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AMERICAN WOODWORKER[®]

#105 January 2004
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- Tips for mastering your Brad Nailer
- Classic Garden Chair

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A READER'S DIGEST PUBLICATION

AMERICAN WOODWORKER®

#105, January 2004

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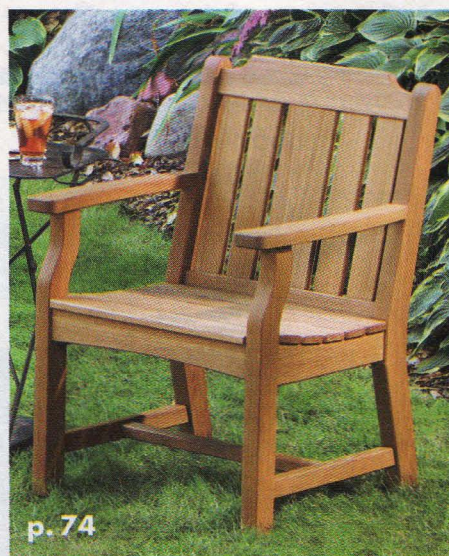
104 *Oops!*



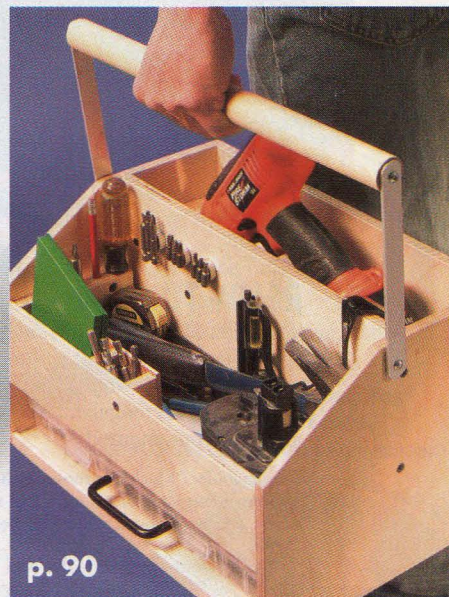
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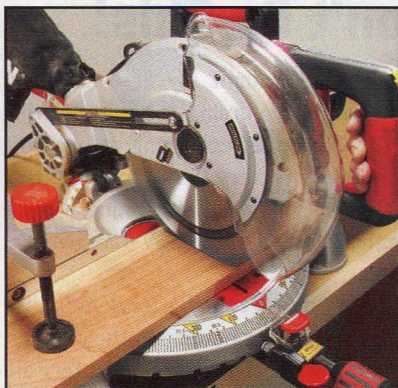
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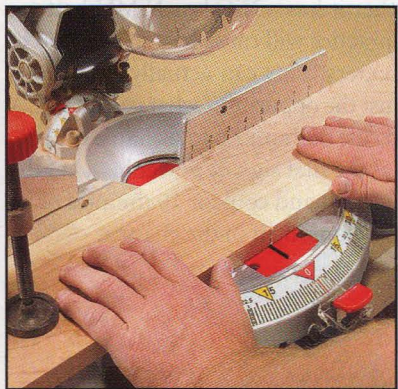
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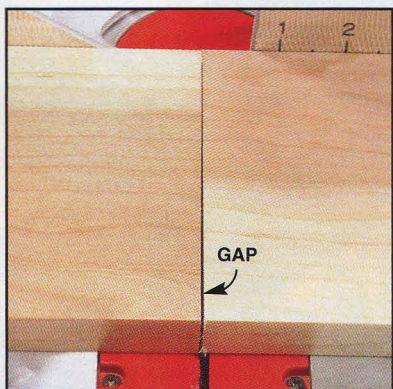
Question & Answer



1
Cut a trial board in half. It must have absolutely straight and parallel sides. Secure it with hold-downs or clamps.



2
Flip over the right half, hold it tight against the miter saw's fence and butt it up to the left half.



3
A gap between the two cut ends indicates the saw isn't set square. The gap represents twice the error.

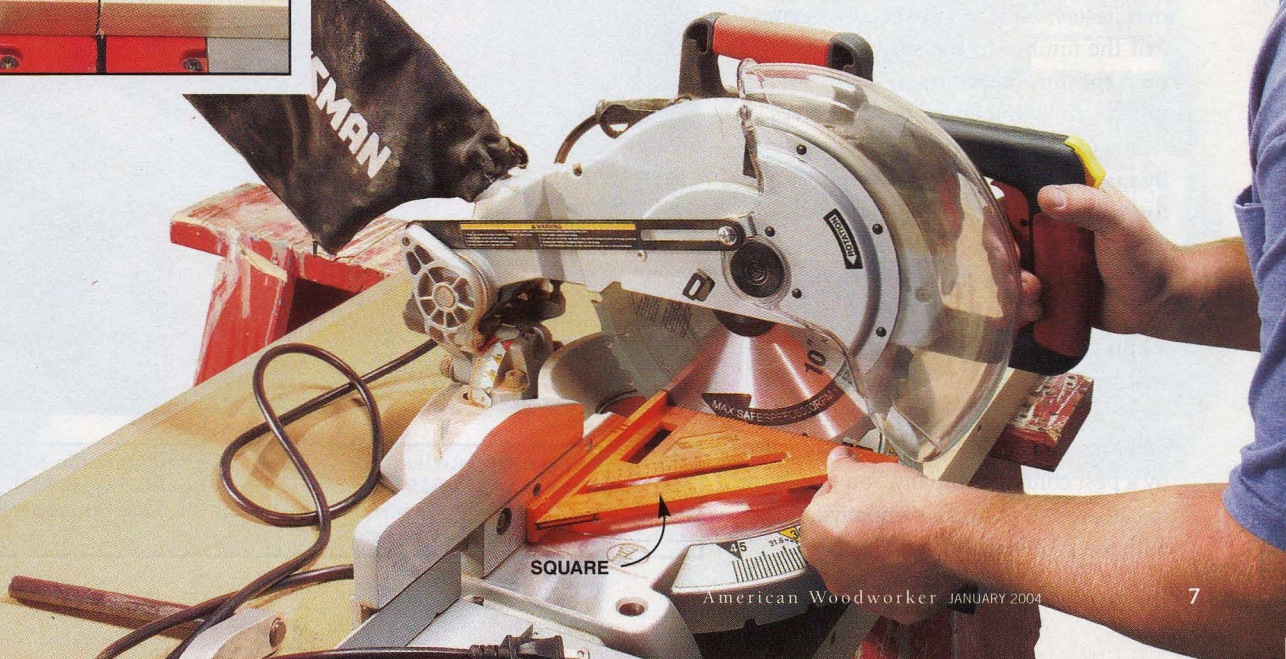
Is Your Miter Saw Square?

Q. I want to adjust my miter saw so it's dead-on accurate, but I don't have a fancy square. How do I do it?

A. Use an old woodworker's trick: set up your saw as close as you can with whatever square you have (see photo below), saw a board in half (Photo 1) and flip over one side (Photo 2).

When your saw is dead on, the two cut ends will butt perfectly together. If there's a gap in the front of the joint (Photo 3), it means the saw blade is angled a bit to the left. If there's a gap in the back, the saw blade is angled to the right. The gap itself is actually *twice* the amount that your saw is off, because you're comparing two cut ends to each other.

Most miter saws can be adjusted by loosening some screws and pivoting the fence. Refer to your owner's manual for details.



Question & Answer



Don't Do This!

Q. When I bought my first cordless drill, I was told to drain the battery all the way down before recharging to prolong the life of the battery. I used to clamp the switch until the drill quit running. Now I hear this is a bad practice. What gives?

A. Don't drain your battery! Actually, you can stick your battery in the charger anytime you like. Draining the battery all the way down is a bad idea, for any drill, whether it has a NiCd or NiMH battery. The practice will cause heat to build up in the battery. This can actually shorten its life, just the opposite of what you intend. A good rule of thumb is to recharge the battery at the first sign of power loss. Let the battery rest and cool for 10 minutes or so before plunking it in the charger.

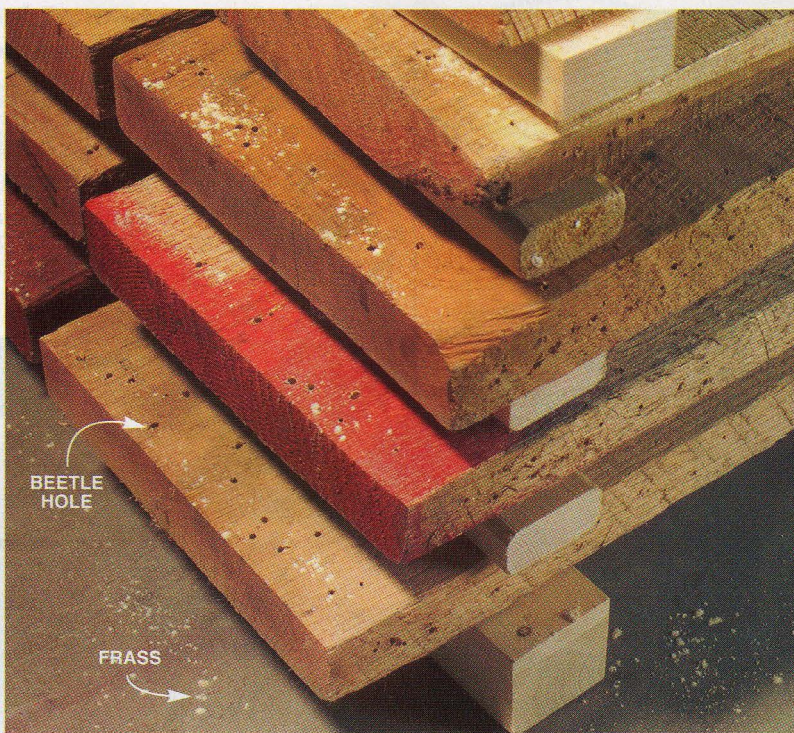
Attack of the Powder Post Beetle

Q. I just noticed that my stack of air-dried oak is peppered with tiny holes. I also noticed little piles of fine dust on and around the stack. What can I do to save my wood?

A. You're probably looking at a powder post beetle infestation. These pests particularly love the sapwood in hardwoods like red oak and ash. The problem usually manifests itself when the beetles begin to exit the lumber in the springtime. They push the dust (called frass) that is packed into the holes out ahead of themselves.

You can help prevent future infestations by maintaining a tidy area around wood that's air drying outdoors. Remove scraps, sawdust, vegetation, etc.

Once an infestation is discovered you have two choices. You can take the wood to a kiln to finish the drying process. Kilns will heat the wood to 140 degrees F or more and that will kill the beetles. Your other recourse is to have the pile fumigated by a pest control company. You may have to call around to find a company familiar with the problem. **AW**



If you have a question you'd like answered, send it to us at: **Question & Answer, American Woodworker, 2915 Commers Drive, Suite 700, Eagan, MN 55121 or e-mail to qanda@readersdigest.com.** Sorry, but the volume of mail prevents us from answering each question individually.

Workshop Tips

8-ft. Straightedge for \$4

Whenever I have to cut down a sheet of plywood I reach for one of my trusty metal stud straightedges. Metal studs are available in different thicknesses for different applications. A 20-gauge non-load-bearing drywall stud (about 35¢/ft.) won't deflect significantly when it's clamped to an 8-ft.-long sheet of plywood.

I bought 3-5/8 in. x 9-ft. metal studs at my local drywall supplier (look in the Yellow Pages under drywall). Home centers usually stock lighter 25-gauge studs, but they can special-order the heavier gauge for you (25-gauge studs deflect about 1/8 in. over 8 ft).

I trimmed one stud down to 8-ft. 6 in. for ripping and cut the other stud to use for crosscutting.

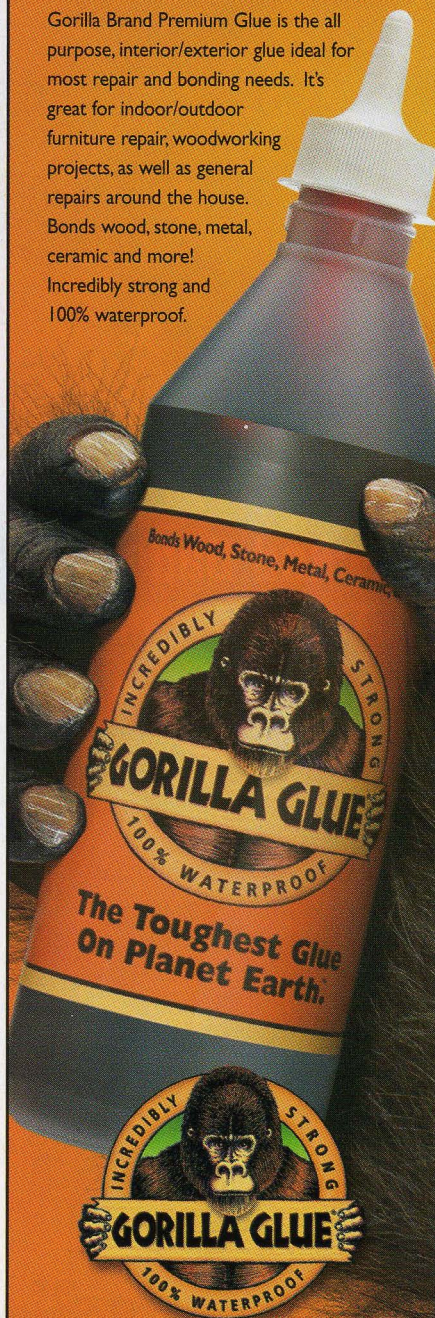
Dennis Densmore

If you have an original Workshop Tip, send it to us with a sketch or photo. If we print it, you'll get \$100! Send to: **Workshop Tips, American Woodworker, 2915 Commers Drive, Suite 700, Eagan, MN 55121** or e-mail to workshoptips@readersdigest.com. Submissions can't be returned and become our property upon acceptance and payment. We may edit submissions, and use them in all print and electronic media.

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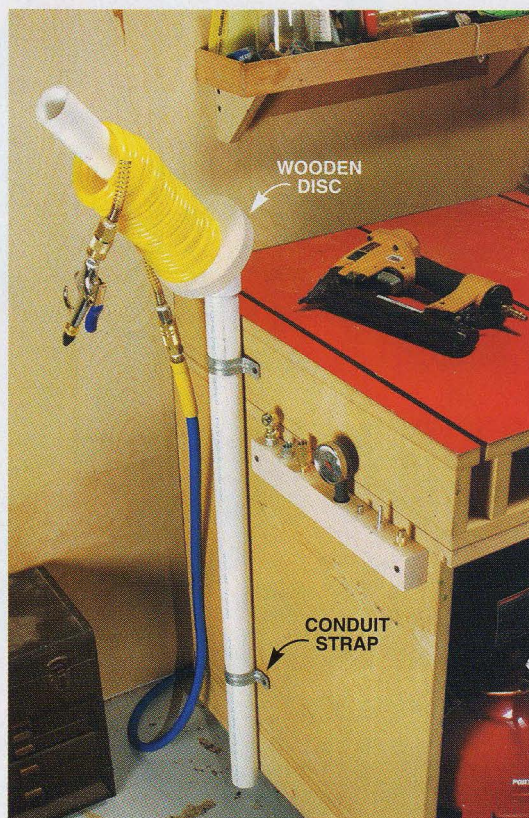


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Workshop Tips

Air Hose Rack

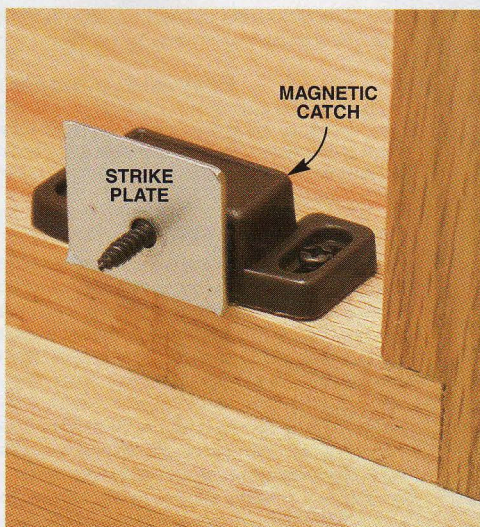
Air tools are great, but the air supply hose is hard to store conveniently. This rack solves this problem, and it's cheap! All you need is some 1-1/4-in. PVC pipe, a 45-degree elbow, two 1-1/4-in. conduit straps, and a wooden disc. I made the rack so it stands 48-in. tall but you can make it any height that is convenient for you. A coiled air hose drops onto the upper pipe section and rests on the disc. The conduit straps hold the



rack to the wall or a workbench. Connect the lower end of the hose to your air compressor and the upper end to an air-powered tool. Uncoil as much air hose as you need for a job, and when you're finished working, disconnect the hose from your tool and drop the coiled hose back on the pipe. The whole thing pivots toward your work for use, and back for storage. A separate rack holds air tool accessories. Not counting the hose, the whole thing cost about \$14 to build.

Betty Lambeth

Strike Plate Mounting Magic



When I had to install a bunch of magnetic catches recently, I came up with this simple method to mark the doors for the strike plate. It requires no measuring and the results are neat and clean.

Just insert the mounting screw in the plate and attach it to the magnet. Then press the door firmly against the screw, so the tip leaves a mark. Drill a pilot hole centered on this mark and then fasten the plate.

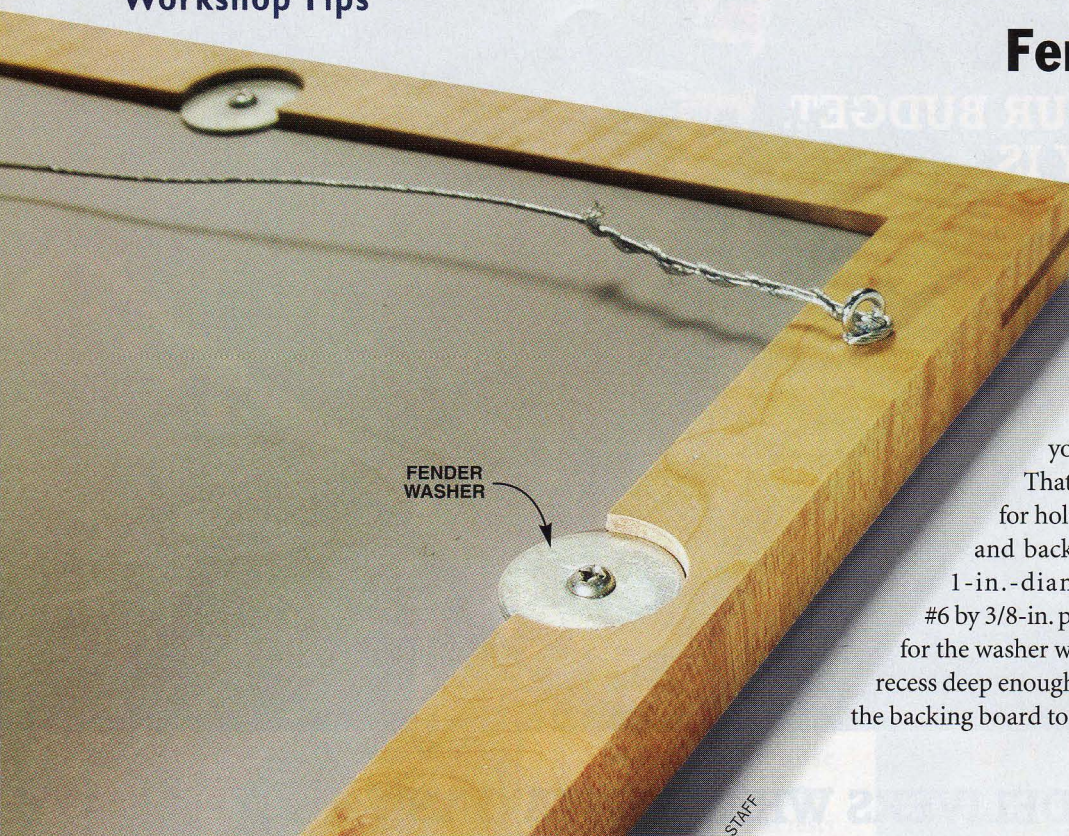
Tim Howell

Fender Washers for Mounting Pictures

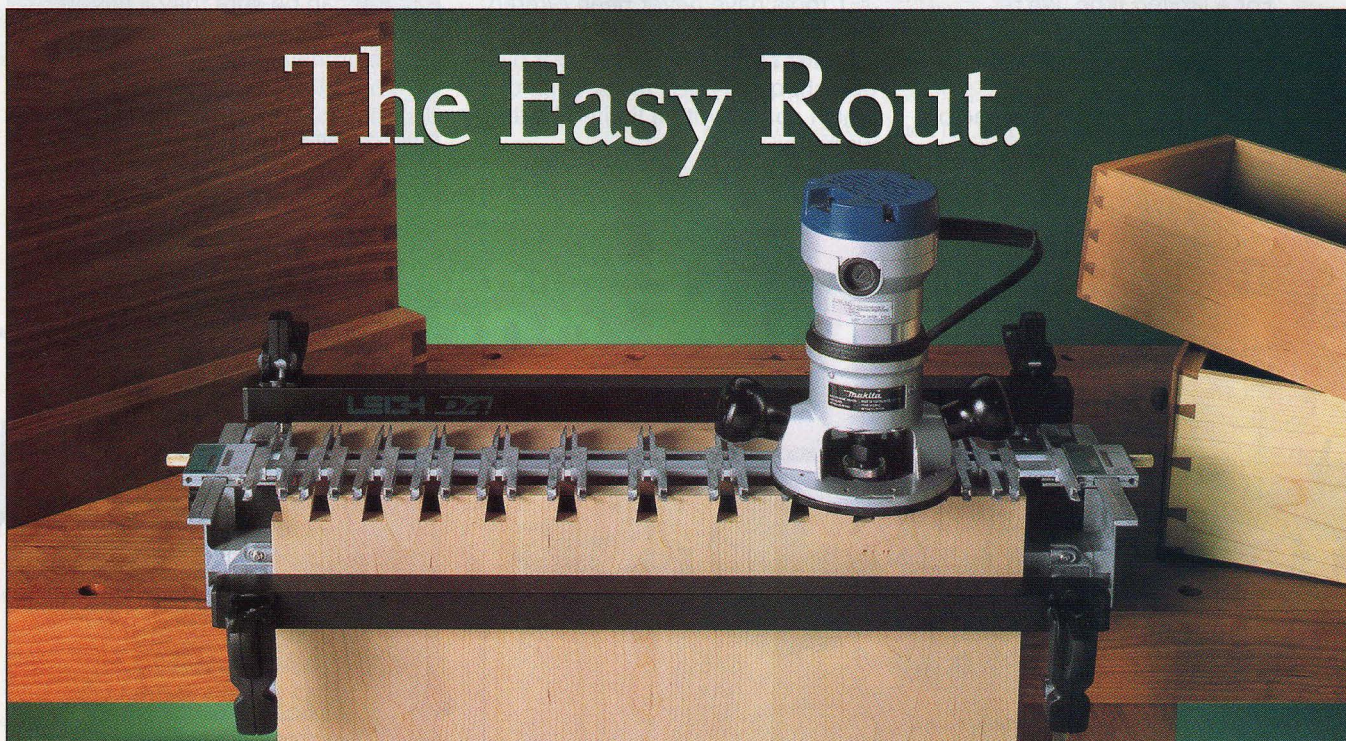
I enjoy making picture frames but always found it a pain to use tacks or staples to hold the picture in place. Plus tacks and staples are hard to remove when you want to change the picture.

That's why I developed this method for holding the picture, glass, matting, and backing board in the frame. I use 1-in.-diameter fender washers and #6 by 3/8-in. pan head screws. I drill the recess for the washer with a Forstner bit and make the recess deep enough so the washer will bear against the backing board to hold everything snug.

Larry Jenkins



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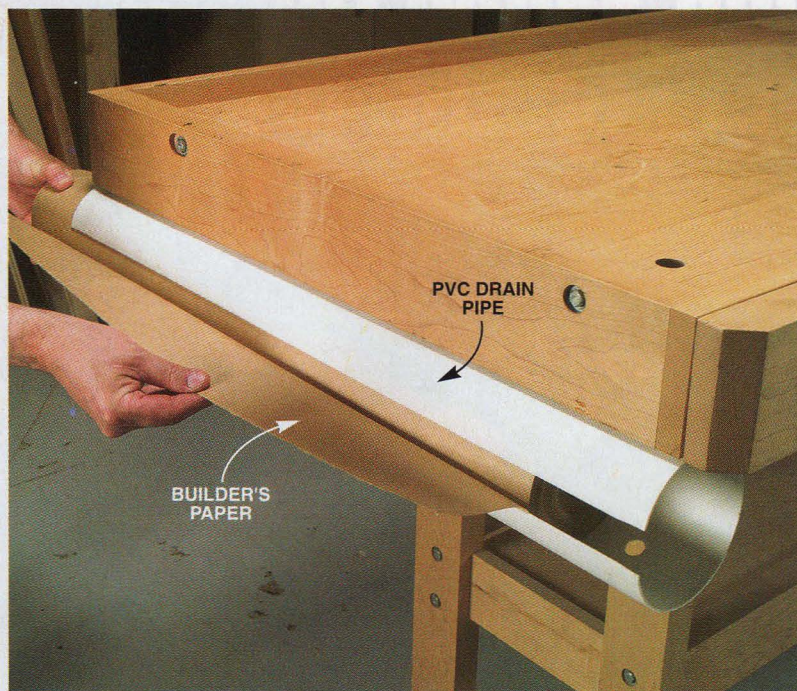
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Workshop Tips

Convenient Benchtop Protection



My workbench is beautiful and I want to keep it that way, so I cover the top with builder's paper (\$7/140-ft. roll at my local home center) whenever I'm gluing or staining. But the heavy roll was hard to handle and a nuisance to store until I devised this simple holder made from 4-in. PVC drain pipe (10-ft. length, \$3).

The holder is no wider than the roll, so there aren't any protruding hangers or rods. Using my chop saw, I cut the PVC pipe and the roll of paper to the width of my workbench. Then, on my tablesaw, using the fence, and with the blade set just high enough to cut through the pipe, I carefully cut a lengthwise slot.

I screwed the pipe to the end of my bench, using the drain holes for access. Then I slid in the roll of paper. It was a tight fit at first, because the new roll was the same diameter as the pipe, but once I'd covered the bench a couple times, the paper pulled out easily. **AW**

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Decibels.....	67-77
Electrical.....	110/220
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The Well-Equip

By George Vondriska

Sandpaper Power-Sharpening System

An excellent sharpening system has just gotten better and cheaper! The Veritas Mark II (\$300) sharpens chisels, plane irons, carving gouges and V-tools incredibly fast with a minimum of fuss.

The Mark II is a simpler version of the Mark I, a sharpening system that ran away with our Editors' Choice Award (AW #89, October 2001), and it costs \$100 less. The Mark I had a grinder (you don't really need it) and drive belt that was difficult to track (the Mark II solves this problem).

You don't need to be an expert sharpener to get professional results with this machine. Completely sharpening any tool takes only a matter of minutes, and it's just about impossible to overheat an edge. Simply stick an 8-in. diameter piece of self-adhesive sandpaper onto one of three interchangeable discs and mount the disc on the machine. Raise the tool rest to one of its preset heights (they correspond to any sharpening angle between 15 and 45 degrees, in 5-degree intervals) and you're ready to go.

The sandpaper ranges from coarse to super-fine. The coarse grit will quickly form an entirely new bevel, so there's no need to use a grinder. The super-fine paper will give you a keen edge that's ready to use, with no further honing required. Each sandpaper disc will last through at least 50 sharpenings, and replacements cost \$2.60 to \$5 each.

Source

Lee Valley Tools, (800) 871-8158
www.leevalley.com

Mark II Sharpening System, #05M31.01, \$300.

Not Grampa's Sanding Block

Remember hooking sandpaper on those three little nails in that old rubber sanding block, and stabbing your fingers more than the sandpaper? No more!

At \$20, the Preppin' Weapon costs a little more than other sanding blocks, but it's as comfortable in your hand as an old shoe on your foot.

The clips that bind quarter-sheets of paper to the block are very easy to use. All it takes is one flip of a lever. In fact, you can load four pieces at a time, and tear them off as the abrasive wears out.

Source

Time-Shaver Tools, Inc., (877) 736-3729

www.timeshavertools.com

The Preppin' Weapon, \$20, plus \$3.50 s & h.



