

13 IDEAL DOVETAIL TOOLS **8 Handy Shop Projects**

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**Craft a Custom Cabinet
for 115 Finishing Supplies**



**Flip Your Mortiser
180°**



**Air Power
Blade Tensioning**

**Weekend Project:
Sawhorse/Bench Combo**

**Carry This Bench
ANYWHERE**



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LIMIT 1 - Save 20% on any one item purchased at our stores or HarborFreight.com or by calling 800-423-2567. *Cannot be used with other discount, coupon, gift cards, inside Track Club membership, extended service plans or any of the following: compressors, generators, tool storage or carts, welders, floor jacks, Towable Ride-On Trencher (Item 65162), open box items, in-store event or parking lot sale items. Not valid on prior purchases after 30 days from original purchase date with original receipt. Non-transferable. Original coupon must be presented. Valid through 7/18/14. Limit one coupon per customer per day.



57743613

SCISSOR SUPER COUPON!

\$5.99 VALUE **FREE** WITH ANY PURCHASE

PITTSBURGH 1" x 25 FT. TAPE MEASURE

LOT NO. 47737/69080/69030/69031

Item 47737 shown

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87241522

OR SCISSOR SUPER COUPON!

\$6.99 VALUE **FREE** WITH ANY PURCHASE

3-1/2" SUPER BRIGHT NINE LED ALUMINUM FLASHLIGHT

ITEM 65020/69111/69052

Item 65020 shown

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44336517

Experts Agree Harbor Freight WINS in QUALITY and PRICE

60" WORKBENCH WITH FOUR DRAWERS

WINDSOR DESIGN

LOT NO. 93454/69054

Item 93454 shown

SAVE \$110

\$139.99

REG. PRICE \$249.99

12420248

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US★GENERAL PRO 26", 8 DRAWER ROLLER CABINET WITH 8 DRAWER TOP CHEST

LOT NO. 67831/61609

Item 67831 shown

• 830 lb. Capacity

SAVE \$200

\$299.99

REG. PRICE \$499.99

18169441

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10" SLIDING COMPOUND MITER SAW

CHICAGO ELECTRIC POWER TOOLS

LOT NO. 98199/61307

Item 98199 shown

SAVE \$120

\$79.99

REG. PRICE \$199.99

15934225

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3 GALLON, 100 PSI OILLESS PANCAKE AIR COMPRESSOR

CENTRAL PNEUMATIC

LOT NO. 61615/95275/69486/60637

Item 95275 shown

SAVE 50%

\$39.99

REG. PRICE \$79.99

90823374

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14" OSCILLATING SPINDLE SANDER

CENTRAL MACHINERY

LOT NO. 69257/95088

Item 69257 shown

SAVE \$60

\$89.99

REG. PRICE \$149.99

44200779

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7 FT. 4" x 9 FT. 6" ALL PURPOSE WEATHER RESISTANT TARP

HFT

LOT NO. 877/69137/69249/69129/69121

Item 877 shown

SAVE 66%

\$2.99

REG. PRICE \$8.99

19238166

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500 LB. CAPACITY STEEL CARGO CARRIER

HaulMaster

Item 66983 shown

LOT NO. 66983/69623

SAVE \$50

\$49.99

REG. PRICE \$99.99

99064635

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2 HP FIXED BASE ROUTER

drillmaster

★WINNER★ Best Buy Award The Family Handyman

LOT NO. 68341

SAVE 35%

\$44.99

REG. PRICE \$69.99

86009305

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RETRACTABLE AIR/WATER HOSE REEL WITH 3/8" x 50 FT. HOSE

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LOT NO. 93897/69265

Item 93897 shown

SAVE \$70

\$59.99

CENTRAL PNEUMATIC

\$89.99

REG. PRICE \$129.99

21866245

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18 VOLT CORDLESS 3/8" DRILL/DRIVER WITH KEYLESS CHUCK

drillmaster

Includes one 18V NiCd battery and charger.

Item 68239 shown

LOT NO. 68239/69651

SAVE 54%

\$15.99

REG. PRICE \$34.99

86628877

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6.5 HP (212 CC) OHV HORIZONTAL SHAFT GAS ENGINES

PREDATOR ENGINES

LOT NO. 68120/60363/69730

LOT NO. 69727 CALIFORNIA ONLY

Item 68120 shown

SAVE \$80

\$99.99

REG. PRICE \$179.99

19732181

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SUPER COUPON!

PITTSBURGH AUTOMOTIVE

• Weighs 74 lbs.

LOT NO. 68048/69227/62116

RAPID PUMP® 3 TON HEAVY DUTY STEEL FLOOR JACK

Item 68048 shown

SAVE \$90

\$69.99

REG. PRICE \$159.99

36419837

SUPER COUPON!

CENTRAL PNEUMATIC 18 GAUGE 2-IN-1 NAILER/STAPLER

LOT NO. 68019/61661

Item 68019 shown

SAVE 56%

\$15.49

REG. PRICE \$35.99

56144699

WE CARRY A FULL LINE OF FASTENERS!

SUPER COUPON!

CENTRAL MACHINERY 4" x 36" BELT/6" DISC SANDER

LOT NO. 97181/93981

Item 97181 shown

SAVE \$42

\$57.99

REG. PRICE \$99.99

69960467

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SUPER COUPON!

6" DIGITAL CALIPER PITTSBURGH

Item 47257 shown

LOT NO. 47257/61585

SAVE 66%

\$9.99

REG. PRICE \$29.99

92928145

Includes two 1.5V SR44 button cell batteries.

SUPER COUPON!

8" x 12" BENCH TOP WOOD LATHE CENTRAL MACHINERY

LOT NO. 95607

SAVE \$50

\$99.99

REG. PRICE \$149.99

84566953

SUPER COUPON!

3 PIECE TITANIUM NITRIDE COATED HIGH SPEED STEEL STEP DRILLS

• Drill 28 Hole Sizes

Item 91616 shown

LOT NO. 91616/69087/60379

SAVE 60%

\$7.99

REG. PRICE \$19.99

14196378

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SUPER COUPON!

8", 5 SPEED BENCH MOUNT DRILL PRESS CENTRAL MACHINERY

LOT NO. 44506/60238/38119

Item 60238 shown

SAVE \$45

\$54.99

REG. PRICE \$99.99

78520870

SUPER COUPON!

2 HP INDUSTRIAL 5 MICRON DUST COLLECTOR CENTRAL MACHINERY

Item 97869 shown

LOT NO. 97869/61790

70 Gallon Capacity

SAVE \$100

\$149.99

REG. PRICE \$249.99

73478816

SUPER COUPON!

4000 PEAK/3200 RUNNING WATTS 6.5 HP (212 CC) GAS GENERATORS

• 70 dB Noise Level

PREDATOR GENERATORS

Item 68528 shown

LOT NO. 68528/69676/69729

SAVE \$200

\$299.99

REG. PRICE \$499.99

35331832

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SUPER COUPON!

DOVETAIL MACHINE CENTRAL MACHINERY

LOT NO. 34102

SAVE 28%

\$24.99

REG. PRICE \$34.99

63188958

SUPER COUPON!

POWDER-FREE NITRILE GLOVES PACK OF 100

• 5 Mil. Thickness

Item 68498 shown

LOT NO. 68496/61363

YOUR CHOICE!

\$6.29

REG. PRICE \$10.99

18182033

SUPER COUPON!

ELECTRIC PAINT SPRAY GUN KRAUSE & BECKER

LOT NO. 60446/47274

Item 60446 shown

SAVE 70%

\$14.99

REG. PRICE \$49.99

81719734

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SUPER COUPON!

14" FOUR SPEED WOODWORKING BAND SAW CENTRAL MACHINERY

LOT NO. 60564/67595/68835

Item 60564 shown

SAVE \$130

\$329.99

REG. PRICE \$459.99

25701695

SUPER COUPON!

