listed in the chart sell complete vacuum-bag veneering systems that include a pump, a bag and necessary hoses and hardware. They all also sell individual components. To choose the system that's best for your woodworking needs, you'll need to select the right components and compare prices.

Choosing a Pump

The heart of a vacuum press is the pump, and there are two general types: electric and venturi.

Electric pumps draw air out of the bag like small vacuum cleaners. These pumps are available in different sizes, rated by cfm (cubic feet per minute). Large 10-cfm pumps are best for production veneering or quick evacuation of large bags. A 5-cfm pump will suit most small shops doing custom work.

Pumps, bags and fittings. *There are three different types of pumps for vacuum pressing. All three use similar vacuum bags and fittings. Left to right: a 5-cfm automatic venturi, a 5-cfm electric pump, and a 2.2-cfm manual venturi.*

Venturi pumps work differently. In these, compressed air supplied by your compressor rushes through an orifice to generate a vacuum. Since they have no moving parts, venturi pumps are less expensive than electric pumps. Venturi pumps come in automatic and manual models. All bags leak air to some degree, and an *automatic venturi pump* turns on automatically to restore the vacuum when it falls below a preset limit. (That's important, because slow-setting glues such as urea formaldehyde take hours to set and the automatic control frees you to concentrate on other work.)

With a *manual venturi pump*, you monitor the vacuum yourself by checking an attached gauge. To restore lost vacuum, you manually open a valve on the pump body. Vacuum veneering with a manual venturi pump is more work, but these "bare-bones" pumps cost hundreds less than most automatic pumps. With a manual pump, you can set up a system for as little as $200.

Venturi pumps are also rated in cfm and need to be matched to a properly sized compressor. (See chart.) For example, a 10-cfm venturi pump requires a 4-HP compressor, while a 1.8-cfm pump will work with a 1-HP compressor. (A large pump on a small compressor will overwork the compressor.)

I tested electric pumps rated at 5 cfm from four different companies. (See chart.) These pumps evacuated my 4-ft. by 6-ft. vacuum bag in about one minute. Speed like this is a good feature if you're doing production veneering.

With an evacuation time of about six minutes, the 1-cfm continuous-running diaphragm pump from Vacuum Pressing Systems is a unit I'd only recommend for occasional use. (Note: Bag evacuation times should be considered approximate, as actual time depends upon the bag size, the type of work being pressed and the condition of the bag.)

I liked the three automatic venturi pumps I tested. The units from Vacuum Pressing Systems (3.2 cfm) and Mercury Vacuum Presses (4.9 cfm) are solidly built and worked well. Each of these units comes with removable filters for vacuum and compressed-air lines. The filters trap sawdust and other minute debris.

The automatic venturi pump I tested from Quality VAKuum Products (1.8 cfm) is constructed of lighter-gauge steel and has no removable filters. I found that a small ball of steel wool placed in the vacuum line did a good job of filtering debris, as the manufacturer suggested. I had to adjust the pressure settings on my compressor to get this pump running properly. But this pump is priced low

PICKING A PUMP FOR VACUUM VENEERING

ELECTRIC PUMP

PROS
- No compressor required.
- Quickest bag evacuation.[1]
- Automatic control maintains vacuum pressure.
- Quiet running.

CONS
- Highest cost.[1]

SMART CHOICE
- For production veneering and other high-volume work.

[1] Except for VPS Compact 100.

AUTOMATIC VENTURI

PROS
- Moderate cost.
- No moving parts.
- Automatic control maintains vacuum pressure.

CONS
- Requires properly sized compressor.

SMART CHOICE
- For shops equipped with a properly sized compressor.

MANUAL VENTURI

PROS
- Lowest cost of any pump.
- No moving parts.
- Most compact size.

CONS
- Requires properly sized compressor.
- No automatic control; user must monitor pressure.

SMART CHOICE
- For occasional veneering; a good entry-level choice where low price is important.

enough ($324) to make it a viable option for someone on a tight budget.

All three automatic venturi pumps I tested evacuated a 4-ft. by 6-ft. bag in roughly the same time—less than four minutes. Quality VAKuum Products' model VM10 (10 cfm) had the quickest evacuation time (less than a minute), followed by the MVG98L from Mercury Vacuum Presses, which did the job in about a minute.

The three manual venturi pumps I tested worked well, evacuating the 4-ft. by 6-ft. bag in about four minutes. But to me, checking the vacuum reading every 10 to 15 minutes and turning a valve to restore the vacuum isn't worth the money you save in buying a low-end system. You can let the compressor run continuously if you don't want to monitor the vacuum, but I wouldn't want to subject my compressor to this kind of stress.

Bags for Veneering

Manufacturers offer a wide variety of vacuum bags differing in size, thickness and material. All bags are clear, except for the standard vinyl bag sold by Woodworker's Supply, which is frosted and difficult to see through.

I'm convinced that the best size bag is one that accommodates a 4-ft. by 8-ft. sheet of plywood. (Only four of the 16 systems listed in the chart include standard bags this large.) When pressing small pieces in a large bag, you can simply roll up and seal off the unused part of the bag to save space and get faster air evacuation.

The most economical bags are 20-mil (0.020-in.-thick) vinyl. They're flexible enough to make loading the bag easier, and they also hold up well for occasional veneering. However, over time they're prone to developing pinhole leaks which cause the pump to run more. The good news is that tears or holes can be fixed easily with a vinyl repair kit that is available from the manufacturer.

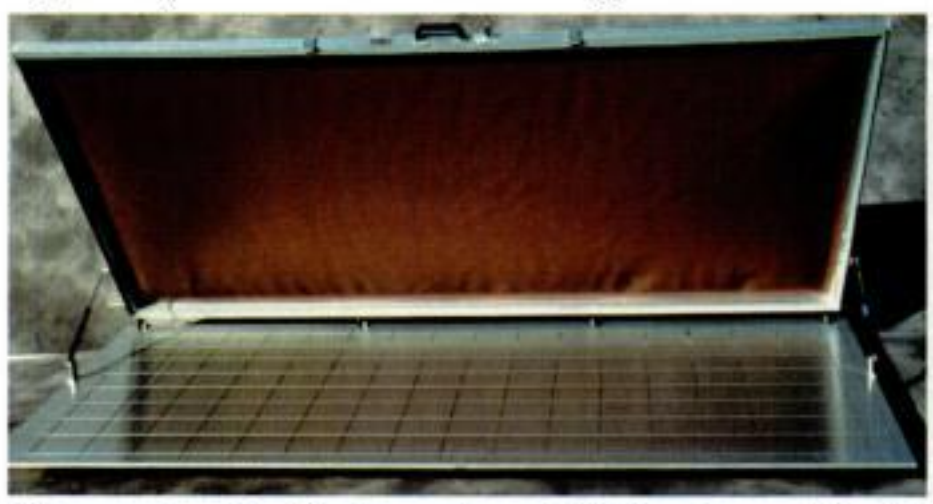
For more frequent veneering—say, once a week or so—you should consider buying a thicker 30-mil vinyl bag. A 30-mil bag will only cost about $30 more than 20-mil vinyl, and it will resist punctures better.

Commercial shops that do continuous veneering and complex curved work should consider purchasing top-of-the-line bags made of polyurethane, which offers good flexibility with several times the toughness of vinyl. The 20-mil polyurethane costs about $170 more than 20-mil vinyl for a 4-ft. by 8-ft. bag, and 30-mil polyurethane (sold by Vacuum Pressing Systems) costs about $260 more. For complex or special

A DIFFERENT KIND OF VACUUM PRESS

For production veneering that involves mostly flat or low-profile curved work, two manufacturers offer an alternative to loose vacuum bags. These membrane presses consist of a plastic or rubber membrane in a rigid frame. The hinged frame raises and lowers easily over the platen, making loading much easier than with a bag.

The membrane press from Mercury Vacuum Presses has a silicone rubber membrane.



Vacuum Pressing Systems offers a Lift-Top Frame Kit with a 30-mil polyurethane membrane.

VACUUM VENEER PRESSES

	Manufacturer/ Model	Pump Price	Vacuum Flow (cfm)	Compressor Motor[1] (HP)	Closure System	System Price	Bag Size[2] (in.)	Comments
MANUAL VENTURI	QVP VP-2	$99	1.8	1	C-Channel	$198	27 x 48	Entry-level system.
	VPS VC100	3	2	1	Rod & Channel	214	48 x 48	Excellent bag closure system.
	MVP VG-2	149	2.2	1	Rod & Channel	238	49 x 49	Vacuum line enters bag from side—most versatile.
	MVP VG-4	189	4	2	Rod & Channel	278	49 x 49	Heavy-duty pump; large gauge.
AUTOMATIC VENTURI	QVP VM2	324	1.8	1	C-Channel	445	52 x 63	No removable filters.
	QVP VM4	349	3.2	1.5	C-Channel	470	52 x 63	No removable filters.
	QVP VM6	389	5	2	C-Channel	530	52 x 63	No removable filters; fast bag evacuation.
	QVP VM10	599	10	4	C-Channel	764	52 x 102	No removable filters; very fast bag evacuation.
	VPS 402-2-3AP	3	4	2	Rod & Channel	565	48 x 96	Removable filters; large gauges.
	MVP MVG98P	445	2.2	1	Rod & Channel	534	49 x 49	Removable filters; large gauges.
	MVP MVG98L	475	4.9	2	Rod & Channel	564	49 x 49	Removable filters; large gauges; fast bag evacuation.
ELECTRIC	VPS Compact 100[4]	3	1	—	Rod & Channel	324	48 x 48	Runs continuously; slow bag evacuation.
	QVP ES5	548	5	—	C-Channel	679	52 x 63	Controller separate from pump.
	MVP MVP50	625	5	—	Rod & Channel	714	49 x 49	Two carrying handles.
	VPS 408-2-5ST	3	5	—	Rod & Channel	760	48 x 96	Quiet operation; large gauges.
	WWS VAC2800	449	5	—	Rod & Channel	529	54 x 108	Only one bag size; frosted bag is difficult to see through.

KEY: [1]Minimum power motor recommended to run pump efficiently. [2]Each manufacturer sells larger bags and in different materials; substitutions may be made for extra cost. [3]Contact manufacturer for individual pump price. [4]Pump is single-cylinder diaphragm design. — = not applicable.

KEY TO MANUFACTURERS: VPS = Vacuum Pressing Systems, (207) 725-0935; Circle #601. **MVP** = Mercury Vacuum Presses, (800) 995-4506; Circle #602. **QVP** = Quality VAKuum Products Inc., (800) 547-5484; Circle #603. **WWS** = Woodworker's Supply Inc., (800) 645-9292; Circle #604.

applications, each manufacturer can recommend the proper bag or custom-design a bag to fit your needs.

Sealing the Bag

Manufacturers use one of two closure systems to seal the open ends of their bags. Mercury Vacuum Presses, Vacuum Pressing Systems and Woodworker's Supply use a C-channel and rod system: You fold the end of the bag around a rod, then slip the C-channel over the rod and bag. The first two companies add hook-and-loop tabs to hold the fold, making it easier to mount the C-channel. Quality VAKuum Products uses a 1-in. PVC slit pipe; you slip it over the edge of the bag and then apply ordinary spring clips (not provided) to make the seal.

All of the closure systems provided an airtight seal in my tests. The rod and C-channel closures were the easiest to operate and were flexible enough to bend.

The vacuum line connection to the bag also varies. I found Mercury Vacuum Presses' connection the most convenient: It enters the bag from the side, allowing the bag to lie flat on the table. It also attaches to the pump with a quick disconnect so you don't need tools to detach the pump. Vacuum Pressing Systems also has a quick disconnect at the pump, but the line enters the bag from underneath, which requires an access hole in the table.

Quality VAKuum Products' bag connection must be installed by the operator. This is easy to do, and it means you can place the connection anywhere you like—an advantage if you're just getting set up for vacuum veneering work.

All manufacturers provided clear instructions for setting up their systems, but Vacuum Pressing Systems' manual was the best. (Instructional videos are in the works.) Quality VAKuum Products already offers an informative video.