LOCKING
LEVER

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EDITOR: TOM CASPAR • ART DIRECTION: PATRICK HUNTER AND EVANGELINE EKBERG • PHOTOGRAPHY: STAFF, UNLESS OTHERWISE INDICATED

opped Shop

New Tools, Supplies and Materials

Three-Base Router System

Multi-base routers give you more bang for your router buck. Instead of reaching for a different router, you just swap bases. The new Ryobi RE1803BK router (\$179) comes with *three* bases: fixed, plunge and D-handle. (A D-handle base gives you more control when routing edges.) Most other multi-base kits cost more and come with only fixed and plunge bases.

Like other multi-base machines, this router has electronic variable speed (15,000 to 25,000 rpm) and soft start. Its 9.5-amp motor is less powerful than other multi-base routers' 12-amp motors, however. Less power means more passes for large cuts. The Ryobi comes with a 1/2-in. collet and a reducer for 1/4-in. shanks.

You don't need any tools to swap bases. The fixed and D-handle bases have an easy-to-use lever-style locking clamp and a great micro-adjustment ring, which simplifies setting bit depth. The plunge base has a micro-adjust for fine-tuning bit depth and a stop rod for setting plunge depth, but lacks a turret for setting multiple depths-of-cut.

The kit includes a dust-collection shroud, five template guide bushings, a fence and a bag to hold everything.

Source

Ryobi Tools, (800) 525-2579
www.ryobitools.com
Ryobi RE1803BK, \$179.

Liquid Bandage

Doesn't matter what I'm doing, I always find a way to nick my hands in the shop. I know I should seal those cuts to avoid infection, but too often I let it go. My hands are so busy that I have a heck of a time getting bandages to stick! New Skin, \$4, is a liquid bandage that has now earned a permanent place by my bench. It's no substitute for stitches, but it's excellent for sealing small nicks and cuts.

Once you brush New Skin over a cleaned cut, it dries almost instantly. It bends and flexes along with your real skin. And it's less obvious than a bandage, so your co-workers and wood-working buddies won't see the results of your mishaps. There are 50 applications in a bottle, according to the manufacturer.

Source

Available at most drug stores
New Skin, \$4 for 0.3 fluid oz.



PHOTOS COURTESY OF MANUFACTURER



PLUNGE BASE



D-HANDLE



Rust Fighter

Rusty tools can bring a tear to the eye of even the most hardened woodworker. Avoid the heartbreak with TopSaver (\$20), a rust remover, cleaner and surface sealer.

If you have a tool that's rusty (or a brand new tool that's full of shipping grease) spritz on a little TopSaver and work it in. Heavily rusted tops may need to be rubbed with an abrasive pad (included with the kit). Greasy tops may require nothing more than a paper towel.

Once the tool is clean, spray on a

little more TopSaver and rub it in. This leaves behind a film that seals the surface and prevents new rust from forming. A silicone-free lubricant in TopSaver also allows wood to slide more smoothly across the tool's surface, so you're not fighting friction.

TopSaver is suitable for all your tool tables and other sliding surfaces, such as router bases and planer tables. **AW**

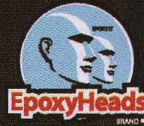
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MDF and Particleboard

How two versatile woods can be both a blessing and a curse

Cheap, plain and definitely not wood. That's how many woodworkers describe particleboard and MDF (medium-density fiberboard), but think these words instead: inexpensive, uniform and stable.

- **Inexpensive.** MDF and particleboard panels run \$25 to \$35 a sheet (oversized at 49 in. by 97 in. so you can cut off a dinged edge).

- **Uniform.** Collectively called composite wood, MDF and particleboard panels don't

have the irregularities of veneer-core plywood, such as voids on the inside and patches on the outside.

- **Stable.** Composite wood doesn't shrink and swell across the grain or warp to the same degree as solid wood.

Composite wood has a few significant drawbacks: it's heavy, easily damaged and not very stiff. In addition, it doesn't hold screws as well as solid wood, swells when it gets wet and creates clouds of obnoxious sawdust.

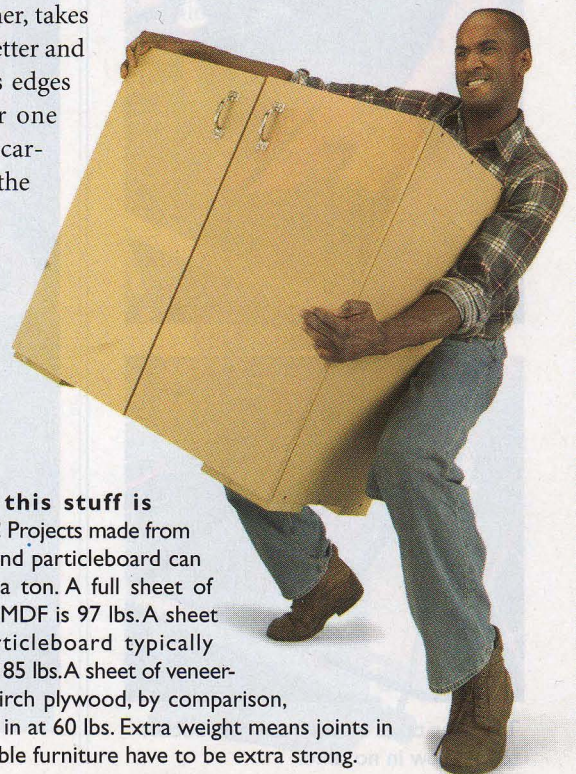
Particleboard is fine for utilitarian work, but MDF is preferred for furniture projects. MDF is smoother, takes better detail, holds screws better and paints very well once its edges are sealed. Whichever one you choose, use only carbide cutters, because the

binders in the wood are very abrasive. Even carbide will wear more quickly than normal.

Here we'll only cover the basics, but a wealth of free technical information on different grades of composite wood is available from The Composite Wood Council. You can download entire pamphlets at www.pbmdf.com or call (301) 670-0604.

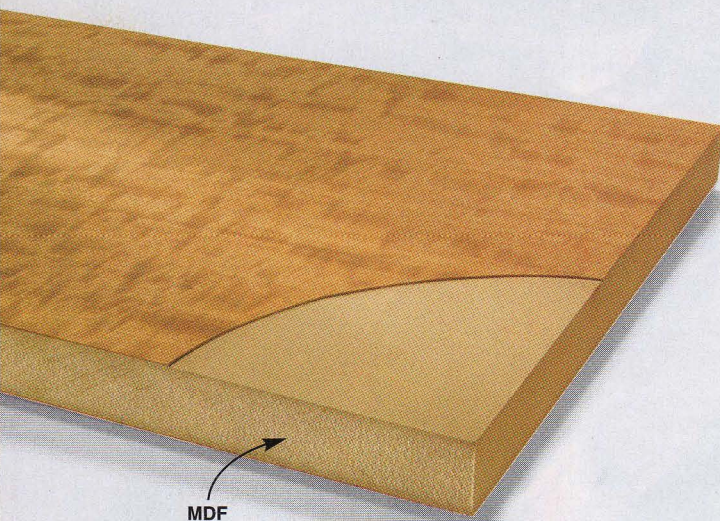


MDF takes a much crisper edge than particleboard. MDF is made of very small wood fibers, almost like flour; while particleboard is made from larger, coarser fibers. Particleboard has a tendency to chip out when routed. If you want sharply defined edges with particleboard, glue on a solid wood strip.

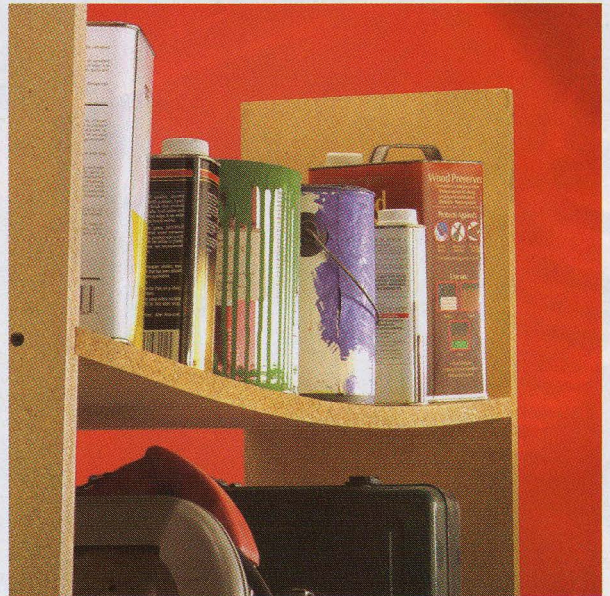


Man, this stuff is heavy! Projects made from MDF and particleboard can weigh a ton. A full sheet of 3/4-in. MDF is 97 lbs. A sheet of particleboard typically weighs 85 lbs. A sheet of veneer-core birch plywood, by comparison, comes in at 60 lbs. Extra weight means joints in moveable furniture have to be extra strong.

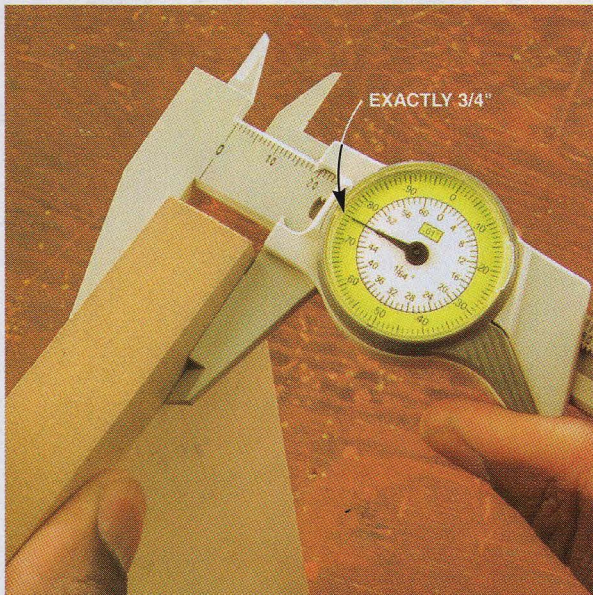
The Way Wood Works



MDF and particleboard are extremely flat. They're perfect for veneering because there are no lumps or ripples to show through extra-thin sheets of veneer. Glue veneer on both sides to keep the panel from distorting.



It may be flat, but it's not stiff. Look familiar? MDF and particleboard shelves are notorious for drooping, even from their own weight, unless they have additional support. Shelves that are 10-in. deep should be no more than 24-in. long.



MDF's thickness is usually right on the money. Unlike plywood, which is generally undersized, MDF and particleboard often fit right into standard-sized grooves. Material that's 3/4-in. thick will swell by 1/64 in. or more if stored in damp conditions, however, so it's a good idea to keep it in a dry place.

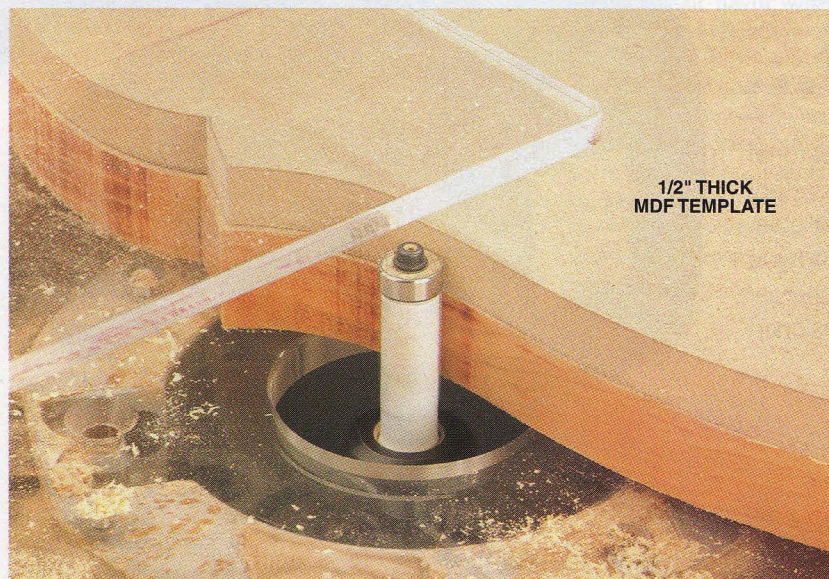


MDF is ideal for jigs. It's flat, smooth, equally stable in length and width, made in precise thicknesses, and cuts and shapes without chipping. In addition, you can drill precisely located holes in it because there are no fibers to deflect the bit. This jig is used to sharpen chisels with sandpaper on a drill press, and was featured in AVW #98, January 2003, page 62.

The Way Wood Works



Thin MDF is handy for making patterns. MDF comes in 1/4 in. and 1/2-in. sheets, although you may have to order them through a lumberyard. MDF is easy to sand, particularly when it's thin. 1/4-in. MDF is a better material than plywood for patterns because its edges are smoother, but it's not strong enough to make long, thin patterns.



Router templates made from MDF have durable edges. 1/2-in.-thick MDF works best. It has more bearing surface than 1/4-in. stuff and is easier to sand to shape than 3/4-in. material. Here's where a perfectly smooth edge on the template really helps to make duplicate parts that require little sanding.

The Delta Edge

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22-580, 13" Two Speed Finishing Planer

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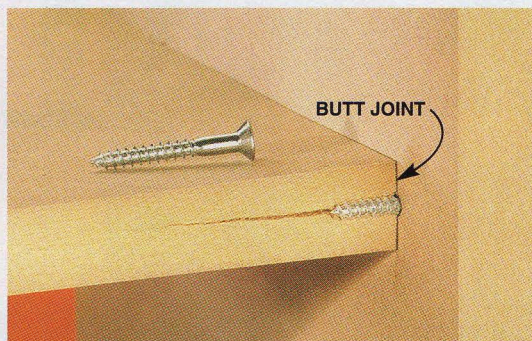
- Does the work for you by dimensioning on one speed, and finishing on the second speed
- This award-winning planer has won every portable planer review ever entered

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DELTA

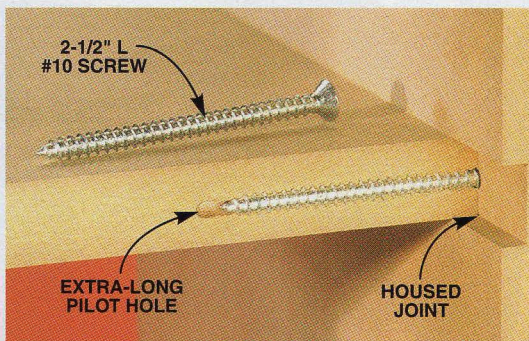
Your achievement. Our tools.

The Way Wood Works



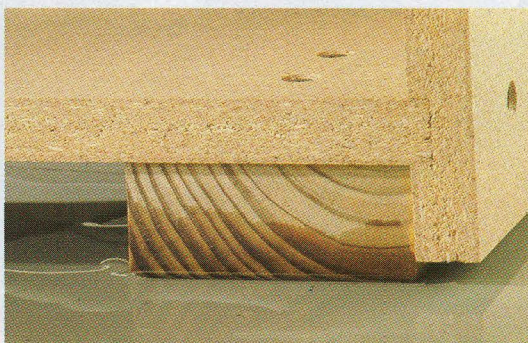
Cracks start easily in composite wood if you cut corners and don't drill a pilot hole for a screw. This spells trouble for a load-bearing butt joint. From tiny cracks come big failures! Short, shallow-threaded wood screws don't hold well in the edge of composite wood.

Long screws and housed joints are best for shelves. Deep threads on the screws are a must. Drill an extra-long pilot hole that's the same diameter as the solid shaft of the screw. Add glue to make a really strong and durable joint. (Use plenty because edges soak up lots of glue!)

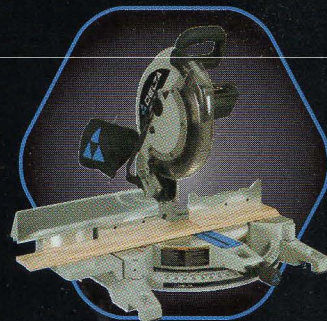


Wet basement or garage floors wreak havoc with MDF and particleboard. The fibers in both woods soak up water and expand like a sponge. However, when the material dries out, it doesn't shrink back. Instead, tiny cracks develop, weakening the wood. If this piece is moved, the bottom edge will crumble.

Raise the case above a wet floor with solid-wood feet. Here we used pressure-treated lumber (so the feet won't rot even if they stay damp) and glued and screwed them to the case with a water-resistant yellow glue. The glue barrier prevents the case from soaking up water.



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Are MDF and Particleboard Hazardous to Your Health?

Formaldehyde and dust are significant concerns with composite wood. The strategies listed here can limit your exposure to both problems.

Formaldehyde is used in the glues and binders of composite wood and is slowly emitted from the entire panel as a gas. Many manufacturers have reduced formaldehyde emissions in the last few years, but some people have allergic reactions to even small amounts.

There are three things you can do about formaldehyde emissions:

- Buy low-formaldehyde panels (see Source, at right, for one such product).
- Air out composite panels in your garage or shed for a few weeks.
- Seal in the formaldehyde by coating all the surfaces of your project with paint, varnish or a laminate.

As woodworkers know all too well, composite wood creates giant clouds of very fine wood and binder dust. MDF is the worst offender. This dust is not only annoying, but prolonged exposure can lead to respiratory problems.

Protect yourself with three levels of dust control:

- Collect the dust at the source with whatever kind of vacuum hose you can rig up.
- Always wear a mask. Look for NIOSH N95 masks with two straps and a nose clip for a tight seal.
- Keep the dust from settling over your shop and home by trapping it in an overhead air scrubber. **AW**

Source

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Small Shop Tips

Mobile Tool Cabinet

I bought my current house because of the big detached garage, which is perfect for my woodshop. However, when I started remodeling the house I got really tired of lugging boxes of tools from the garage to the house every weekend.

To make things easier on my back, I made this mobile tool cabinet. It holds a variety of essential tools, which are easy

to swap out for different tools when your needs change. I built this cabinet using 1x10 pine boards which are lightweight yet rugged. I fastened the cabinet sides to the top, bottom and shelves with biscuits, screws and glue.

Then I glued and screwed the boards for the back. I added the pegboard inside to hang a variety of tools.

I surface-mounted the leaf hinges to the outside of the cabinet.

This approach allows the doors to stop in an "open book" position. This makes accessing

the tools on the doors much more convenient than if the doors swung all the way around to the sides of the cabinet.

I also added a small block of wood underneath the front edge of the cabinet so it tips backward slightly which helps keep the doors open when in use. To keep the doors closed I used a sliding bolt, but a screw eye and hook is equally simple and effective.

I attached the cabinet to a dolly with four conduit straps. All the materials, including the dolly, were purchased at a home center for about \$40.

Patrick Hunter

CUTTING LIST

Overall Dimensions: 18-1/2" W x 36" T x 9-1/4" D

Part	Qty.	Length
Doors, Sides and Back Panels	6	36"
Top, Bottom and Shelves	4	17"

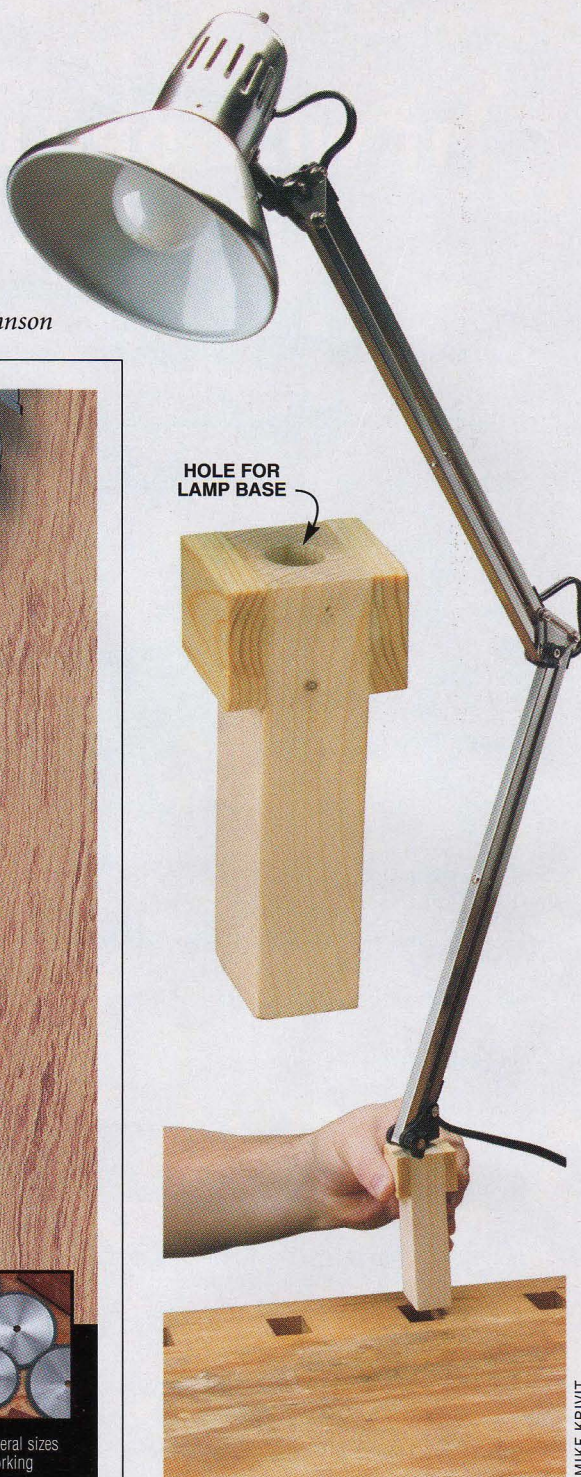


Small Shop Tips

Bench Dog Light

With this shop-made bench dog I can put light right where I need it. The dog is just a square chunk of wood with two smaller pieces glued to the sides. The smaller pieces act as stops. I used my drill press to drill the hole to a diameter that matched the base of my desk lamp.

Randy Johnson



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If you have an original Small Shop Tip, send it to us with a sketch or photo. If we print it, you'll get \$100! Send your tip to: **Small Shop Tips, American Woodworker, 2915 Commers Drive, Suite 700, Eagan, MN 55121** or e-mail to **smallshoptips@readersdigest.com**. Submissions can't be returned and become our property upon acceptance and payment. We may edit submissions, and use them in all print and electronic media.



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Rockville

Small Shop Tips



See-Through Chisel Holder

Here's a chisel rack that protects those sharp edges and allows me to see the right chisel for the job at hand.

The rack is easy to customize for any size chisels. Glue a 1-in.-wide strip of 1/2-in.-thick wood across a plywood backer board. Next, arrange your chisels across the 1-in. strip in whatever order you prefer. Add spacer blocks to fit the width of each chisel blade. A third 1/2-in. strip creates the chisel holes. A piece of acrylic screwed to the last strip protects the chisel edges and your hands.

Louis Giolitto



Quick-and-Easy Storage Boxes

I finally found a use for all that scrap plywood I've been hanging onto. I made a bunch of small storage boxes with it and a small shelf to put them on. They're quick to build. Just glue and nail the ends to the bottom and then glue and nail on the sides. That's it! They're so handy I think I'll go and build some more right now.

Patrick Hunter

AW

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DREAM W



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ORKBENCH

by Dave Munkittrick



A modern bench that features
storage, stability and mobility

BENEFITS



Tons of easy-access storage

Full extension drawers and shelves keep your equipment organized and right at hand. There's room for hand tools, power tools and all of their accessories. Plus no bending down and fishing through dark cabinet interiors for the tool you need.

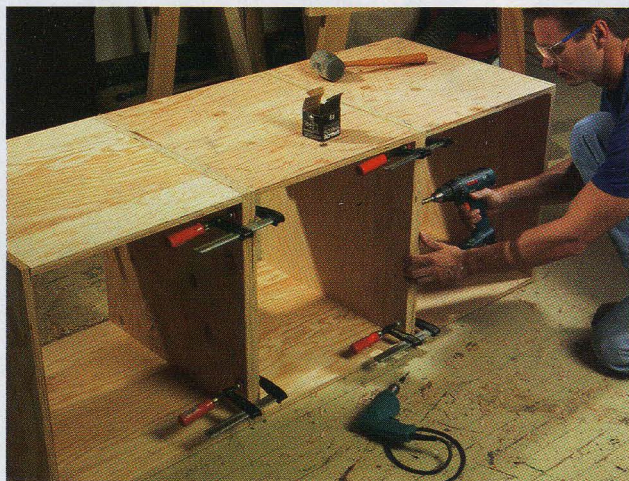


Extra-wide, heavy-duty top

This solid maple top can take a real beating. Plus it's wide enough to double as an assembly table. If you only have room for one bench in your shop, this is it.



1 Start the base cabinet by assembling three identical boxes with butt joints and screws. Make sure all the parts are square and the joints are flush. Use a flat area, like the top of your tablesaw, to help keep things in line.



2 Screw the three boxes together to create the cabinet base. Use clamps to hold the boxes flush and even.

Tired of working on a sheet of plywood thrown over a pair of sawhorses? Had it with rolling benches that wiggle and wobble? Hate running around your shop whenever you need a tool? Boy, do we have the bench for you.

Our dream bench starts with traditional workbench features like a thick top, a sturdy base, bench dogs and a pair of vises. Then we added tons of storage, an extra-wide top, and modern, cast-iron vises. Last but not least, we devised a simple method to make the bench mobile and still provide a rock-solid work platform.

Our bench is built to withstand generations of heavy use. Simple, stout construction absorbs vibration and can handle any woodworking procedure from chopping deep pocket mortises to routing an edge on a round tabletop.

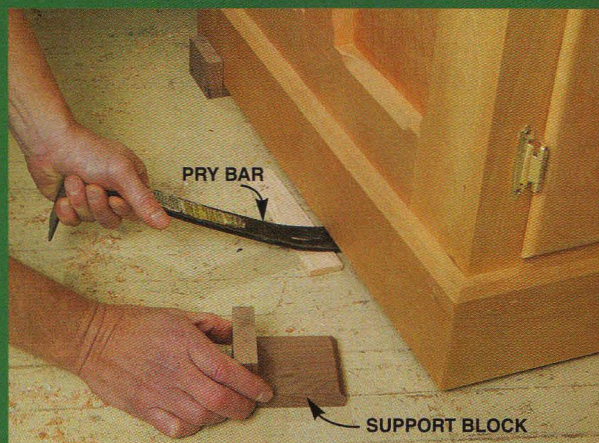
The thick, butcher-block-style top is truly a joy to work on. We'll show you how to surface this huge top without going insane trying to level 24 separate strips of glued-up hardwood. Our top doesn't waste wood—even the offcuts are used.



You name it, this bench can clamp it down

A traditional bench dog system secures your work for machining and sanding. The modern cast-iron vises are strong yet easier to install than traditional vises.

The generous overhanging top allows you to clamp anything from round tabletops to benchtop machines anywhere along the edge.



It's rock-solid but mobile

Under the base cabinet are six heavy-duty casters that make the bench easy to move. When you're ready to use it, lift the edge of the bench with a pry bar and slip four 5/8-in.-thick, L-shaped support blocks underneath. This gives you a rock-solid feel and unlike locking casters, there's no wobble or slippage.

Tools and Materials

If you go all out like we did you can expect to pay about \$900 for materials. If you can't swing that much dough all at once, don't worry; you can build an equally functional version for about \$450. How? Save \$220 right off the bat by substituting common 2x4s for the maple top. We made several tops this way and they work great. Just be sure you dry your 2x4s to around 8-percent moisture content before you build. You can save \$75 by skipping the expensive birch plywood and hardwood. Just stick with construction lumber. The inexpensive bench may not look as classy, but hey, it's still a great workbench.

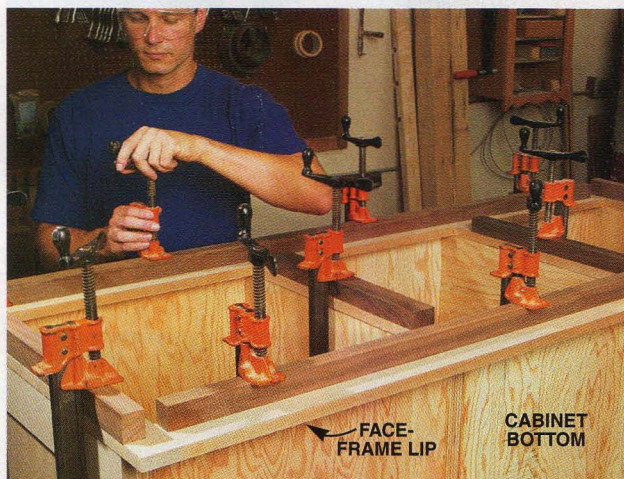
You could build adjustable shelves inside the cabinets instead of drawers and pullout trays. They're less convenient, but it'll save you another \$110 in drawer slides.