1.5 CUBIC FT. SOLID STEEL DIGITAL FLOOR SAFE

Item 91006 shown

LOT NO. 91006/61565

SAVE \$50

\$124.99

REG. PRICE \$149.99

45644547

SUPER COUPON!

12" RATCHET BAR CLAMP/SPREADER PITTSBURGH

LOT NO. 46807/68975/69222/69221/62123

Item 69222 shown

SAVE 66%

\$1.99

REG. PRICE \$5.99

13177972

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SUPER COUPON!

BADLAND 2500 LB. ELECTRIC WINCH WITH WIRELESS REMOTE CONTROL

Item 61258 shown

LOT NO. 68146/61258/61297/61840

SAVE \$70

\$49.99

REG. PRICE \$119.99

53907173

SUPER COUPON!

Bunker Hill Security 36 LED SOLAR SECURITY LIGHT

Item 69644 shown

LOT NO. 69644/98085/69890/60498

SAVE 33%

\$19.99

REG. PRICE \$29.99

43625447

SUPER COUPON!

CHICAGO ELECTRIC WELDING 90 AMP FLUX WIRE WELDER

Item 68887 shown

LOT NO. 68887/61207/61849

SAVE \$50

\$99.99

REG. PRICE \$149.99

19890926

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A clever joint locks the top and base into a rock-solid unit.

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AMERICAN WOODWORKER

#171, April/May 2014

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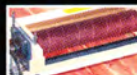
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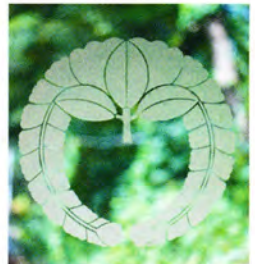
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Workshop Tips

Clever Ideas From Our Readers

Terrific Tip!

Accurate Angled Holes

ACCURATELY DRILLING an angled hole by hand is a challenge—particularly if you're using a brad point bit or Forstner bit. This angled drilling guide keeps the bit from wandering as it enters the stock. The guide can be cut at any angle, and its alignment marks provide dead-on accuracy.

To make the drilling guide, start with a piece of hardwood about 2" x 2" and at least 12" long. Make sure it's perfectly square. Mark centerlines around all four faces and both ends. Drill all the way through the block using a drill press, then rip the desired angle on a tablesaw, saving the offcut. Trim the block to a shorter length, if needed. Cut two pieces from the angled offcut and glue them onto the drilling guide as shown. These pieces create parallel sides on the guide block, which makes clamping easier.

To use the drilling guide, mark crosshairs on your workpiece that intersect where you want the hole centered. Line up the marks on the guide with the marks on your workpiece, clamp the guide in place, and drill away.

Richard Helgeson

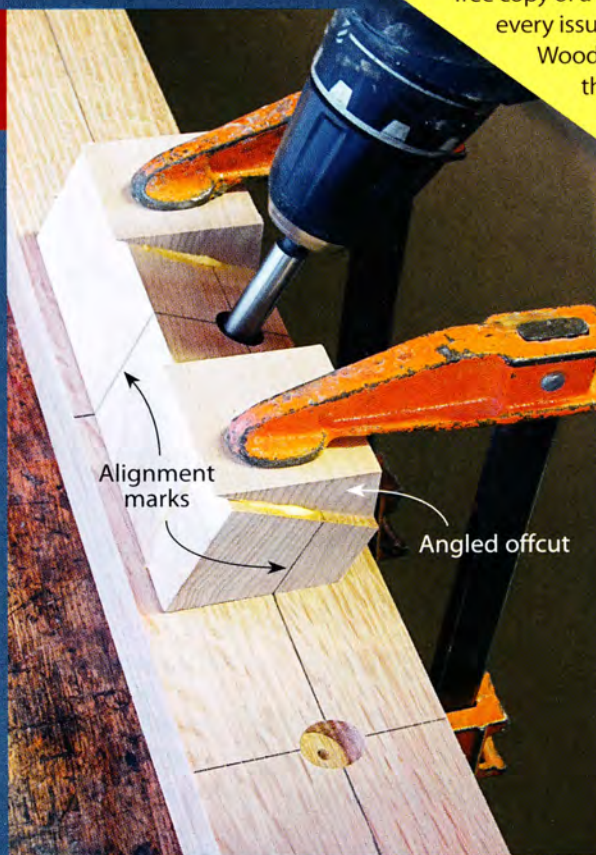


PHOTO COURTESY OF CONTRIBUTOR

Sanding Strip Organizer

I CUT STRIPS from full sheets of sandpaper for pen turning. Naturally, some of the strips don't have the grit information on them. I used to just clip the stacks of strips in clothespins marked with the grit sizes. I've improved on this system by building an organizer that allows me to easily see when I run out of certain grits. Plastic conduit tubes hold unused strips; clothespins fastened on the organizer hold used sandpaper that still has some life left in it.

Charles Mak



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Lee Valley

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PHOTO COURTESY OF CONTRIBUTOR

Easy Through-slots

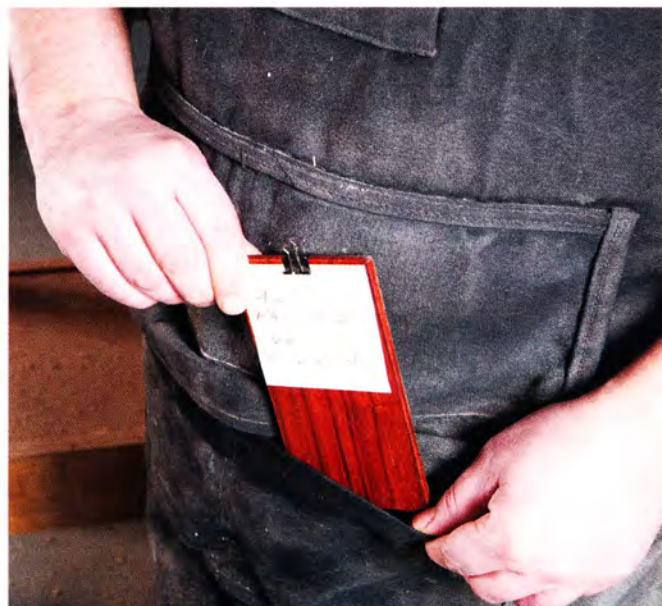
MAKING THROUGH-SLOTS without a router may sound tricky, but it couldn't be easier. In the days before I could afford a router, I made through-slots by gluing up scraps instead.

Here's how to do it. Cut some pieces of wood the same width as your desired slot. Cut these slot spacers to length and then glue them between two outer boards.

This method is so simple that even after I purchased a router, I never used it to make through-slots. It's a great way to use up scraps. Also, slot widths aren't dependent on any particular bit size. You can make them any width you need.

The photo shows one of my favorite applications for through-slotted boards: adjustable workbench legs. If your shop's floors are uneven like mine, adjustable legs are essential. A wiggly workbench is unbelievably annoying.

John Cusimano



Pocket-size Clipboard

CARRYING A SHORT CUTTING LIST to the saw is a habit I learned long ago. I used to jot a few numbers down on a block of wood or piece of paper, then stuff it into my apron pocket. Rather than hunt around for fresh blocks or clean paper, I once tried using a small spiral notebook. No go—the notebook ended up getting rumpled and torn to the point where it was no longer usable.

My solution is this little shop-made clipboard. It's made from a bright-colored hardwood—cocobolo, in this case—so it's always easy to spot when I set it down. My clipboard is 1/4" x 3-1/4" x 6-3/8"—perfect for holding one or two 3" x 3" sticky notes. I keep a block of sticky notes in my bench's tool tray, ready to use at any time.

With this system, I attach a fresh page for each session at the saw. If I need to hang on to a sticky note for a while, I add a metal clip to insure that the paper doesn't accidentally fall off the clipboard.