Recommendations

I've found that the type of work you do matters more than a brand name when choosing a system. If you work with complex forms or quick-drying glue, get a pump that can evacuate a bag quickly.

If you'll only be veneering occasionally, I'd recommend any of the entry-level manual systems. All are less expensive than the other types, and they all work about the same; the chief distinction is capacity. The VP-2 system from Quality VAKuum Products can be upgraded to a higher capacity or automatic operation at any time for as little as $25.

If you will be using your press often, I would recommend buying a 5- or 10-cfm electric or automatic venturi pump and a sturdy 30-mil vinyl or polyurethane bag.

Since I have a 5-HP compressor, I ended up buying Mercury Vacuum Presses' MVG98L automatic venturi pump with a 4-ft. by 8-ft., 20-mil vinyl bag. I liked the bag closure, side-entry vacuum line and the lower cost compared to an electric system.

If you need a professional-quality vacuum veneer system but don't want to dedicate a compressor to a venturi pump, an electric pump is the way to go.

With the exception of Vacuum Pressing Systems' underpowered Compact model, I liked all the electric pumps I tested. You'll pay more for an electric pump, but the four 5-cfm models (see chart) will handle any veneering you'd want to do. ▲

JEFF JEWITT
runs a cabinet shop in Ohio and conducts finishing seminars across the country.

Maple Side Table

Try Your Hand at Traditional Joinery

A simple touch of the 18th century. *Fine proportions and the beauty of curly maple give this pair of Hepplewhite-inspired side tables their authentic appearance.*

by R.S. Wilkinson

A remarkable variety of furniture can trace its lineage to English craftsman George Hepplewhite, whose book *The Cabinet Maker and Upholsterer's Guide* was first published in 1788. (The book is currently available from Dover Publications Inc., 31 E. 2nd St., Mineola, NY 11501, 516-294-7000.) With some 300 drawings, Hepplewhite's book quickly became a style manual for countless cabinetmakers on both sides of the Atlantic.

From the late 1700s through the mid-1800s, cabinetmakers in Boston, New York and Philadelphia turned out a sumptuous selection of Hepplewhite-style furniture—everything from chairs to sideboards. Many of these pieces were made from imported mahogany and featured decorative string inlays and ornate bandings.

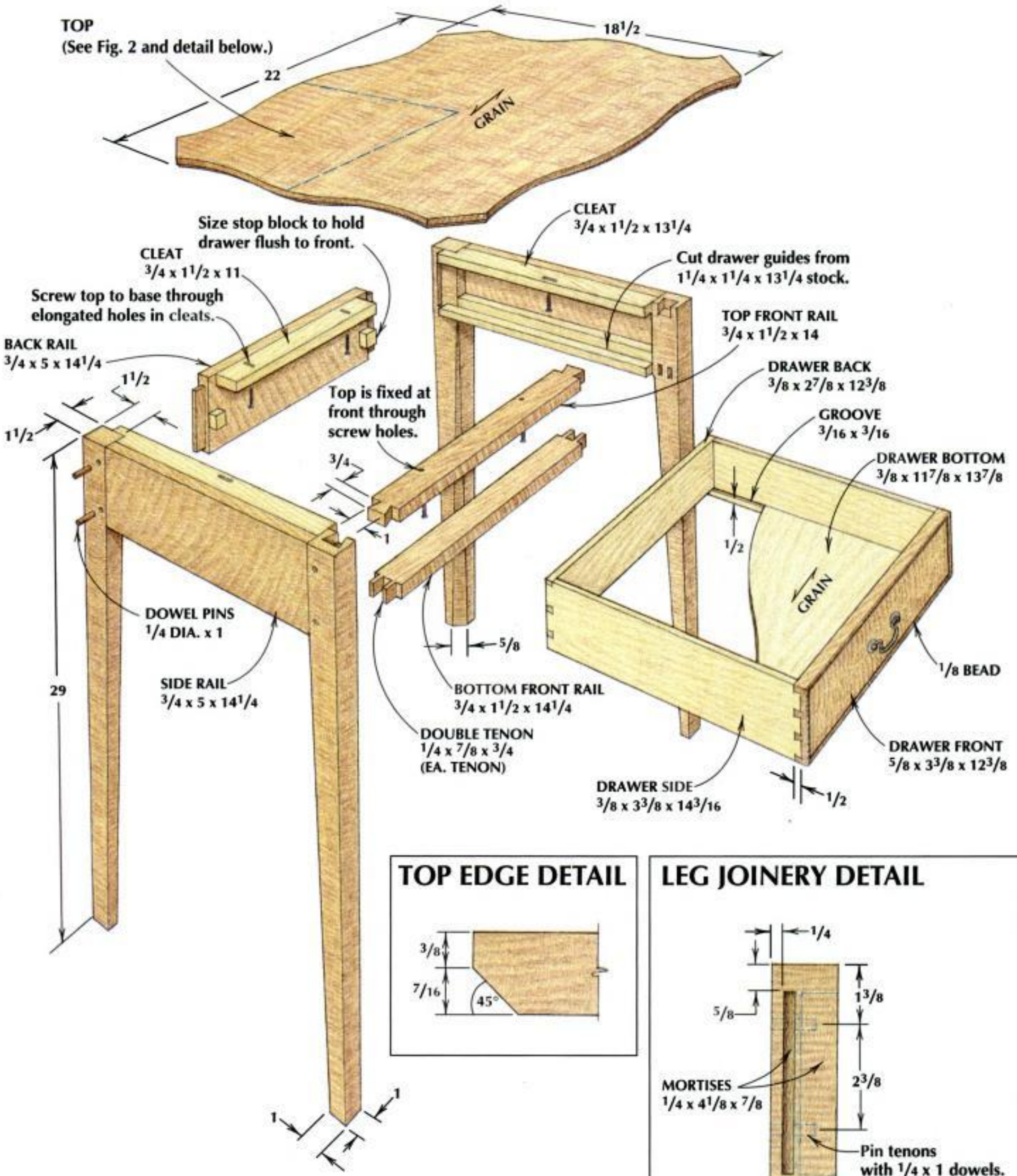
Though my side tables lack the ornamentation of the classic Hepplewhite furniture described above, they are no less authentic. In my work as a conservator of period furniture, I have come across numerous examples of unadorned, Hepplewhite-inspired pieces that were built by rural American craftsmen during the same time period. My table's charm lies in its finely shaped top, beaded drawer front and rich curly-maple grain. As a project, this table offers the challenge of duplicating the proportions, joinery details and even the finish of a project that might easily have been built more than a century ago. I decided to build a pair to use as bedside tables.

The Base First

Each table was built in three sections: the base, the top and the drawer. I began by making the base.

First, I milled up four $1\frac{1}{2}$-in.-square by 29-in.-long pieces of stock for the legs. Then I laid out the mortises on the upper sections of the legs for the rail tenons. As shown in Fig. 1, the bottom front rail has a pair of tenons on each end instead of a single tenon. The double tenon provides much better resis-

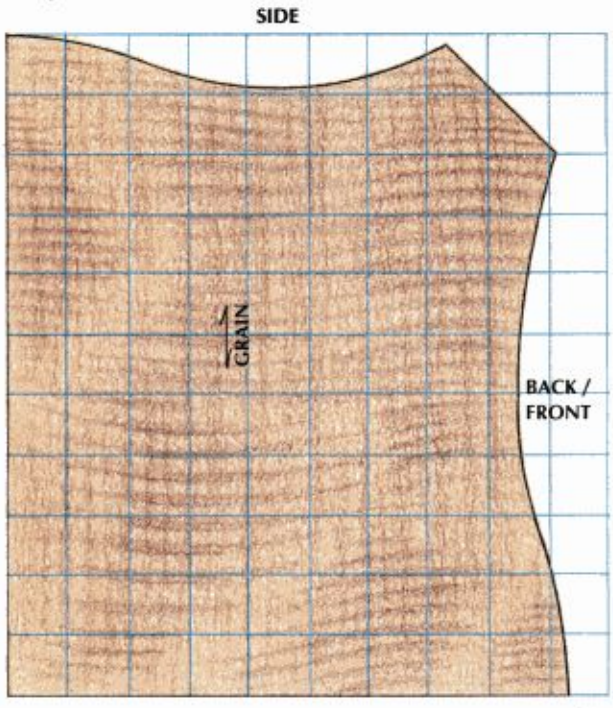
FIG. 1: SIDE TABLE CONSTRUCTION



TOP EDGE DETAIL

LEG JOINERY DETAIL

FIG. 2: QUARTER PATTERN OF TOP



tance to twisting forces, as when a loaded drawer is fully extended. I cut the mortises using a 1/4-in. hollow-chisel mortising attachment on my drill press. Alternatively, you could drill and chop them by hand or use a plunge router.

Next, I milled up stock for the rails, drawer guides and top cleats, and cut these pieces to finished size. (See Fig. 1.) I cut the tenons on the side and back rails and bottom front rail to fit their mortises. Note that the outer faces of the rails should be flush with the outside faces of the legs.

Then I dry assembled the base and clamped it to make sure joints were tight and the base was square. With the base clamped up, I laid out the dovetails on the ends of the top rail and cut them with a dovetail saw. Then I put the rail on top of the front legs and scribed for the dovetail sockets with a razor blade. After unclamping the base, I cut out the sockets with a dovetail saw and chisels.

I tapered the legs' inside faces next. I do this on my tablesaw with a taper jig that runs against the saw's rip fence. (See AW #3, page 28.) The tapers begin where the bottoms of the rails meet the legs, 5 in. down from their tops.

After sawing all the tapers, I chamfered the inside corner of each leg. The chamfers begin just under the rails with a "lamb's tongue," or slight scoop (see Leg Joinery Detail, Fig. 1), and end in a 5/8-in.-wide flat at the bottom of the leg. This traditional edge detail lends a light stance to the finished table. I used the jointer to cut the chamfers, setting the fence to 45° and taking fine passes until the cut was complete. You'll have to lower the leg onto the rotating cutterhead to create the lamb's tongue. This technique takes practice and care. Be sure to use a push stick. If you're not confident doing this, you can use a drawknife and a hand plane instead. When I was done with the chamfers, I hand-planed the legs and rails to remove any milling marks left by machines.

At this point the base was ready for glue-up. I used hot hide glue for this project—as I do with nearly all of my furniture. Hide glue is reversible, so it's easier to repair broken joints. You can also manipulate hide glue easily for longer or shorter assembly times.

First, I glued the legs to the side rails, making sure each subassembly was square. When the glue was dry, I glued the front and back rails to the legs. Then I fit the drawer guides and glued them to the side rails.

The cleats were installed next, but before gluing them to the rails, I predrilled and countersank the elongated screw holes for attaching the top. Elongating the holes as shown in Fig. 1 allows the top to expand and contract with normal changes in humidity. I didn't elongate the holes in the top front rail; this keeps the top fixed at the front of the table where appearance is most important.

Last, I drilled the 1/4-in.-dia. holes for the dowels that pin the rail tenons to the legs. I made my own dowel pins from the same maple stock. First I ripped and beveled 1/4-in.-square stock into an octagonal shape. Then I used a hand plane to round and taper the pieces to fit into the holes. I glued the dowels in their holes and cut them flush with the legs.