The best thing is you can cut costs and still get a fully functional bench right away, even if you go with the least expensive options. When you've got the extra cash, you can always build the maple top or add the full-extension hardware.

3 Glue and clamp face frames to the cabinet.

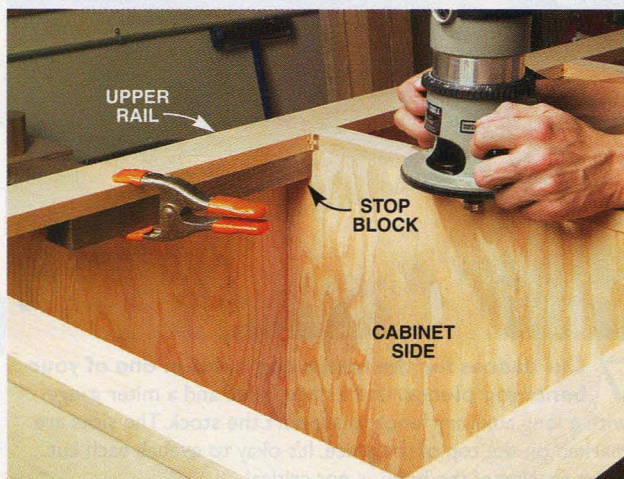
Start with the side frames.

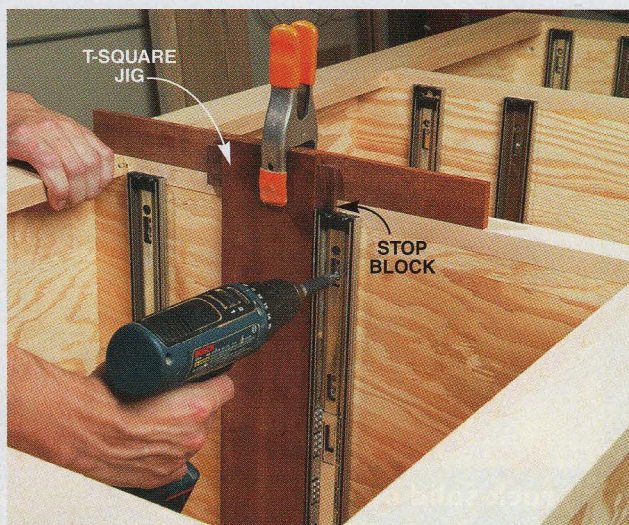
Then add the front face frame so it overhangs the bottom of the cabinet to form a lip for the 2x4 base you'll build later.



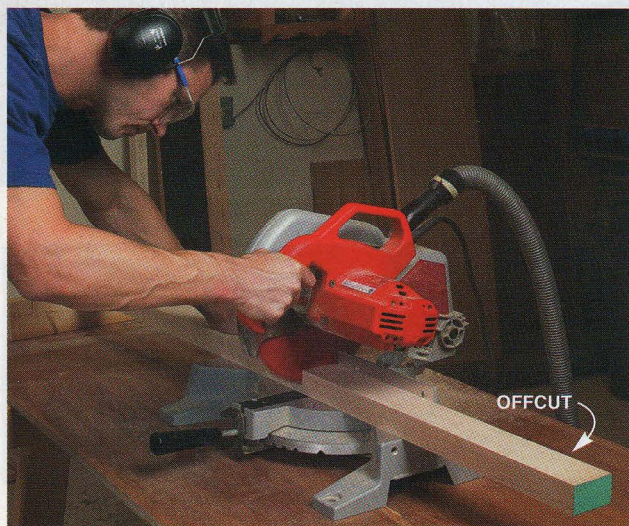
4 Trim the face frame flush to the cabinet sides.

Use a stop block at the top of the cabinet openings to prevent the router from cutting into the upper rail.





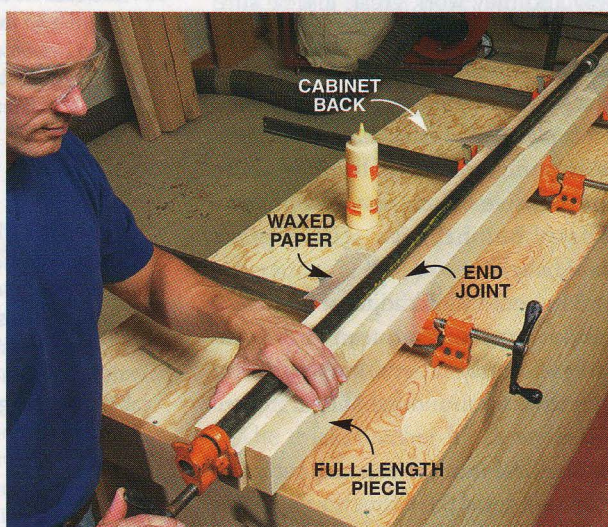
5 Attach the drawer slides to the cabinet. A simple T-square jig positions the slide for quick installation. Stop blocks hold the slides 1/2 in. back from the front edge for the half-overlay doors. The doubled-up box sides automatically flush up with the 1-1/2-in.-wide face frame so there's no need to add blocks for the drawer slides.



6 Cut pieces for the benchtop, making them 2-in. longer than the finished top. Don't toss the offcuts into the firewood pile. We'll build them into the top so nothing goes to waste.



7 Cut dados for the bench dog holes in one of your benchtop pieces. Use a dado blade and a miter gauge with a long auxiliary fence to support the stock. The slots are marked on the top of the piece. It's okay to eyeball each cut. Exact spacing of the holes is not critical.



8 Glue together the offcuts end to end. Clamp them between two full-length pieces to keep them straight. This yields a few more strips for the top and uses up your offcuts. Waxed paper around the joint keeps the segmented strip from sticking to the full-length pieces. We used the back of the cabinet for a flat glue-up table.

To build the bench you'll need a tablesaw, planer, belt or orbital sander, a router and a circular saw. You'll also want a flush-trim bit and a dado blade for your tablesaw.

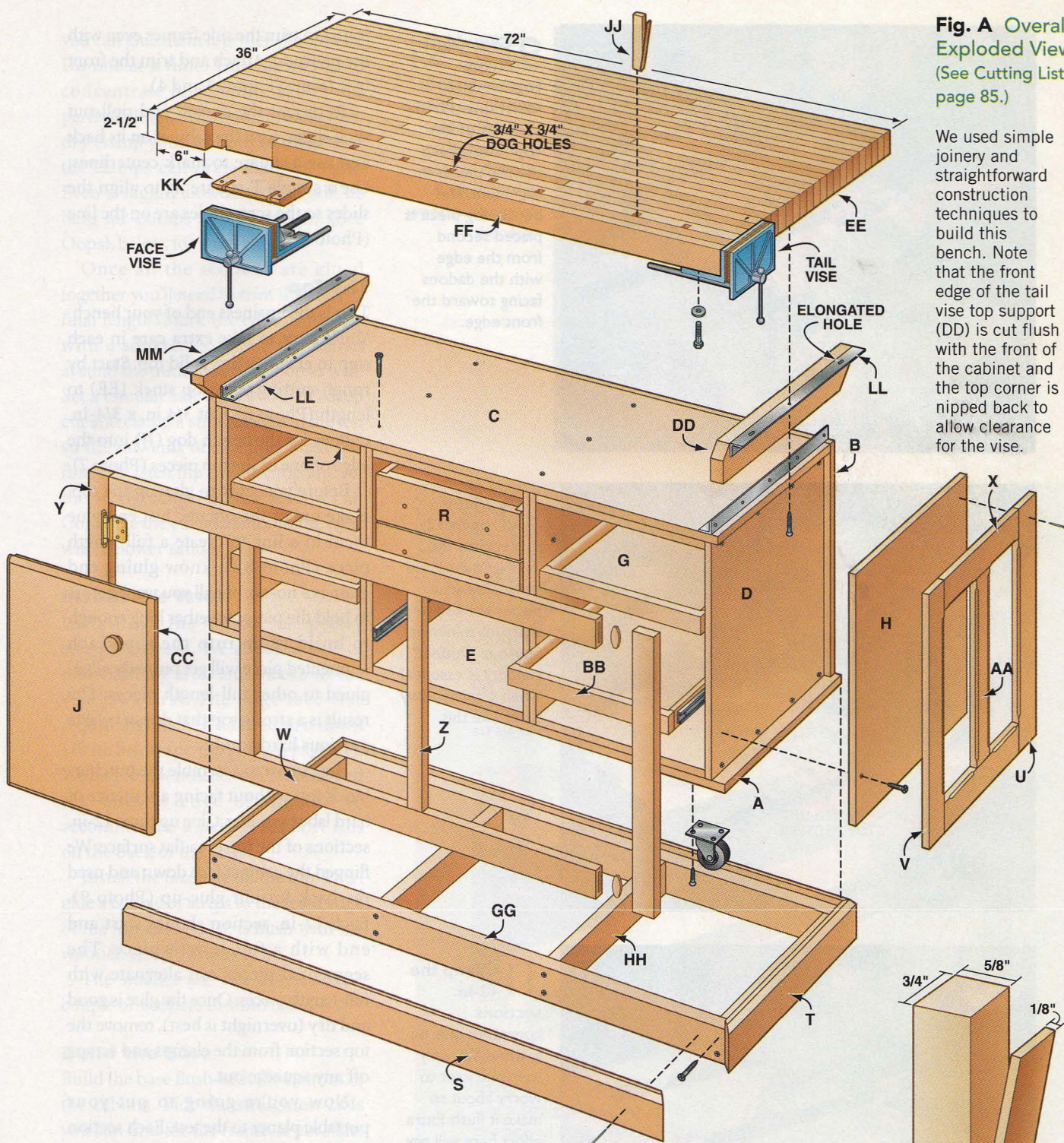
Build the Cabinet

Cut the plywood parts for the three individual boxes (Parts D and E) and assemble them (Photo 1). The three boxes are joined to form the cabinet (Photo 2). Screw the two end pieces of birch plywood (H) to the cabinet, placing the screws where the face frame will cover them (Fig. A). Cut the plywood top (C) according to the actual measurements of your assembled cabinet and attach with screws. Do the same for the back (B).

Cut and assemble the three face frames (parts U through AA). Use the actual measurements of your cabinet to determine rail lengths. The face frames are built slightly oversize to give you a little wiggle room when gluing them to the carcass. The extra overhang will get trimmed off later. Clamp and glue the side frames first. Tack the frames down with a couple of brad nails so they don't scoot around under clamping pressure. Use a flush-trim bit and a

Fig. A Overall Exploded View
(See Cutting List, page 85.)

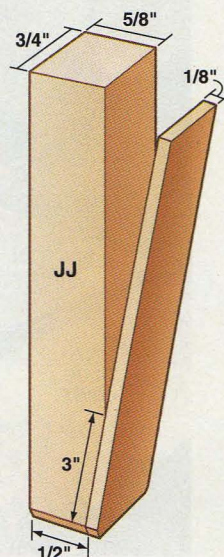
We used simple joinery and straightforward construction techniques to build this bench. Note that the front edge of the tail vise top support (DD) is cut flush with the front of the cabinet and the top corner is nipped back to allow clearance for the vise.

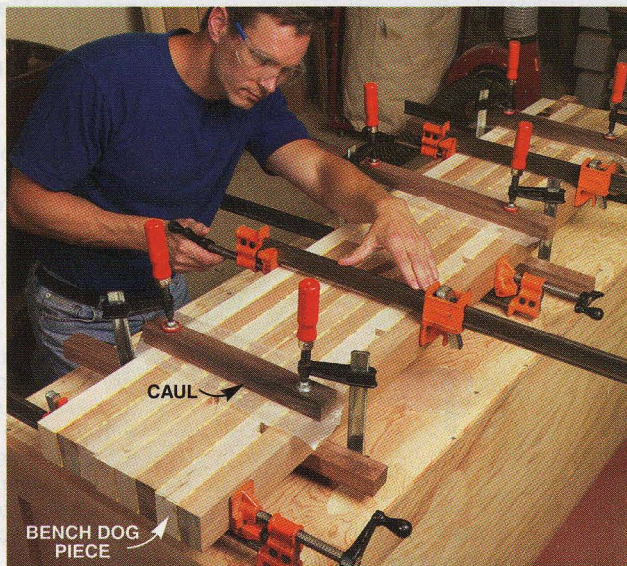


A simple, stout
workbench that will
last for generations

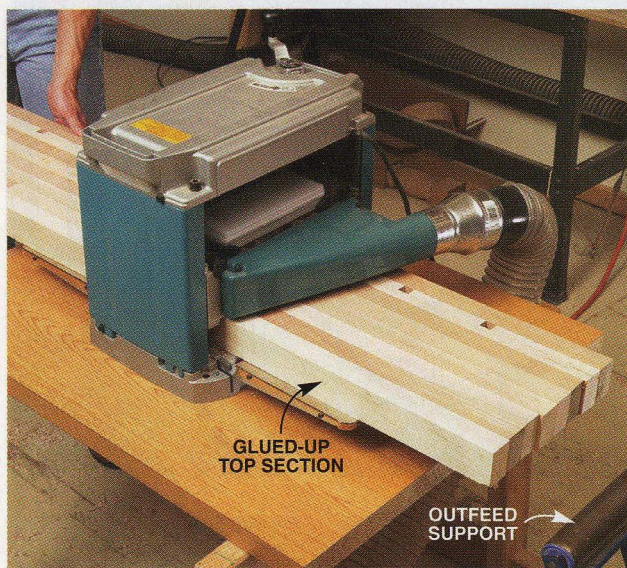
**Detail 1
Bench Dog**

Use straight-grained
hardwood stock for
your bench dog.

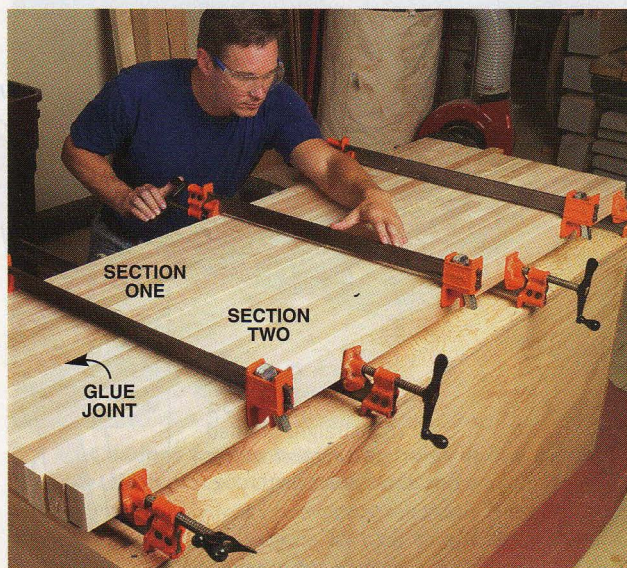




9 Glue eight strips together to form one 12-in. section of the top. Cauls keep the top pieces in alignment. The bench dog piece is placed second from the edge with the dadoes facing toward the front edge.



10 Plane each 12-in. section flat. Take light cuts and make sure your planer knives are sharp, to minimize tear-out. Outfeed support is essential when planing heavy stock like this.



11 Clamp the 12-in. sections together one at a time. You only have one joint to worry about so make it flush. Extra effort here will pay off in the end. You'll only have to lightly sand for a flat, smooth top.

router to trim the side frames even with the plywood. Attach and trim the front face frame (Photos 3 and 4).

To mount the drawer and pull-out shelf slides, turn the cabinet on its back and use a square to mark centerlines. Use a simple T-square jig to align the slides so the screw holes are on the line (Photo 5).

The Top

This is the business end of your bench. You'll want to take extra care in each step to ensure a flat, solid top. Start by rough-cutting your top stock (EE) to length (Photo 6). Cut 3/4 in. x 3/4-in. dadoes for the bench dog (JJ) into the edge of one of the top pieces (Photo 7).

Before you start to glue up the top, make use of the offcuts. Just end glue them in a line to create a full-length piece (Photo 8). I know gluing end grain is a no-no, but all you want here is to hold the pieces together long enough to build them into the top. Each segmented piece will get properly edge-glued to other full-length pieces. The result is a strong top that doesn't waste precious hardwood.

Here's how to assemble the butcher-block top without facing a sentence of hard labor sanding. Glue up three 12-in. sections of the top on a flat surface. We flipped the cabinet face down and used the back for our glue-up (Photo 9). Each 12-in. section should start and end with a full-length piece. The segmented pieces can alternate with full-length pieces. Once the glue is good and dry (overnight is best), remove the top section from the clamps and scrape off any squeeze out.

Now you're going to put your portable planer to the test. Each section gets planed down to 2-1/2-in. thickness (Photo 10). Take light cuts for the sake of your planer, and to minimize tear-out. Try wetting the top's surface before the last pass for the smoothest possible cut. Some minor tear-out is inevitable with a big glue-up like this. Remember it's a workbench, not a museum piece.

Once all three sections are surfaced,

you can glue them together (Photo 11). Do one at a time. This allows you to concentrate on keeping each joint perfectly level. Before you use any glue, dry clamp your sections to make sure the clamps can draw the joint tight. Even a slightly bowed section will be hard for clamps to pull straight. (See Oops!, below, for a nifty fix.)

Once all the sections are glued together you'll need to trim the ends to final length. Mark the ends of the top with a square. Continue the marks around the underside of the top as well. Set a circular saw for a 1-1/2-in.-deep cut and clamp a straightedge to the top so the saw cuts on the line. Make the first cut. Then flip over the top and set the straightedge for the second cut. Complete the cut and smooth the ends with a power sander.

Install the Vises

Installing the vises is pretty straightforward. We added a pair of non-marring wooden cheeks to the vise jaws first. The large face vise required a block (KK) to shim it down 1/8 in. below the top (Fig. A, page 81). We had to saw notches in the block and the bottom edge of the top to accommodate a pair of support ribs on the back of the vise.

Install the face vise on the top. Then glue a couple of strips to the front edge of the top so the edge is flush with the wooden cheek (Photo 12).

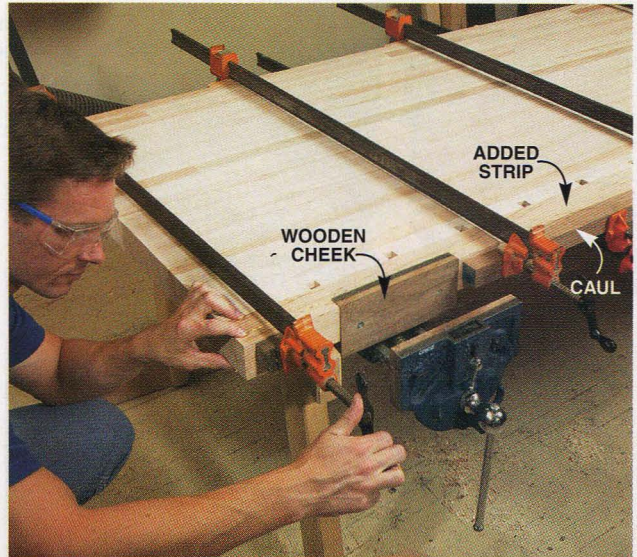
The smaller tail vise only needs a couple of washers to shim it down.

Build the Base

Build the base flush with the bottom of the cabinet. Pick the straightest 2x4s you can find for the frame. If possible, we recommend starting out with 2x6s that have been dried to about 8-percent moisture content. Then joint and plane them to make straight and true 2x4s. Assemble the 2x4 frame with screws. A plywood base top (A) is fastened to the frame to finish the base.

If your bench is going to be stationary, go ahead and shim the base

12 Mount the face vise, then glue two strips on either side. This will make the front edge of the top flush with the wooden cheek of the vise.



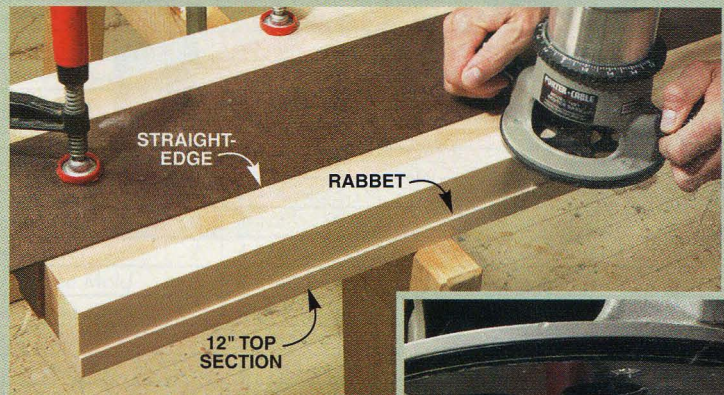
Oops!

It's possible for the edges of the laminated top sections to end up with a slight bow. With 12 in. of width, you're not likely to straighten them

out with clamp pressure. So what should you do?

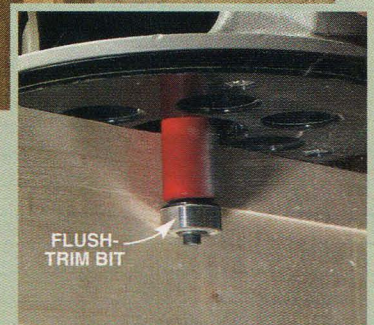
A jointer is out of the question; the 12-in. section of top is just too big and heavy, even for two people.

We used a simple two-step process with a router and a straightedge to joint our bowed top section.



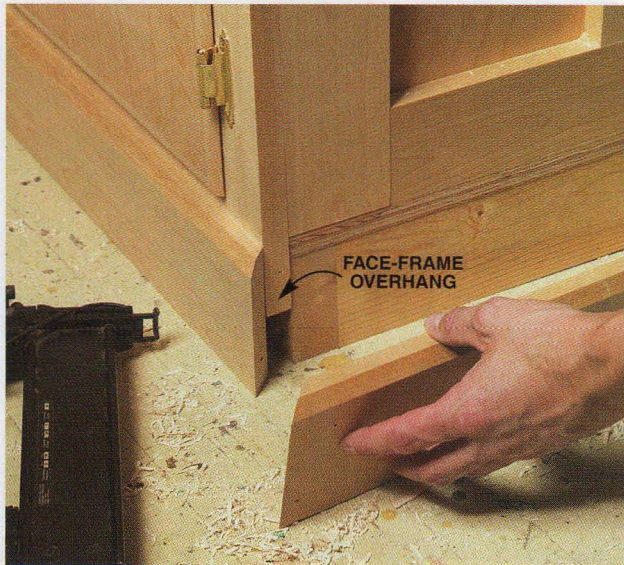
Step 1

Cut a straight, shallow rabbet on the bowed edge of the 12-in. top section. Chuck a 1/2-in. straight cutter with a 1-1/2-in. cutting length into your router and set it for maximum depth. Clamp a straightedge to the top section so the router shaves off just enough material to leave a continuous straight edge.

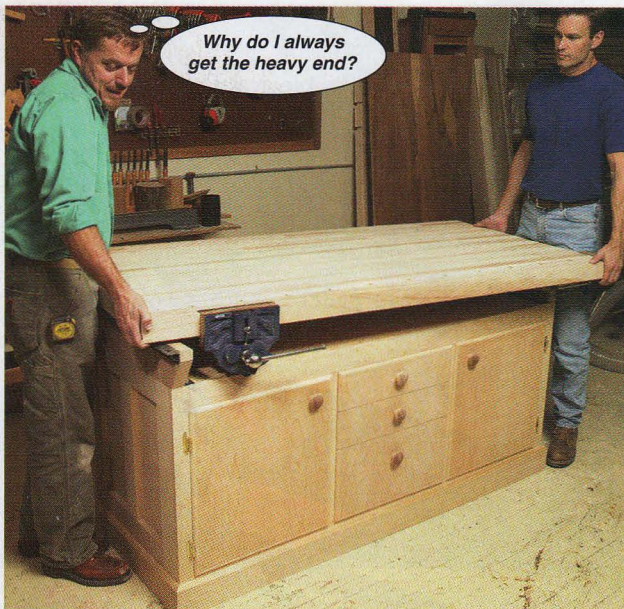


Step 2

A second pass with a flush-trim bit removes the ledge created by the first pass. Just flip over the top and rout. The result is a clean, straight edge that's ready for glue-up.



13 Screw the cabinet onto the base and nail on the base molding. If your bench is going to be mobile, use glue as well as nails to prevent the molding from being inadvertently pried off when the bench is lifted.



14 Place the benchtop on the cabinet. This top is heavy, so get a friend to help with the lifting. Check for an even overhang on all four edges. Then secure with lag bolts.

level before adding the cabinet. If you want to make a mobile bench, attach the six casters to the underside of the plywood base's top (Fig. A). Leave just enough room for the casters to rotate freely inside the 2x4 frame. Six casters allow the bench to glide smoothly, even if your floor is uneven. Add the base molding to finish the bench (Photo 13).

Doors, Drawers and Pull-Out Shelves

Start by cutting three door blanks (J). Add the 1/2-in.-birch edging on all four edges. Put a 3/8-in. round-over all the way around the outside edge of all three blanks. On the tablesaw or router table, cut a 3/8 in. x 3/8-in. rabbet on all four inside edges. Crosscut the drawer fronts (K, L and M) out of one of the blanks and use the other two for doors.

Build and mount the drawers and pullout shelves according to Fig. C, page 85.

Now all that's left is to secure the top to the cabinet (Photo 14). Accommodate the expansion and contraction of the solid-wood top by elongating the two outside holes on the angle-iron cleats under the top (Fig. A). A simple oil finish completes the job. There, now you've got all the support you'll ever need for your woodworking. **AW**

Fig. B Plywood Cutting Diagram

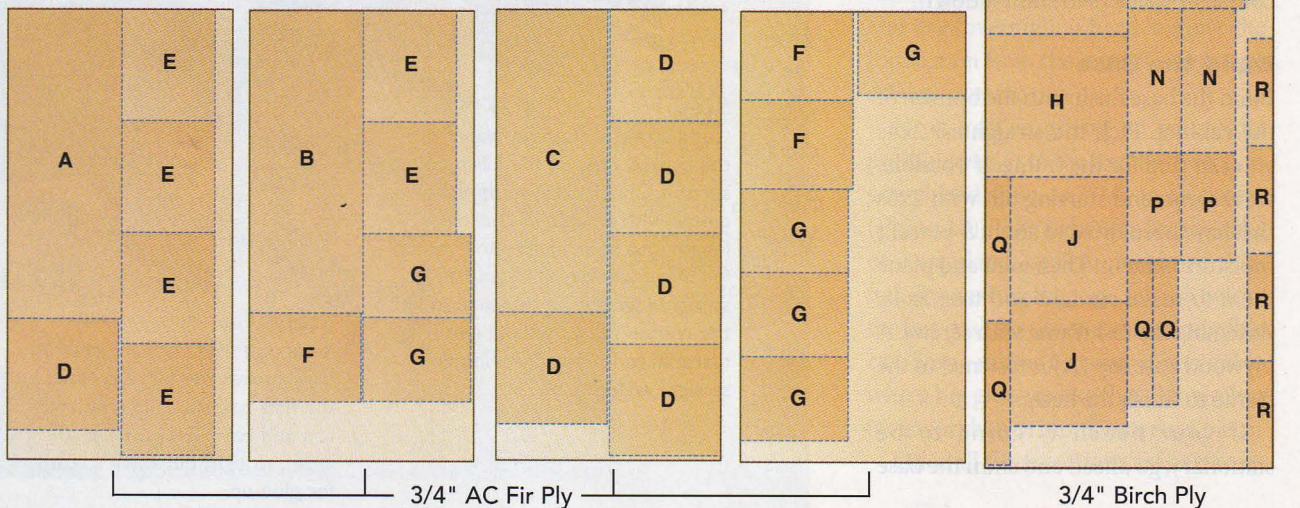
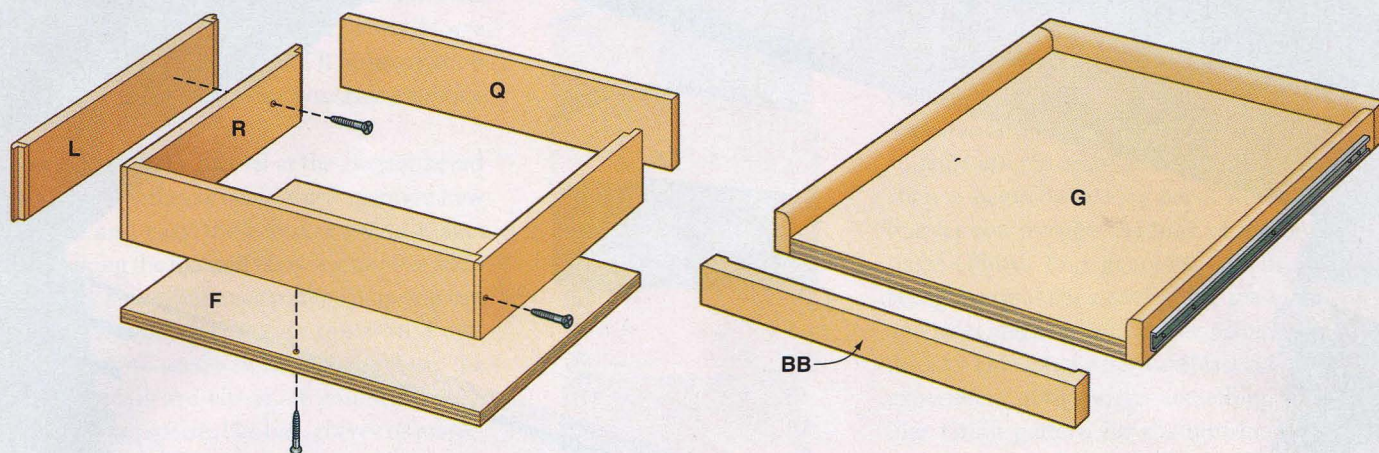


Fig. C Drawers and Pullout Shelves

The plywood drawer bottoms are screwed directly to the drawer boxes.
Hardwood edges on the pullout shelves create a lip so tools won't slide off.