Tom Caspar



PHOTO COURTESY OF CONTRIBUTOR

Curve Crossbow

MARKING CURVES using a piece of flexible material presents a challenge unless you have three hands. This device eliminates the need for that third hand. The bow is a strip of composite decking 1/8" x 1" x 12". It's notched at both ends to attach the string and has a hole in the center. The hole slips over a finish nail in the stock's end so the bow doesn't slip off. The stock has 1/4" deep kerfs, spaced 1/4" apart.

To use, pull back on the string and drop it into any notch to make the curve that you want. Drill extra holes along the bow's length to make asymmetrical curves.

Phil O'Rourke



Equal-space Rule

MARKING EQUAL DIVISIONS on parts isn't always straightforward when it comes to dividing odd lengths. Quick—what's $1/5$ of $9-3/16$? On a recent trip to my local office supply store, I found a drafting tool that has become a valuable addition to my shop: a 12" triangular engineer's scale. (Be sure you buy an *engineer's* scale, not an architect's scale.)

An engineer's scale has six edges, with a different scale on each edge. The scale marked "10" is full size, the "20" scale is half size, the "30" scale one-third size, and so on down to "60." The units are in $1/10$ gradations.

Initially, I used the ruler to find the center of a part by measuring the

part's length and then using the half size scale to find the center point. This worked great. Then I realized I could also use the ruler to divide a line into as many as six equal lengths. This works really well for laying out fasteners, dowels and inlays.

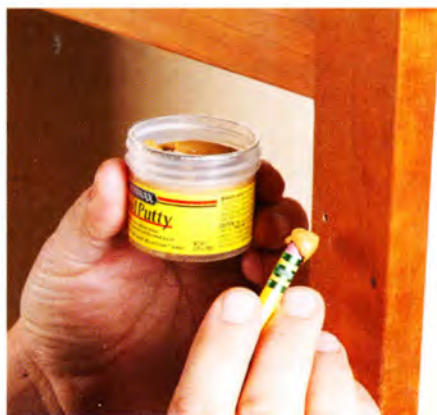
Here's how it works. If I had a 7" long board and wanted to divide it into three equal lengths, I'd use the "30" scale and make marks at 7 and 14—increments of seven. (The end of the board would automatically line up with the 21 mark.) If I wanted to divide an $11-1/2$ " line into five equal segments, I'd use the "50" scale and mark off at $11-1/2$ " increments.

Bill Wells

No-mess Putty Applicator

APPLYING PUTTY with your finger works great, but it's messy. Instead of using my finger, I just stick a blob of putty on a pencil eraser. It works great, and my finger stays clean!

Dick Schlickman



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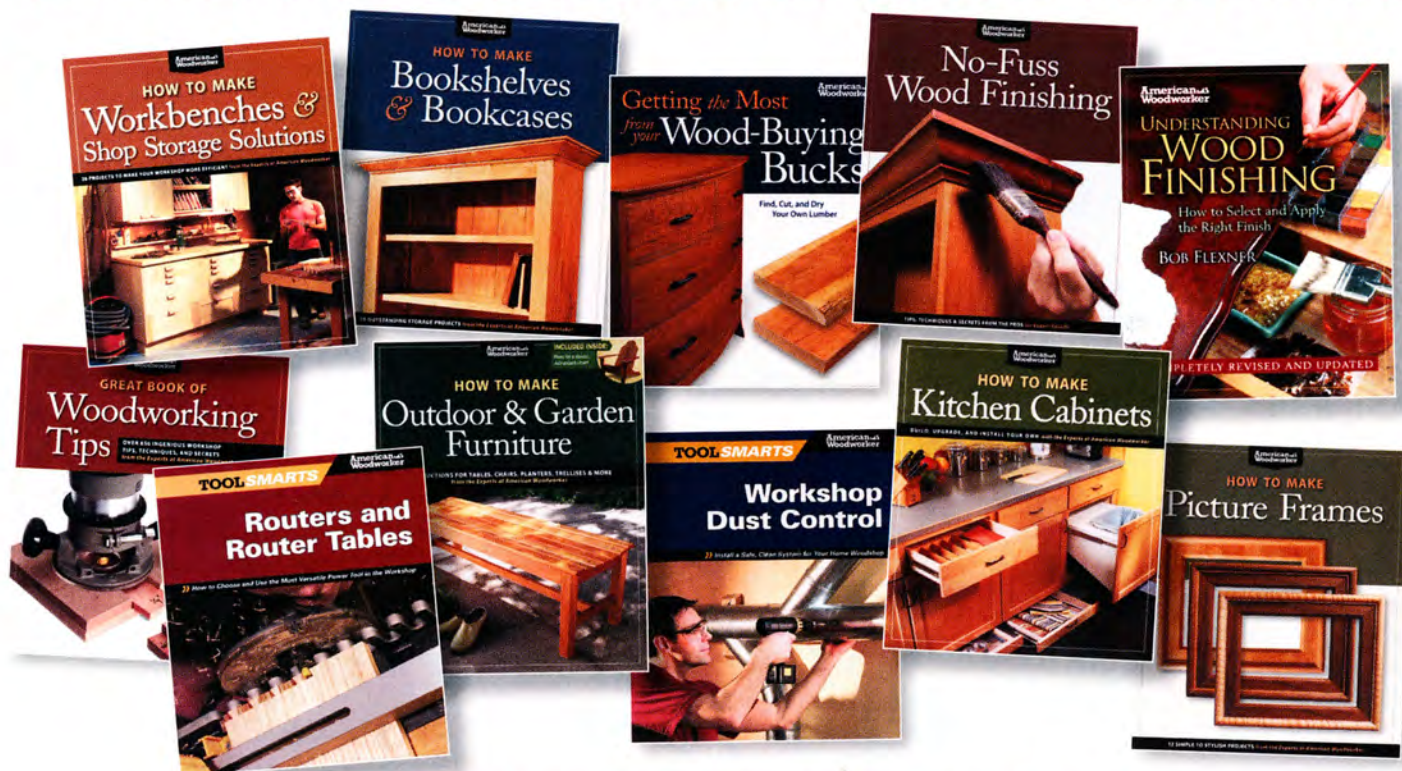
IRONING EDGE BANDING that has hot-melt glue backing is familiar to most woodworkers. But what if you don't have any iron-on edge banding on hand, or it's not available in the wood species you're using? I learned this trick from a friend of mine who is a veneering expert. You can make iron-on banding using regular wood glue if you plan ahead a bit.

First, cut your veneer into whatever size strips you need, then apply a liberal coat of wood glue to the back surface. When the glue on the strips has thoroughly dried, apply fresh glue to the part receiving the edge banding and iron the strip onto the workpiece. The fresh glue and heat from the iron re-activates the dried glue just enough to make it stick as though it were hot-melt glue; no clamping required.

Richard Tendick



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Tablet Tripod

I USE MY TABLET in the shop all the time. I keep project plans, cutting lists and other pertinent information in its memory. I also use it to video chat with other woodworkers when I want to show them a project or ask them a question. I needed a place to keep my tablet close at hand yet out of the way, so when I saw this old camera tripod, my wheels started turning.

I made an easel from a leftover piece of laminate flooring. A short strip of quarter-round acts as a ledge to keep the tablet from sliding off the easel. I fastened a raised tab that fits my tripod's locking mechanism to the back side of the easel (left). Now I can put my tablet anywhere I need it, and it's not taking up any valuable bench space.