Making the Top

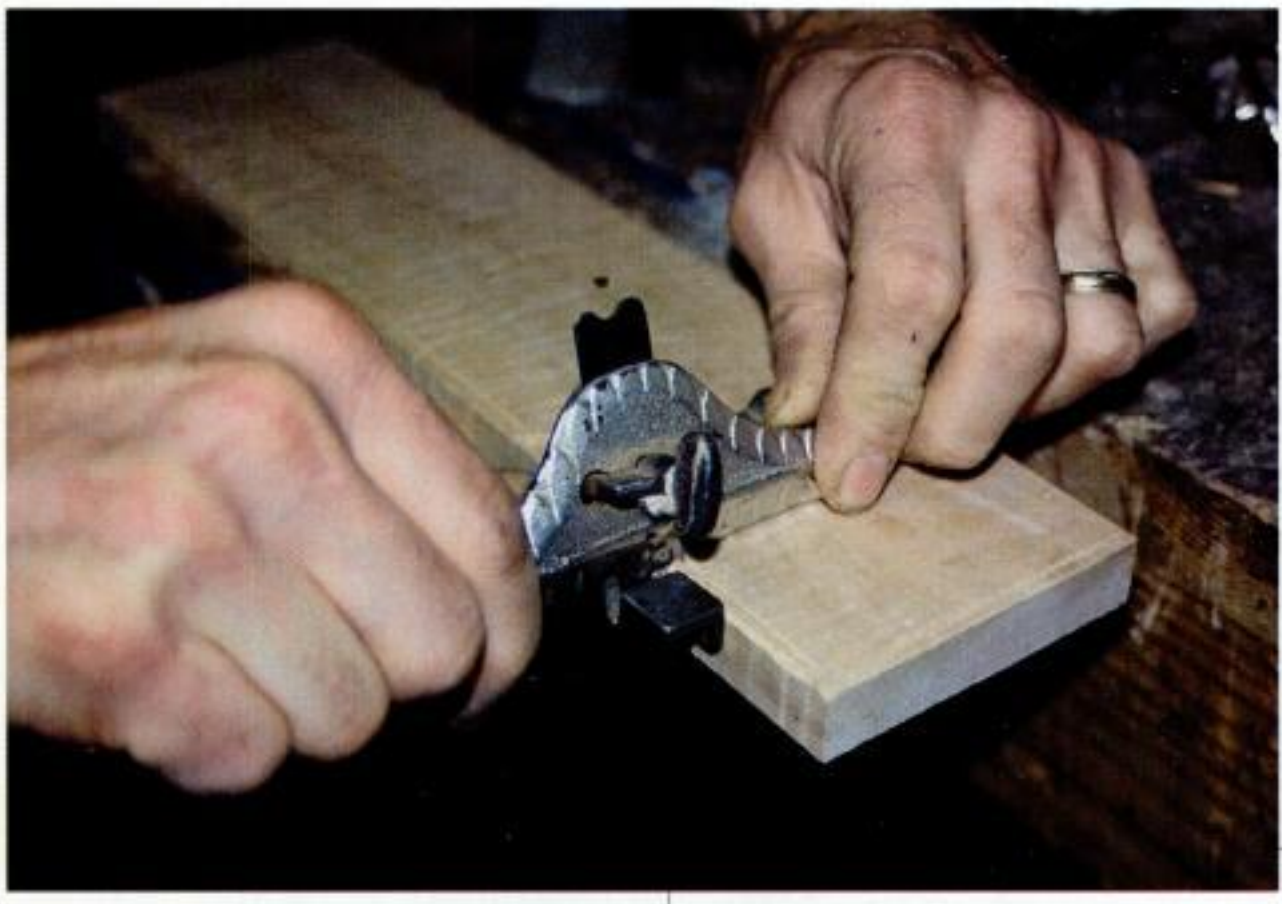
I made the top from a single board 18 1/2 in. wide by 22 in. long. You can edge-join two boards to this size, but avoid using more if you want to create an authentic look. I used a thickness planer to mill the top blank to its finished thickness of 13/16 in. If your planer isn't wide enough to plane the whole top at once, you could plane two pieces, then join them and scrape the joint flush.

The pattern for the top is shown in Fig. 2. I cut out the shape on the bandsaw and then smoothed the edges with a drawknife and spokeshave, taking very fine cuts with razor-sharp tools to minimize tearout on the curly maple. I chamfered the bottom edge of the top to the profile shown in the Top Edge Detail of Fig. 1. You can use a router, but I prefer using a drawknife and spokeshave because I like the hand-crafted feel they produce. After chamfering, I hand-planed both surfaces of the top and attached it to the base with screws through the cleat holes. The top should overhang an equal distance in front and back.

Making the Drawer

I made the drawer sides and back from poplar. The sides are attached to the maple front with hand-cut blind dovetails and to the back with through dovetails. I made the drawer bottom from solid 3/8-in.-thick poplar stock, beveling its side and front edges to fit in 3/16-in.-wide grooves in the drawer sides and front. The grain on the drawer bottom runs side-to-side, allowing for front-to-back expansion and contraction.

After cutting all of the drawer parts to size, I beaded the drawer front using a Stanley No. 66 scratch beader. (See photo, opposite.) If I get tearout when beading across the grain, I cut the line with a razor blade in that section and shape the bead with a chisel. It's faster



Getting the bead. *The author uses a Stanley No. 66 scratch beader to cut the detail on the drawer front. You can also cut this detail using a shop-made scratch beader, as shown in Fig. 3. Use a chisel to join the perpendicular beads at the drawer corners.*

to cut the bead with a router, but this makes too perfect a profile for the authentic appearance I prefer. If you like, you can make your own low-tech scratch beader from a screw and a scrap of wood, as shown in Fig. 3. (For more on scratch beaders, see AW #37.) At the corners of the drawer front, I chiseled out the detail to make the beads meet.

Next, I hand-cut the dovetails on the drawer sides (see AW # 29) and the pins on the front and back pieces. Run a 3/16-in. by 3/16-in. groove in the drawer sides and front to accept the drawer bottom panel. Assemble the pieces to check the fit, then glue up the drawer, making certain it's square.

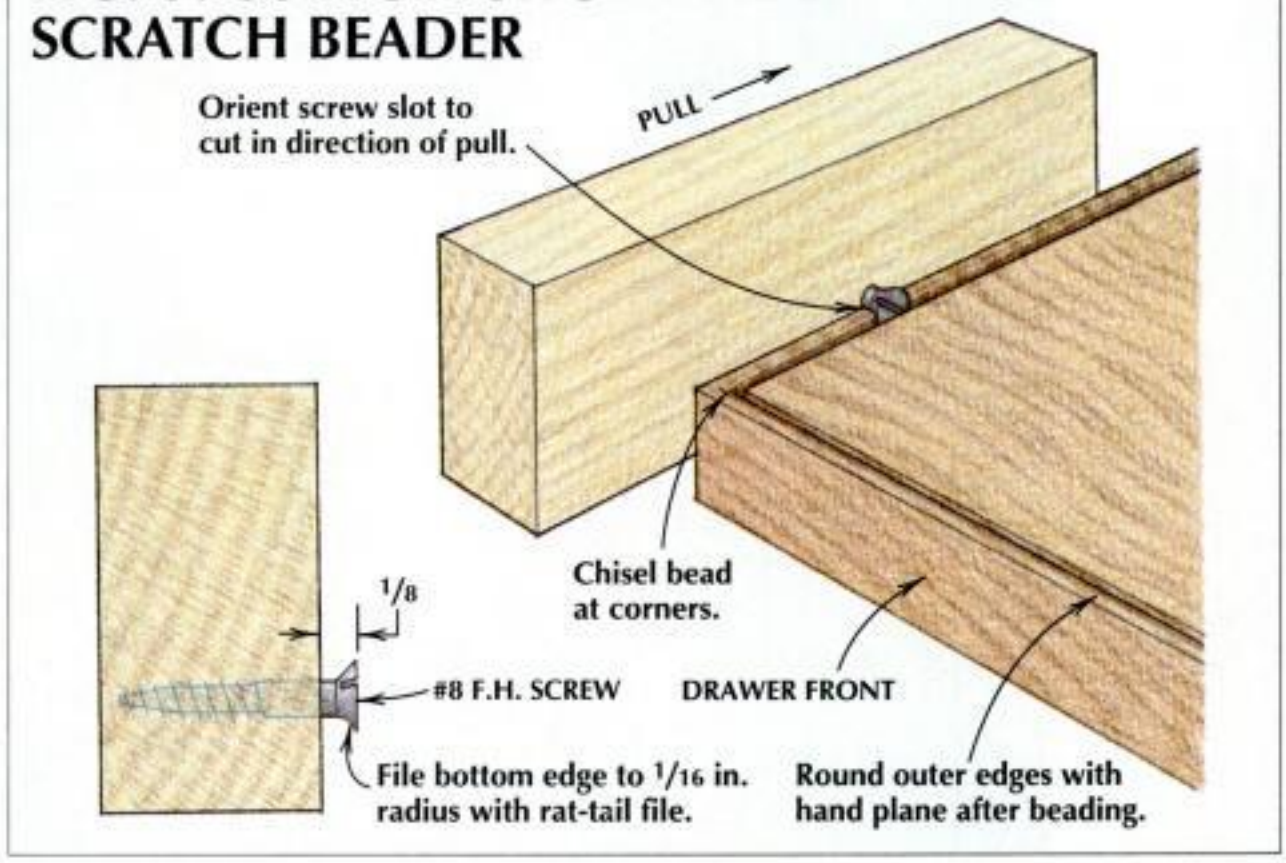
Cut the drawer bottom to size, and bevel the underside of the front and side edges to fit in the panel grooves. I did this with a spokeshave, but you could use a saw or router. Slide the panel into the groove. To secure the drawer bottom, you can either drive a brad through it into the drawer back, as was traditionally done, or apply a spot of glue in the drawer-front groove before you install the bottom.

Fit the drawer into place and glue stop blocks to the back rail to stop the drawer front flush with the front rails.

Finishing

Had it been built in the late 18th century, this table probably would not have been stained. It might have been finished with beeswax, varnish or linseed oil. I stained my table with maple-colored, alcohol-based dye (see Sources) followed by shellac to match the existing furniture in my house.

FIG. 3: USING A SHOP-MADE SCRATCH BEADER



Before finishing, I gave all exposed surfaces a final scraping and light sanding with 180-grit sandpaper. I stained them and then applied a dozen or so thin coats of shellac. I like shellac because it's easy to restore if the finish is damaged. When the final shellac coat was dry, I waxed the entire table and fitted the drawer with a brass bail-style pull. (See Sources.) ▲

R.S. WILKINSON
reproduces and restores antiques at his shop in Connecticut.

SOURCES

Brass bail-style drawer pulls
are available from:
Horton Brasses Inc.
Nooks Hill Rd.
Cromwell, CT 06416
(203) 635-4400 *Circle #605*
Order item #H-10S-678.

Ultra Penetrating Stain
is available from:
Mohawk Finishing Products Inc.,
4715 Rte. 30
Amsterdam, NY 12010
(800) 545-0047 *Circle #606*
Order item #520-2406, Colonial Maple.

Steam-Bending Basics

Smart Wood Selection and Well-Designed Forms Yield Bends Instead of Breaks

by Mike Dunbar

Curves, pegs and wedges. *Dunbar pulls an oak chair back around a simple, sturdy form. The workpiece is held with wedges that work against a fixed block or against wooden pegs that are inserted into holes in the form's base.*

Bending wood is more art than science. I've seen pieces of wood with obvious defects bend without raising a splinter, while a seemingly flawless piece will break. But these are exceptions. Over the long term, there are proven ways to avoid breakage when bending wood. Assuming that you have an effective way of steaming your wood (see AW #43, page 68), here's what you need to know about the wood itself and the formwork for bending.

First of all, it's important to use species of wood that bend well. Ring-porous woods such as oak, ash and hickory are good choices, mainly because their porosity maximizes the effect of steam treatment. Woods that are uniformly dense—maple and cherry, for example—aren't as receptive to steaming. The same is true for any wood that has been kiln-dried. Green or air-dried wood makes better steaming stock.

Use straight-grained wood that's free from defects. When you bend wood, you force the fibers near the outside surface of the bend to stretch, at the same time compressing the fibers along the bend's inside surface. If there is a weak spot—a knot or irregular grain—the wood is likely to fail at that spot.

To get uniform strength along each surface of the workpiece, you want the same layers of annual growth to run from one end of the piece to the other. The surest way to obtain such wood is to rive it from the log and spokeshave it to thick-

Beginning the bend. *Fresh from the steam box, the oak workpiece is secured with its midpoint positioned against the centerline of the bend. Wedges and pegs stand ready to secure the oak against the form.*

ness and width. Riving and spokeshaving follow the grain, helping you to avoid severing wood fibers. When you dimension bending stock on the tablesaw, this isn't the case. While it is possible to bend sawn stock, this definitely increases the likelihood of failure.