Sources

Home Center
Four sheets 3/4" AC fir plywood,
\$27 ea. (\$108 total)
One sheet 3/4" birch plywood, \$37
Three 8' 2x4s, \$3.50 ea. (\$10.50 total)
9 ft. 1-1/2" x 1-1/2" angle iron, \$1.50 ea.
(\$14 total).

Wall Lumber Co., (800) 633-4062
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Ten 24" full-extension drawer slides
with 1-in. overtravel,
KV8405 B24 ANO, \$11 ea.
(\$110 total)
Two 3/8" inset, self-closing hinges,
A07128 3, \$1.50 ea. (\$3 total)
Six 3" swivel-plate industrial casters,
rubber, \$10 ea. (\$60 total)
Five 2" birch knobs, SBKR 200, 75¢ ea.
(\$3.75 total)
1/2" x 1-1/2" straight cutter,
CMT812.627.11, \$17
1/2" x 1-1/2" flush-trim bit,
CMT806.629.11, \$21.

Highland Hardware, (800) 241-6748
9" quick-release vise,
199152, \$100
7" quick-release vise,
199151, \$70.

Grand total: \$899.25.

CUTTING LIST

Overall Dimensions: 37" D x 36-1/2" T x 72" L

Material	Part	Name	Qty.	Dimensions	Notes
3/4" Fir Ply	A	Base	1	24-1/2" x 66"	Measure assembled cabinet for final cutting dimensions.
	B	Back	1	24-1/2" x 64-1/2"	
	C	Top	1	23-3/4" x 64-1/2"	
	D	Box Sides	6	23-3/4" x 23-3/4"	
	E	Box Top/Bottom	6	19-1/2" x 23-3/4"	
	F	Drawer Bottoms	3	18-1/2" x 23-3/4"	
	G	Pull-Out Shelves	7	17-1/2" x 22-3/4"	
3/4" Birch Ply	H	Birch Sides	2	23-3/4" x 23-3/4"	
	J	Doors	2	19" x 20-1/4"	Add 1/2" birch strip to all four edges.
	K	Bottom Drawer	1	10-1/2" x 20"	Start with a plywood door blank (J). Add 1/2" strip to all four edges, then crosscut two at 5-1/4" and one at 10-1/2."
	L	Middle Drawer	1	5-1/4" x 20"	
	M	Top Drawer	1	5-1/4" x 20"	
	N	Drawer Sides	2	9" x 23-1/4"	
	P	Drawer Fronts/Backs	2	9" x 18-1/2"	
	Q	Drawer Sides	4	4-1/4" x 23-1/4"	
3/4" Birch Hardwood	R	Drawer Fronts/Backs	4	4-1/4" x 18-1/2"	
	S	Base Mold	2	4-1/4" x 67-1/2"	Cut to fit finished base.
	T	Side Base Mold	2	4-1/4" x 27"	
	U	Side Stiles (Back)	2	4" x 24-1/2"	Measure assembled cabinet and make appropriate adjustments to rail lengths.
	V	Side Stiles	2	3-1/4" x 24-1/2"	
	W	Front Rails	2	3" x 61-1/2"	
	X	Side Rails	4	3" x 17-1/2"	
	AA	Side Mullions	2	3" x 18-1/2"	
	Y	Front Stiles	2	2-3/8" x 27"	
	Z	Mullions	2	1-5/8" x 21"	
	BB	Pull-Out Trim	28'	1/2" x 1-1/2"	
	CC	Door/Drawer Trim	24'	1/2" x 3/4"	
1-1/2" Birch	DD	Top Supports	2	5" x 30"	
	EE	Top	24	2-3/4" x 74"	Some of these can be made from offcuts.
	FF	Front Edge	1	1" x 2-1/2" x 72"	Measure vise to determine thickness.
2x4 Lumber	GG	Base Frame	2	3-1/2" x 66"	Cut to fit Part A. Dry stock to 8% MC before using.
	HH	Base Frame	4	3-1/2" x 21-1/2"	
Scrap hardwood	JJ	Bench Dogs	2	3/4" x 3/4" x 8"	
	KK	Face Vise Block	1	1' x 5-1/4" x 9"	
Angle Iron 1-1/2"x1-1/2"	LL	Top Hold-Down	3	24-1/2"	
	MM	Top Hold-Down	1	30"	



As the holidays approach, my thoughts turn to how I can weasel out of gift shopping. And this year I have the perfect scheme: While the malls are jammed with poor saps, I'll be in my shop blissfully building these boxes for everyone on my list.

When they marvel at the elegant keyed joinery at the corners, I won't mention how fast and easy these boxes are to make. Making the jigs and resawing lumber takes a few hours, but once you're set up you can churn out three or four boxes in a day. There's no need to mention how cheap the materials are either. If you stick with common species like oak, cherry or maple, each box will cost only \$10 to \$15.

Tools and Materials

The box shown at left is made from 3/8-in.-thick wood, so I used a bandsaw for resawing and a planer to take the wood to final thickness. For more information about resawing, check out "Bandsaw Resawing," AW #81, August 2000, page 46.

If you don't have a bandsaw and planer you can also mail order 3/8-in. wood (see Sources, page 57). You'll also need a

tablesaw, belt sander, router table, 1/8-in. and 3/4-in. straight router bits and some 3-in. spring clamps.

Start With Grain Selection

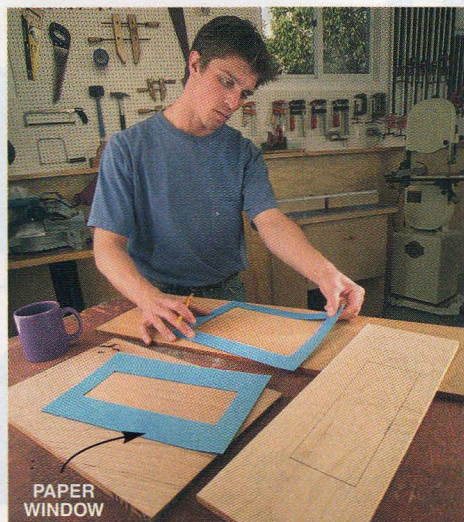
Grain pattern has a big influence on the appearance of a small project like this box, so don't just rip up boards and leave it to chance. Begin by making paper windows that let you preview the look of the box parts (Photo 1). I generally use finer, straighter-grained material for the ends and sides and a more dramatic pattern for the top. This is not a hard and fast rule, so experiment until you get something you like. Grain pattern for the bottom isn't critical, since it doesn't show. For the keys I use a different color wood so they contrast with the box.

Cut the Sides

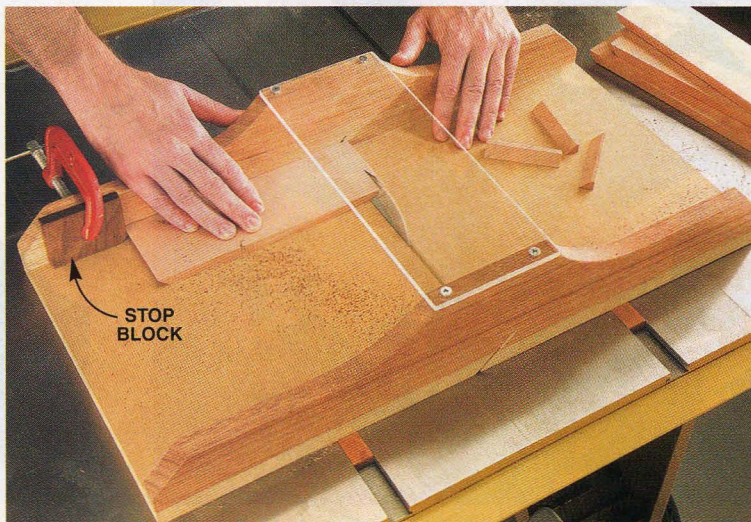
I strongly recommend you miter the box sides on a tablesaw using a tablesaw sled (Photo 2). The every-time accuracy of a well-made tablesaw sled is hard to beat. In fact, I built a small one just for building these boxes. For more information on making a sled, see "The Ultimate Shop-



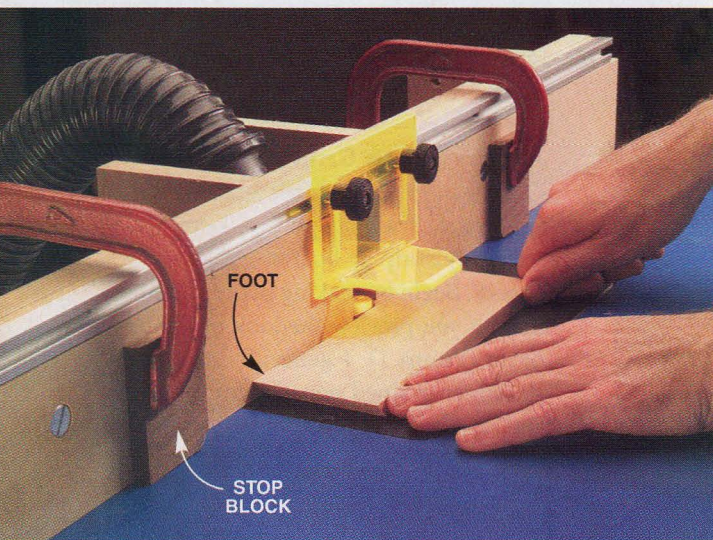
Build them in bunches and avoid gift shopping this year



1 Lay out the box parts exactly where you want them using a paper window. The window helps you see the grain patterns for each part before you cut them to final size.



2 Miter the box ends and sides on your tablesaw with the help of a tablesaw sled. Miter one end of all the pieces first. Then clamp a stop block to the sled when cutting the other ends.



3 Create feet on the sides and end by using a 3/4-in. straight bit in your router table. Set up a pair of stop blocks to limit the length of the cut. To prevent the grain from chipping out at the feet, make three passes, raising the bit about 1/8 in. after each pass.

Built Crosscut Sled," AW #75, October 1999, page 38 (for reprints, see page 3). Cut the parts for the ends and sides and make an extra set to test your machine setups later on.

Next cut the dados in the ends and sides for the bottom (Fig. A, page 55). The dados should be wide enough to provide an easy fit for the bottom.

Now select two ends and two sides that have the least attractive grain and mark them "GP" for guinea pig. These GP parts are the first to go through each step in the machining

process and hopefully the only ones to suffer from setup mistakes. Beginning with the GP parts, rout the relief in the bottom of the ends and sides to form the corner feet using a 3/4-in. straight router bit in your router table (Photo 3).

Clamping jigs take the panic out of the gluing and assembly process.

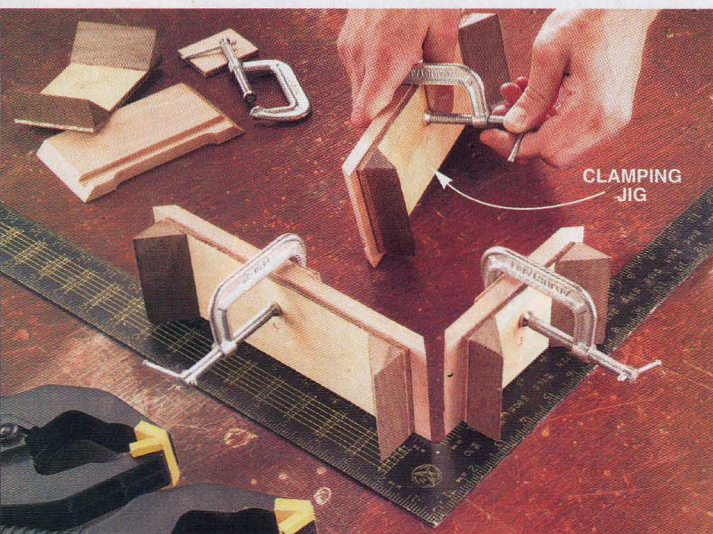
The Bottom and Top

Cut the bottom for the box next. The bottom is about 1/16-in. undersize to give it some room for expansion. Next cut the top but don't cut the rabbets until the box is assembled. That way you can custom fit the top for a snug-but-not-too-snug fit.

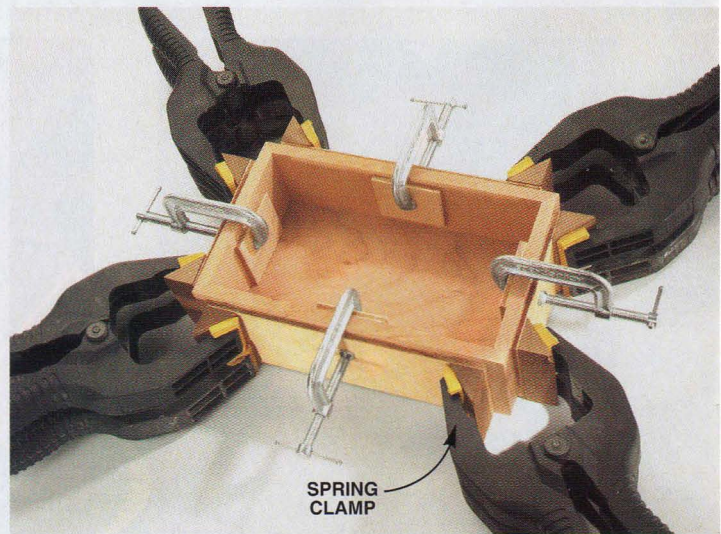
Clamping Jigs Make Glue-Up a Cinch

Assembling the box begins by making a set of clamping jigs. They are simply made from scraps of 1/4-in. plywood that have 45-degree beveled blocks glued to them (Photo 4). Make them 3/4-in. shorter than the outer dimensions of the box so they don't interfere with assembly. The advantage of these clamping jigs over other clamping methods is that you can deal with each joint independently, avoiding the frantic rush of trying to align, clamp and square all the corners at once.

Do a full dry assembly to make sure the jigs and box parts come together correctly. Then disassemble the box and sand the bottom and the inner surfaces of the ends and sides. Add the jigs, glue and spring clamps to the miters (Photo 5). Assemble a guinea pig box too, using the GP parts. Once the

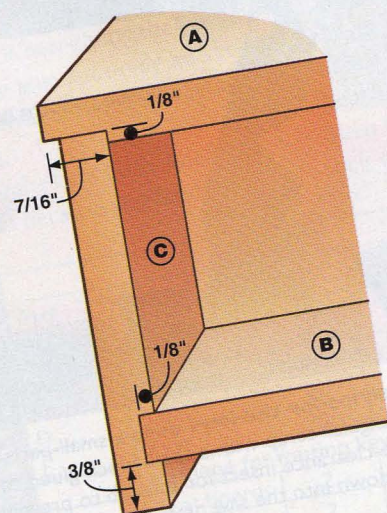
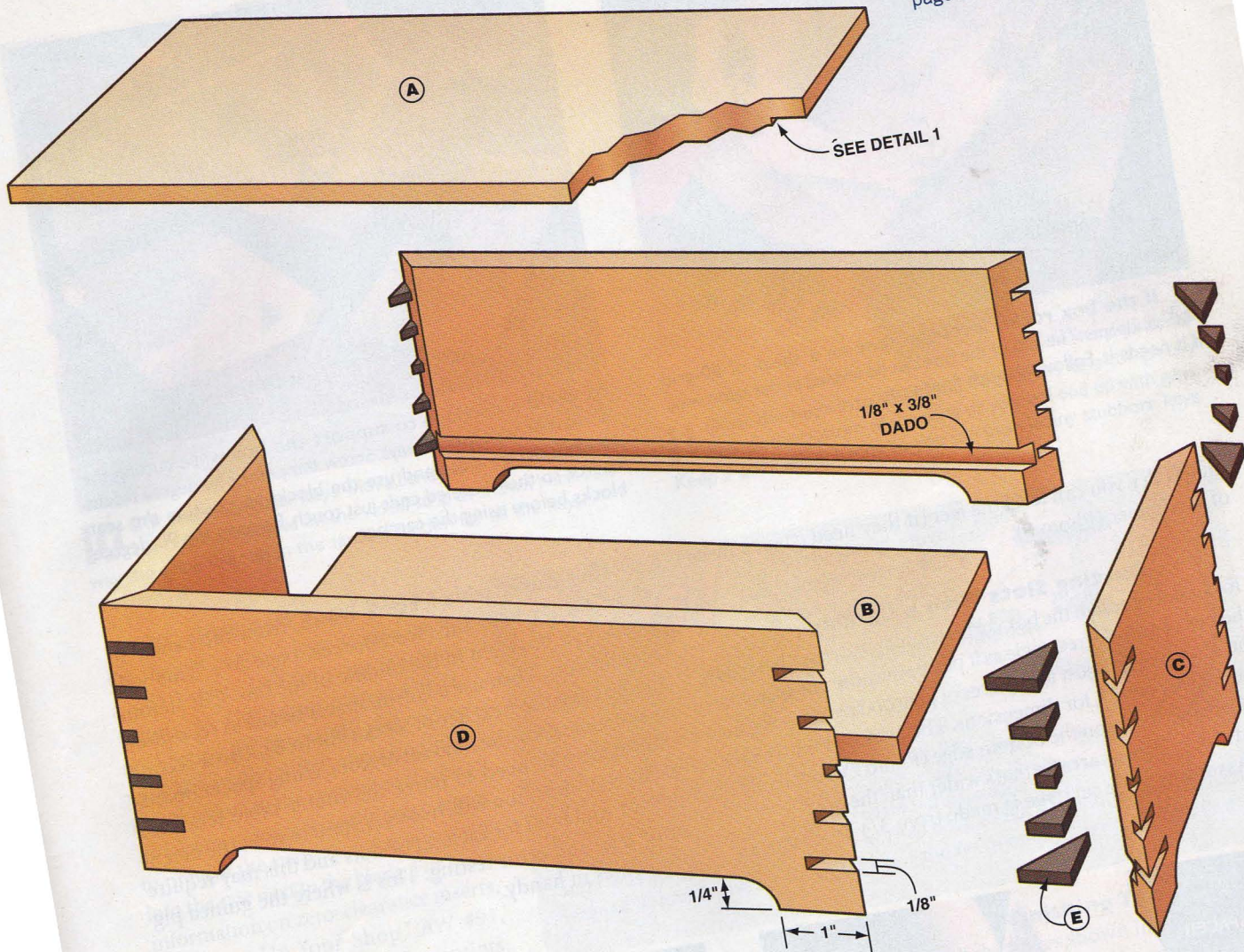


4 Attach clamping jigs to the ends and sides of the box. The jigs are a bit shorter than the parts so they don't interfere with the joint during assembly.

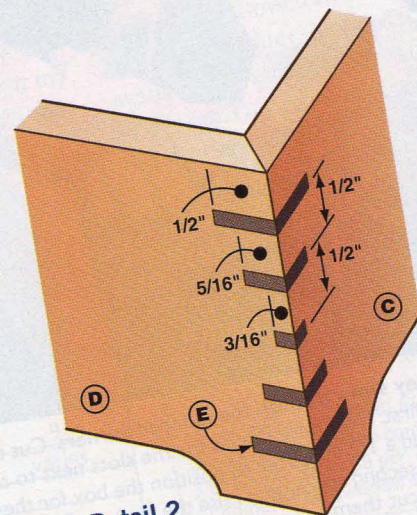


5 Add spring clamps to one corner at a time. Square the parts by adjusting the position of the spring clamps. Let the glue set for a few minutes before adding the bottom and the last side. Double-check that all the parts are square.

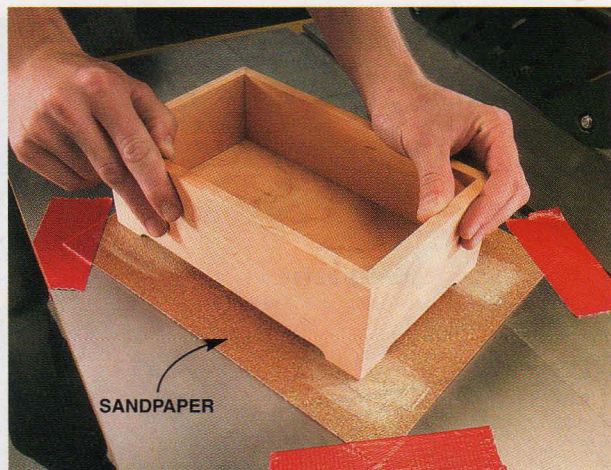
Fig. A
Exploded View
(See Parts List,
page 57.)



Detail 1
Lid and Bottom Detail



Detail 2
Key Dimensions



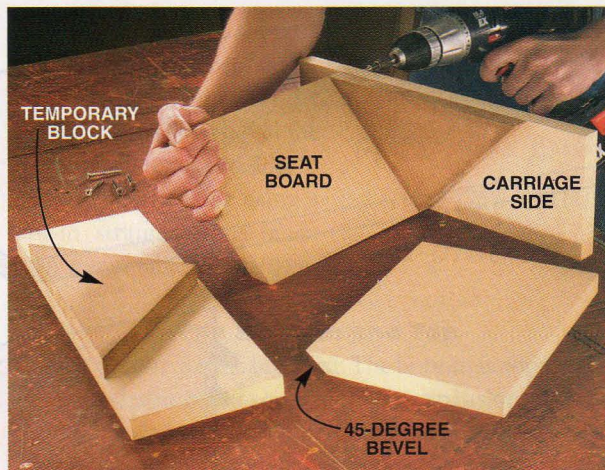
6 If the box rocks, level the feet on a sheet of 80-grit sandpaper. The top of the box can be leveled in the same way, if it needs it. Follow up with finer grits.

glue is dry you can level the feet (if they need it) on a piece of sandpaper (Photo 6).

Cutting Slots With a Carriage

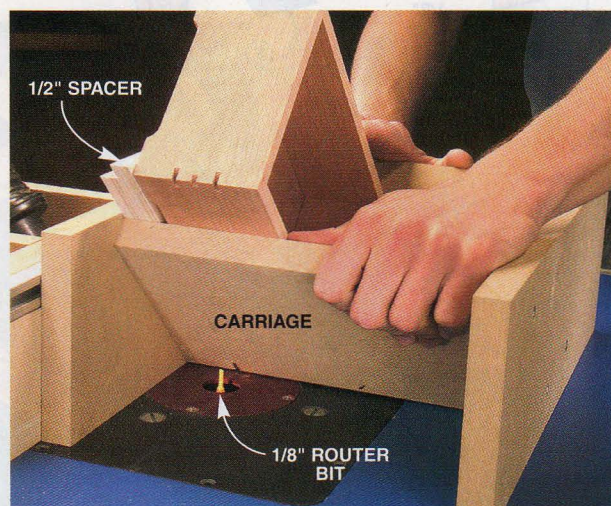
To cut slots through the box corners, build a carriage that holds the box at a 45-degree angle as it passes over the 1/8-in. router bit. The carriage is just four pieces of plywood or MDF. See the Parts List, page 57, for dimensions. The two seat boards have a 45-degree bevel on the bottom edge (Photo 7). For stability and safety, I like a carriage that's wider than the box.

Assuming your carriage is made from 3/4-in. material,

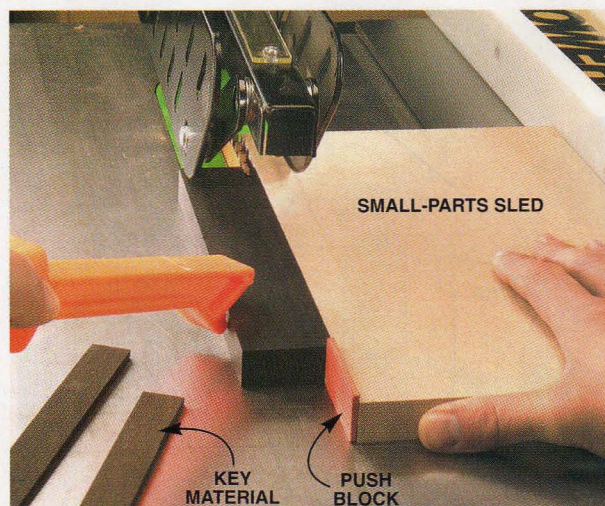


7 Build a carriage to support the box while cutting the corner slots for the keys. Screw temporary 90-degree blocks to the carriage sides and use the blocks to position the seat boards so their beveled ends just touch. Remove the 90-degree blocks before using the carriage.

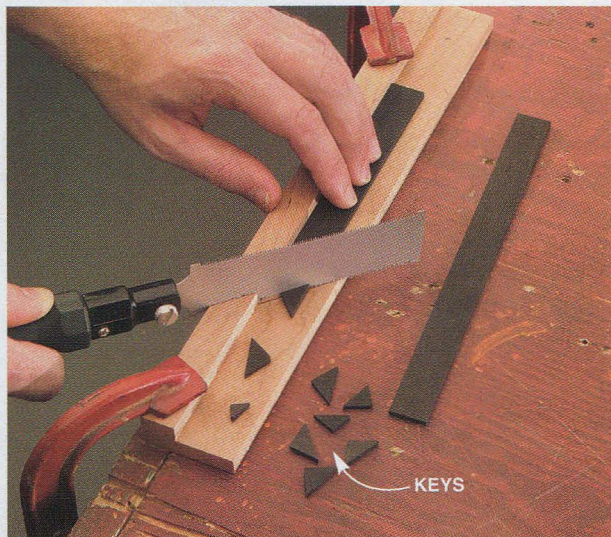
set your router table fence 2-1/4-in. from the center of the 1/8-in. router bit (see Sources, page 57). This will position a slot right in the middle of the box. Cut all four middle slots. Then use a 1/2-in. spacer board to reposition the box for the next set of slots (Photo 8). Use a second spacer board for the final set of slots. Using spacer boards eliminates the need to move the router table fence for each set of slots. You will, however, have to reset the height of your router bit for each set of slots and this may require some trial and error testing. This is where the guinea pig box comes in handy.



8 Rout the key slots through the mitered corners. Cut the center slots first. Then raise the bit for the slots next to the center slot and add a 1/2-in. spacer to position the box for these slots. Finally add a second spacer and raise the bit for the top and bottom slots and cut them.



9 Saw wood strips for the keys using a small-parts sled; simply a rectangular scrap with a small block glued to one corner. Use a zero-clearance insert for this job to prevent the strips from falling down into the saw next to the blade.



I Cut the triangular keys with a bandsaw or small handsaw. Lay out the triangles on the wood strip as shown here. This way the grain will run in the same direction for all the keys.

II Glue the keys into the slots. Be sure the keys completely seat to the bottom of the slots or you will end up with gaps. Keep a small block handy so you can push in any stubborn keys.

Cut, Glue and Sand Keys

Rip the 1/8-in.-thick key material using a small-parts sled on your tablesaw (Photo 9). Cut scrap material first, readjusting the fence until you end up with key material that slips smoothly into the slots in the corners of the box. Make sure to use a zero-clearance insert to prevent the strips from falling down into the saw next to the blade. For more information on zero-clearance inserts, see "Soup Up Your Shop," AW #91, December 2001, page 41 (for reprints, see page 3).

Cut the key material into triangles with your bandsaw or a small handsaw (Photo 10). Cut the triangles about 1/8-in. oversize. When gluing the triangles in place, use glue sparingly and make sure you fully seat each key into its slot (Photo 11).

Sanding the keys flush with the box sides is fun because you finally see the

Oops!