Gary Wilson



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Workshop Tips

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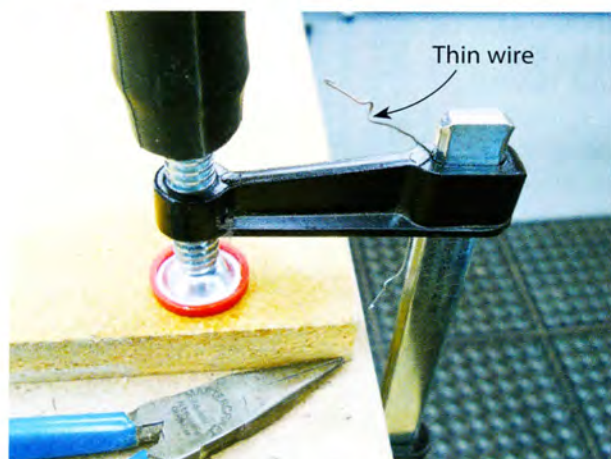


PHOTO COURTESY OF CONTRIBUTOR

Bar Clamp Fix

A BAR CLAMP can wear out over time. Usually, it's because the ridges on the bar get worn down. When this happens, the clamp loses its grip, rendering it useless. Just one worn spot on a bar can be very annoying.

So why not just go buy a new clamp? Well, I'm a little too frugal for that. Since I couldn't bring myself to throw away a worn clamp, I started looking for a solution.

First, I tried slipping a toothpick between the bar and the sliding jaw. Even though that worked great, the toothpick was destroyed each time I used the clamp. Since I didn't want to keep a supply of toothpicks on hand, I scrapped that idea. Then I tried using a short length of wire instead of a toothpick: problem solved! I'll be able to get many more years of use out of my "worn-out" clamp.

Serge Duclos



1



2

PHOTO COURTESY OF CONTRIBUTOR

Bit Spacer

WHEN INSTALLING A ROUTER BIT, I've always heard that you should leave a little space between the collet and the bit's head. I find this is especially hard to do when the router is installed in a router table. With a wrench in each hand—one of which is under the table—I don't have another hand available to position the bit while tightening the collet. I solved this problem by making a simple tool from a short piece of 10 gauge copper wire.

Bend the wire as shown (**Photo 1**). When installing a bit, place the wire tool on the collet, drop in the bit and tighten the collet (**Photo 2**). As you finish tightening, the collet nut drops down slightly, allowing the tool to be easily removed.

Fred Burne

Krud Kutter

RESIN BUILD-UP on saw blades makes them less effective. A clean blade runs cooler, doesn't cause burning on your workpiece, stays sharp longer and cuts more accurately. Cleaning blades is a chore, however, so I'm always on the lookout for ways to make it easier.

Krud Kutter Cleaner/Degreaser seems to remove resin buildup pretty easily. Even though Krud Kutter is biodegradable and nontoxic, the manufacturer still recommends that you wear gloves when you use it. Just spray it on, let it soak for a minute, and then wipe it off. Tough deposits may take a couple applications and some elbow grease. Krud Kutter Cleaner/Degreaser is available at hardware stores and home centers.

Brad Holden

SOURCE:

Krud Kutter, krudkutter.com, 800-466-7126, Cleaner Degreaser, 32 oz./\$12.



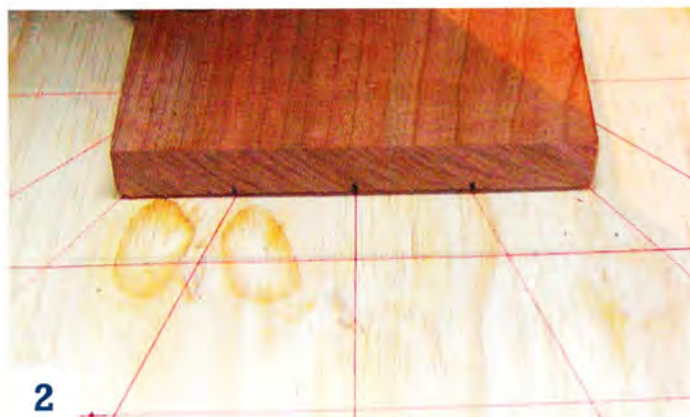
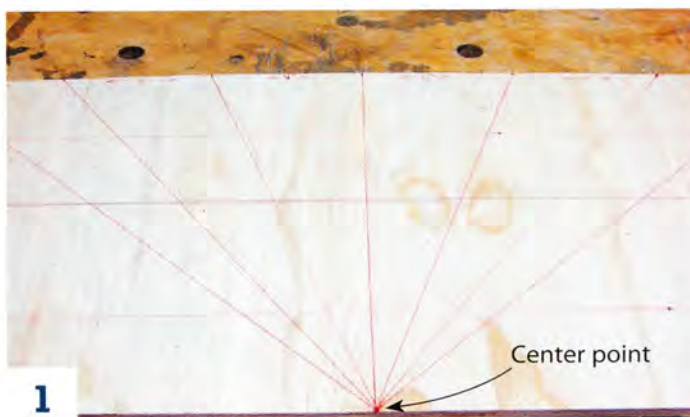
Dovetail Marking Fan

WHEN LAYING OUT DOVETAILS, I always start by marking the centers of the pins (or tails) so the distance between them is approximately the same. I came up with this trick that allows me to quickly position any number of equally spaced pins without the use of a ruler. I marked a piece of plywood that's about 36" x 24" with a fan-shaped series of lines to use as a spacing board.

To make the pattern, first mark the center point of one of the spacing board's long sides. On the opposite long side, make a mark every 3". Draw lines connecting all of those marks to the center point (**Photo 1**).

To mark pins or tails, slide your workpiece over the fan shape until the desired number of lines intersects the corners of the board (**Photo 2**). Mark one of these intersections, then draw a line across the length of the spacing board parallel to the board's long sides. Make marks on your workpiece opposite the fan lines and you're all set.

Alejandro Balbis



PHOTOS COURTESY OF CONTRIBUTOR

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Craftsman Gravity Stand

MOBILE TOOLS are one of the keys to working efficiently in a small shop or at a jobsite. Mounting a heavy miter saw on a tall stand with wheels sure makes sense, and here's a nice one. The new Quick Lift Gravity Stand from Craftsman is easy to operate and sturdy; it'll hold up to 330 lbs. Best of all, it's at a price point that's relatively easy on your wallet.

Folding stands similar to this one have been on the market for a while. I've used several different brands, and they all seem to work similarly. With the push/pull of a lever, they just kind of pop into position with no heavy lifting. They make easy work of moving and storing a large miter saw.

In the folded position, you can tuck the Gravity Stand away in a corner when you're not using it. It'll stand on end either with or without the saw mounted. The stand is 35" tall and 35" wide excluding the adjustable support rollers. In use, it feels solid and stable. The stand's large, 8" dia. wheels make it easy to wheel over most any terrain. The Gravity Stand includes two universal mounting brackets. According to the manufacturer, the brackets accommodate all major sliding and compound miter saws. The brackets feature a quick release mechanism, so you can easily remove the saw from the stand if needed.

Craftsman's Gravity Stand weighs 55 lbs. and comes standard with support rollers, which extend 45" to both the right and left. The rollers' height is adjustable, and they feature integrated flip stops for repeat cuts.

SOURCE

Craftsman, craftsman.com, 800-349-4358, Quick Lift Gravity Stand, #3760, \$200.



PHOTOS BY JASON ZENTNER



PHOTO BY JASON ZENTNER

Crack Repair

DRY, CRACKED HANDS are the bane of many woodworkers, particularly during the cold, dry months in northern climates. If this sounds familiar, and you haven't yet discovered O'Keeffe's Working Hands, you owe it to yourself to try it out.

I'm not exactly a hand-cream connoisseur, but my hands used to get pretty dry and chapped in the winter. After using O'Keeffe's Working Hands for the past year, dry hands are no longer an issue. A little dab at the first sign of dryness, and then a bit more every few days is all it takes. One 3.4 ounce tub has lasted me more than a year.

SOURCE

O'Keeffe's Company, okeeffescompany.com, 800-275-2718, Working Hands, 3.4 oz., \$8.