Making and Using Forms

After steam treatment, the workpiece must be bent around a form and held in place until it is completely dry. Most forms are very simple, but they need to be strong and durable. As you bend the wood, you work against the form, often exerting considerable force. Flexing or shifting is a real disadvantage in a form.

Two-part form. *Designed to bend the crest of a Windsor chair, this form can be pulled tight and held with a single bar clamp.*

I don't skimp on materials when making forms. I usually make the base, or backboard, from 3/4-in.-thick exterior-grade plywood. It's a good idea to make the base oversize so that it can easily be clamped to the workbench. To make the form members themselves, I use 2x-dimension stock: 1 1/2-in.-thick fir framing lumber. Unless the form member must be removable, I fasten it to the plywood back with drywall screws.

Steam-bent wood won't spring back if you dry it thoroughly. For this reason, I don't design my forms to over-bend a given piece. One of the simplest forms I use is for the curved back member on a sack-back Windsor chair. On this type of form, wedges and pegs constitute the clamping system for securing the workpiece. (See photo at left.) Bending starts at the center of the curve, where I drive a wedge between the workpiece and a wood block that's screwed to the form's base. When the center is secure, I pull one side against the form, then the other. To hold these ends, I insert a wooden peg in a base hole and drive a wedge against the peg.

Bending in two planes. *Designed for a continuous-arm Windsor chair, this form relies on a pair of angle irons to secure the down-curved ends.*

To bend the crest piece on a high-back Windsor chair, I use a two-part form. (See left photo, below.) One part is concave; the other has a matching convex curve, minus an allowance for the thickness of the workpiece. I place the steamed workpiece between the form members and use a bar clamp to keep the form compressed while the curve is setting.

The back on a continuous-arm Windsor chair requires bends in more than one plane. The form for this compound curve isn't complex, but it's tricky to maneuver the long workpiece around the large upper curve and down around the tighter lower ones. (See right photo, below.) A strong piece of angle iron, fastened to each lower curve, lets me secure these bends quickly without placing pegs or driving wedges.

It's important to work quickly when steam bending. Once you remove the workpiece from the steam box, you've got about 45 seconds to bend it. As the part cools, the chances of breakage increase. Before bending, I always do a mental dry run to make sure everything is ready; then I'm set to remove the part from the steam box.

Steam-bent wood needs to dry thoroughly before you remove it from the form. I try to hasten the drying time as much as possible. I have had success drying small parts (on their forms) in a 150°F to 175°F oven. For larger work, I rely on the wood stove (in winter) or the sun to speed drying. It's not difficult to tell when the wood is dry: It shrinks slightly and holds its shape against the form, while the wedges simply slip free. ▲

MIKE DUNBAR
is a contributing editor to AW. He builds Windsor chairs and teaches chairmaking courses in New Hampshire.

MAKING A STEAM-BENT PLANT HANGER

Last spring, a friend of mine decided to hang plants around his deck. He came to me with an idea for a wooden plant hanger bent like a shepherd's crook: A large curve holds the flower pot clear of the wall or post; a small curve holds the hook extending from the pot. (See photo, right.)

After a little experimentation, I came up with a curved shape that pleased us both and a basic, multipart form that enables us to turn out these steam-bent hangers quickly and easily.

The workpiece is 5/16 in. thick, 1 in. wide and 32 in. long. After cutting the blank to size, use a drawknife or spokeshave to taper the end that will be bent to the small curve. Starting about 6 in. from this end, I taper the thickness down to 1/8 in., also rounding the end slightly for appearance.

As shown in the drawing, the form consists of a 3/4-in. plywood base and four form members that I made from 1-in.-thick pine. The tapered tip is clamped between a fixed concave member and a small, adjustable convex member that is secured to the base with 1/4-in. by 2-in. carriage bolts and wing nuts. The bolts pass through oversize (1/2-in.-dia.) holes in the form member. The play created by the oversize holes in the small convex form member is important. This allows me to force the convex and concave form members together before tightening the wing nuts to secure the small bend.

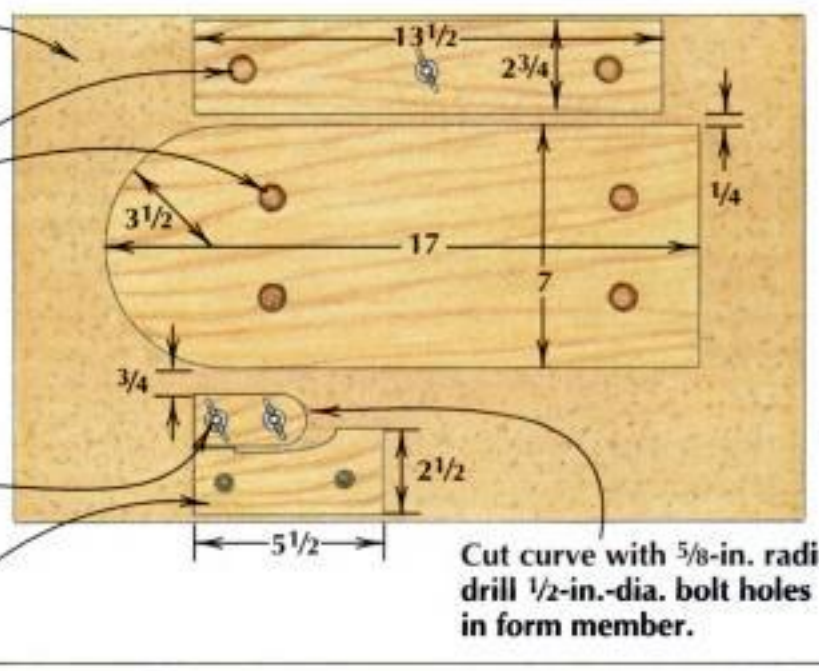
The large curved form member is designed to lift on and off the base so that I can position it after making the small bend in the tip. Four dowel pegs are glued in holes drilled in this form member. The pegs extend into holes in the base to lock the part in position. I fit the large form to the base just before I start to make the big bend. (See center photo, below.)

The last form member to go on in the sequence is a straight piece. It also pins in place with 3/4-in.-dia. dowels and is secured with a single carriage bolt and wing nut.

—*M.D.*

Steam-bent from a 32-in.-long oak strip, this plant hanger is shaped like a shepherd's crook.

PLANT HANGER BENDING FORM



Small bend. *With the tip of the workpiece clamped, Dunbar lifts the free end up to make the small bend.*

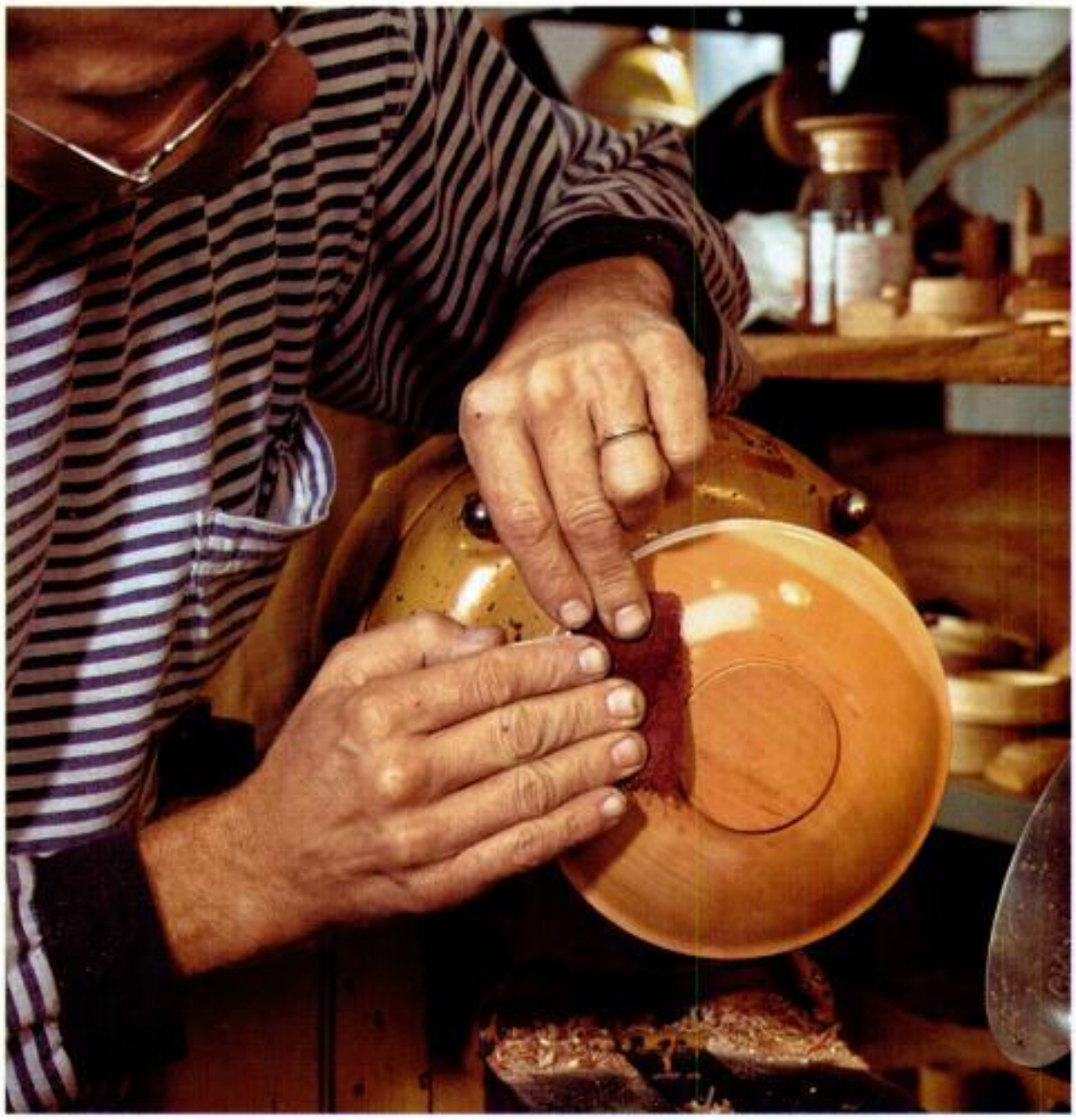
Big bend. *After fitting the large form member to the base, the author pulls the workpiece around it.*

Final form. *Bolting down a straight form member locks the workpiece in the form, fixing its final shape.*

French Polishing on the Lathe

A Fast Finish With No Fuss

by Michael Mode



Five-minute finish. *Michael Mode builds up a shellac gleam on this spinning cherry bowl.*

I've always liked the sense of immediate gratification possible with lathe work. In just an hour or two, you can turn a rough block of wood into a lovely object. Here's a decorative finish that gives me the same sort of satisfaction. All coats are done in less than half an hour, right there on your lathe in the midst of the shavings, the dust and, probably, the clutter.

Is this a new high-tech, synthetic wonder? Hardly—or only partly. It's traditional French polishing, with just a few new tricks to make the process easier.

French polishing scares some people because they've heard it's an arcane art based on secret recipes, a mysterious applicator pad and hard work requiring supernormal skill. A blend of shellac, alcohol and boiled linseed oil, laboriously hand-rubbed by a master finisher, seems like too much work, with too much chance for something to go wrong.

Well, there's some truth in that. The recipes aren't really secret, but the materials *do* matter. And experience does show the way. But with my method, the lathe does most of the brute work, and disposable strips of towel replace the mysterious applicator pad.

Still, the final truth of the legend is in the finish itself. When you get it right the effect is like magic. I really enjoy teaching this in workshops because there is always that moment of "Wow, look at that!"

Different strokes. *The round segments of this purpleheart, holly and ebony "winged vessel" were French polished with the lathe running at low speed.*

Materials and Supplies

The main ingredients are shellac and boiled linseed oil, but you'll also need a small bottle of cyanoacrylate glue, some denatured alcohol, a selection of sandpaper up to 400 grit, some strips of towel, a handful of polyester batting and some bathroom tissue.