One of the things I love about making boxes is that I can experiment with exotic woods without spending a bundle. But unfamiliar woods can lead to unexpected problems. When I gave this box a coat of spray lacquer, the red padauk keys bled into the surrounding finish, making a pink mess. So I sanded off the lacquer and tried again. Two very light coats of lacquer, about 10 minutes apart, sealed the padauk and I was able to follow up with a normal coat about 20 minutes later. Lesson learned: When trying a new wood I test the finish on my guinea pig box first.

decorative effect. It's also scary because it's easy to mess up a mitered corner or gouge a side of the box. My tool of choice for this operation is a belt sander mounted upside down on my bench and equipped with a 120-grit belt. To prevent gouging make sure to keep the box parallel with the sanding belt when sanding.

Finishing Touches

All the boxes shown in this article got a final sanding with 180-grit sandpaper followed by a couple coats of spray lacquer. Spray lacquer is available at hardware stores for about \$7 per can. One can is enough for three or four boxes. **AW**

PARTS LIST				Final Dimension		
	Part	Name	Qty	T"	W"	L"
	A	Lid	1	3/8	5-5/8	9-1/8
	B	Bottom	1	3/8	4-15/16	8-7/16
	C	Ends	2	3/8	3	5-1/2
	D	Sides	2	3/8	3	9
	E	Keys	20	1/8	varies	varies
	Carriage for routing keys					
		Seat boards	2	3/4	6	8
		Sides	2	3/4	5	10

Sources

Grizzly, (800) 523-4777
www.grizzly.com
 1/8" router bit, #C1693, \$13
 3" spring clamps, #G3305,
 \$5 each on orders of 4 or more.

Sloan's Woodshop, (888) 615-9663
www.sloanswoodshop.com
 3/8" lumber, \$6 to \$8 per 7" x 24" pc.
 of domestic hardwoods; more for exotics.



EDITOR: TOM CASPAR • ART DIRECTION: VERN JOHNSON • PHOTOGRAPHY: LEAD PHOTO, BILL ZUEHLKE; ALL OTHERS, STAFF, UNLESS OTHERWISE INDICATED

Tool Test

Miter Saws

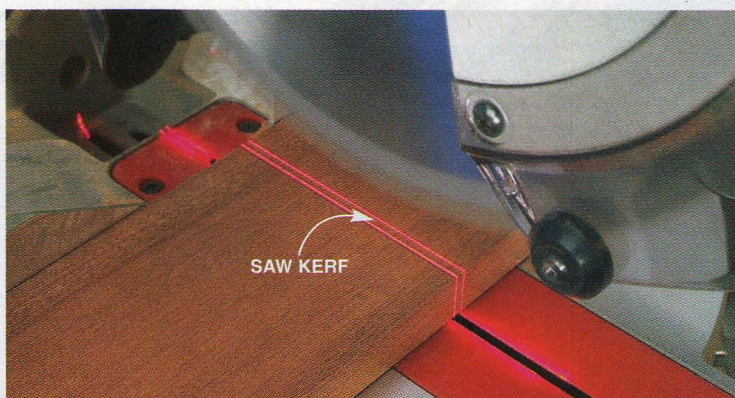
by Jon Stumbras

Whether you're building furniture, cutting trim molding or framing a garage, a compound miter saw is an indispensable tool. It can swivel left or right to make a standard miter and tilt to make a compound cut.

Miter saws are capable of both rough and precision work. But no matter what you're doing, hitting your marking line right on the nose has always been a problem.

Help is on the way. An accurate laser shows you exactly where the cut will go (Photo 1). A laser just might save you from a careless accident, too. As a fellow woodworker put it, "If the red line is shining on your hand, don't cut!"

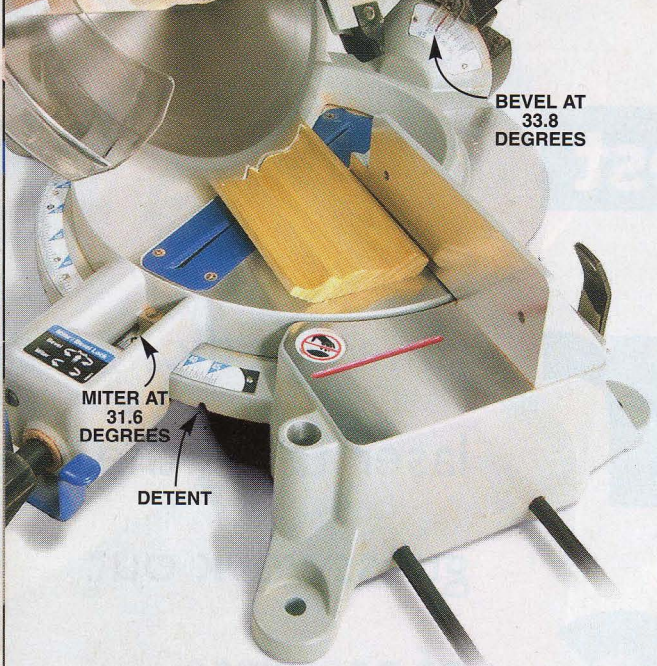
One terrific laser takes the guesswork out of accurate sawing.



1 The glowing red line of a laser is the latest innovation in miter saws. It's supposed to show you exactly where the blade will cut, but some lasers work better than others (see page 66). This one is top-notch!



2 Accurate cuts are no problem at the pre-set angles on any saw. The catch is that you must be picky about aligning the fence to the blade when you first set up the saw (see Q&A, page 7).



3 Tilting and rotating a miter saw allows you to make a right-angle joint with a wide piece of crown molding. Many saws have a detent at 31.6 degrees for making this cut.

10-Inch vs. 12-Inch Saws

Most miter saws come with 10-in. or 12-in.-diameter blades. (Some saws take 8-in. blades, but we didn't test any of those. We also excluded a few saws that can't tilt.) Both sizes share the same general features, but there are major differences:

Capacity. Using construction lumber as a rough guide, a 10-in. saw can crosscut and bevel 4x4s and 2x6s. To handle 2x8s and wide crown molding you have to move up to a 12-in. saw.

Price. There's a huge difference. 10-in. saws start at about \$100; 12-in. at \$250.

Weight. A 12-in. saw can weigh twice as much as a 10 in. Your back will know the difference if you have to lug the machine around a lot.

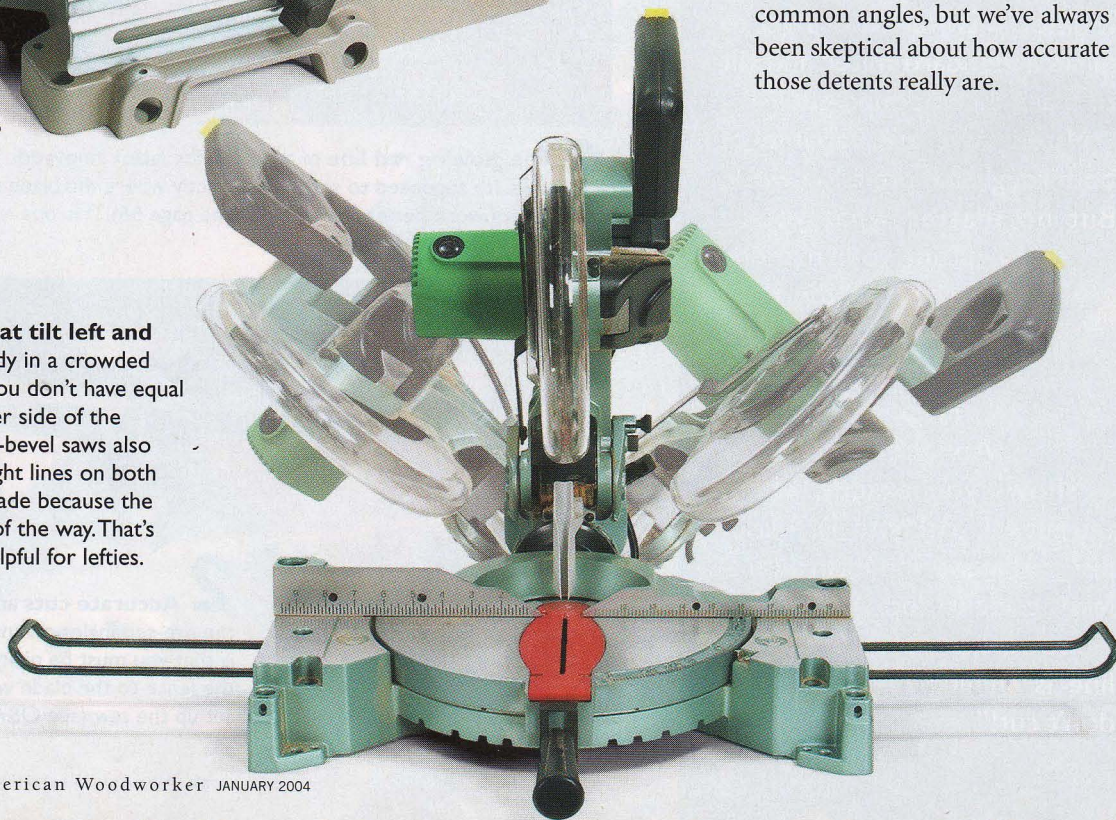
Accuracy

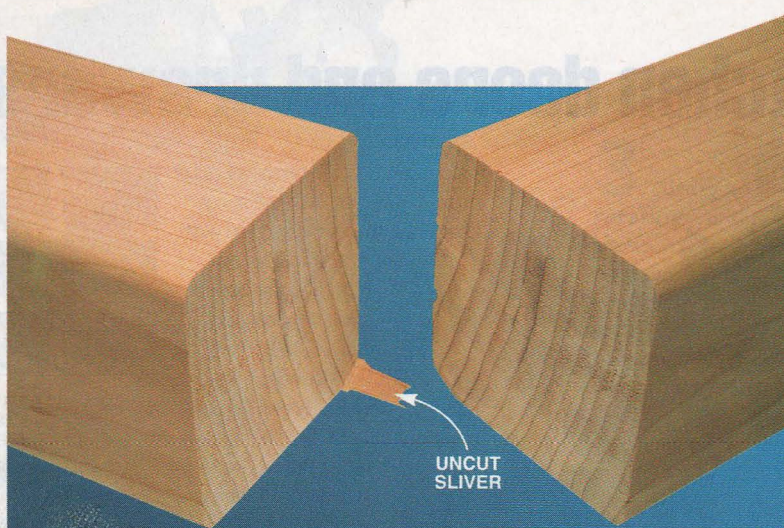
Although a miter saw is awfully handy in the shop for simply whacking off boards to an approximate length, you should also be able to rely on it to precisely make a square cut and miter any angle. Every saw has preset detents for common angles, but we've always been skeptical about how accurate those detents really are.



4 Saws with tall fences and stops are best for cutting crown molding in an upright position. This is a more intuitive method than laying the molding flat because the blade isn't tilted. However, with many saws you must rig up a tall wooden fence for it to work.

5 Saws that tilt left and right are handy in a crowded shop, where you don't have equal room on either side of the machine. Dual-bevel saws also have better sight lines on both sides of the blade because the motor is out of the way. That's particularly helpful for lefties.





Maximizing Capacity

Few things are as annoying as a miter saw that doesn't have quite enough capacity to make a complete cut through your stock, as shown above. Miter saw capacity can be a confusing numbers game, but here's the simple version:

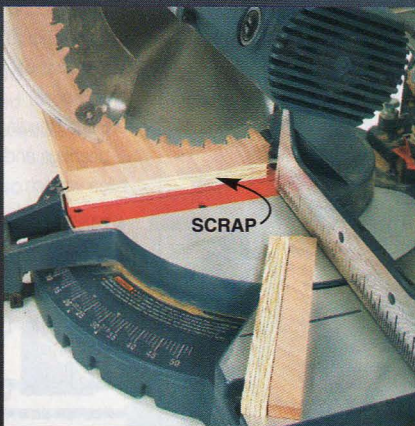
- A 10-in. saw can handle 4x4s and 2x6s.
- A 12-in. saw can handle 4x4s, 2x6s and 2x8s.

The two simple tricks below can add a crucial amount of capacity to any miter saw.

Increase cutting depth by adding a piece of scrap to the fence. This saw previously left a sliver hanging on a 4x4, but now it makes a clean cut.



Increase cutting width by laying a piece of scrap on the bed. A 3/4-in.-thick piece adds 1/2 to 3/4 in. to the saw's capacity. Sometimes that's all you need.



Our test results with a high-quality blade showed that virtually all saws are accurate to 1/12 degree of their stated angles (Photo 2). That's an error of 1/64 in. over an 11-in. cut. Not perfect, but pretty darn good! Here's the catch: Every saw, right out of the box, has to be tweaked to cut a perfect 90-degree angle before the other detents will be accurate. After that, you're all set.

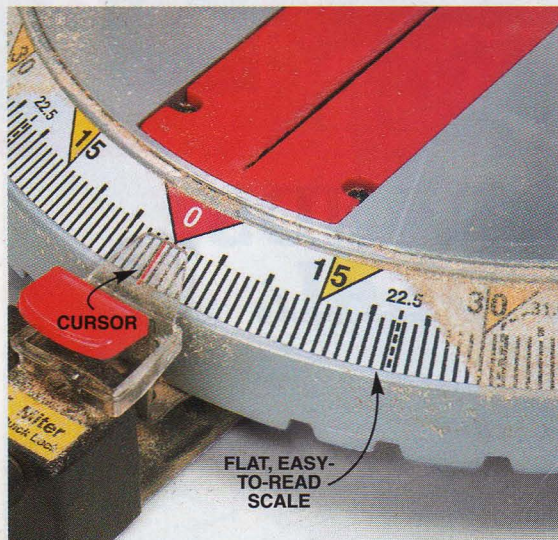
All miter saws aren't equally accurate between the detents, however. The best saws can easily be locked down 1/2 degree off a detent, but some need babying with two hands to prevent them from sliding back into the detent. At other angles, the best saws lock down without moving. However, the turntable on some saws rotates slightly, changing the angle from what you intend (see Chart, pages 68 and 69).

Cutting Crown Molding

Compound miter saws excel at cutting long lengths of molding. The most difficult to cut is crown molding, a wide, contoured piece of trim that's angled between the wall and ceiling or placed at the top of a piece of furniture. The hard part is cutting crown molding to form a right angle, such as the inside corner of two walls.

To cut that 45-degree miter on crown molding with any saw, you can lay the molding flat, tilt the blade and make a compound cut (Photo 3). Many saws have a helpful turntable detent at 31.6 degrees and a marking on the bevel scale at 33.8 degrees for this unusual cut. (However, the turntable detent replaces one at 30 degrees, a standard angle for splicing other kinds of trim molding, such as quarter-round.)

On saws with tall fences, you don't have to confuse matters by tilting the blade. Instead you can leave the blade at 90 degrees and stand the molding upright (Photo 4).



6 A flat, easy-to-read scale with a thin, hairline cursor gets a big thumbs up. Miter saws kick up a lot of dust, but flat scales are easy to wipe clean. We prefer a cursor that's out in the open, where no shadows can obscure it.



7 Hold-downs improve safety and accuracy. An easy-to-use hold-down eliminates the need to put your fingers near the blade. You'll get straighter cuts when you use a hold-down, too, particularly on miters.



8 We prefer a horizontal handle for comfort. Unlike a vertical handle, it works equally well for short and tall users. Unfortunately, most horizontal handles don't have safety lock-out buttons, to prevent you from accidentally starting the saw. You must push the lock-out before pulling the trigger for the saw to start.

Other Features

Dual Bevel. Some saws tilt both left and right (Photo 5). This means you can do all your cutting with the stock on one side of the saw. You only need one long extension table or support.

Easy-to-Read Scale. Legibility is paramount, especially under dim or dusty conditions (Photo 6). Scales that are out in the open are best. You must look down inside a deep, shadowy well to read other scales. We prefer a hairline cursor rather than a pointer.

When it's time to tilt the blade, we like flat bevel scales because they're easy to dust off. Scales with raised markings are harder to read. They're dust magnets! Dusty or not, many bevel scales are difficult to read because their lines are too close together. We'd rather have a scale with widely spaced markings.

Quick-Action Hold-Downs. Hold-downs are more convenient and work far better than clamps to secure your work (Photo 7). Some situations call for a horizontal hold-down; others, a vertical. The best saws have both, but often you must purchase them as accessories.

Horizontal Handle. Horizontal handles are comfortable when the saw is any height off the floor (Photo 8). In fact, they're good even when the saw is on the floor. Vertical handles work well at one height only.

Safety Lock-Out Button. Many pros cringe at this feature because they find it a bother, but we like an additional button that prevents you from accidentally starting the saw (Photo 8). Unfortunately, few horizontal handles have this button.

Low Noise. You should wear hearing protection when working with any miter saw. There's a huge range of noise levels. The loudest ones are 10 times noisier than the quietest ones.

Good Dust Collection. Most miter saws throw dust everywhere. None have substantially solved this annoying problem.

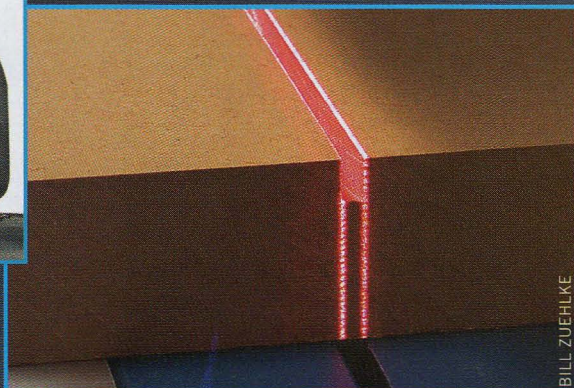
Lasers

Lasers leave the old trial-and-error method of sawing to a line back in the dust. There's no more guessing where the first cut actually goes. Imagine being able to accurately align a cut every time. When your mark is on the uneven surface of a molding, a laser shining across the whole face is really sweet.

Here's a close-up look at the three types of lasers available on miter saws:



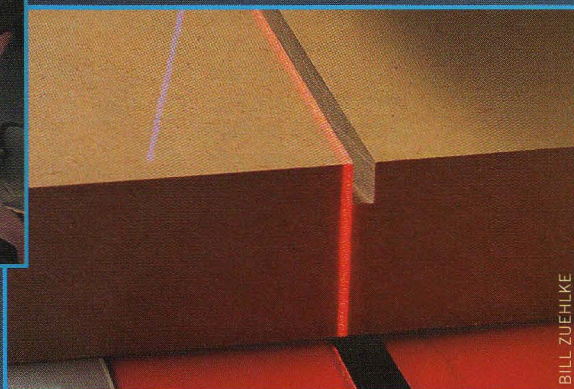
Two lasers are better than one. These lasers are located inside the guard housing. They're easy to re-aim for blades of different thicknesses.



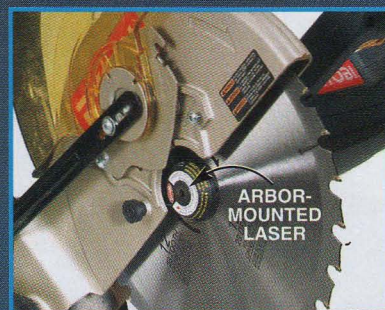
Adjustable double-line lasers are clearly the best. They can be independently aimed to show you exactly where the kerf will go. With two lines, it doesn't matter whether your mark is on the right or left side of the blade. There's a switch on the handle to turn on the lasers. These lasers are featured on one Delta and one Porter-Cable saw.



This laser is mounted on an arm in front of the guard. The laser can be adjusted to shine on either the left or right side of the kerf.



An adjustable single-line laser is second-best. It wraps down the front edge of a board, too, which is handy if that's where your mark is located. There's a switch on the arm to turn on the laser. You'll find this kind of laser on one Tradesman saw.



This laser is mounted in a disc that serves as the saw's arbor washer. It only shines on the left side of the kerf, and cannot be aimed.

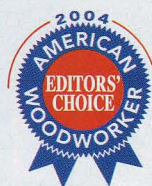


A non-adjustable single-line laser is only a rough guide. The laser may be right on the money when the blade is upright, but the line moves off the kerf as you bring down the blade. The laser only comes on when the blade is spinning. You'll find it on several Craftsman, Ridgid and Ryobi saws.

Recommendations

On average, there's a \$150 price difference between 10-in. and 12-in. saws. Outfitted with a good blade, both are equally accurate. 10-in. saws are smaller and lighter, but a 12-in. saw has the extra capacity that someday, somewhere, you're bound to want.

A laser is icing on the cake. You don't absolutely need one, but it sure makes cutting to a line far easier, particularly on moldings. **AW**



Editors' Choices
Delta 36-255L, \$350
Porter-Cable 3802L, \$350

Remarkable state-of-the-art double-line lasers distinguish these two 12-in. miter saws. Both saws are essentially the same, and even without the lasers they're great tools. One drawback: they're large and heavy.

Brand & Model		Street Price	Laser	Miter scale legibility	Bevel scale legibility	No turntable creep	Crown molding detent	Dual bevel	Fence Height left of blade	Weight (lbs)	Handle style	Safety lock out button	Vertical hold-down	
10-in. Saws	Craftsman 24350	\$150	N	***	***	N	N	N	2-5/8	32	V	Y	NA	
	Craftsman 24276	\$180	N	***	**	Y	Y	N	3-3/4	51	V & H	Y	*	
	Craftsman 21253	\$200	Y3	***	*	Y	N	N	4-1/8	32	H	N	NA	
	Delta MS250	\$110	N	*	*	Y	Y	N	2-1/2	28	H	N	NA	
	Delta MS350	\$200	N	*	**	N	Y	N	4-3/8	34	H	N	NA	
	Delta MS275	\$180	N	*	*	Y	N	N	2-1/2	33	H	N	NA	
	DeWalt DW703	\$230	N	*	*	Y	Y	N	4-3/4	33	H	N	***	
	Hitachi C10FCB	\$170	N	*	*	Y	Y	N	3-1/2	33	V	Y	*	
	Hitachi C10FCD	\$220	N	*	*	N	Y	Y	1-3/4	33	V	Y	*	
	John Deere ET-3403-J	\$260	N	*	*	Y	Y	N	3-1/2	33	V	Y	*	
	Makita LS1040	\$240	N	*	*	Y	N	N	4-1/2	24	V	Y	*	
	Milwaukee 6494-6(7c)	\$250	N	*	*	Y	N	N	3-1/2	37	V	N	*	
	Pro-Tech 7207	\$115	N	*	*	N	N	N	3	28	V	N	NA	
	Ridgid MS1065LZ	\$200	Y3	*	*	Y	Y	N	4-3/4	37	H	Y	NA	
	Ryobi TS 1340	\$100	N	***	***	Y	N	N	2-3/4	28	H	N	NA	
	Ryobi TS 1352	\$170	Y3	**	**	Y	N	N	2-7/8	38	H	N	NA	
Tradesman 8329N	\$120	N	***	*	Y	Y	N	2-1/2	28	V	Y	*		
Tradesman 8329L	\$200	Y2	***	*	Y	Y	N	3-3/4	29	V	Y	*		
12-in. Saws	Bosch 3912	\$270	N	*	*	Y	Y	N	5	43	H	Y	*	
	Craftsman 21223	\$300	Y3	**	***	Y	Y	N	5-1/8	41	H	N	*	
	Delta MS 450	\$250	N	*	**	Y	Y	N	5	53	H	N	**	
	Delta 36-255	\$300	N	**	**	Y	Y	N	5	63	H	N	**	
	Delta 36-255L	\$350	Y1	**	**	Y	Y	N	5	63	H	N	**	
	Delta 36-312	\$300	N	**	*	Y	Y	N	5-1/4	46	H	N	**	
	Delta 36-412	\$400	N	**	*	Y	Y	Y	5-1/4	52	H	N	**	
	DeWalt DW705(S)	\$300	N	*	*	Y	Y	N	5	40	H	N	NA	
	DeWalt DW706	\$350	N	*	*	Y	Y	Y	4-5/8	44	H	N	**	
	Makita LS1221	\$310	N	*	*	Y	Y	N	4-1/2	36	H	Y	*	
	Porter-Cable 3802	\$300	N	**	**	Y	Y	N	5	63	H	N	**	
	Porter-Cable 3802L	\$350	Y1	**	**	Y	Y	N	5	63	H	N	**	
	Pro-Tech CS72121	\$250	N	*	*	N	Y	N	4-1/8	52	V	Y	***	
	Ridgid MS1250 LZ	\$300	Y3	*	*	N	Y	N	5-1/8	49	H	Y	NA	
	Ryobi TS 1551	\$230	Y3	**	***	Y	N	N	4	45	H	N	NA	

Legend

Y = Yes
N = No

Y1 = adjustable, dbl. line
Y2 = adjustable, sgl. line
Y3 = non-adjustable, sgl. line

*** = Above Average
** = Average
* = Below Average

H = Horizontal
V = Vertical
NA = Not Available



Best Buys

Ryobi TS 1340, \$100

This lightweight 10-in. saw has a very readable scale, a smooth-acting turntable and comes with a hold-down.

Craftsman 24276, \$170

This 10-in. saw is user-friendly and loaded with accessories. It's got a handle you can rotate vertically or horizontally.

Runners-Up

If you want a top-notch 12-in. saw but don't want to pay extra for a laser, take a look at these models:

Delta 36-255, \$300.

Porter-Cable 3802, \$300.

If a 12-in. saw is too large, heavy and expensive for you, here's an excellent 10-in. saw, without a laser:

DeWalt DW703, \$230.

If you need a saw that tilts both left and right to fit into a tight shop, here are our picks:

Delta 36-412, \$400.

DeWalt DW706, \$350.

Horizontal hold-down	Noise level in decibels	Comments
*	102.3	Extension wing, hold-down and 2nd blade included
NA	99.7	Many extra accessories, plus hold-down included
*	99	Extension tables, stop and hold-down included
*	98.2	Padded miter handle
*	98.3	Miter and bevel lock at front handle, hold-down included
*	96.1	Pull out extension wings, hold-down included
NA	99	6-1/4" crosscut capacity (largest among 10" saws)
NA	103.6	Tool-less arbor cover, vertical hold-down included
***	93.1	Excellent sight lines left and right, vertical hold-down included
NA	103.6	Tool-less arbor cover, hold-down included
***	99.7	Tall flip fence on left, good dust collection
NA	101	Handle lock to override detents
NA	101.7	Easy blade changes
***	105.5	Good horizontal handle, crown bevel stops, hold-down included
*	101.6	Hold-down included
*	98.3	Extension wings, stop and vertical hold-down included
NA	99.1	5-yr warranty on saw, hold-down included
NA	101	5-yr warranty on saw, hold-down included
NA	99	Detent lock-out, hold-down included, crown molding stops available
NA	99.5	Extension wings, stop and hold-down included
*	95	Extension wing, stop and hold-down included
*	95	Solid-locking miter handle
*	95	Solid-locking miter handle
NA	96.5	Front-mounted bevel lock
***	92.3	Built-in crown stop, 9-1/4" crosscut capacity (largest among 12" saws), hld.-dwn. incl.
***	97.6	Smooth-running saw, crown molding stops available
NA	93	Smooth-running saw, crown molding stops available
***	94.8	Crown stops available, vertical hold-down included
*	95	Solid-locking miter handle
*	95	Solid-locking miter handle
***	102.1	Extension table and hold-down included
***	94.2	Excellent horizontal handle, 4" dust port, bevel crown stops, hld.-dwn. incl.
*	98	Extension wings included

Contacts

Bosch
(877) 267-2499
www.boschtools.com

Craftsman
(800) 377-7414
www.sears.com/craftsman

Delta
(800) 438-2486
www.deltawoodworking.com

DeWalt
(800) 433-9258
www.dewalt.com

Hitachi
(800) 829-4752
www.hitachi.com/powertools

John Deere
(866) 993-3373
www.johndeere.com

Makita
(800) 462-5482
www.makitatools.com

Milwaukee
(800) 729-3878
www.milwaukeetool.com

Porter-Cable
(800) 487-8665
www.portercable.com

Pro-Tech
(800) 888-6603
www.protechpower.com

Ridgid
(800) 474-3443
www.ridgid.com

Ryobi
(800) 525-2579
www.ryobitools.com

Tradesman
(800) 243-5114
www.tradesman-rexon.com

Master Your Brad Nailer

Tips and products to make your brad nailer safe and easy to use

Avoid the Blowout Curse

A brad that unexpectedly shoots out the side of your project is guaranteed to make you curse, especially if your finger happens to be in the way. Blowout is instantaneous and dangerous.