Are Pants Also Tools?

STRICTLY SPEAKING, NO, they're not. But these Fire Hose Work Pants from Duluth Trading Co. are as at-home in the shop as any of my tools. The "Fire Hose" name comes from the fact that they're made with the same heavy 11.5 oz. cotton canvas that's on the outside of a fire hose. In other words, they're super-rugged and made to take serious abuse; they're also really comfortable.

I've been using a pair for a few months, and they seem to stand up really well to the rigors of shop work. The great thing is, if they don't, there's a lifetime guarantee. That's right; Duluth Trading will replace them for free.

Fire Hose Pants are available for both men and women in many varieties. Duluth Trading offers lighter-weight Flex Fire Hose Pants that have a little stretch to them, Fleece-lined Fire Hose Pants for us Northerners, and everything in between.

SOURCE

Duluth Trading Company, duluthtrading.com, 866-300-9719, Men's Fire Hose Work Pants, #92204, \$65.



Dowels and Tenons with a Grip

DOWELS AND LOOSE TENONS have stood the test of time, making strong, simple and reliable joints. While a number of manufacturers make furniture dowels and loose tenon stock, the Expandable Dowel Pins and Compressed Loose Tenons from Laurier Wood Craft are a cut above the rest.

Laurier manufactures their products in Canada using domestic hardwoods. The dowels and tenons are milled over-size and then compressed. Multiple grooves formed by the compression process cover the entire surface of Laurier's dowels and both cheeks of the tenons. (Most conventional dowels have just one or two grooves.) According to Laurier, their dowels and tenons "take advantage of compressed dry wood's ability to regain much of its original size with the addition of moisture. Water base glues are not 100% solids and shrink during curing. Our pins absorb some of the glue moisture and expand to take up the space left by the shrinking glue, creating an excellent mechanical and chemical bond."

The importance of grooves on dowels and tenons can't be overstated. Without grooves, glue can become trapped underneath the dowel or tenon while you're assembling the joint, causing "hydraulic lock." With nowhere for the glue to escape, the joint will not go together. Additionally, the more grooves there are, the more surface area there is for a chemical bond to form between the glue and the wood.

The grooves spiral around the Laurier dowels and are angled 2° in opposing directions on the tenons' faces. In addition to preventing hydraulic lock, grooves that are spiraled or angled help spread the glue across the entire surface of the dowel or tenon.

Some manufacturer's dowels and tenons have straight grooves running along their length. While straight grooves prevent hydraulic lock, if the glue bond should fail the dowel or tenon can pull out. The angled grooves on Laurier's dowels and tenons create a mechanical bond similar to the threads on a screw. So even if the glue fails, the dowels or tenons will still hold.

Laurier offers dowels and tenons in a full range of sizes. Tenon stock is sold in 1' lengths, so you can cut custom lengths according to your needs.

SOURCE

Laurier Wood Craft, justjoinery.ca, 705-386-1274, Expandable Dowel Pins; Compressed Loose Tenons.

Precision Rulers, Nice Price

A **PRECISION-RULED STRAIGHTEDGE** is one of those tools I think every shop should have. You may know the iGaging name from their digital devices, but they offer traditional measuring tools as well. Let's face it: Not everything can be done digitally! Their Premium Straight Edges are quite nice for the price.

For most tasks, a tape measure is sufficiently accurate. Sometimes, though, a tape measure isn't precise enough or it just isn't practical. It's awkward to use a tape measure to take measurements from a drawing, for example. Also, compared to a precision ruler, the lines on most tape measures are thicker, meaning that they're open to interpretation.

If you've never checked your tape measure against a precision rule, you should. You might be surprised. When I checked mine, I found that it was pretty good—never off by more than a scant 32nd of an inch (no big surprise). What was surprising was the fact that over a 3' span, it went back and forth between measuring either long or short several times!

Premium Straight Edges from iGaging are graduated in 64th's for their entire length and have a satin finish, which is much easier to read than a polished finish. I wish the ruler markings were black instead of gray, however. I found they were a little hard to read, particularly with a mark every 64th of an inch.

As the name implies, these aren't just rulers; they're



straightedges as well. Both edges are ground and lapped parallel and straight. The 12" and 24" versions are guaranteed straight to within .001", and the 36" version is guaranteed within .0015".

All of the straightedges are 3/16" thick, so they'll stand on edge without having to be held. That's a great feature for checking your machines. A precision straightedge is very useful for seeing if both beds of your jointer are parallel, for example, or whether the top of your tablesaw is crowned or flat.

SOURCE

iGaging, igaging.com, 949-366-5708, Premium Straight Edges, 12" Bevel Edge, #36-012-KS, \$26; 24" Bevel Edge, #36-024-KS, \$35; 36" Bevel Edge, #36-036-KS, \$55.

Plus-Size Tenon Saws

CUTTING TENONS on large pieces of wood often requires bringing the tool to the work, instead of the work to the tool. This situation isn't something one encounters every day, but when you do, you'd be happy to have these Large Tenon Saws from Veritas on your bench.

Veritas Tenon Saws come in both rip and crosscut versions. When you cut tenons, cutting the cheeks is a rip cut; cutting the shoulders is a crosscut. These saws are well balanced and have comfortable wooden handles. They're Western-style saws, so they cut on the push stroke. Both saws have 16" blades and will cut just about 4" deep.

Why not just use regular handsaws to cut large tenons? You sure can, but these tenon saws are easier to control, more precise and leave a smoother finish than typical rip and crosscut saws used in carpentry. The rip saw has nine tpi (teeth per inch), and the crosscut saw has 12. That's more tpi than their typical carpentry counterparts, resulting in smoother cuts and better control.

Also, the Veritas saws have a spine to stiffen the blade, like a back saw. This makes it possible to have a very thin blade. By removing less wood, the saw is easier to push. The tenon saw blades are only .024" thick, and the teeth are set only .003" per side—the thickness of a sheet of paper.



SOURCE

Lee Valley & Veritas, leevalley.com, 800-871-8158, Veritas Rip Tenon Saw, #05T14.01, \$119; Veritas Crosscut Tenon Saw, #05T14.05, \$119.

PHOTO BY JASON ZENTNER

George Wurtzel

Blind, but visionary.

by Spike Carlsen

SIXTY-SOMETHING YEAR OLD George Wurtzel has turned porch posts for mansions, built furniture for R&B stars and crafted hundreds of kitchen cabinets. He's run a cabinetmaking and countertop fabrication shop, worked as a Volkswagen repairman and taught industrial arts. He's attended design fairs in Milan Italy and skied 500 miles across Finland. An impressive resume—made even more impressive by the fact that George is blind. “That I’m blind is no more challenging to me than a lefty trying to use right-handed scissors,” he explains. “You just need to use different scissors.”

Poor vision; great passion

“You’ve got to follow your passion in life regardless of the obstacles in your way,” George says. “Never allow someone who doesn’t have to *pay* the consequences *dictate* the consequences of your life.”

George started life with poor vision and it deteriorated from there. But that never kept him from working with his hands. His grandfather, a carpenter and cabinetmaker, introduced George to woodworking. His father, an excavator, introduced him to mechanics. “Most kids had swing-sets in their backyards. We had backhoes, cranes and a thousand acres to play on.” But his mother, who grew up on a farm and was extremely creative, was the one who taught George that he could make anything. “On a farm you grow up learning how to do stuff—and she knew how

to do stuff. It rubbed off on me.”

George primarily attended schools for the blind, where he learned to read braille and navigate a world designed by and for sighted people. While attending one such high school—one that offered metalworking, woodworking and auto mechanics classes—George realized he was gifted with his hands. “Some people pooh-pooh schools for the blind, but I feel like I’m a better person for it,” he reflects, “because there was no one to tell me I couldn’t do something because I couldn’t see.”