I've tried ready-mixed shellacs and seen the results of padding lacquers, but in my experience, nothing beats fresh shellac. Purchase it in dry flakes, in the highly refined

grade known as super blonde. I get mine from Woodworker's Supply (1125 Jay Lane, Graham, NC 27253, 800-645-9292), but many catalogs carry a similar grade. Also, use only denatured alcohol as a solvent. I recommend Behkol. (See photo below.)

Dissolved shellac has a shelf life of only a few months, so mix small batches as you need them. Choose a clean glass jar with a lid, and fill it one-third full with shellac flakes. Then add alcohol to about twice the depth of the flakes, so that the jar is two-thirds full of the mixture. With occasional stirring, the flakes should dissolve completely by the next day. This is a ballpark mixture that you can vary according to the size and speed of the work, as I'll explain later.

To apply the shellac, I make disposable pads that I use only once, to finish one particular area of a turning. In 15 years of trial and error, the best pad material I've found is brand-new, unwashed cotton velour.

Purchase a 100-percent-cotton bath towel with a "velour" or "polished cotton" side, and cut out pieces about 1 in. wide by 6 in. long. Fold these to a 1-in. by 3-in. double-layered pad, velour side out. I economize in other ways: For wiping away excess sealer or oil from a turning, I use bathroom tissue.

Preparing the Surface

For practice, turn a cylinder about 2 in. in dia. out of a close-grained wood such as maple. Sand it to at least 320 grit, beginning with the grit required to remove all turning marks. Sand carefully through the grits, because any scratches will show up as if magnified.

Then apply a sanding sealer. I recommend cyanoacrylate glue as a sealer. It hardens very quickly, both sealing and toughening the wood. I apply it with tiny disposable brushes, which I make by wrapping a small wad of polyester quilt batting (available at any sewing store) with masking tape to provide a handle. (See photo, right.) I leave the head about the size of a Q-tip. (Real Q-tips won't work well because the glue hardens very quickly on cotton.)

Brush the glue on very quickly, with the lathe turned off to avoid flinging glue into your eyes, and to avoid lap marks which will look like sloppy sanding. Wipe off excess glue immediately to eliminate extra sanding. Allow a few minutes for hardening, then sand to 400 grit, beginning with 320 if that's where you stopped.

Cyanoacrylate glue is the fastest-drying sealer I know of. But a lacquer-based sanding sealer will work instead, or even shellac itself, provided you let the first coats dry thoroughly.

Applying the Base Coat

Position a light so that you can see a reflection off the wood's surface. Take one of the folded pads and drip on a scant 1/4 teaspoon of shellac near the folded end. With your lathe running at about 800 to 1,000 rpm (for your 2-in.-dia. practice cylinder, slower for larger work), hold the pad against the cylinder.

Finish, pads and brushes. *Mode uses squeeze bottles to apply shellac and linseed oil to his cotton-velour French polishing pads. He applies his cyanoacrylate glue "sealer" with tiny shop-made glue brushes.*

French Polishing

Super sealer. *With the lathe turned off, the author applies cyanoacrylate sealer to a maple practice piece that he has sanded to 320 grit.*

Move from one end to the other slowly enough to completely wet the surface with shellac. Allow a few minutes for this base coat to dry.

Now you're ready to complete the finish, a process that takes just five minutes.

Applying the Polish

Add a few more drops of shellac to the same spot on the pad and a few drops of boiled linseed oil near the opposite end. The pad should be wet but not sopping with oil. Again at slow speed (see left photo, opposite page), hold the pad firmly with fingers supporting it to apply pressure, and make a first pass across the work. Hold the pad so that the end with shellac leads the way and the oil end follows. Angle the pad diagonally, as if it were following an imaginary screw thread on the wood, with the movement of the lathe gradually leading the pad toward the tailstock.

If your cylinder is 6 in. long, take five or six seconds to complete the pass, allowing the pad to run off the end of the work. Then reverse the angle of the pad and immediately make a second pass at the same speed back toward the headstock.

One pass in each direction completes one coat of polish. Four to six such

First pass. *This pass applies shellac and oil at slow speed from headstock to tailstock end. The author angles the pad as if following a screw thread along the work. A second pass toward the headstock will complete the first coat.*

Final pass. *Heat from the friction of the pad on the workpiece does the polishing for you. Above, a series of five coats, applied in quick succession, has built the finish to a rich gloss.*

coats, applied consecutively, will complete the finish. As the finish builds, the pad will begin to drag and you'll have to apply pressure. The heat produced is what does the actual polishing.

As necessary, add more shellac and oil, drop by drop, to the pad. Learning the balance between the two—the "feel"—is a trial-and-error affair. Either too little or too much drag means you're running into problems.

If there is no drag, there is probably too much oil, or oil got on the work before the shellac. In this case, the finish will not build up to a gloss. Sand with 400-grit sandpaper, let the work cool down for five minutes and try again with a new pad.

If there is too much drag from lack of oil, or too heavy a shellac buildup at one time, the surface will develop streaks or lumps. This is caused by heat melting the shellac. Again, sand, let the work cool and start over. Try a fresh pad with less, or slightly thinner, shellac.

When the polishing is correct, the finish will appear very glossy as it builds, but this gloss may be an excess of oil on the surface. So after several passes, wipe the entire surface firmly with clean tissue paper. This will not stick or affect the finish, which dries almost instantly.

Only a certain amount of polish can be applied in one session. Attempting further buildup will only lead to streaking. Experience counts here: I always get a satisfactory finish in four or five passes of the pad. The photo at right above shows how things should look. If you want a heavier finish than you can get in one session, let the shellac harden overnight, sand it very lightly, and polish again.

Be careful when you remove the piece from the lathe. The shellac will be soft from heat, and it can easily take an all-too-permanent fingerprint.

Fine Points

Adjust your shellac recipe according to your results. If the mixture is too thick, it will streak. If it's too thin, buildup will be slower and more affected by the oil. I have found that higher surface speeds and larger surfaces call for slightly thinner shellac. Keep in mind that the rim of a large bowl is turning much faster than its center. When polishing rims, you might try thinner shellac and a pad wetter with both shellac and oil.

When polishing complex shapes, vary the size of the pad to suit the area being polished. Whenever the shellac begins hardening on the pad, the pad loses effectiveness and I switch to a new one.

When you have the touch as well as the feel, you won't need to watch your hands. You can learn to hold the pad on the back or the underside of the work, so it's easier to see the finish build.

Another skill worth learning is hand-rubbing a French polish. Do the same preparation, including a base coat of shellac. Next, add the oil to the pad and hold it between your thumb and forefinger on the shellac end and between your ring finger and pinkie on the oil end, with the pad under your middle fingertips. Rub in a circular motion, leading with the shellac end of the pad. Use a fast motion and slide the pad on and off the work. Stopping the pad on the work will leave an imprint.

Polishing by hand takes more time, and you'll definitely know which muscles are in use, but it's the way to touch up damaged areas and bring them right back to life. ▲

MICHAEL MODE *is a turner who lives in the Champlain Valley of Vermont.*

JUST FINISHING

Milk Paint

A Safe and Simple Paint Finish for Wood

by Michael Dresdner

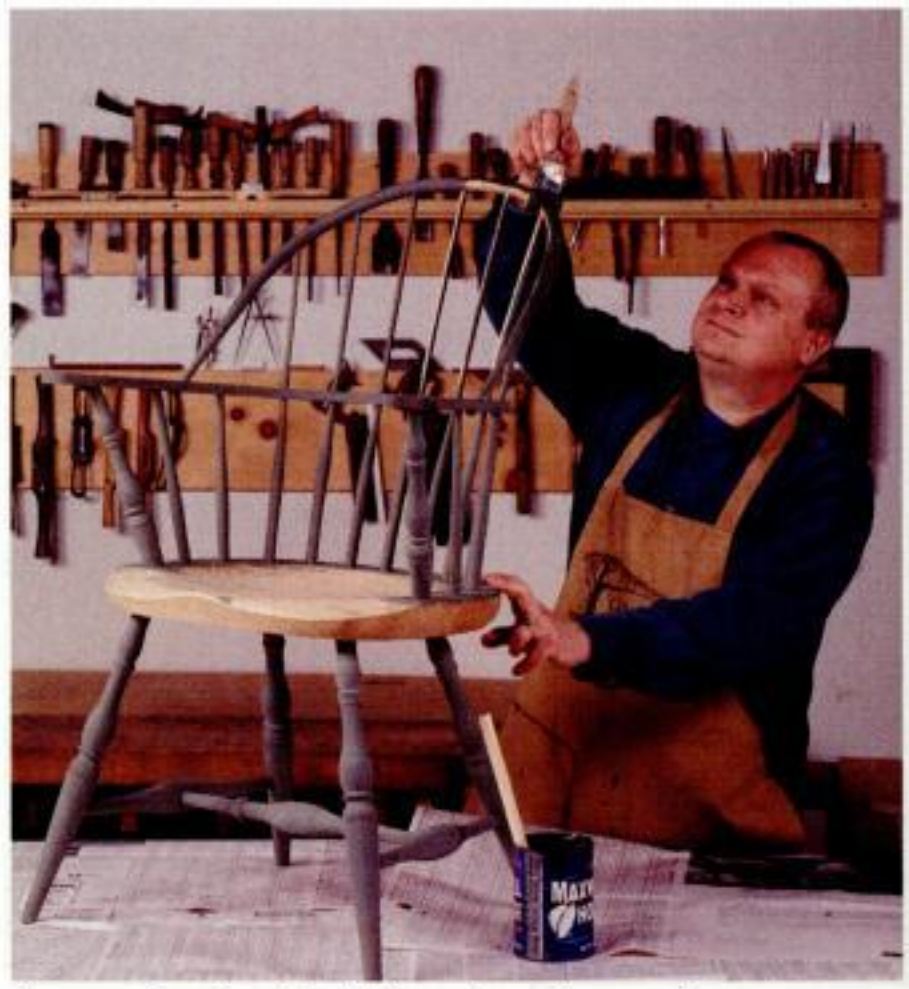
These days more and more woodworkers are looking for finishes that are odorless, durable and environmentally safe. It helps if the finish is attractive, too. These thoroughly modern requirements are all filled by one of our oldest pigmented coatings: milk paint.

Milk paint has a long and colorful history. Versions have shown up everywhere, from early cave paintings to Colonial furniture. It was generally homemade before becoming commercially available during the mid-19th century.

Properties of Milk Paint

Milk paint, also known as casein paint, is a simple mixture of milk, lime, and colored clay. Once the mixture dries, it forms a nontoxic coating that resists even most paint removers, although there is a special milk paint stripper available. (See Sources, page 68.) Traditionally made with earth-colored clays, milk paint tends to be drab rather than vibrant. It dries to a chalky, completely flat finish that gives a great foothold to subsequent finishing coats, acting almost like raw wood. Consequently, you can stain it with wood stains for special effects, recoat it with more milk paint, or seal it with a clear varnish to make it glossier.

On the downside, milk paint tends to show water spots and and it weathers poorly, making it a bad choice for exterior use. Famed Windsor chairmaker Michael Dunbar, who uses milk paint on his chairs, suggests this technique to help alleviate water spotting: After the last coat of milk paint is dry, brush on a coat of linseed oil thinned about 20 percent with mineral spirits, and let the oil dry for two days. This will add an attractive sheen as well as protection from stray water drops.



Easy and authentic. *Milk paint enhances the appearance of Colonial furniture such as Michael Dunbar's Windsor chairs.*

Mixing It Up

Today, there is only one company left in the U.S. that sells the genuine article: The Old Fashioned Milk Paint Company. (See Sources.) They offer this delightful, virtually odor-free paint in 16 colors. To mix a batch, just combine equal parts of the ready-to-mix powder with warm water.

If you've always wanted to try your hand at mixing your own coatings, milk paint is a great place to start. It's inexpensive and the basic ingredients are all available at local stores: skim milk, hydrated lime (the same stuff you add to your garden soil), calcium carbonate and colored pigment.