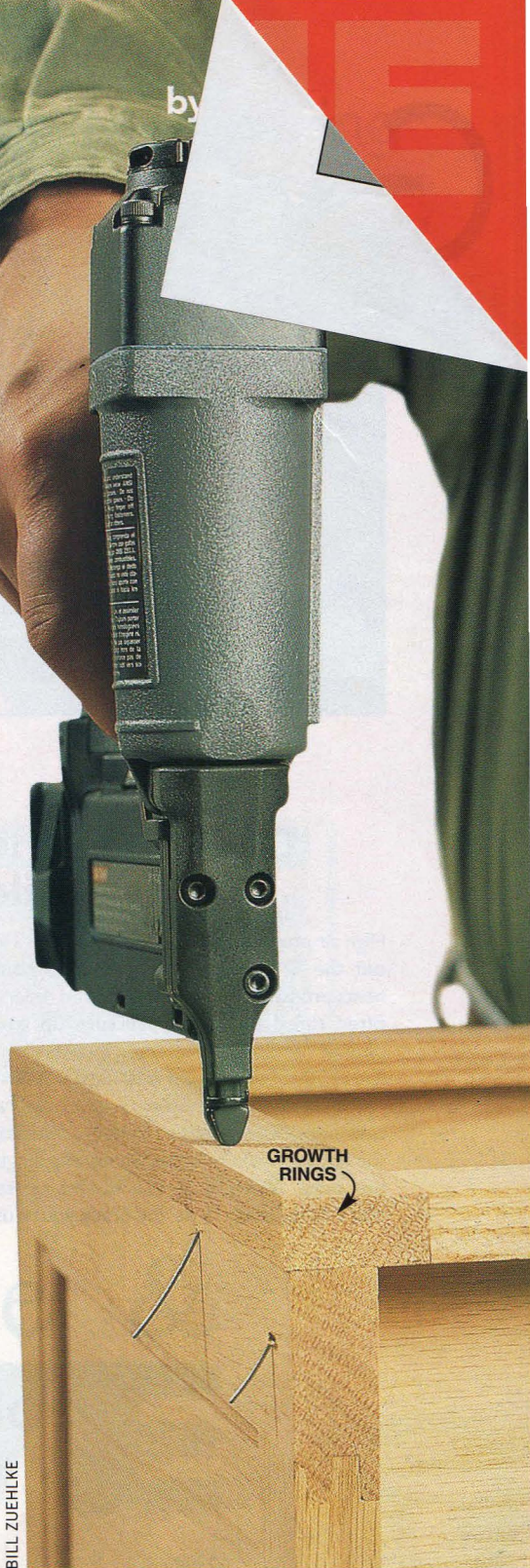
18-gauge brads are so darn thin, they have a tendency to deflect whenever they encounter something hard, like a knot. In most cases, blowout is caused by the wood's uneven cellular structure, so you can take steps to limit its occurrence.

- Orient the brad correctly. If you're attaching a face frame, hold your nailer so its handle is perpendicular to the outside edge (not parallel, as shown in the photo). This positions the brad's wedge-shaped tip so any side-to-side deflection will be contained in the wood.

- Fire into the face frame's growth rings. Check the end grain. If your firing angle parallels the growth rings, the brad will simply deflect off the hard latewood.

- Increase the air pressure when you nail into hard wood. Just like a putt that falls off line when it loses speed, a brad driven softly is more likely to deflect.

- Protect yourself. Even when you take preventative safety precautions, blowout can still occur. Always wear eye protection and keep your fingers well away from the brad's path.

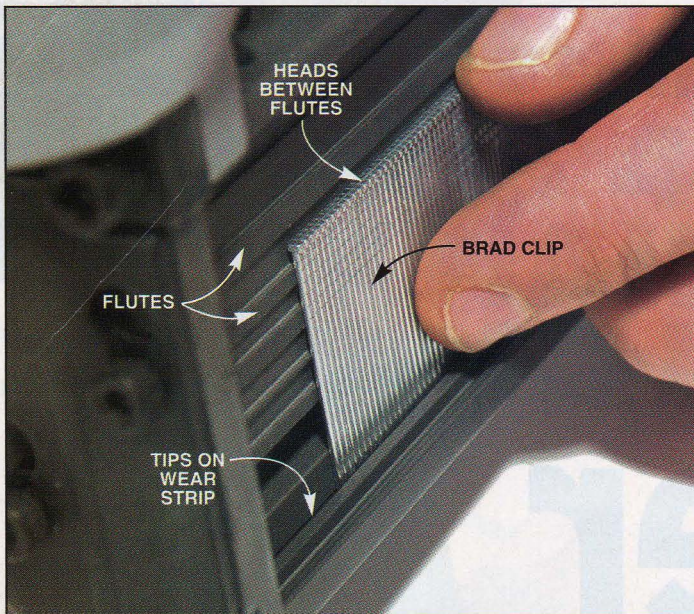


BILL ZUEHLKE

Avoid Nailer Elbow

A stiff, unwieldy air hose makes your nailer hard to maneuver, especially in tight spots. This swiveling air plug (\$9 for 1/4-in. hose; \$10 for 3/8-in. hose) increases your range of movement by acting as a stress-relieving universal joint between your nailer and hose (see Sources, page 72).





18-Gauge Brads are Interchangeable

Argh! You're all out of brads. The owner's manual says "USE OUR BRADS ONLY!," but the store doesn't carry the right brand for your nailer. What to do?

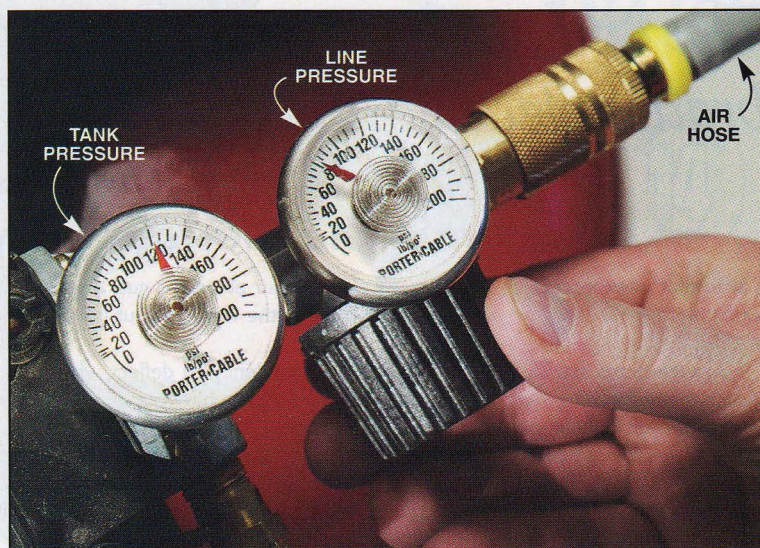
If you're in this pickle, don't worry about the brand. The shafts of all 18-gauge brads are essentially the same size. Just make sure the brads you buy are the right length. Most owner's manuals list the lengths that'll fit, but here's how to be sure:

On the side of your nailer's magazine is a series of flutes that correspond to the different brad lengths it accepts. To fit, the brad clip must sit on the steel wear strip at the bottom of the magazine and the brad heads have to rest between the flutes. Brad strips that hang from the flutes without bottoming on the wear strip don't fit. They'll cause misfires, jams and/or premature wear.

Don't Hammer Your Nailer

High air pressure is hard on your nailer. It'll wear out the O-rings and other internal components prematurely. Even though brad nailers are often rated to handle pressure up to 125 pounds per square inch (psi), they'll work just fine at 90 psi or less, and they'll last a lot longer.

Adjust the air pressure (within the range specified in the owner's manual) according to the hardness of the material and the length of the brad. Operate at the lowest pressure that'll consistently drive the brads you're using.



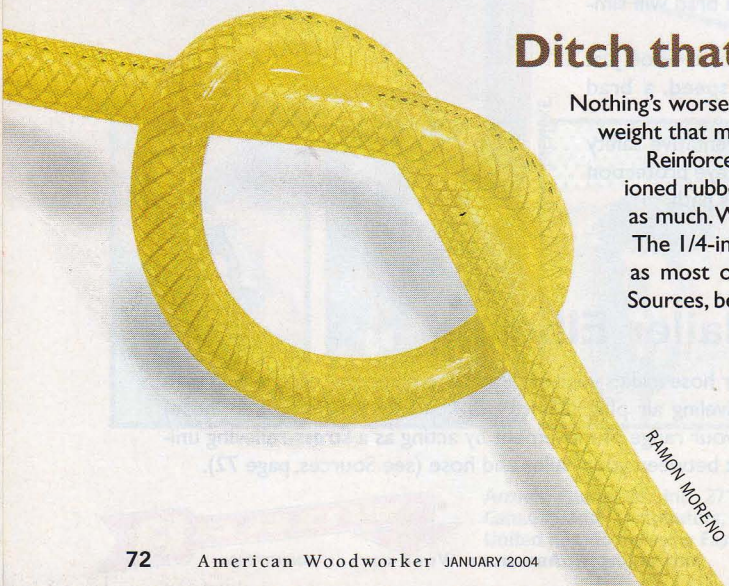
Ditch that Old Hose

Nothing's worse than being tethered to a cumbersome air hose. It adds dead weight that makes your nailer hard to maneuver and tiring to use.

Reinforced polyurethane hose is tougher and more durable than old-fashioned rubber hose. It's also thinner, more flexible, and weighs less than half as much. When it's attached to your nailer, you'll hardly know it's there. The 1/4-in. inside diameter supplies plenty of air for brad nailers, as well as most other pneumatic tools. A 25-ft. length costs about \$36 (see Sources, below). **AW**

Sources

Carlson Systems, Inc., (800) 325-8343, www.csystems.com
 1/4" ball swivel air plug, 948600, \$9
 3/8" ball swivel air plug, 948624, \$10.
 Coilhose Pneumatics, (732) 390-8480, www.coilhose.com
 Flexeel reinforced polyurethane straight hose,
 PRE14-25, 1/4" i.d.; 25' length, \$36.



RAMON MORENO

Garden Chairs

by Tim Johnson



Enjoy your setting while comfortably sitting

Stylish and comfortable, these chairs are also built to last. Made of rot-resistant white oak, with robust joinery secured with weatherproof glue, they're guaranteed to become some of your garden's most cherished perennials.

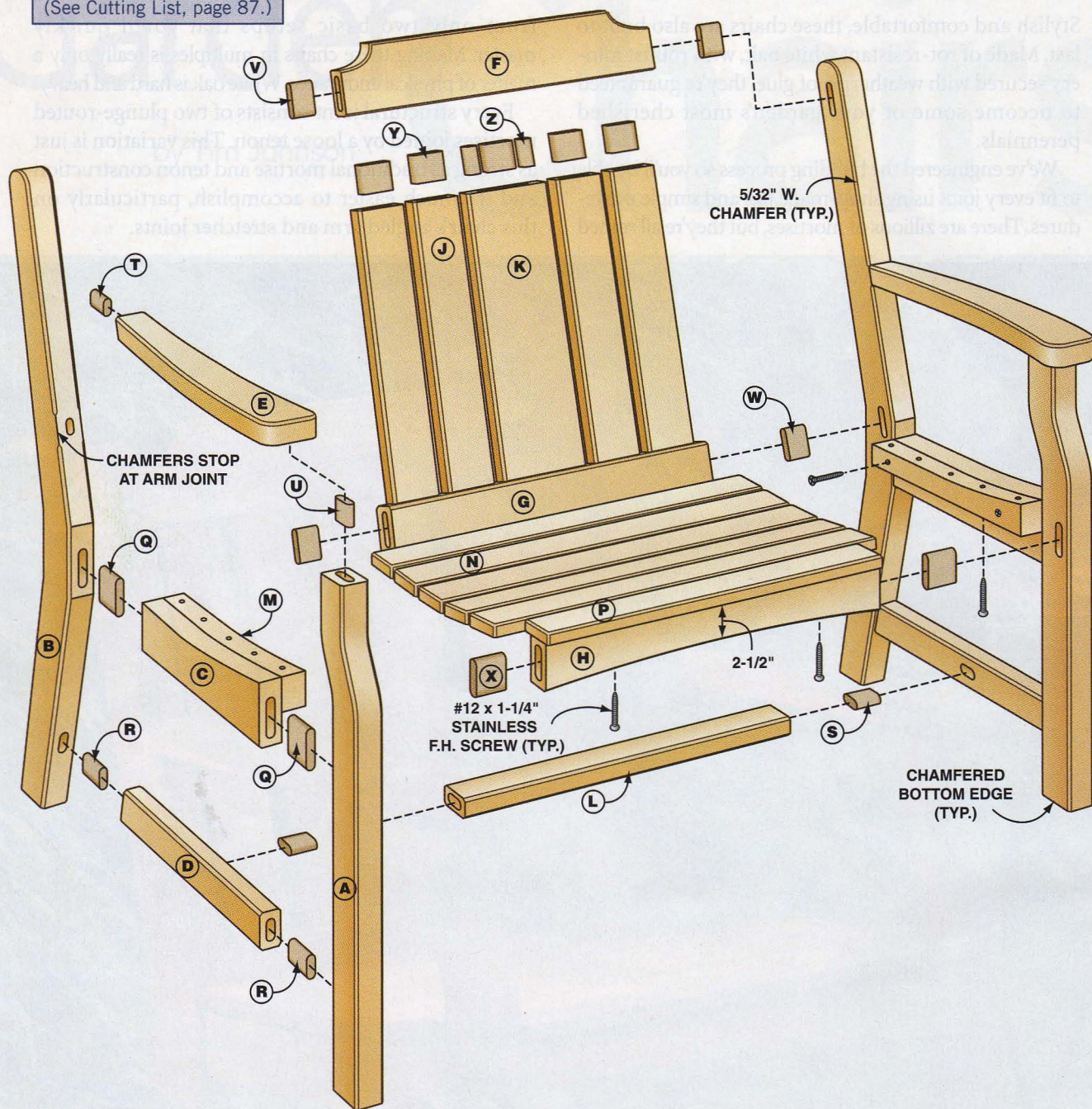
We've engineered the building process so you'll be able to fit every joint using shop-made jigs and simple procedures. There are zillions of mortises, but they're all routed

from only two basic setups that you'll quickly master. Making these chairs in multiples is really only a matter of physical endurance. White oak is hard and heavy!

Every structural joint consists of two plunge-routed mortises joined by a loose tenon. This variation is just as strong as traditional mortise and tenon construction and it's much easier to accomplish, particularly on this chair's angled arm and stretcher joints.



Fig. A Exploded View
(See Cutting List, page 87.)



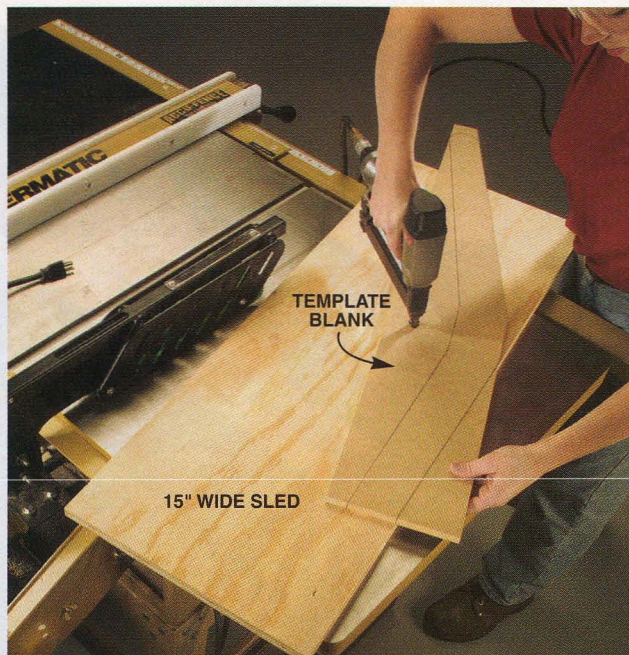
Lumber and Tools

White oak is a bargain compared to other rot-resistant hardwoods like teak and mahogany, and it's readily available in a variety of thicknesses. We used 8/4 stock for the legs (wide boards so we didn't have to glue up the blanks), 6/4 for the arms, rails and stretchers and 4/4 for the slats and tenon stock. For dimensional stability, we chose

boards with straight grain. Each chair requires about 35 bd. ft. of lumber. We paid \$160 per chair for our rough-sawn stock.

Routing all the mortises will give your plunge router a real workout. It must have a 1/2-in. collet, an edge guide, 2-1/8 in. of plunge capacity and the guts to plunge deep in white oak (at least 1-1/2 hp).

This project also requires a table-saw and bandsaw, a drill press with a sanding drum and a router table. You'll need 3/8-in. and 1/2-in. straight bits for mortising, a 2-in. flush-trim bit, a 1/4-in. round-over bit and a chamfering bit (see Sources, page 87). A jointer and planer are recommended, but not essential. You can have your stock milled to thickness at the lumberyard.



1 **Make templates** so all of your duplicated parts will be identical. Cut the templates' long, straight edges on your table saw, using a sled. First, set the fence and rip the sled to width. Then tack the template blank in place and run the sled through the saw.

Building Tips

Squarely-cut blanks are essential for sound joinery and good results. Make sure your table saw's miter gauge makes square crosscuts. The heavy leg blanks may require a crosscut sled or an accurate chop saw.

Use templates to duplicate the shaped legs, arms and seat rails (Fig. D - G, page 84). 1/2-in.-thick MDF is excellent template material (available at most home centers for \$5 per 2-ft. x 4-ft. sheet).

Use layout marks to guarantee that mortises and adjoining pieces go where they're supposed to go.

Plunge-rout the mortises, using a straight bit, an edge guide and clamped-on stop blocks. Mortises are either routed into the end grain using a jig, or into the long grain, using a flush-mounted support block.

Rout mortises before you cut profiles. It's much easier to fit the angled joints around the mortises than vice-versa.

Always rout from the same face so all the mortises in each piece are consistently located, even if they aren't perfectly centered. Then the joints will always line up. Simply mark all the edge-guide faces with arrows before you rout (Photo 3).

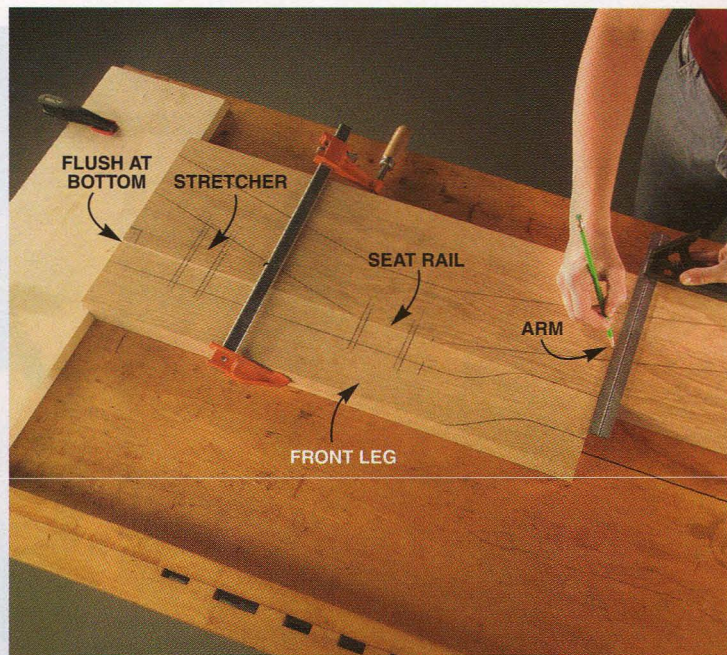
Make Templates for the Legs

Cut the leg templates from blanks that match the leg blanks (Fig. D). For the best results, saw straight portions of the templates on your table saw (Photo 1). Bandsaw curved shapes oversize and finish them using a sanding drum in your drill press.

To cut the back side of the back leg template on your table saw, you'll have to make stopped cuts from each end. Finish by cutting the remaining middle section on your bandsaw. When you cut the inside edge of the front leg template, stop the table saw cut at the beginning of the curve and cut the rest on the bandsaw.

Mark the Leg Blanks

Before tracing the template profiles onto the leg blanks, make sure the



2 **Locate the leg mortises.** Marking both blanks simultaneously guarantees that the mortises will line up. Use the top of the front leg to locate the bottom of the arm on the back leg.

template and blank are aligned. The front leg template (Fig. A, page 76, Part A, and Fig. E) is easy to position, but the only reference surfaces for the rear leg (Fig. A, Part B, and Fig. D) are at the middle of the front edge and on the bottom.

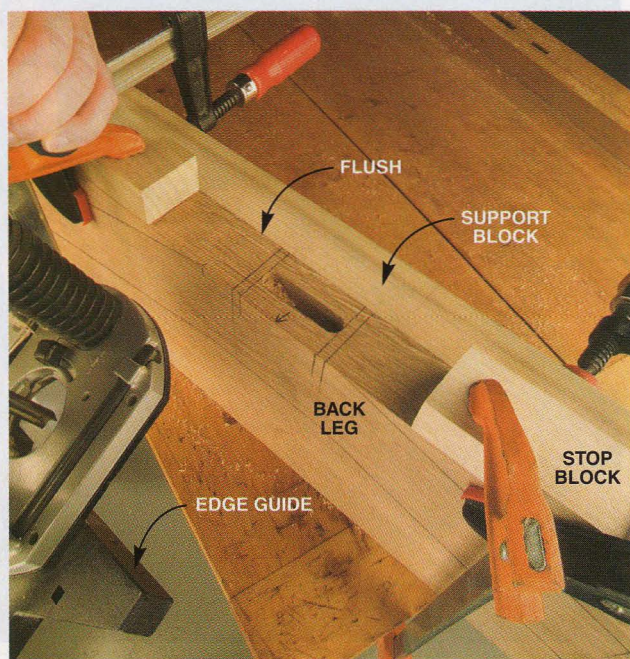
After tracing the profiles, clamp the front and back leg blanks together. Then mark the locations of the mortises and outside edges of the seat rail (C), side stretcher (D) and arm (E) on the front leg blanks (Photo 2).

Mortise the Back Leg Blanks

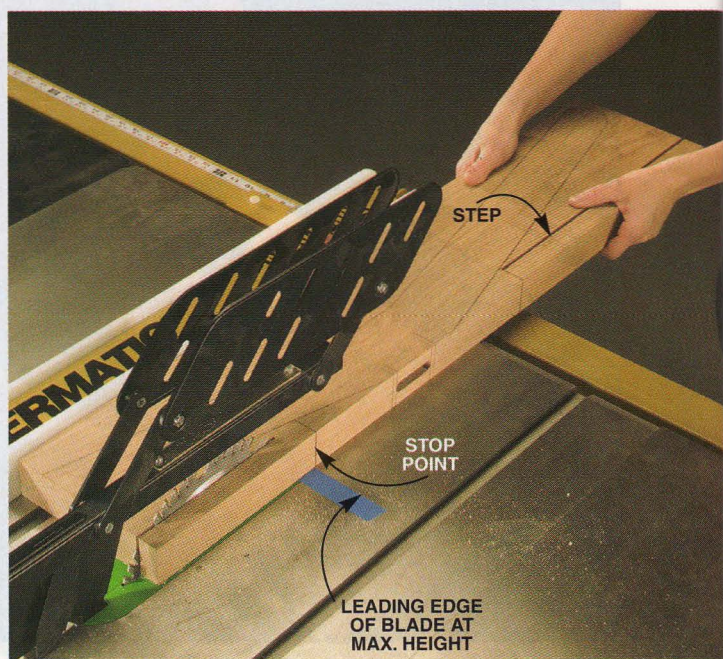
First, adjust your router's edge guide to center the mortises on the edge of the blanks. Then rout mortises for the seat rails (Photo 3).

To rout mortises for the stretchers and arms, steps have to be cut to get the router close enough (Fig. B, page 78).

To create the steps, first make a stopped cut on the table saw (Photo 4). Finish cutting the remaining angled portion of the step on the bandsaw, making sure to stay on the outside of the line.

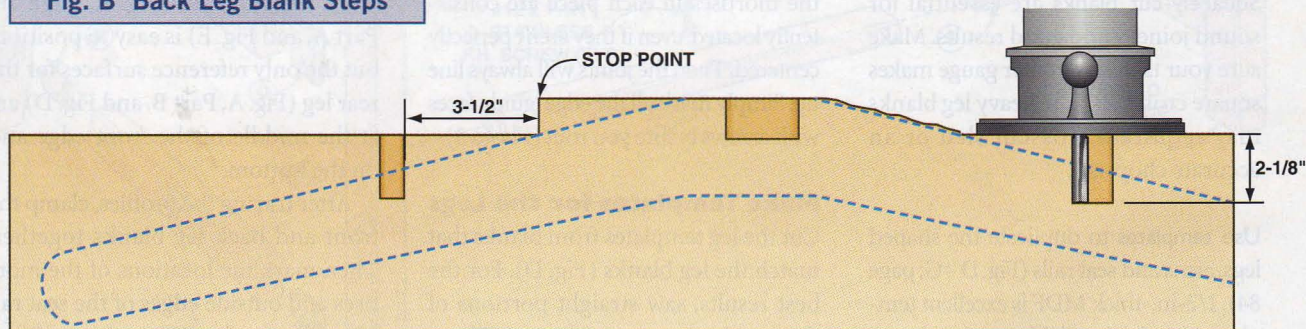


3 Rout mortises for the seat rails in the back legs with a plunge router. Clamp on a wide support block to stabilize the router and stop blocks to establish the ends of the mortise.



4 Cut steps in the back leg blanks so you can rout the arm and stretcher mortises (Fig. B, below). First, locate the blade edge and the stop point. Then make a stopped cut. Turn off the saw and back the blank out after the blade stops.

Fig. B Back Leg Blank Steps



Steps must be cut to get the router motor close enough to rout the arm and stretcher mortises. Extend a line 3-1/2 in. from the upslope end of each mortise location and mark the point just before the line intersects the edge of the leg. This is the stop point for your tablesaw cut. If your router's base is over 7-in. diameter, your steps must be longer.

Extend the mortise layout lines onto the steps. Then rout 2-1/8-in.-deep mortises for the arms and stretchers (Photo 5).

Shape the Back Legs

First, rough-saw the back leg on your bandsaw to the outside edge of the pattern line. Then fasten the template with heavy-duty double-faced tape, making sure it's flush with the leg at both the bottom and front edges.

Shaping the legs requires some routing against the grain, which can cause tear-out. For the best results, mount the template on the right side of the blank (when viewed from its front edge). This setup limits against-the-grain routing to the less-visible lower portion of the leg (Photo 6).

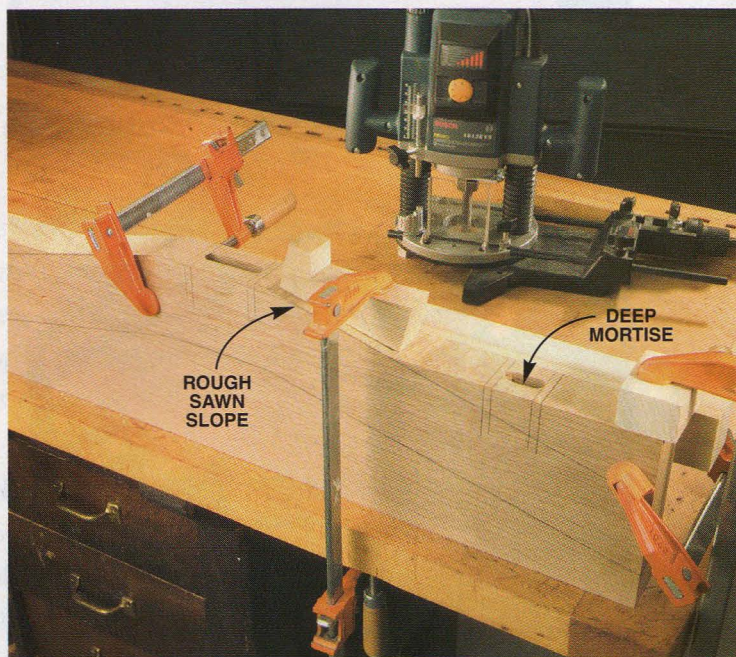
Finish the back legs by routing the mortises for the back assembly on their inside faces, using extensions to support the router. The extensions must be

as thick as the leg and clamped in line with its edge (Photo 7 and Fig. K, page 87). Be sure to adjust your edge guide before routing.