After deciding to become a mechanic, George worked in Volkswagen and bicycle repair shops. But he didn’t like getting greasy, so he turned to woodworking. “Being the stubborn cuss I am, I just started building stuff,” he explains. “I built a few pieces of lawn furniture and put them outside. Within a month I got an order for a hundred chairs. I put a radial arm saw and a jointer on my brother’s charge card and I was in business.”

Business boomed for nine years. George’s shop expanded to 5000 square feet and eight employees. During this time, he built a piano-shaped coffee table (see



VISIONALIST ENTERTAINMENT PRODUCTIONS

EDITOR: TIM JOHNSON | PHOTOGRAPHY: JASON ZENTNER; COURTESY OF GEORGE WURTZEL, UNLESS NOTED

photo, this page). A one-third scale model of a Steinway & Sons Model D concert grand, it was presented to Stevie Wonder—George's former classmate—as an outstanding achievement award.

But when interest rates soared and the economy crumbled in 1982, so did George's fortunes. He lost his shop, house and livelihood before deciding to relocate from Michigan to North Carolina. "You know you're not doing so well when you can move everything you own on a Greyhound bus," he recalls.

George applied for and was accepted into the Catawba Valley Community College Furniture Production Management program. The entry process was not without incident. "I walked into the admissions office with my white cane and the first thing the guy said was 'We have a problem.' I said, 'Who's we?' He said 'You're blind.' I replied, 'I noticed when we shook hands that you were missing two fingers.' He explained he'd lost them in a woodworking accident. I told him that all I was looking for was the same opportunity to cut off my fingers that he'd had—and I got in!"

While finishing his course work, George was hired to set up a cabinet-manufacturing shop. He designed the space, bought and set up all the machinery, and wound up managing the facility, which produced up to eight kitchens per week.

A few years later he went back into business on his own, naming his new company "SellAmerica." "I wasn't sure what I was going to make," he recalls. "I figured a name like that would allow me to sell anything." George designed a triangular display box for veteran interment flags and established accounts with 2500 funeral homes and the armed forces. He eventually sold the company and spent the proceeds on "drugs, sex and rock and roll—and the rest foolishly." For a while he dabbled in raising horses, worked in a bakery and ran a camp for blind kids.

In 2009, George moved to Minneapolis to work as an industrial arts teacher for an organization called Blindness Learning in New Dimensions (BLIND). He enjoyed working with students facing the same challenges he had faced.



Computer Desk (2013); white oak, 48" x 30" x 18".



Piano Coffee Table (1978); walnut, 16" x 36" x 20".



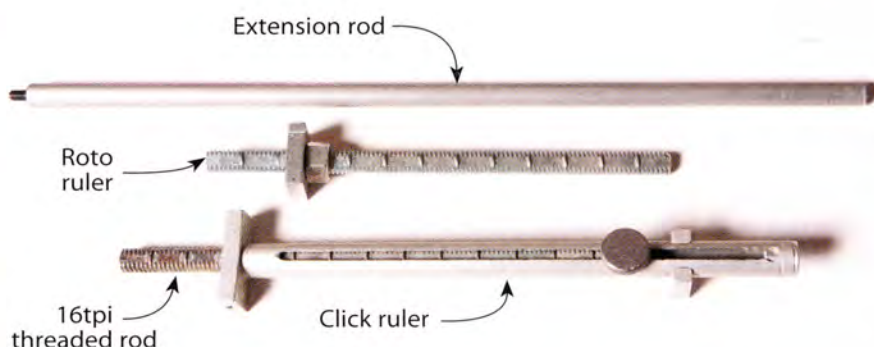
Dining Table (2013); white oak, glass, 29-1/2" x 66" x 36".

A Great American Woodworker

continued



Reproducing architectural millwork is one of George's specialties.



Measuring precisely is no problem for George. His "click" ruler makes an audible sound with each 1/16" change. Each quarter-turn of the square-headed nut on his "roto" ruler marks 1/64". Screwing on one or more extension rods increases the range of both rulers in 12" increments.



"**A poor-man's tool**" is what George calls his Felder multi-machine. "After you pay for it," he jokes, "you're poor!"

"But you know," he explains, "when you work by yourself for a long time, you like to do things your own way." In 2011, he again dove headlong back into the furniture-building business, this time concentrating on a line of puzzle furniture.

Designing without erasers

George's puzzle furniture is based on the interlocking wood puzzles his grandfather made for him when he was a child. The furniture has a Craftsman-style look and feel (see photos, page 21). Designed for people living an "urban, nomadic lifestyle," according to George, it can be easily assembled, disassembled and moved. Each piece is held together with a single fastener—a hidden thumb-screw. George has applied the basic design to create coffee, end and dining tables, as well as bookshelves and a laptop desk that adjusts for standing or sitting.

The joinery is complex and precise. As with all of his pieces, George designed everything in his head. "Good design can be felt, not just seen," he explains. When asked



Turned Vessel (2013); black ash burl, 6" x 11-1/2" x 10-1/2".

about the challenges of designing cerebrally rather than on paper, George says, "Creativity doesn't come out of your eyeballs; it comes out of your head. Some people are blessed with the ability to sing, some with playing baseball. I've been blessed with the ability to see everything in my mind's eye. When I'm designing something I can look at it from every angle by rotating it, using my brain's built-in computer mouse." George maintains most people design with a pencil because there's an eraser on one end. "My eraser is the scrap bin," he jokes.

Working in darkness

George's shop looks like any other woodworking shop. It sports a drill press, miter saw, bandsaw, half a dozen routers and stacks of wood. A huge lathe—large enough to turn porch posts—occupies one corner. As George lives in an older part of Minneapolis, he's recently found a niche reproducing architectural millwork (see photo, above). He turns delicate vases and sculptural bowls on the same lathe (see photo, above).

A massive Felder multi-machine that incorporates a shaper, jointer, planer and rolling-table saw occupies the center of George's shop (see photo, page 22). One tool that might look foreign to most woodworkers is the small "click ruler" that George keeps in his back pocket (see photo, page 22).

The heart of this ruler is a 12" long 16tpi threaded rod with one side flattened and scribed in 1/2" increments. This rod slides inside a tube that has a stop at one end and a spring-loaded ball bearing located precisely 6" away. Each time the ball bearing engages the next thread, it clicks—indicating a 1/16" change in dimension.

By engaging the stop and adding together the 6" fixed dimension, the number of exposed 1/2" scribe marks and the audible clicks, this ruler measures up to 12" in 1/16" increments.

To measure in 1/64" increments, George uses another ruler that's also based on 16tpi threaded rod. This "roto" ruler simply has an adjustable nut with a square head. Each quarter turn of the nut measures 1/64".

George uses a scribe for marking, rather than a pencil, so he can feel the lines. Two other tools he's fond of are the audio-output tape measure he uses for rough measurements and the push-button remote that allows him to control his dust-collection system from any place in the shop.

George doesn't use a blade guard on his tablesaw. Because he works primarily by feel, the guard continuously gets in the way, he says. Yet, after 40 years of woodworking he still has 9-7/8ths of his fingers; he nipped one while doing a repetitive task at the end of a day. We've all been there.

As a person who "sees" with his fingertips, George doesn't understand people who focus on how a piece of furniture looks and ignore how it feels. When it comes to sanding and finishing, he's a perfectionist. "Don't be in a hurry," he explains, and then adds—with a twinkle in his eye, "If it's worth the effort to build it, it's worth the effort to sand it."

Some people feel a piece of furniture or wood art should stand aesthetically on its own; others feel a greater appreciation can be gained by understanding the era in which it was created or knowing who created it. George's furniture and turnings surely stand on their own, but knowing the man—and his story—makes them even more special. And yes, George's eyes do twinkle. 🌟

To see more of George's work, visit gmwurtzel.com.