I recommend skim milk because the butterfat in regular milk can act as a food for bacteria that want to eat the dried paint. Plaster of Paris is a nearly identical substitute for calcium carbonate. Powdered earth pigments are available through the mail (see Sources), but I've had good luck with squeeze bottles

Refining the finish. *Subsequent coats of stain or finish create interesting visual effects.*

of brightly colored snap-line chalk from the hardware store. The chalk colors are intense and varied, and they work just like the powdered earth colors. To mix all the ingredients, I recommend a small mixer that fits in your electric drill. For almost endless color variations, you can add artists' acrylic colors (available at art supply stores).

To mix a batch of milk paint, start with 1½ cups of skim milk. Mix in 1 ounce of lime while stirring briskly. After two to three minutes, when the lime is thoroughly dispersed, add 8 ounces of plaster of Paris. While mixing, add pigment until you like the color. Blue chalk yields a lovely Wedgwood color, while a combination of red and white acrylics and yellow chalk yields a light terra-cotta. You can vary the amount of plaster of Paris for a thinner or thicker mixture, and add more pigment for a deeper color. Allow the mix to sit for an hour or so until it stops foaming. When applying the paint, it helps to re-stir the mixture every five or 10 minutes to prevent settling.

You can apply milk paint with a China bristle, polyester bristle or foam-on-a-stick brush, but I prefer a cheap, 2-in. China bristle. The "store-bought" mixes will cover with one wet coat, but two coats cover even better. Keep in mind that milk paint dries very dull and much lighter than its wet color. You can add extra pigment after your first coat if the color is too light.

After the paint dries, you can try some more experiments. Both pigment and dye stains produce interesting effects, as do waxes and oil finishes. Oiling darkens the color more than wax, but both coatings added a luster to the surface. (See bottom photos, page 66.)

If I had to choose between a ready-mixed powder and the homemade version, I'd choose the ready-mixed. Making your own is cheap and fun, but the commercial version gives you richer results with less work. ▲

SOURCES

Ready-mixed milk paint, stripper, clear top coat and a special crackle finish are available from:

The Old Fashioned Milk Paint Company
Box 222, Groton, MA 01450
(508) 448-6336
Circle #607

Powdered pigments are available from:

Empire Blended Products
250 Hickory Lane
Bayville, NJ 08721
(908) 269-4949
Circle #608

Garrett Wade
161 Ave. of the Americas
New York, NY 10013
(800) 221-2942
Circle #609

TOOL BOX

Our Favorite Router Accessories

AW Editors Separate the Best From the Rest

What's the best Tool Box treatment for an issue that features a new take on the ultimate router table? Router accessories, of course. On these pages, you'll find the personal favorites of AW staff members—aftermarket items that we're particularly fond of. Some enhance precision, while others increase your router's capabilities or make it easier to perform certain operations. We decided to leave out router bits and router-table fences, since both of these categories deserve to be treated on their own. So what's left? Have a look—you're bound to find some gems among these editors' picks.

In each write-up, we've listed the source where we obtained the item. See the "Sources" box on page 76 for a list of other mail-order suppliers that sell a broad selection of router accessories.

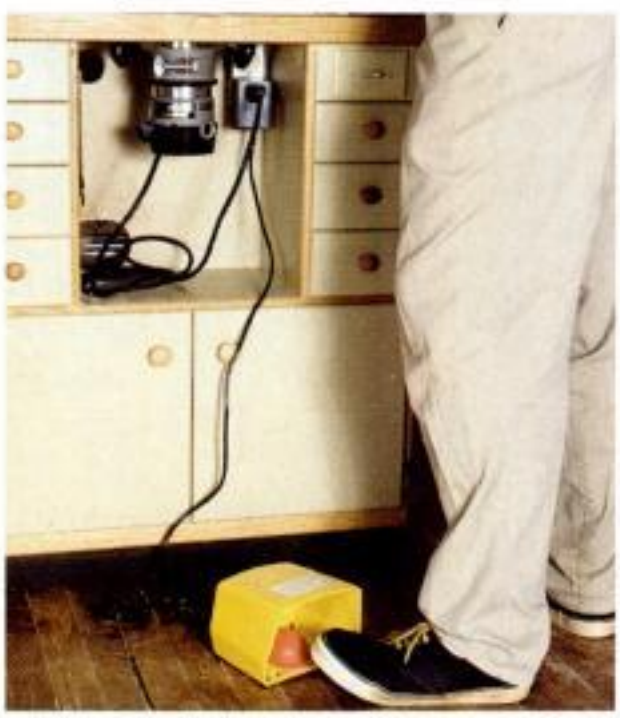
The right stuff. *Staff members put their heads and routers together to come up with a selection of favorite accessories for this special Tool Box. From left: Dave Sellers, Andy Rae, Ellis Walentine, Tim Snyder, Paul Anthony.*

Two Handy Router Controls

Router accessories don't have to be complex to improve the way you work. Take these two control switches, for example.

The Air Foot Switch from Eagle America puts your foot in charge of turning your router on and off, thus freeing both hands (and your attention) to focus on the work.

It only takes a few seconds to install the foot switch. Plug the switch module into an electrical outlet, plug your router into the module, and connect the 8-ft. rubber tube between the switch module and a bulblike foot pedal. When you step on the foot pedal, air pressure switches the circuit on. The switch is available in two forms: alternate action (press once for "on," press again for "off") or momentary action (press for "on," release for "off").



I thought the foot pedal might feel mushy, but it's reassuringly responsive, requiring only a light tap to trip the switch. To protect against accidental switching from dancing feet, I recommend buying the optional plastic shroud to cover the pedal.

Needless to say, the air-powered switch will work with other tools besides your router. If you do any kind of production work, or if you like to have both hands free when working solo, here's an effective, low-tech way to increase efficiency and convenience. (Price: $29.99; optional foot shroud, $12.99) *Eagle America, Dept. AWT, Box 1099, Chardon, OH 44024, (800) 872-2511.* **Circle #619**

Many routers now have variable speed control, a feature much appreciated by woodworkers for the added control and safety it affords. But there are still plenty of perfectly good single-speed routers out there that would benefit from a variable-speed retrofit.

With this add-on speed control plugged in between your router and an electrical outlet, you can dial in any speed from near-zero to the router's full rated rpm. Special circuitry feeds more power to the router as the load increases, just like on the latest models. This gives you constant torque at any selected speed. Lowering the speed on a router

can reduce burning and tearout; you'll also have a higher safety margin when spinning large-diameter bits (such as panel-raising bits).

I use my speed control on the Porter-Cable 690 router that's mounted in my router table. (It won't work with the soft-start motors found on many modern routers.) The speed dial isn't linear, so most of the speed variation occurs in the first third of the dial's range; I don't find this to be a problem.

The speed control will also work on portable drills, sanders, saws or any electric tool with a universal (brush-type) motor up to a 15-amp rating. The unit comes with a clip to fasten on your belt and a fuse to protect against overloads. (Price: $39.95) *Woodcraft Supply, Dept. AWT, 210 Wood County Industrial Park, Box 1686, Parkersburg, WV 26102, (800) 225-1153.* **Circle #620**

—D.S.

Quick Change for Bits

Routers are wonderful tools, but changing bits can be a pain. Even on routers equipped with a spindle lock, you have to contend with at least one big wrench to loosen the collet. This difficulty gets magnified when you're working on a router table: Limited space makes it hard to get the wrench onto the collet, and a slip of the wrench can nick the posts of a plunge router or smash your knuckles.

The Eliminator Chuck is the first alternative router collet I've seen that overcomes these shortcomings. The Eliminator is a hardened alloy steel replacement collet which grips the bit's shank with curved wedges that you tighten by turning an Allen screw. Loosen the Allen screw and the bit pops out easily, without sticking.

The Eliminator Chuck is so new, it's currently manufactured to fit only Porter-Cable routers, but models to fit other popular brands will be available in the future. I tried one on my Porter-Cable router and found it gripped the bit perfectly with no runout or slippage.

Mounting the Eliminator is easy. You simply unscrew the old collet nut, lift out the original collet, insert the Eliminator in its place and tighten once with a wrench. From then on, one-handed tightening or loosening with the Allen wrench is all it takes to change the bit. (Price: $74.95) *Walsh & Marmo Enterprises Inc., Dept. AWT, 7649 Long Pine Dr., Springfield, VA 22151, (703) 644-5647.* **Circle #622**

—D.S.

A Guide for Mortising and More

The Mortise/Edge-Guide/Flush-Trim Jig from Woodhaven makes several basic router operations quicker and easier to accomplish. I ordered my jig with Woodhaven's standard (7¾-in. by 10¼-in.) insert plate, but it will also work on other plates if you drill four ¼-in.-dia. installation holes as instructed.

Out of the box, this accessory kit doesn't look like much: a pair of clear acrylic fences, each with a built-up edge, and some installation hardware. But when attached to the underside of your plunge router's insert plate, these fences align the router quickly and easily for milling mortises. Since the fences adjust independently, offset mortises are no problem. Remove a fence and the remaining one can work as an edge guide or flush-trim jig.

I really like how quickly the mortising fences attach, adjust and detach. This makes it easy to switch from router-table mode to mortising, edging or flush-trimming—a real plus if you only have one plunge router.

To mortise stock less than ¾ in. wide, you just clamp scrap boards on both sides of the workpiece, providing a broader base for the router to ride on. With its ease of use, this mortising jig will have you switching from traditional mortise-and-tenon joinery to paired mortises and loose tenons. (Price: $36.99) *Woodhaven, Dept. AWT, 5323 W. Kimberly Road, Davenport, IA 52806, (800) 344-6657.* **Circle #621**

—T.S.

Precision Guide Makes Edge Cuts Easier

If you've ever been frustrated with conventional router edge guides that are hard to set up, you'll appreciate the precision of Micro Fence. It's the only aftermarket edge guide that lets you actually measure how you adjust the fence, so repetitive test cuts are a thing of the past.

Some standard edge guides have screw-type adjustments, but they lack fine threads for precise adjustments, and they don't tell you how far you're moving the fence. Micro Fence has a built-in micrometer screw that allows you to adjust the fence position in increments as fine as 0.001 in. (One full turn of the micrometer screw equals 0.050 in.) Numbers on the micrometer dial are clear and easy to read.

Micro Fence is great for cutting dadoes in two passes to fit odd-sized plywood, and it lets you return to previous settings or reproduce cuts after the setups have been broken down. It makes exact spacing in fluting, reeding and veining opera-

tions easy. You can also fine-tune hinge or lock mortises for a better fit.

Micro Fence is precision-machined from solid aluminum with stainless steel rails, lead screw and brass lock screws. With the standard low-profile maple fence attached, I was able to rout the face of 3/4-in.-thick stock clamped to a benchtop. A deep-profile maple fence works best for mortising applications. Optional half-round inserts attached to the fence let you rout parallel to curved edges.

The unit comes in sizes to fit routers from Porter-Cable, Bosch, Makita, Elu, Black & Decker and DeWalt. The optional package includes 12-in. guide rails, deep profile fence and half-round inserts. An optional conversion kit for laminate trimmers is also available. (Price: $98; with optional package, $125) *Micro Fence, Dept. AWT, 11100 Cumpston St., #35, North Hollywood, CA 91601, (800) 480-MICRO.* **Circle #623**

—D.S.

A New Slant on Router Bases

Woodhaven's Angle Ease adds a new dimension to routing by allowing you to pivot your router up to 45° in one direction and 10° in the other. Although this accessory router base can be used freehand, it's most useful when installed in a router table.

With your router angled in this base, you can create your own custom profiles using a combination of router bits. This helps when matching an old piece of molding or when cutting details for which no commercial bit is available. Set up with a slot-cutting bit, you can also rout splines in miters while feeding the workpiece flat on the router table rather than at an awkward angle. This tool increases your router's capabilities in proportion to your own creativity.

The unit will accept most 3 1/2-in.-dia. router motors. The motor is clamped in a laminated wood block that adjusts up and down on pivoting aluminum arms which lock to the unit's phenolic resin sides. An elongated bit opening in the 3/8-in.-thick phenolic resin base allows use of bits up to 2 in. in diameter. The base on the unit I used was dead flat.