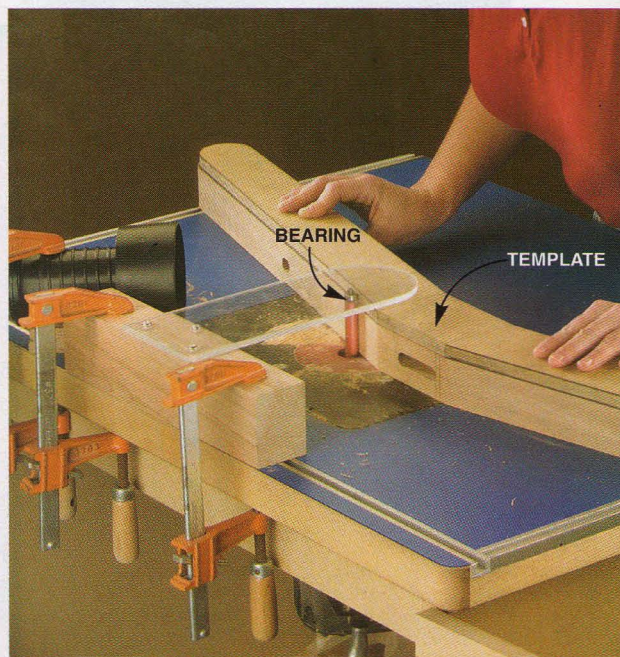
Complete the Front Legs

First, rout centered mortises for the arms, using a jig (Photo 8 and Fig. C, page 80). These mortises are offset because they're routed before the profiles are sawn.

Saw steps in the front leg blanks so



5 Rout super-deep mortises for the stretcher and arm from the steps, so a functional mortise remains when you cut away the waste. Rough-sawing the slope beyond the steps makes it easy to clamp on stop blocks.



6 Rout the leg to its final shape with a 2-in. flush-trim bit. Before you rout, rough-saw the blank and affix the template with heavy-duty double-faced tape.

you can rout the seat rail and stretcher mortises. Make stopped tablesaw cuts (on the outside edge of the pattern line) from the bottom of the blank to the start of the curve at the top. Band-saw the remaining curved profile. Attach support and stop blocks and rout the mortises.

Rough-saw the outside curve at the top of the legs. Then mount the template (on the right side of the blanks) and rout the front leg profiles.

Mortise the Seat Rail, Stretcher and Arm Blanks

The seat rails, side and center stretchers (L) are all the same thickness, so they can all be routed with the same set of cleats mounted on the end-mortising jig (Fig. C, Detail 1, page 80).

First, rout 1-1/4-in.-deep mortises in the seat rail blanks (Fig. G), centered between the faces and offset from the top edge. Be sure to rout both ends from the same face.

Reposition the right-hand cleat and rout 1-1/2-in.-deep mortises in the

stretcher blanks (Fig. H, page 84).

Mortise one end of both arm blanks (Fig. F). This job requires its own set of extra-wide cleats and support blocks (Fig. C, Detail 2).

*Weatherproof glue
and white oak
are the perfect
combination
for long outdoor life*

Make the Loose Tenons

Individual 1/2-in.-thick tenons (Q through X) are cut from long pre-milled blanks. First, plane 2-ft. lengths of straight-grained stock to 1/2-in. thickness and rip them to width. Then shape the edges on your router table (Photo 9).

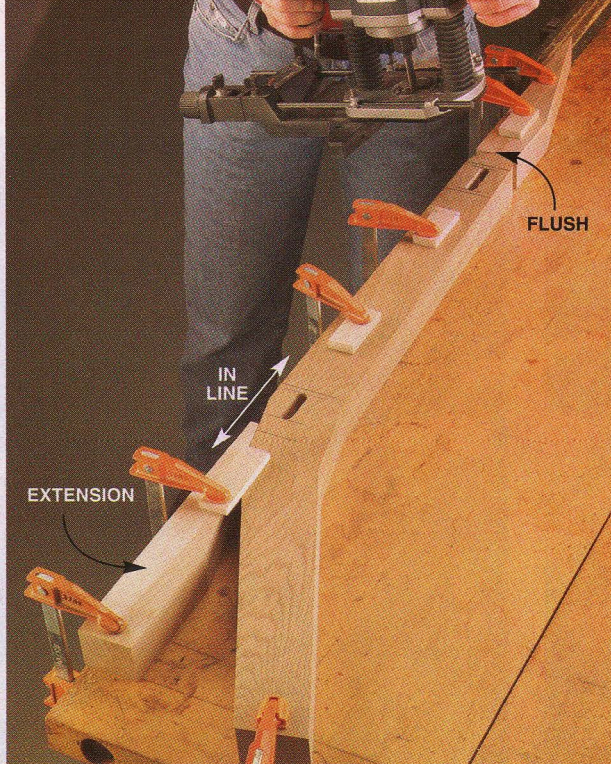
Your tenon stock should slip in and out of the mortises without binding (too tight) or rattling (too loose). Cut the tenons about 1/16-in. short and test-fit the seat rail and stretcher joints. Adjust the fit by shaving the tenons or wedging the mortises until the adjoining pieces line up with the layout lines.

Fit the Angled Joints

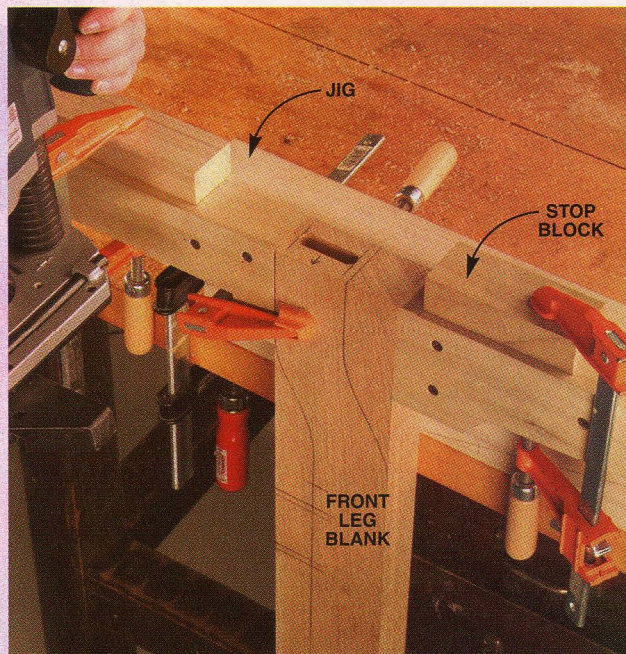
First, find the cutting angle for the stretchers (see Real-World Angles Don't Lie, page 82). Then transfer this angle to your tablesaw's miter gauge using a sliding bevel square. Mark the stretcher for the angled cut (Photo 10) and cut it to length.

Find the cutting angle for the back end of the arm. Tilt the blade to this angle. Reset your miter gauge to 90 degrees and cut the back end of the arm blank.

Rout mortises in the side stretchers for the center stretcher (Fig. H). Then assemble the sides and install the arm blanks so you can locate and rout the front mortises (Photos 11 and 12).



7 Rout mortises in the back legs for the back assembly using extensions to support the router and edge guide.



8 Rout mortises for the arms in the tops of the front leg blanks using a shop-made jig to support the router (Fig. C).

Fig. C Jig for Mortising on the End of a Piece

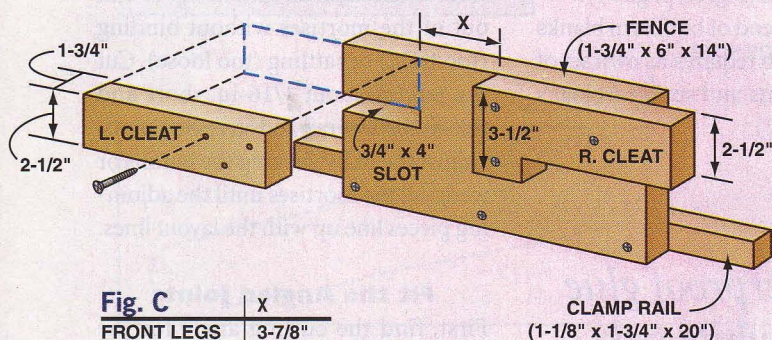


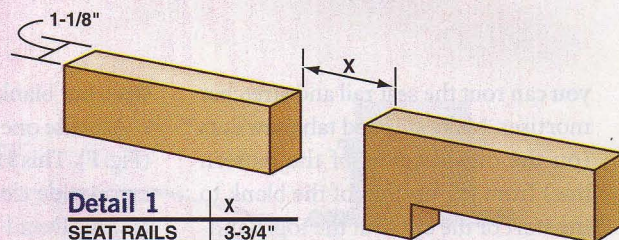
Fig. C	X
FRONT LEGS	3-7/8"

This simple jig provides a stable platform for the router and a continuous surface for the router's edge guide. It holds the workpiece securely and easily accommodates stop blocks.

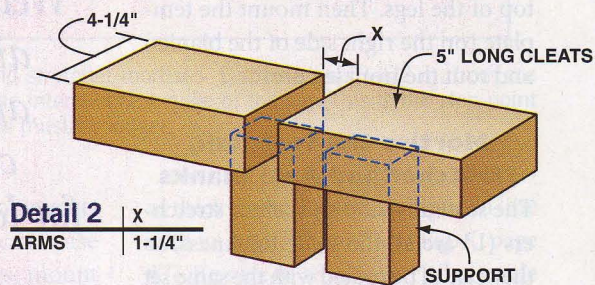
The jig consists of a fence and two 7-in.-long cleats. The cleats must be the same thickness as the workpiece and have one square corner. They mount flush with the top of the fence and are spaced so the workpiece fits between them. The fence is slotted so you can clamp the workpiece in place,

flush with the top. A rail attached to the back of the fence allows you to clamp the jig securely to your workbench. Variations of this jig, depending on the thickness and width of the workpiece, allow you to rout all of the end-grain mortises.

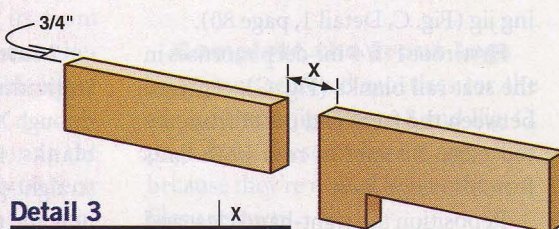
You can use the same fence for all the variations, just change the cleats. You'll need four pairs of cleats to complete the chair. If you plan to make more than one chair, it's a good idea to make a separate jig for each pair of cleats.



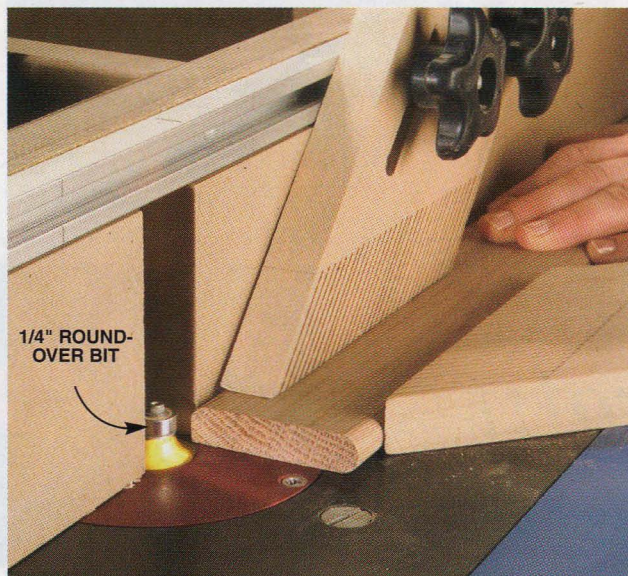
Detail 1	X
SEAT RAILS	3-3/4"
STRETCHERS	1-3/4"
CREST RAIL	4"
FRONT AND BACK RAILS	3"



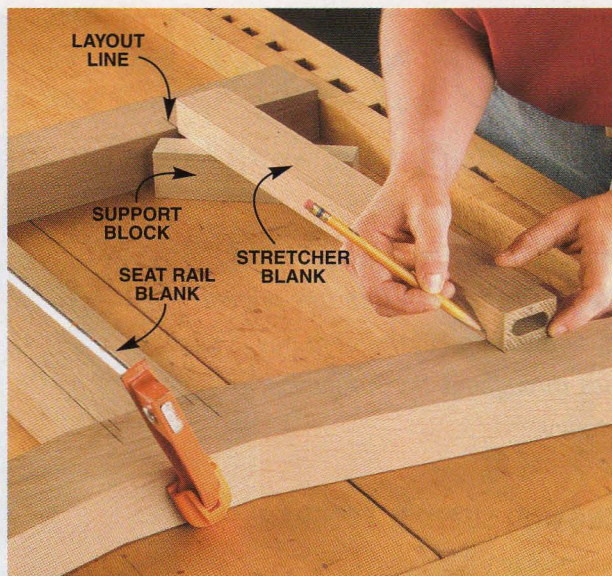
Detail 2	X
ARMS	1-1/4"



Detail 3	X
OUTER BACK SLATS	3"
CENTER BACK SLAT	5-1/2"



9 Shape loose tenon stock on the router table with a round-over bit, featherboards and a fence.



10 Cut the stretchers to fit after dry-assembling the legs and seat rail blank. Align the stretcher with the layout lines, butt its front end against the leg and mark the back end.

Assemble the Sides

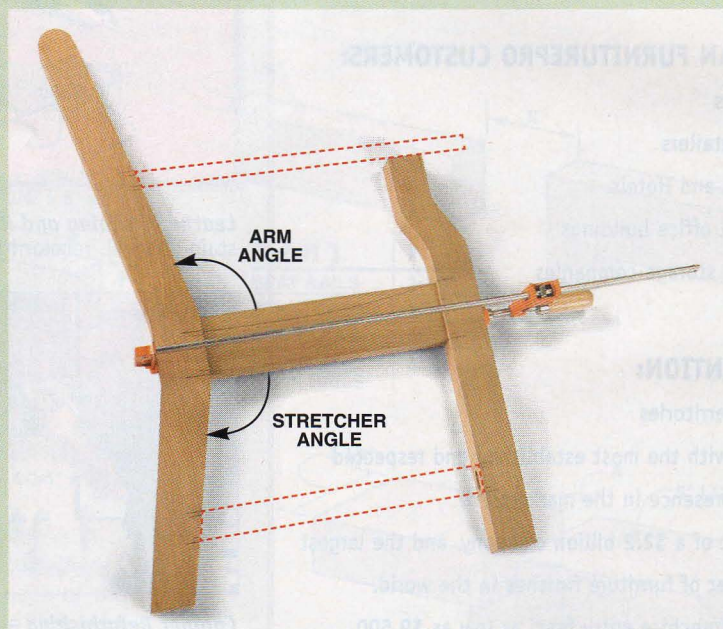
Mount the arm blanks with tenons installed in both mortises. Trace the arm's profile onto the blanks while holding the template (Fig. F) against the back leg, flush on both sides. Remove the arm blanks and rough-saw them. Then attach the template and rout the profile on the router table using the flush-trim bit.

Rough-saw and rout both seat rail blanks using the template (Fig. G). Chamfer all the exposed sharp edges on the arms, legs, seat rails and stretchers. The chamfers stop above and below the arm joint on the back legs. Chamfer only the bottom edges of the seat rails. Don't chamfer the ends of pieces that butt at joints. Then glue each side assembly together (Photo 13).

Assemble the Back

Rout 1-in.-deep mortises in the ends of the crest rail blank (F) and lower back rail (G), using the jig (Fig. C, Detail 1). These mortises are offset (Fig. J, page 84 and Fig. K, page 87). Mortise the ends of the front rail (H) now as well.

The 3/4-in.-thick back slats (J and K) require thinner mortises and tenons (Y and Z), but the plunge routing procedure remains the same. Draw layout



Real-World Angles Don't Lie

The old adage "divide and conquer" is apropos when you have to fit an assembly that includes angled joints, like the chair sides. Instead of cutting all the parts based on a cutting list, fit the joints one at a time.

Dry-clamping the square joints between the seat rail blank and the

legs gives you all the information you need to fit the angled joints. The angle for the back end of the side stretcher is the same as the angle between the bottom of the seat rail blank and the leg. The arm's back-end angle is the same as the one between the seat rail blank and the top of the leg.

Fig. J Back Assembly

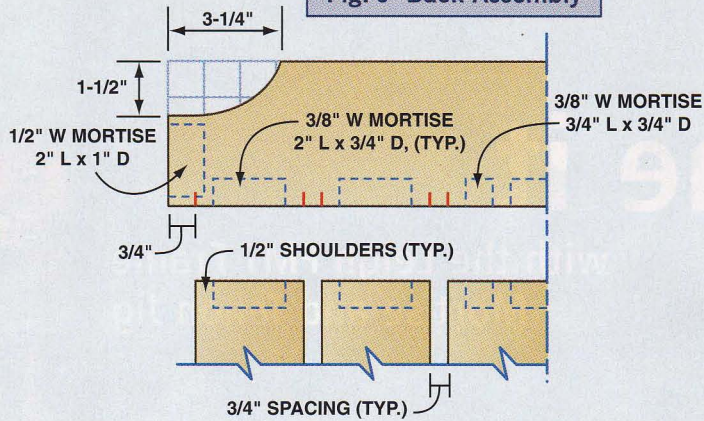


Fig. D Back Leg

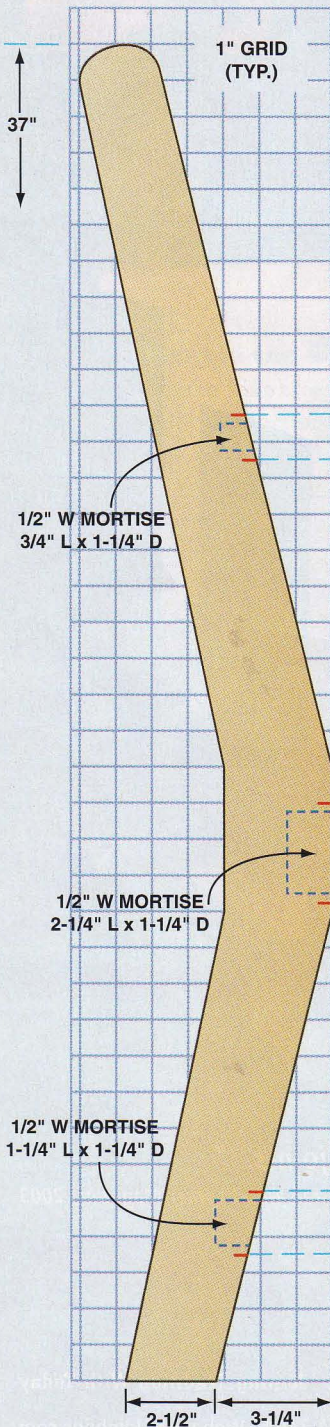


Fig. F Arm

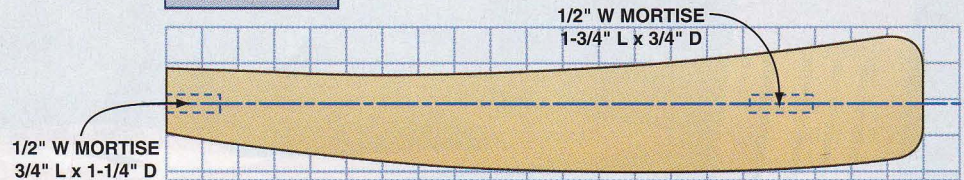


Fig. E Front Leg

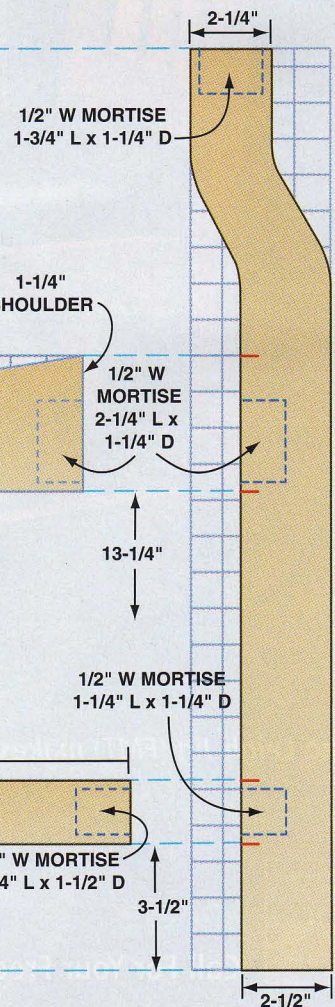


Fig. G Seat Rail

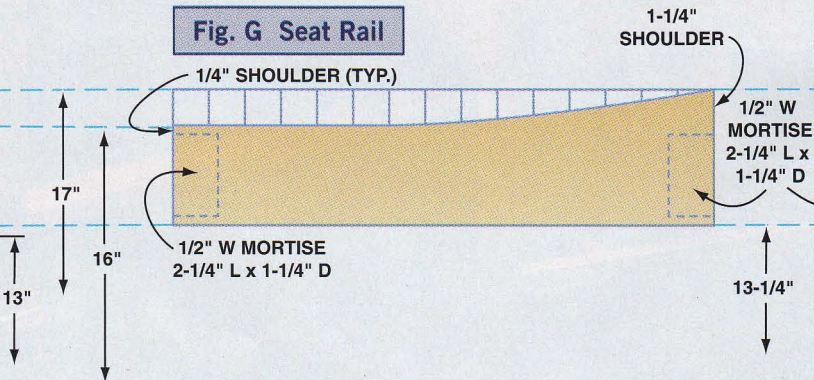
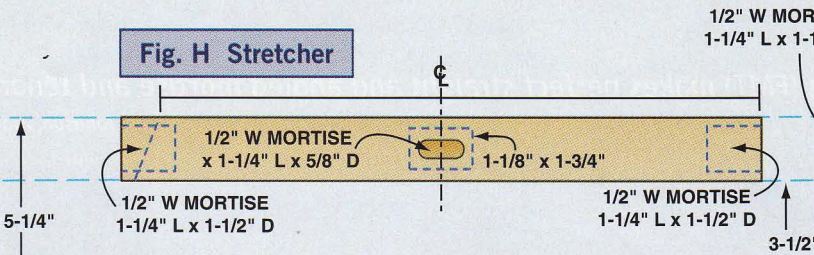
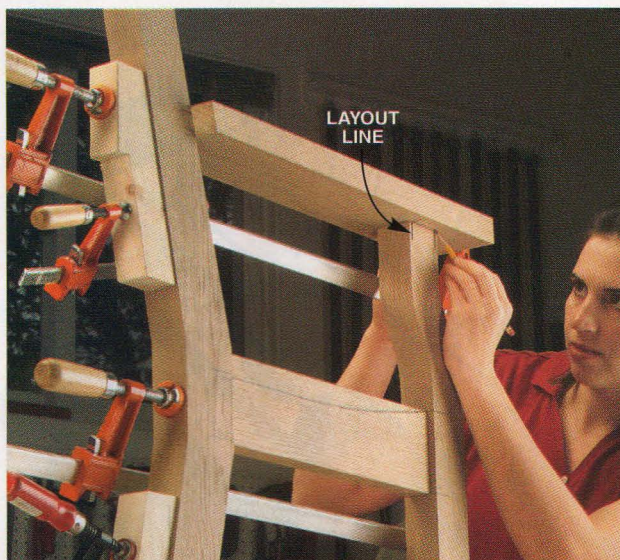


Fig. H Stretcher

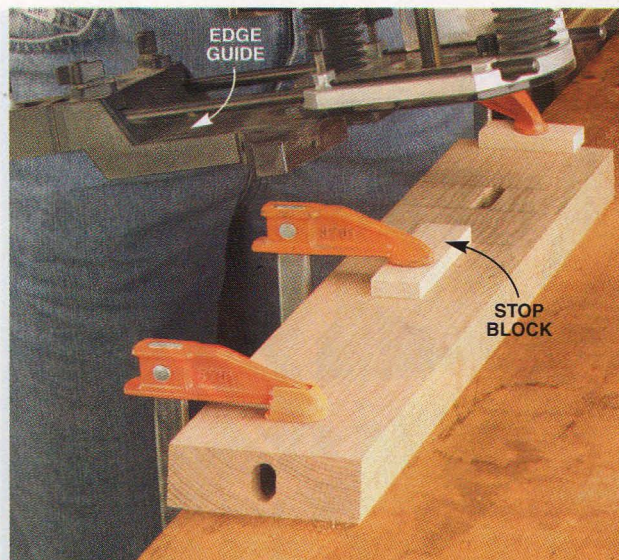




11 Locate the arm mortise. First, cut the bevel on the back of the arm blank. Install the loose tenon and clamp the blank to the back leg. Then transfer the layout lines for the mortise from the front leg to the arm.

lines on the rails (Fig. J), clamp on a fence and stop blocks, set the edge guide and always rout from the same face.

Make sure the back slats are the right length. Dry-clamp the crest and lower back rails in place between the glued-up sides and verify the distance between them. Then mortise the ends of the slats using the jig (Fig. C, Detail 3, page 80).



12 Rout the mortise in the bottom face of the arm blank. It's centered, just like the mortise in the end.

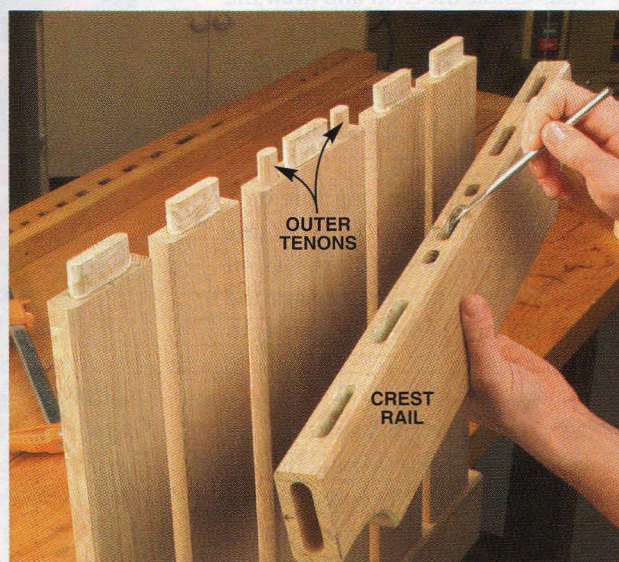
Bandsaw the curved profile on the ends of the crest rail and smooth it on your drill press with the sanding drum. Next, chamfer all the edges (but not the ends) of the rails and slats.

Make tenon stock to fit the 3/8-in.-thick mortises, using the 1/4-in. round-over bit, lowered slightly, to round the ends. For this 28-mortise

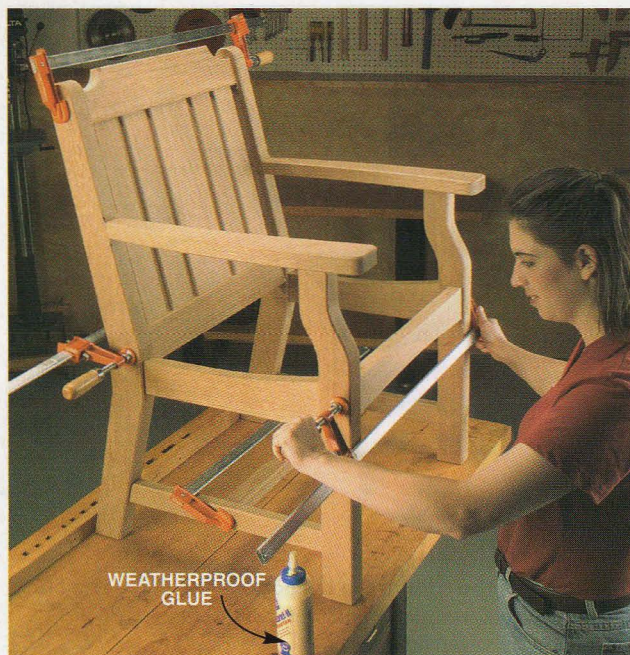
glue-up, give yourself some wiggle room by making the tenons slightly undersize (see Oops!, page 86). Then rely on your layout lines to position the slats when you glue the back assembly together (Photo 14). After clamping, measure the diagonals and make any necessary adjustments to make sure this assembly is square.



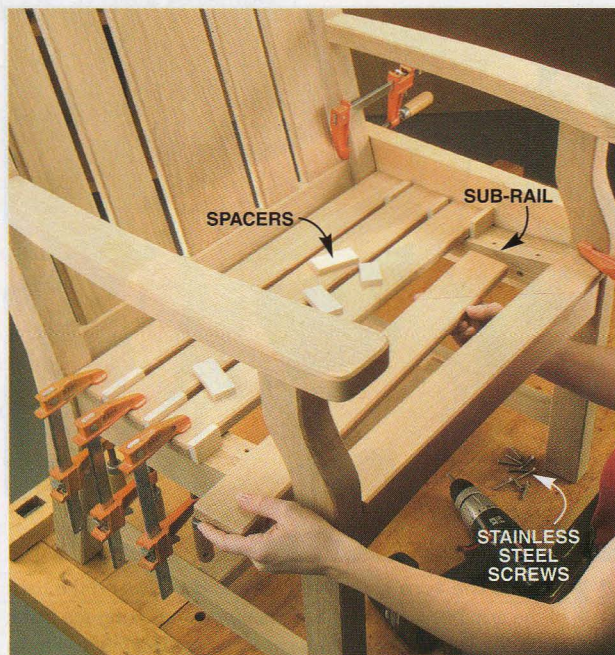
13 Glue the side assembly together standing up, so it's easy to clamp and clean glue squeeze-out. Center the clamps on the joints using angled blocks to direct pressure squarely on the angled joints.