Spike Carlsen is the author of *Woodworking FAQs* and other books. His newest offering, *The Backyard Homestead Book of Building Projects* (Storey), will be available spring of 2014. For more information, visit facebook.com/spikecarlsenbooks.



VISIONALIST ENTERTAINMENT PRODUCTIONS

A Special Project

George's most recent project reflects his creativity and compassion. He met Maire (Mary) Kent through Keith Famie, a filmmaker who's producing and directing "Maire's Journey," a feature documentary. Maire was enamored by the children's book *Paddle to the Sea*, but having been diagnosed with advanced cardiac sarcoma, realized she wouldn't be able to trace the journey of the book's main character while she was alive.

Maire died at the age of 24—but not before she and George met face-to-face to discuss an idea—building a sailboat that would allow her to complete the journey in the afterlife. This vessel would carry Maire's ashes to the sea, following the route described in the book. Based on her wishes, George crafted a prototype and tested its seaworthiness using bags of sugar as surrogate ashes. Then he built Maire's boat.

This summer, Maire's boat will be launched from Northern Michigan with the goal of making its way through the Great Lakes "to the sea." This message from Maire will be painted on it: "My name is Maire Kent. I died of sarcoma cancer. I'm making my way to the ocean. If you find me, please set me back on my path. I will bless you from heaven."

Keith and his Emmy-winning production company Visionalist Entertainment Productions will film the voyage, documenting how people react to Maire's custom-built vessel and the journey she's on.

"We're not sure when the boat will reach the ocean," George explains. "But we know two things: First, we want it to travel down the Detroit River during the fireworks celebration on the Fourth of July. Second, it's definitely not sturdy enough to go over Niagara Falls."

To learn more about "Maire's Journey," visit v-prod.com.

Table Lamp

Turn a classic form using basic tools.

WHETHER SHAPED AS A VASE, a column or even as an egg, a turned lamp is more than an attractive project. Its flowing convex and concave contours offer excellent skill-building challenges for turners of all levels. Similarly, applying this lamp's eye-catching finish encourages thinking beyond stain and varnish.

You'll need a 1/2" or 9/16" detail/spindle gouge to shape the lamp's contours (see Sources, page 27). You'll also need a 1/4" parting tool, a 1/2" or 5/8" skew chisel, a 1-1/4" to 1-3/4" spindle roughing gouge and a pair of outside calipers to set the diameters. If you turn a finial, you'll need a 1/4" detail/spindle gouge to shape its tight coves.

The harp, socket, cord and other hardware can be purchased as a kit at a lamp store, a home center or online (see Sources). And the answer to the inevitable question, "How the heck do I get the hole through the center?" is simpler than you might think.

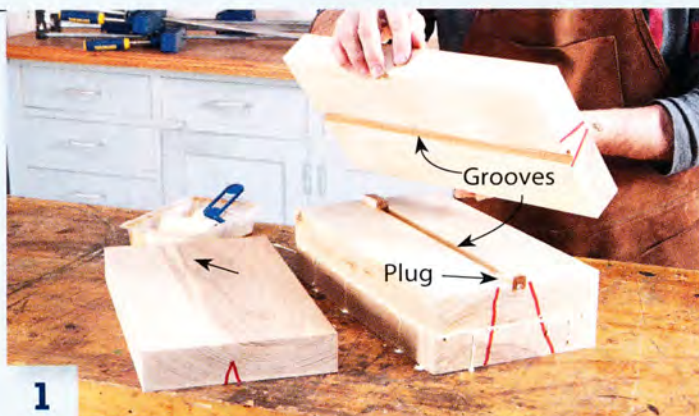
Initial choices

You can use just about any wood—just make sure it's adequately dry. Knowing the lamp's height and diameter before you begin turning is important, because these dimensions affect how you prepare the turning blank you start with and the method you use to drill the hole through its center.

This lamp stands just over 16" high without the harp and shade (Fig. A, page 27). The 7-1/4" dia. of its body virtually rules out using a blank made from single piece of wood, so gluing up 8/4 stock is the best option. The 8-1/4" dia. of the lamp's base is even larger, but because the base is a separate part, it can be turned from a single piece of 8/4 stock.



Learn to cut convex and concave forms with the detail spindle gouge at AmericanWoodworker.com/WebExtras



1 Glue the blank together after cutting grooves and installing plugs so the grooves form a channel for the wiring. The plugs also allow mounting the blank on the lathe.



2 Turn the blank to a cylinder after sawing off its square corners to create an octagon. Then define the lamp's convex middle section by reducing the diameters at both ends.



3 Start at the high point to shape the middle section. Roll the gouge in the direction of the curve as you work toward each end.



4 Create an asymmetrical cove at the neck by cutting in from each side. Start with the gouge on its side and slowly roll it upright.



5 Complete the lamp's body by turning another asymmetrical cove at the bottom, just above the tenon that fits into the base.



The large diameter of a lamp's base is not a minor detail—it's an important safety feature designed to keep the lamp from tipping over. In order to meet UL (Underwriters Laboratories) standards, a lamp must withstand an 8° tip without falling over.

The center hole

Drilling through the wood to create the center hole is a viable option when the lamp's body is relatively short or consists of a single piece of wood. However, starting with a glued-up blank almost always makes the job easier. You simply saw or rout centered grooves in the two inside faces of the lamination to create a 7/16" square channel to house the threaded lamp pipe (Photo 1). This method works regardless of the lamp's diameter or height.

Glue up the blank

Make sure the boards you plan to laminate are flat. Cut the centered grooves 7/16" wide and slightly more than 7/32" deep. Then size a pair of 1-1/2" long plugs to fit. The boards must close tightly together when the plugs are installed.

Spread an even coat of glue on both surfaces of each lamination and glue the plugs flush with the ends of the boards. In addition to aligning the grooves, the plugs are used to mount

the blank on the lathe. Standard white or yellow glues work well, although glues such as Titebond III and plastic resin glues have less creep. Clamp the blank properly, allow the glue to dry for 24 hours and wait at least another 24 hours before turning. Cut the blank into an octagon before mounting it on the lathe; it's too massive to mount as a square.

Turn the lamp's body

Use a spur center in the headstock and a high quality live center in the tailstock to securely mount the blank on the lathe. Spin the blank by hand to make sure it doesn't contact the tool rest before turning on the lathe. Then rough the blank into a cylinder using the spindle roughing gouge (Photo 2).

Size the diameters at both ends, using a parting tool and outside calipers. Then locate and size the critical diameters for each detail. However, do not size the coves to their final depth, as this will prematurely weaken the blank.

Shape the large, convex middle section first, using the detail/spindle gouge (Photo 3). Make multiple cuts to complete this egg-shaped form, gradually deepening and refining its overall shape. The goal is to create a flowing, continuous curve that fully realizes the form.

To cut with the grain when the blank is oriented as it is here—with its grain running parallel to the lathe's bed—you



6

Drill through the plugs at both ends of the lamp body. Then use a bell hanger's bit to clear the center channel.



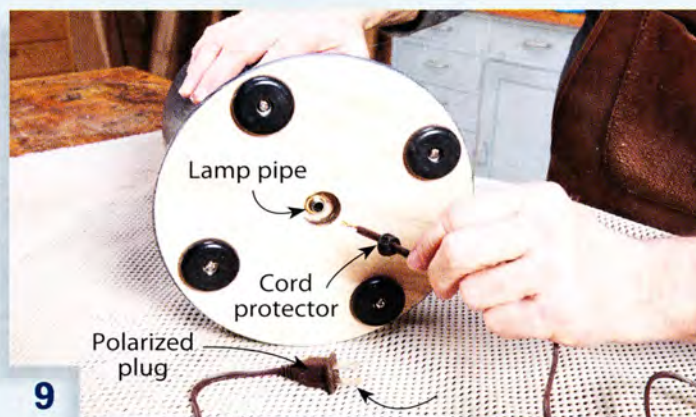
7

Use a parting tool to accurately size the mortise in the lamp's base after roughly hollowing it with the detail/spindle gouge. Shape the base's shallow ogee profile using the same gouge.