A couple of observations: Although it's a fairly sturdy unit, there is some flex

in the 1/4-in.-thick phenolic resin sides. This can translate into some chatter marks when making a heavy cut. Also, the angle scale on the sides can be difficult to see when mounted under a table. The painted degree markings won't last long anyway, since the paint sheds off of the sides. (Price: $94.99 for the standard 7 3/4-in. by 10 1/4-in. base; $99.99 for the large 9 1/4-in. by 11 3/4-in. base) *Woodhaven, Dept. AWT, 5323 W. Kimberly Rd., Davenport, IA 52806, (800) 344-6657.* **Circle #621**

—P.A.

A Slab for Plunge-Routed Pin Holes

A new template jig made by MEG Products makes quick work of routing shelf pin holes in casework sides. Sure, there are a number of comparable jigs for use with portable electric drills. But a 1/4-in.-dia. router bit spinning at 22,000 rpm cuts clean, perpendicular holes free of the edge tearout a drill bit produces. With the jig positioned on the workpiece, you can make a 28-in.-long row of holes spaced 1 in. apart. For longer rows, simply move the jig over and index it on a previously routed hole with a 1/4-in. index pin.

The 1/2-in.-thick aluminum plate is precision-bored to accept a 5/8-in.-dia. router template bushing. To locate the row of holes, you insert two 1/4-in.-dia. metal pins in the plate to serve as a fence. The front and rear rows of shelf

holes are aligned by placing the jig's center line on a pencil line squared across your case side. A pair of toggle clamps included with the jig hold it securely to the workpiece. Chuck up a 1/4-in.-dia. straight bit in your router, dip the template guide into each hole in turn, and plunge the router to rout the holes.

At $224, this jig isn't inexpensive, but it should last a long time. The holes are deep enough to maintain accuracy even after suffering gouges from errant router bits. At just over 14 pounds, the unit is a bit heavy, but the weight didn't make it awkward to use.

In the spring of 1995, the manufacturer plans to introduce a 32mm system template that will use a 5mm router bit. (Price: $224) *MEG Products, 9 John Lenhardt Rd., Hamilton Square, NJ 08690, (609) 587-7187.* **Circle #624**

—E.W.

A New Level for Table Inserts

Woodhaven's Stay-Tru Plate Levelers solve a vexing problem I've encountered when building router tables in the past: how to get the insert plate perfectly flush with the table surface. The usual approach to "hanging" a router involves cutting a rabbeted opening in the table for the insert that's attached to the

SOURCES

These additional sources offer broad selections of accessories for routers:

Cascade Tools (800) 235-0272
Circle #610

CMT Tools (800) 531-5559
Circle #611

Hartville Tool (800) 345-2396
Circle #612

Highland Hardware (800) 241-6748
Circle #613

Leichtung (800) 321-6840
Circle #614

MLCS (800) 533-9298
Circle #615

Trendlines (800) 767-9999
Circle #616

Woodworkers' Store (800) 279-4441
Circle #617

Woodworker's Supply (800) 645-9292
Circle #618

router base. Unless the rabbet depth is an exact match for the insert thickness, you'll get an insert that wobbles or isn't flush with the table surface.

Woodhaven's set of four leveling blocks eliminates the need for that troublesome rabbeted ledge—you simply rout a straight-sided opening for the insert. Then screw the leveler blocks to the underside of the table. They're designed to align automatically with the edge of the opening, so there's no measuring involved.

A pair of thumbscrews on each block lets you fine-tune the ledge that supports the insert. These are hard to turn: I resorted to a pair of pliers when my thumb and forefinger got sore. But the adjustment is precise, solid and foolproof. There's even a small rabbet milled in the top edge of each leveler to keep accumulated sawdust from raising the insert out of level. And there's no problem adjusting the blocks if you switch to an insert of a different thickness.

Woodhaven supplies these levelers with their own router tables, but the blocks will also work on other tables. If you're interested in breaking the rabbet habit, this is a good way to go. (Price: $14.99) *Woodhaven, Dept. AWT, 5323 W. Kimberly Road, Davenport, IA 52806, (800) 344-6657.* **Circle #621**

—A.R.

SHOP TESTED

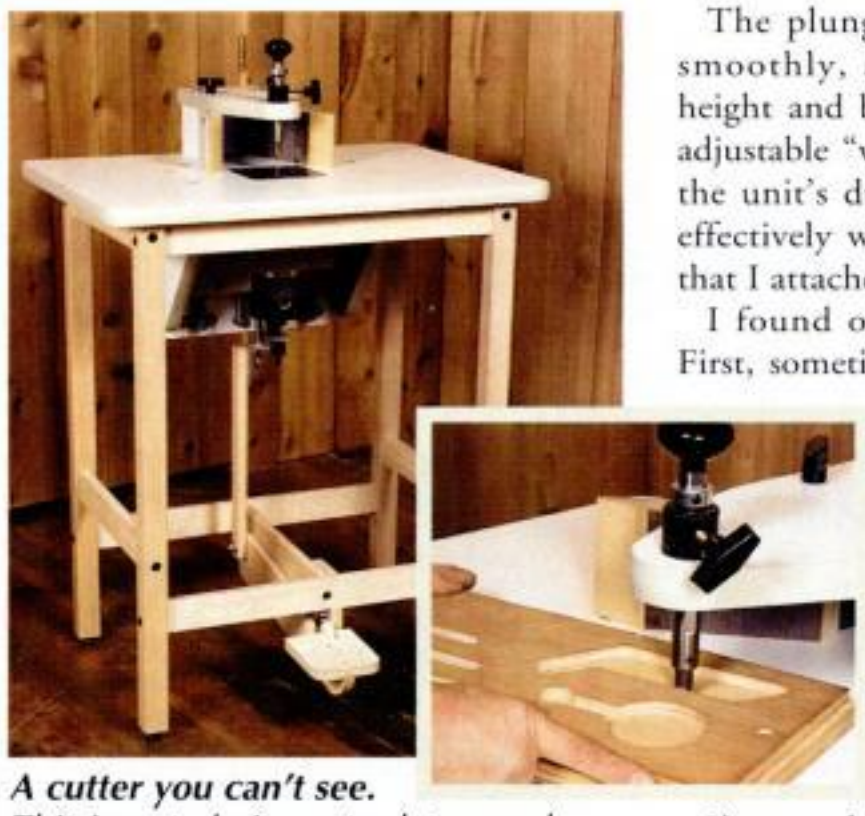
WOODHAVEN PIN ROUTING MACHINE

If you like to shape parts on your router table but want to "automate" some repetitive jobs or take on more complex shapes, you should take a look at Woodhaven's new Pin Routing Machine.

A pin router resembles a router table but is designed to follow a pattern, as a pattern-cutting bit does. But instead of guiding the cut with a bearing on the bit's shaft, a pin router uses a round steel pin that follows a template secured to the top of the workpiece. Woodhaven's machine is an inverted pin router: The guide pin is centered over the bit, held in an arm that extends over the template. To begin routing a pattern, you position the pin against the template and depress a foot pedal to plunge the bit upward through a hole in the table and into the bottom of the workpiece. Though you can't see the bit, you know it's always centered under the pin. Routing is safer since you're never exposed to the cutter.

This configuration makes the Woodhaven Pin Routing Machine ideal for reproducing curved parts, hollowing out recesses, and making interior cuts such as grooves. With a shop-made fence positioned on the table, you can cut slot mortises easily and precisely. The machine handles stock up to 2 1/2 in. thick and will rout to the center of a 16-in.-wide piece.

Assembly took me a few hours, including the wooden leg set, tabletop, foot pedal and pin arm. Knockdown fasteners made it easy. The machine comes with pins of three different diameters: 1/2 in., 3/8 in. and 1/4 in. You supply your own 3 1/2-in.-dia. router motor.



A cutter you can't see. *This inverted pin router lets you do template routing work faster, more safely and accurately than with a hand-held router.*

I found that stock fed smoothly when I used a moderate feed rate. The bit can chatter if you feed too fast, or if the bit isn't mounted deep enough in the router's collet. To avoid chatter, I recommend using 1/2-in. shank bits. In terms of power, there's plenty for light and medium-duty projects, but I'd like to see Woodhaven offer a router mounting block that accepts larger 2-HP and 3-HP routers.

The plunge mechanism works very smoothly, and adjustments for pin height and bit centering are easy. Two adjustable "wings" beside the pin made the unit's dust collection system work effectively with the Fein shop vacuum that I attached.

I found only two minor problems. First, sometimes when I pushed on the pedal to release the plunge lock after a cut, the extra pressure flexed the mechanism a little, making the bit dimple the freshly cut recess. The second problem was that the knurled plunge-depth stop nuts vibrated loose until I tightened them more securely.

I've used large industrial-type pin routers for many years, so I approached Woodhaven's machine with some skepticism. I came away impressed. Certainly, Woodhaven's pin router won't replace my 2,000-pound Onsrud, but it's not intended to. I'd recommend the Woodhaven machine to anyone wanting to try pattern routing on a tight budget. And for small-shop professionals doing limited production runs, this machine will pay for itself a lot quicker than an industrial model. (Prices: complete machine excluding router, $599.99; machine without leg set, $499.99; pin arm only with dust wings and vacuum outlet, $124.99) *Woodhaven, Dept. AWT, 5323 W. Kimberly Road, Davenport, IA 52806, (800) 344-6657.* **Circle #621**

—Ken Dieterly

WOOD FACTS

Wenge

by Paul McClure

For centuries, the native craftsmen of East Africa have used wenge to make masks and statues representing spirits and gods. Before the advent of power-driven machines and high-grade cutting steel, this very dense, heavy wood was worked with fire. The natives would "cut" sections from a downed, well-seasoned tree by building controlled fires beneath it and burning through the log until they had a manageable section to haul back to the village.

There, the "carving" was also done by selective burning, protecting surrounding areas with damp cloths. First an eye was formed, then a cheek, a nose, a mouth—until the entire mask or statue was fire-sculpted. The craftsman then scraped away the charred wood to reveal the chocolate-colored wood beneath.

Found in swampy forests in the Congo region of eastern Africa, wenge is a fairly small tree, generally less than 60 ft. tall and 2 ft. in diameter. It is nearly indistinguishable from its close cousin, Panga Panga (*Millettia stuhlmannii*), and the two are often sold as the same species.

Appearance

Wenge's figure is fairly straight. The dirty-white sapwood is sharply demarcated from the heartwood, which is composed of very thin, alternating dark and light brown veins. The wood has a coarse texture due to its large, open pores which sometimes harbor shiny resin particles.

Workability

Wenge is very dense, and it is best worked with machine tools. Use carbide cutters when possible since the wood dulls cutting edges easily. In spite of wenge's density, it is an excellent wood for turning: It cuts cleanly and displays fantastic color, grain and figure.

Resin in the wood can sometimes prevent good glue adhesion. Surfaces to be joined should be wiped down with acetone prior to gluing. When long-term joint strength is needed, consider using dovetails or other mechanical joints. You'll have to predrill for screws, nails or other fasteners.

For a smooth finish, the pores must first be filled. Oil and varnishes turn the wood almost black, but the color mellows over time to a rich, dark brown. I don't oil wenge because it can leave small, barbed splinters in your hands.

A caveat: Sanding wenge can be irritating to the skin, eyes, and respiratory system. It's wise to work in a ventilated area using dust collection and a mask.