14 Glue the back slats and rails. To keep the wide center slat from cracking, leave its outer tenons unglued.



15 Glue the frame together. To ensure even clamping pressure on all the joints, center your clamps, keep them level and tighten them sequentially, one twist at a time.



16 Install the seat slats, using spacers and a clamped-on board for alignment. Clamp the slats and fasten them from underneath, through predrilled, countersunk holes in the subrails.

Glue the Frame Together

Dry-fit the chair frame and clamp it together. Then determine the exact length of the center stretcher by measuring between the side stretchers. Cut it to fit.

Disassemble the chair and draw the shallow arch on the bottom of the front rail. Flex a yardstick or thin piece of scrap to use as a pattern. Bandsaw the arch and smooth it with the sanding drum.

Glue the chair frame together on a level surface (Photo 15). Use your layout lines to make sure all the rails are in position. After clamping, measure the inside diagonals of the seat opening to check for square.

Install the Seat

Make the seat subrails (M) and the seat slats (N and P). Screw the subrails to the seat rails. Glue and screw the front slat to the front rail, flush with the back edges of the legs. Then install the rest of the slats (Photo 16).

Oops!



My loose tenons were too tight!

My loose tenons fit the mortises perfectly, but gluing the back assembly, with its 14 tenons and 28 mortises, turned out to be a nightmare. By the time I spread glue on all the parts, the pieces wouldn't go together whether I clamped, hammered or prayed!

I didn't realize that, given the chance, water-soluble glue can make the wood expand enough to effect the way joints fit. I couldn't have worked any faster, so I should have made the tenons a bit thinner. A good rule of thumb for a lengthy assembly like this one is to test-fit the joints with paper wrapped around the tenons. This amount of tolerance (two thicknesses of paper) allows enough slack to get the assembly together, without seriously weakening the glue joints, as long as you remember to remove the paper!



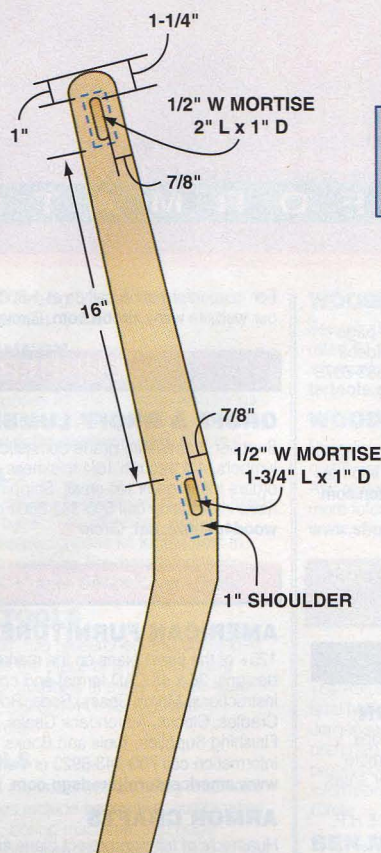
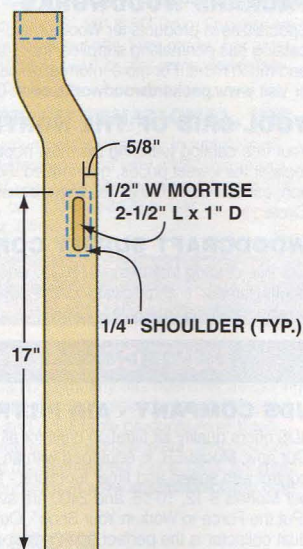


Fig. K Mortise Locations for Back Assembly and Front Rail



The Finish

White oak is rot resistant, but left unprotected, your chair will turn gray and may feel somewhat rough, because exposure to moisture will raise the grain. If it stays damp for extended periods, mildew can be a problem. You can get rid of mildew and restore the oak's natural color by treating it with a deck renewal product. Light sanding will smooth the surface.

We chose an outdoor oil finish (see Sources, below) because it makes the oak come alive with color. It also offers a layer of protection against the elements, including mildew. You should plan to apply (brush on/wipe off) several coats of this finish every year.

The most durable exterior finish is spar varnish, which also gives the oak a pretty color. It's a brushed-on, high-gloss finish that will last for several years without peeling or cracking. You'll have to sand it down before recoating. **AW**

CUTTING LIST		OVERALL DIMENSIONS 27-1/2" W X 25-1/2" D X 37-1/2" H		
PART	NAME	NUMBER	BLANK DIMENSIONS	FINAL DIMENSIONS
A	FRONT LEG	2	1-3/4" X 3-7/8" X 25-1/2" **	1-3/4" X 3-7/8" X 25-1/2"
B	BACK LEG	2	1-3/4" X 7-1/4" X 39" **	1/3/4" X 7" X 37"
C	SEAT RAIL	2	1-1/8" X 3-3/4" X 15" **	1-1/8" X 3-3/4" X 15"
D	SIDE STRETCHER	2	1-1/8" X 1-3/4" X 17-3/4" **	1-1/8" X 1-3/4" X CUT TO LENGTH
E	ARM	2	1-1/4" X 4-1/4" X 22" **	1-1/4" X 3-7/8" X 21"
F	CREST RAIL	1	1-1/8" X 4" X 22" **	1-1/8" X 4" X 22"
G	LOWER BACK RAIL	1		1-1/8" X 3" X 22"
H	FRONT SEAT RAIL *	1		1-1/8" X 3" X 22"
J	OUTER BACK SLATS	4		3/4" X 3" X 16"
K	CENTER BACK SLAT	1		3/4" X 5-1/2" X 16"
L	CENTER STRETCHER	1	1-1/8" X 1-3/4" X 23" **	1-1/8" X 1-3/4" X 22-5/8"
M	SEAT SUBRAIL	2		1-1/8" X 2-1/4" X 15"
N	SEAT SLATS	5		13/16" X 2-5/8" X 25-1/2"
P	FRONT SEAT SLAT	1		13/16" X 2-5/8" X 22"
Q	SEAT RAIL TENONS	4	1/2" X 2-1/4" X 24"	1/2" X 2-1/4" X 2-1/2" ***
R	SIDE STRETCHER TENONS	4	1/2" X 1-1/4" X 24"	1/2" X 1-1/4" X 2-3/4" ***
S	CENTER STRETCHER TENONS	2	USE SIDE STRETCHER TENON BLANK	1/2" X 1-1/4" X 2-1/8" ***
T	BACK ARM TENONS	2	1/2" X 3/4" X 24"	1/2" X 3/4" X 2-1/2" ***
U	FRONT ARM TENONS	2	1/2" X 1-3/4" X 24"	1/2" X 1-3/4" X 2" ***
V	CREST RAIL TENONS	2	1/2" X 2" X 24"	1/2" X 2" X 2" ***
W	LOWER BACK RAIL TENONS	2	USE FRONT ARM TENON BLANK	1/2" X 1-3/4" X 2" ***
X	FRONT RAIL TENONS	2	1/2" X 2-1/2" X 24"	1/2" X 2-1/2" X 2" ***
Y	BACK SLAT TENONS	10	3/8" X 2" X 24"	3/8" X 2" X 1-1/2" ***
Z	CENTER SLAT TENONS	4	3/8" X 5/8" X 24"	3/8" X 5/8" X 1-1/2" ***

* ARCHED BOTTOM EDGE RISES 1/2" AT CENTER ** BLANK MUST BE SQUARELY CUT *** CUT 1/16-IN. SHORT OF ACTUAL MEASURED LENGTH

Sources

Seven Corners Hardware
(651) 224-4859
www.7corners.com

1/2" x 2" straight bit (1/2" shank)
Bosch 85251M, \$25

3/8" x 1-1/4" straight bit
(1/2" shank)
Bosch 84207M, \$22

1/2" x 2" flush-trim bit
(1/2" shank)

Freud 42-116, \$32
1/4" round-over bit (1/2" shank)
Freud 34-120, \$35

Chamfering bit (1/2" shank)
Freud 40-114, \$41.

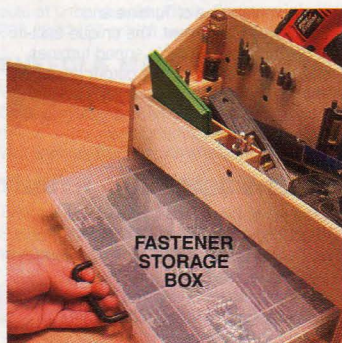
General Finishes
(800) 783-6050
www.generalfinishes.com

Outdoor Oil, qt., \$10, gal., \$27.

Drill Caddy

By Jan Carr

This drill caddy is compact, yet big enough to hold your cordless drill, an extra battery, and all the tools and fasteners you'll need for any installation project.



Our drill caddy features a holster for your cordless drill, a space for a drill index, magnetic bit holders and a removable storage box for fasteners.

Tired of rummaging around your shop to find what you need to hang a picture or put up a shelf? This drill caddy will stow your cordless drill, and neatly organize and store everything you need for any installation job. It's compact enough to fit on a 12-in.-deep shelf, and with the handle folded down, it's only 9-1/2-in. high.

The plastic storage box (see Sources, page 94) has movable compartments, and is a great way to store a full range of screws, wall anchors and picture hooks.

This caddy has a "holster" for your cordless drill, and plenty of space for an extra battery, hammer, torpedo level, screwdrivers and a drill index. The magnets hold extra drivers and bits for easy access.

Building the caddy is simple, with glued and nailed butt joints. We also made it modifiable: the middle partition and the drill holster are attached with screws, so you can easily reconfigure the storage compartments if your needs change.

For all your installation gear, you'll find this caddy beats a 5-gallon bucket hands down. It's more convenient, neater, and more compact. And it looks better, too!

Tools and Materials

To build this caddy you'll need a table-saw, a drill, a 2-in. hole saw or Forstner bit and a hacksaw. A bench grinder works great for rounding over the metal handle parts, but a file will also do the job. An air nailer and a miter saw are handy, but not essential.

The caddy is made from 1/2-in. Baltic birch plywood, a scrap of 1/4-in. plywood, a small strip of birch lumber, a birch dowel and common hardware items (see Cutting List, page 92, and Sources, page 94). The materials cost about \$35.

Saw Out the Parts

Cut the 1/2-in. Baltic birch parts (B through K) and the wood retainer strip (A) according to the Plywood Cutting Diagram (Fig. C) and the Cutting List.

Next, cut a 2-in. hole in the middle of the holster board (part G, Fig. A) with a hole saw or Forstner bit (see Sources, page 94). A 2-in. hole will accommodate most cordless drills, but check yours to make sure the hole is big enough.

Once the plywood parts are cut, give all the pieces a quick sanding, front and back. This caddy has a lot of inaccessible spots that are hard to sand once assembled.

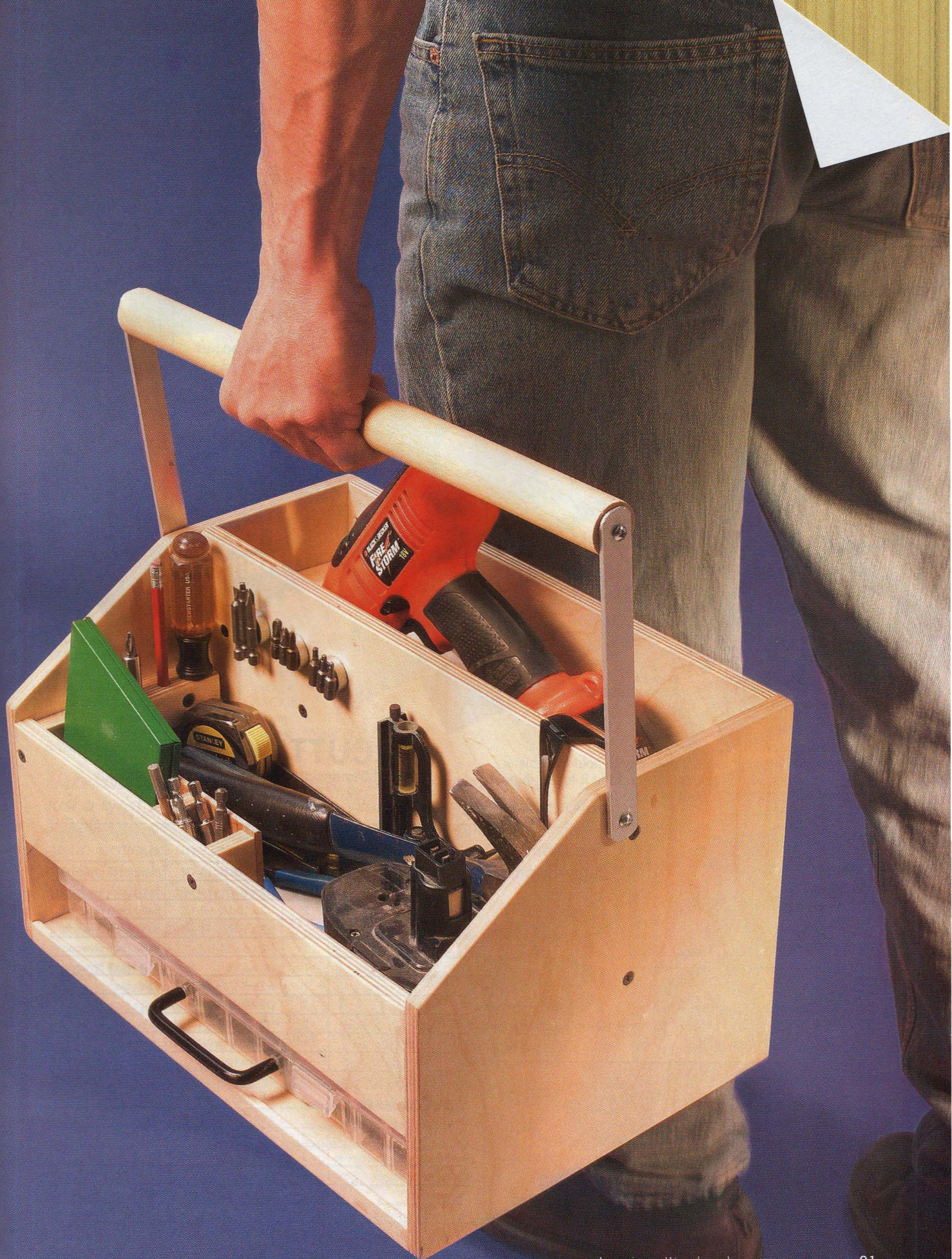


Fig. A
Exploded View

The primary wood in this drill caddy is 1/2-in. Baltic birch. Butt joints make assembly simple. The pull-out plastic storage box has movable compartments for storing screws and fasteners. The dowel handle folds down for easy storage.

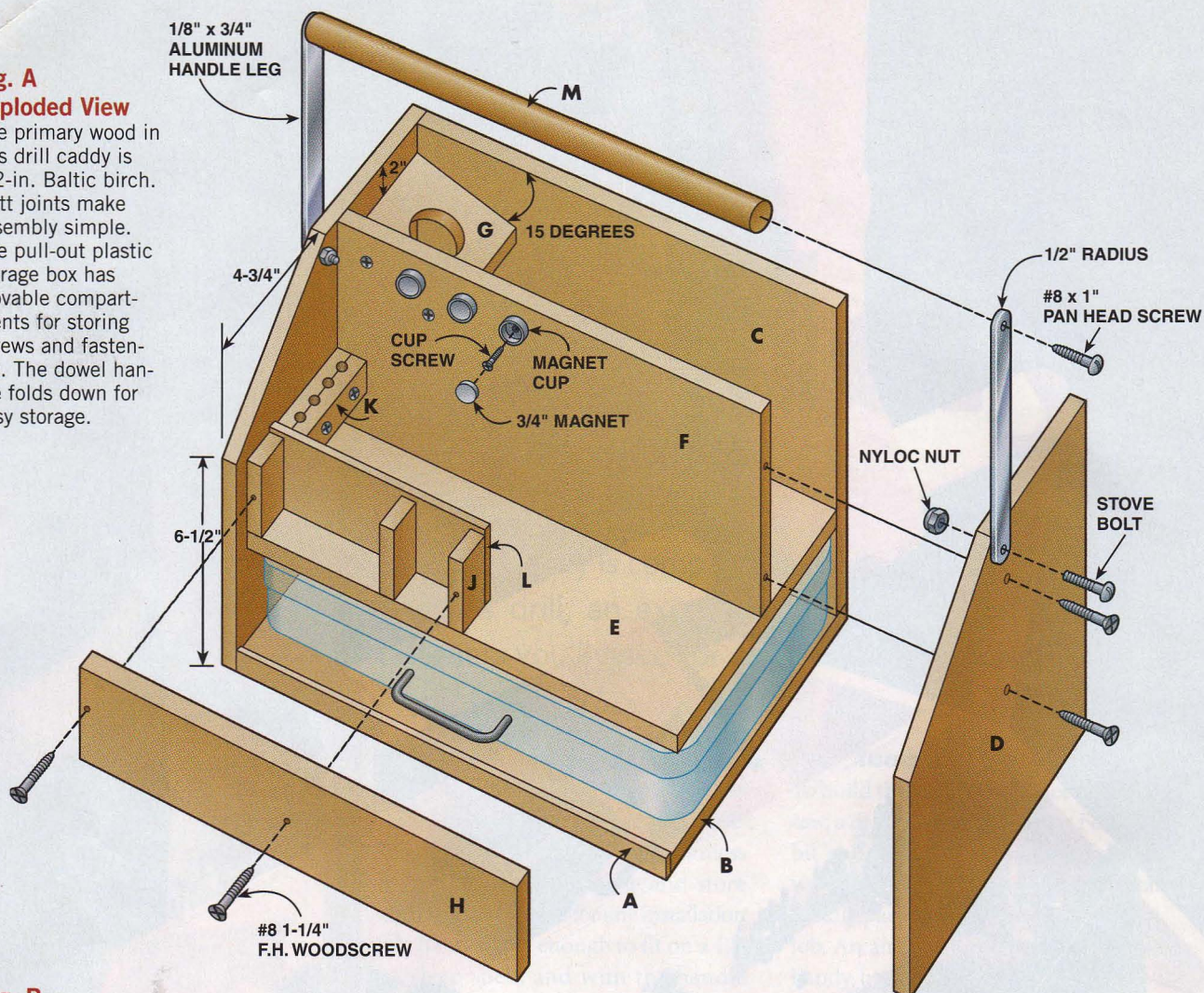


Fig. B
Angled Spacer Block

This temporary spacer is a fail-safe way to hold the holster block in position while drilling and screwing it to the middle partition and back. You'll need to make two.

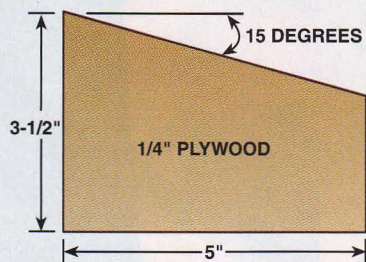
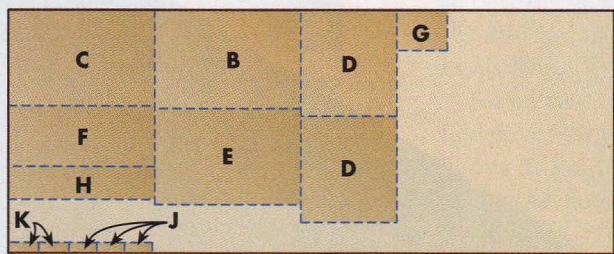


Fig. C
Plywood Cutting Diagram

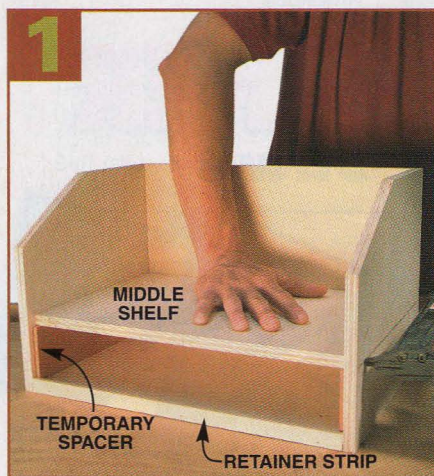
It only takes one 24-in. x 60-in. sheet of Baltic birch to make the main parts for this caddy.



CUTTING LIST

Overall Dimensions (with handle folded down):
9-1/2"H x 16"W x 11-3/4"D

Part	Name	Qty.	Dimensions in "	Material
Case				
A	Retainer strip		1/4 x 5/8 x 14-1/2	Birch
B	Bottom shelf	1	1/2 x 9-3/4 x 14-1/2	Baltic birch plywood
C	Back	1	1/2 x 9-1/2 x 14-1/2	Baltic birch plywood
D	Ends	2	1/2 x 10-1/2 x 9-1/2	Baltic birch plywood
E	Middle shelf	1	1/2 x 9-1/2 x 14-1/2	Baltic birch plywood
F	Center partition	1	1/2 x 6 x 14-1/2	Baltic birch plywood
G	Holster board	1	1/2 x 4 x 5	Baltic birch plywood
H	Front side	1	1/2 x 3-1/4 x 14-1/2	Baltic birch plywood
J	Dividers	3	1/2 x 1 x 2-3/4	Baltic birch plywood
K	Driver bit holder	2	1/2 x 1 x 3-3/4	Baltic birch plywood
L	Small partition	1	1/4 x 2-3/4 x 7-1/2	Plywood
M	Handle	1	1-1/8 x 15-9/16	Wood dowel
Hardware				
	Aluminum handle legs	2	1/8 x 3/4 x 7-1/2	
	Stove bolts with lock nuts	2	#10-24 x 1	
	Nyloc nuts	2	#10-24	
	Pan head sheet metal screws	2	#8 x 1	
	Plastic storage box	1	2 x 9 x 14	
	Cabinet pull	1	3-1/2	
	Pan head machine screws	2	#8-32 x 1/2	(use with cabinet pull)



Glue and nail the middle shelf in place. The temporary spacer boards make it easy to accurately position the shelf.

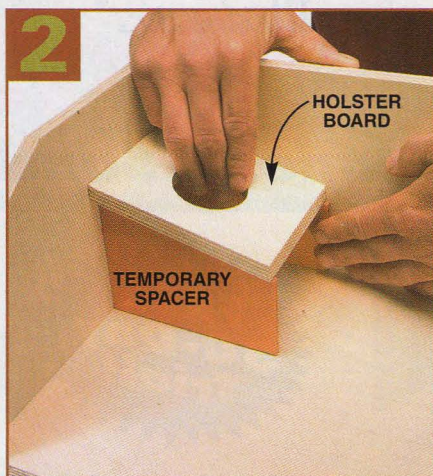
Assemble the Box

Glue and nail the retainer strip (A) to the front edge of the bottom shelf (part B, Fig. A). This strip keeps the storage box from accidentally sliding out. Then glue and nail the back (C) to the bottom and add the ends (D). Cut two temporary spacer boards to position the middle shelf (E) 2-1/2 in. above the bottom shelf. Glue and nail the middle shelf into place (Photo 1).

Make the temporary spacers out of 1/4-in. material so they can be easily flipped on their sides for removal. Thicker material will jam and the retainer strip prevents the spacers from being pulled straight out.

Mount the Drill Holster

The center partition (F) and holster board (G) are screwed in place without glue. This makes them easy to remove if you ever



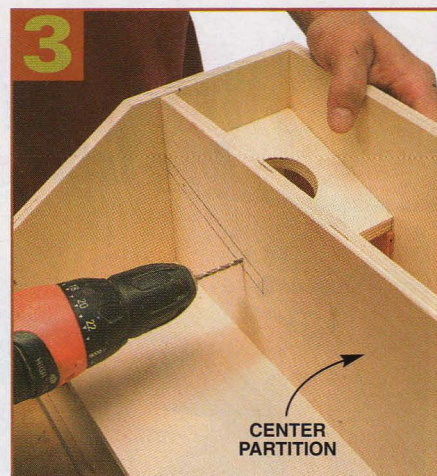
Position the holster board using angled temporary spacer boards. Experiment to find the best position for your drill.

want to change the storage compartments.

Use angled temporary spacer blocks to position the holster board (Fig. B and Photo 2). Once the center partition (F) is in position, drill pilot holes into the holster board (Photo 3). Now drill the holster board through the back (C). Screw the holster in place and remove the spacer blocks. Drill pilot holes through the ends (D) into the center partition and add screws (Fig. A). Then glue and nail the front (H) in place.

Install the Drill Bit Storage Bins

Glue and nail the small partition (L) to the three dividers (J) to create storage bins for a drill index and miscellaneous bits and drivers. Use two screws to attach the dividers to the front of the caddy. Skip the glue here as well.



Drill pilot holes through the center partition into the holster board. Do the same through the back. Then screw the holster board in place.

Next, glue two pieces of 1/2-in. Baltic birch plywood together to form the driver bit holder (K). When the glue is dry, drill four evenly spaced 5/16-in. holes. Mount the holder to the end of the caddy with two screws and no glue. Install the magnets (see Sources, below left) on the center partition (F). The magnets are perfect for holding extra driver bits.

Attach the Folding Handle

The legs of the folding handle are made from aluminum bar stock (see the Cutting List and Sources). Cut the legs to length, then round the ends on a grinder or with a file and drill 3/16-in. holes in the center, 1/2 in. from both ends (Fig. A). Attach the legs to the caddy sides with stove bolts, using Nyloc nuts (see Sources), so they won't work loose when the handle is folded up and down. The dowel is cut 1/16 in. longer than the length of the caddy, which spreads the handle legs just enough to prevent them from binding on the ends of the caddy. Use the pan head screws to attach the legs to the dowel handle.

Final Touches

To complete the drill caddy, putty the nail holes, give it a final sanding and put on a couple coats of wipe-on oil. While it's drying, add the cabinet pull to the plastic storage box. You're now ready to load up your caddy and go to work. **AW**

Sources

Cabela's
(800) 237-4444
www.cabelas.com
Plano plastic storage box, model 3700,
#ID-010237, \$4 ea.

Lee Valley Tools Ltd.
(800) 871-8158
www.leevalley.com
3/4" rare-earth magnets,
#99K32.11, \$6 pkg. of 5
3/4" cup for magnet,
#99K32.54, \$1.15 ea.

2" hole saw, 99J02.32, \$7.20
2" Forstner bit, 06J01.32, \$7.90.

Woodworker's Source
(800) 423-2450
www.woodworkerssource.net
1/2" Baltic birch, \$15.50 per 2' x 5' sheet.

Home Center or Hardware Store
#10-24 Nyloc nuts, 16¢ ea.
Aluminum bar stock 1/8" x 3/4" x 2', \$3 ea.
Cabinet pull, \$3 ea.

Oops!

Edited by **Tim Johnson**

If the Shoe Fits...

One morning as I raced off to work, I noticed that my shoe's inner-sole liner was loose and bunched up under my toes. Late and in a hurry, I pulled the liner out, grabbed my trusty polyurethane glue off my workbench and slathered some on. I slid the liner back in and put my shoe back on. Great!—no more sliding.

At the end of a long day, I was ready to kick off my shoes and relax. But—you guessed it—one shoe didn't want to come off! The glue had seeped through the liner's ventilation holes and securely anchored my foot.

When I finally did manage to wrench my foot free, most of my sock stayed behind. I spent the next 45 minutes peeling glue from my foot.

Michael C Borgeest



Spring-Apart Glue Joint

A co-worker asked me to build an enclosure for a large hot-water-heat radiator in her home. The top was so long and wide, I decided to use biscuits to align the boards for gluing.

After cutting the slots with my plate joiner, I applied glue and installed #20-size biscuits. I should have realized something was amiss right away because it was really hard to draw the boards together. But it had been raining (four straight days!) and I assumed the

biscuits had swelled a bit from the humidity.

Several hours later I removed the clamps, and...BOING!!! The joints instantly snapped back open.

I couldn't figure out what I'd done wrong until I checked the setting on my plate joiner. Sure enough, it was set to cut slots for smaller #10-size biscuits. I'd squished #20-size biscuits into #10-size slots.

John Politano

If you have a woodworking blunder you're willing to share, send it to us. You'll receive \$100 for each one we print. Send to: **AW Oops!, American Woodworker, 2915 Commers Drive, Suite 700, Eagan, MN 55121, or e-mail to oops@readersdigest.com.** Submissions can't be returned and become our property upon acceptance and payment. We may edit submissions, and use them in all print and electronic media.

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