Uses

Wenge is widely used in cabinetry, furniture making and turning. Strong and abrasion-resistant, it's also used in the construction of stairs and flooring. Its weight makes it unsuitable for plywood manufacture, but veneers are commercially available. ▲

WENGE

Species and Common Names	*Millettia laurentii - wenge, mibotu, palissandre du congo*
Growing Region	*Eastern Africa: Zaire, Cameroon Republic, and Gabon*
Specific Gravity	*0.88*
Density	*55 lbs. per cubic ft.*
Wood Movement[1]	*Very small (less than 1/8 in. per ft.)*
Durability	*Resistant to termites and decay*
Sustainability	*Sustainable at current harvest levels*
Availability	*Specialty lumber dealers*
Size: Thicknesses	*4/4 through 12/4*
Widths	*6 to 16 in.*
Lengths	*8 to 16 ft.*
Cost: Lumber	*$8 per bd. ft.*
Veneer	*$1.90 per sq. ft.*

[1] *Indicates movement across the grain.*

SNEAK PREVIEW

GALLERY

Philadelphia Furniture Show

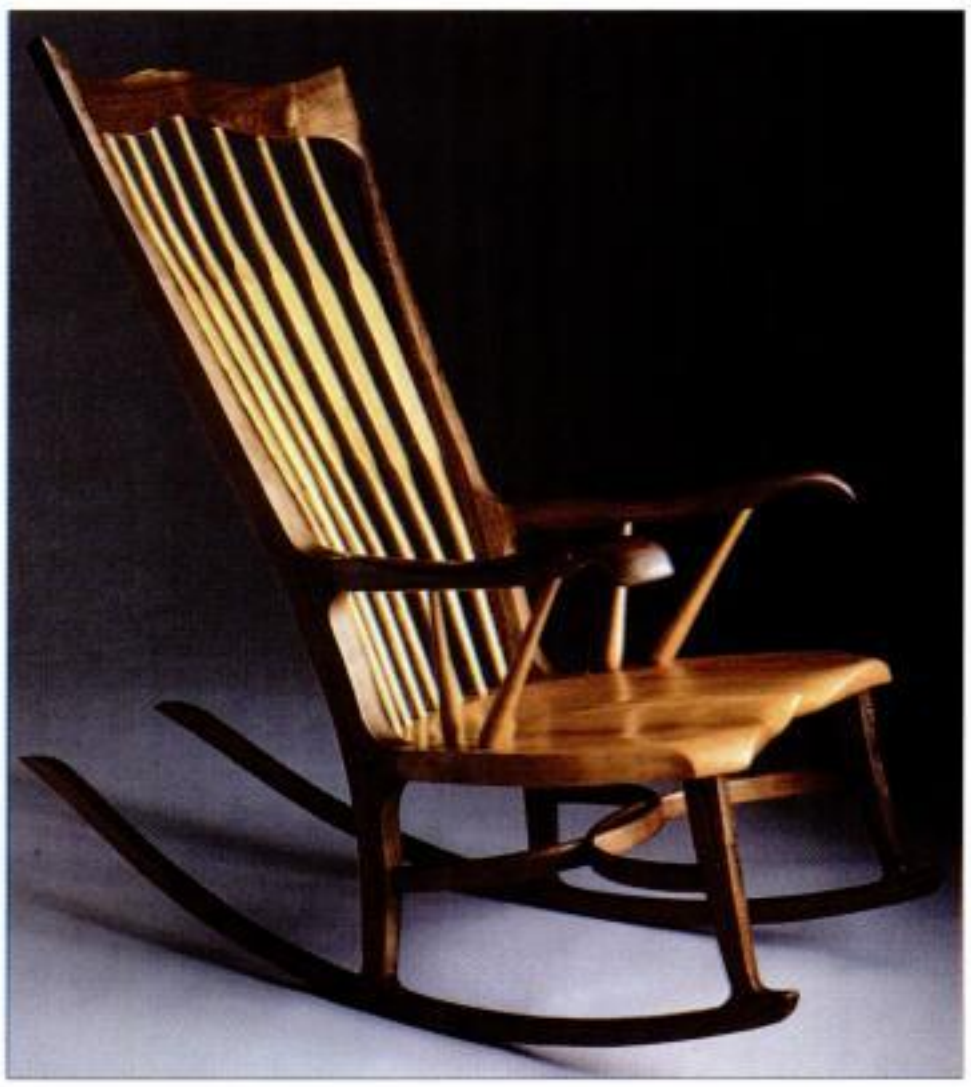
Philadelphia furniture makers Bob Ingram and Josh Markel have organized the biggest exhibit of studio furniture ever—in a town known for its rich history of furniture making. The Philadelphia Furniture Show will highlight three generations of furniture makers, many of whom hail from the Philadelphia area. Here's a sneak preview of some of the work that will be on display. The exhibit is being held at the Pennsylvania Convention Center in Philadelphia and is open to the public from Friday, April 21, through Sunday, April 23. For more information, call: (215) 440-0718.

▲ Sled-based coffee table by Mira Nakashima-Yarnall, New Hope, PA. Black walnut.
62 L. x 30 W. x 15 H.

PHOTO BY ROBERT HUNSIKER

▲ "Walking Vessel" by Jack Larimore, Philadelphia, PA. Cherry, milk paints, aniline dyes.
38 L. x 18 W. x 36 H.

PHOTO BY TOM BRUMMETT



▶ Room divider by John Dodd, Canandaigua, NY. Cherry, ebonized cherry, curly ash, glass.
36 W. x 13 D. x 83 H.

PHOTO BY WOODY PACKARD

◀ Rocking chair by Ray Kelso, Collegeville, PA. Walnut, cherry.
28 W. x 47 D. x 49 H.

PHOTO BY TOM CRANE

▲ Federal-style card table by Walter Raynes, Baltimore, MD. Mahogany, poplar; veneers of mahogany, rosewood, curly maple, holly.
36 L. x 18 W. x 28 1/2 H.

PHOTO BY BREGER & ASSOCIATES

▲ "Isleboro Series Blanket Chest" by I.M. Syron and Bonnie Bishoff, Philadelphia, PA. Ash, basswood. 36 W. x 20 D. x 20 H.

PHOTO BY JOSEPH DOMINIC CHIELLI

▲ Van Muyden Chairs by Robert Erickson, Nevada City, CA. Cherry, quilted maple, walnut. 24 W. x 25 D. x 36 H.

PHOTO BY STEVE SOLINSKY

▼ Dresser by Rob Hare, Kingston, NY. Cherry, wrought steel. 78 W. x 20 D. x 42 H.

PHOTO BY RALPH GABRINGER

▲ China chest by Michael Maxwell, Bedford, VA. Cherry, walnut. 40 W. x 24 D. x 72 H.

PHOTO BY HASAN JARANE

◀ "Zero Chair" by Andrew Willemsen, Newburyport, MA. Cherry, ash, Dacron, copper. 21 W. x 19 1/2 D. x 42 H.

PHOTO BY BILL TRUSLOW

▶ Library ladder by Wharton Esherick, Wharton Esherick Museum, Paoli, PA. Walnut. 17 W. x 17 D. x 49 H.

PHOTO BY MANSFIELD BASCOM

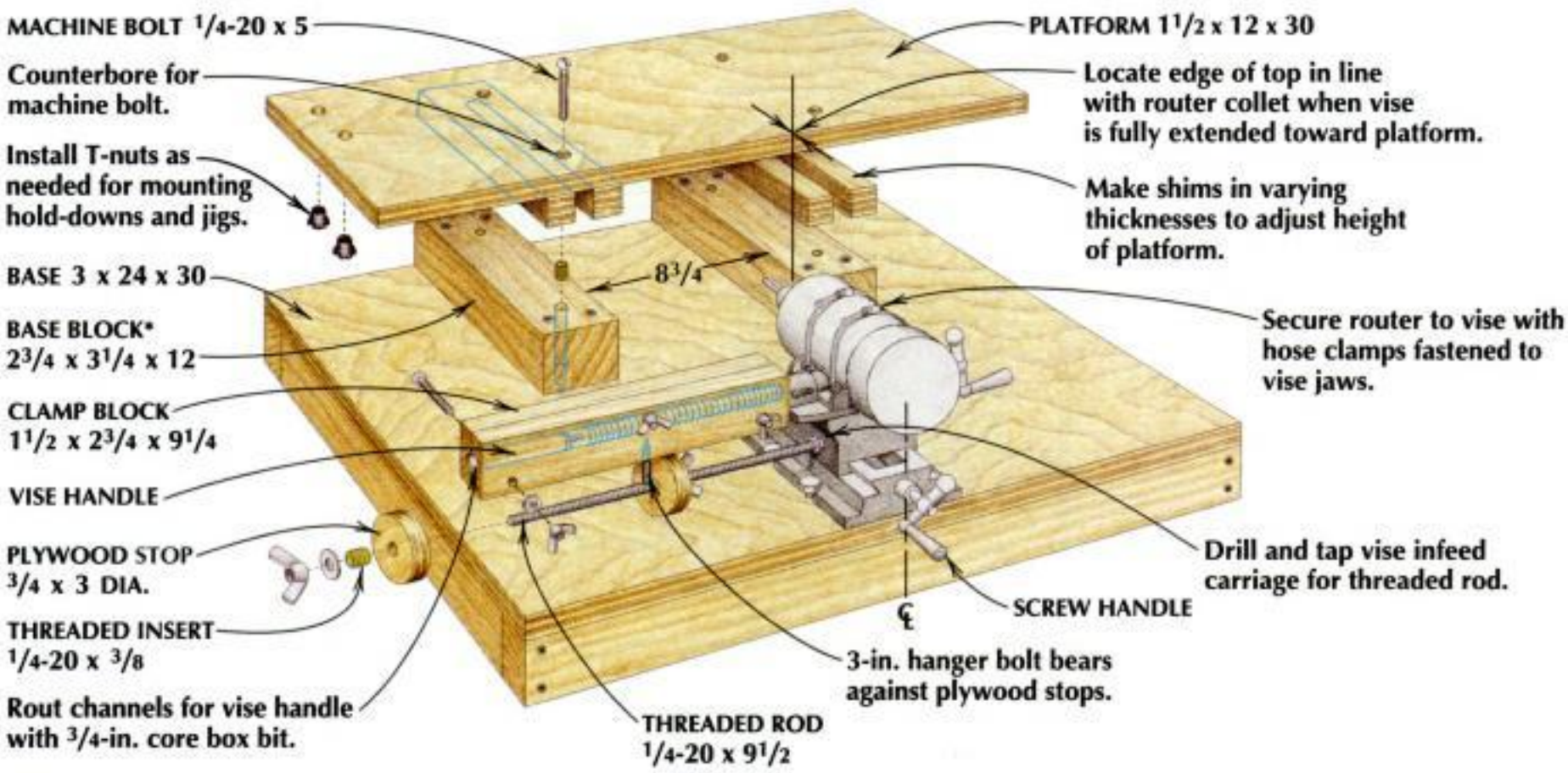
Want to see your work in "Gallery"? Send color slides or color transparencies to: "Gallery," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098. Please include materials, dimensions, name of photographer, your name, address, and phone number. We'll pay you $35 if we publish your work. If you want your photos returned, enclose a self-addressed stamped envelope.

SHOP SOLUTIONS

Horizontal Mortiser

Cut Accurate Mortises With a Router and a Cross-Sliding Vise

by Andy Rae



*If using different vise, adjust height of base block to accommodate thickest workpiece.

Reader David Volker, a former machinist, made slot mortising a reality when he bought an inexpensive cross-sliding vise from Grizzly Imports (Box 2069, Bellingham, WA 98227, 800-541-5537; $39.95). The vise holds his router horizontally, facing the workpiece, which is clamped on an elevated platform. He plunges the router bit and moves it side-to-side by turning the vise's two screw handles. "The action is similar to rubbing your tummy and patting your head at the same time," remarks Volker, but he says the process is fast and easy once you get the hang of it.

To adjust the platform height, Volker inserts shims of varying thicknesses between the top and the base. Then he presets his mortise length by positioning round plywood stops on both sides of a hanger bolt. The hanger bolt is screwed into a split block bolted to the vise handle. He controls the depth of cut by eyeballing the bit as it's cutting. Where precise depth is critical, he makes a mark on the body of the vise and stops routing when the vise's sliding carriage reaches the mark. Volker prefers a carbide-tipped, two-flute straight bit for cutting his mortises. For more efficient chip removal, you could opt for a spiral up-cut bit. ▲

Mortising magic. *An inexpensive machinist's vise, some shop scrap and your router make an efficient mortising machine.*

ANDY RAE *is an assistant editor of AW.*

Do you have a favorite shop fixture you'd like to share? Send a drawing or sketch with a full explanation to: AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098. If we publish your "Shop Solution" we'll send you this Porter-Cable plunge router, list price $320.