8

Apply the distinctive "salt and pepper" finish in two steps. First, brush on a coat of India ink. Then wipe white gel stain into the wood's pores. This lamp is made of ash, which has large pores.



9

Insert the cord in the lamp pipe and push through a sufficient length to make connections at the socket. Install a cord protector to keep the cord from rubbing against the metal lamp rod.

must work from larger to smaller diameters. In this case—shaping a convex form—that means working from the high point to both ends of the curve.

Next, move to the tailstock end to work the top section of the body, called the neck (**Photo 4**). Use the parting tool to establish the final diameters, then switch to the detail/spindle gouge to complete the details. Save the deep asymmetrical cove for last. Cut in towards the center from both sides. Start with the gouge on its side and gradually roll it face-up as you cut in to the center. Strive to create graceful, flowing curves.

Finish the body by completing its bottom section (**Photo 5**). Establish the final diameters and rough out the tenon that will be used to mount the body on the base. Then, as before, complete the details and turn the deep, asymmetrical cove. Lastly, use the parting tool and calipers to turn the tenon to its final diameter.

Sand the lamp's body to remove any torn grain; then work through the grits until the sanding marks are gone.

Take the body off the lathe to drill through the plugs (**Photo 6**). Then make sure the center channel is clear of

debris from end to end by running a 7/16" bell hanger bit all the way through (see Sources).

Turn the lamp's base

Bandsaw a disc of 8/4 stock for the base and mount it on the lathe using a 3" dia. faceplate with screws that penetrate about 1/2" into the underside. Use the detail/spindle gouge to round the disc, level its top surface and roughly hollow to size the mortise for the lamp body's tenon. Then cut straight in with the parting tool to finish sizing the mortise (**Photo 7**).

Cut the mortise slightly deeper than the tenon's length and about 1/16" larger in diameter. The goal is to allow for the difference in wood movement over time due to the cross-grain orientation of the lamp's body and base. The threaded lamp pipe will be used to securely connect these two parts.

Measure the body above the tenon and mark this diameter on the disc. Then use the detail/spindle gouge to create an ogee curve on the face of the disc, from just outside the diameter line to a point about 1/4" up from the bottom at the edge.

To cut with the grain when the blank is oriented as it is here—with its grain running perpendicular to the lathe's bed—you must work from a smaller to a larger diameter. So, start the cut from just outside the diameter line and work toward the outside edge. Shaping this reverse curve



Learn how to drill through a solid wood blank while it's still on the lathe at AmericanWoodworker.com/WebExtras

requires finesse, so take it in stages, refining the look until you're satisfied.

Complete the turning by cutting a small chamfer on the underside of the base that rises to meet the end of the ogee curve. Finish-sand the base. Then drill a 7/16" dia. hole through the center, with a 3/4" deep x 1" dia. counterbore on the underside. Fasten feet (see Sources) to raise the base just high enough for the lamp cord to exit.

Apply finish

I chose ash for this lamp because it looks great with my "salt and pepper" finish (**Photo 8**). Brush India ink (see Sources) onto the body and base. Let the ink dry for an hour or so. Then wipe on white gel stain (see Sources) and immediately rub it off, working across the grain so the white color remains only in the pores. If the pores aren't sufficiently filled, reapply the gel stain after allowing adequate drying time. Then apply your favorite topcoat to protect the finish.

Final assembly

A lamp kit includes all the metal and electrical parts you need to complete the lamp, along with instructions for assembly and wiring (see Sources). If necessary, replace the kit's threaded lamp pipe with one that's long enough to run all the way through the lamp, so you can securely connect all the parts. Measure and cut this pipe to length so that everything screws together firmly (**Photo 9**). Make sure the bottom end of the pipe has no sharp edges to cut into the cord. I recommend installing a cord protector, a specialty grommet that screws over or slips inside the end of the pipe.

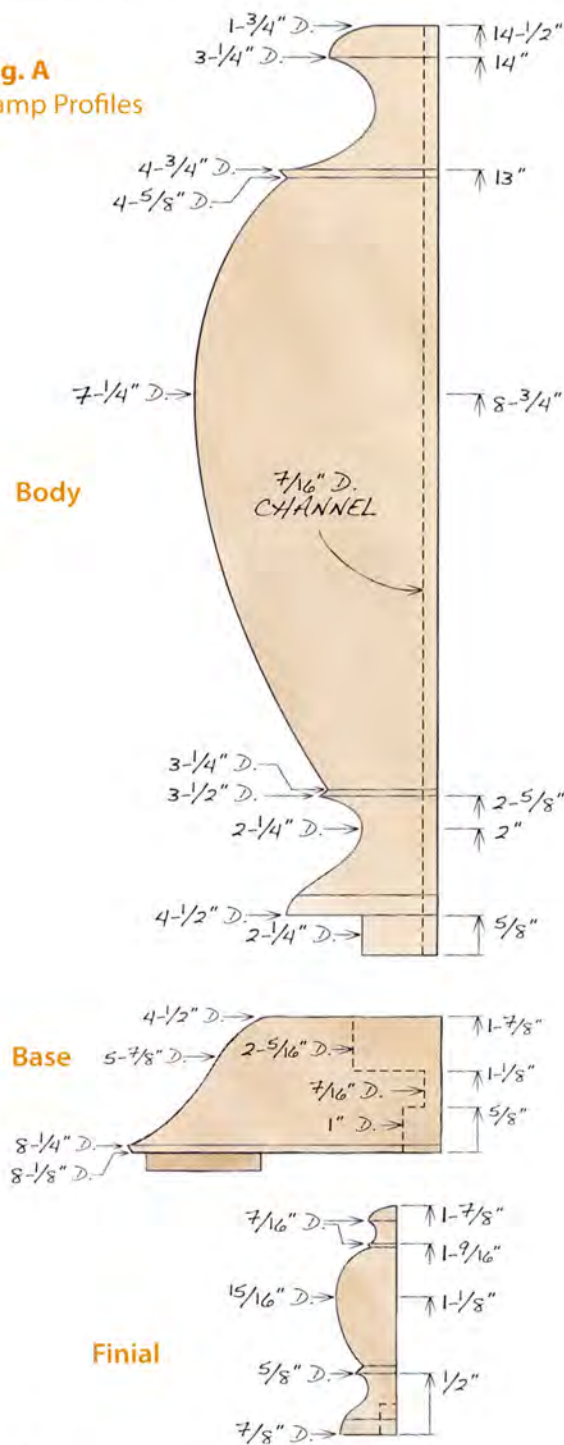
Carefully follow the wiring instructions that come with the kit. But before you plug in the lamp, use a continuity tester (available at hardware stores) to verify that you've wired it correctly. The lamp is good to go if the tester's light comes on when you touch one of its leads to the wide tine on the cord's polarized plug and the other lead to the inside of the metal socket that the bulb screws into. If there's no light, switch the wires on the socket's terminals and retest. The tester's light must come on for the lamp to be correctly wired.

Take the lamp with you to find a shade. The shade shown here is 12" tall x 16" dia. and sits on a 9" harp. Don't worry about tossing the harp that came with your kit in favor of one that fits the shade you've chosen. After all, finding a shade that perfectly matches the lamp is far more important.

Similarly, turning your finial, rather than using the one that comes with the kit, can add the perfect finishing touch to your turned lamp. I epoxied a nut sized to fit the harp (1/4" x 28tpi in this case) into a piece of ash, mounted it in a scroll chuck and turned it to echo the lamp's form. Then I applied the "salt and pepper" finish. 

Alan Lacer is a turner, writer, demonstrator and instructor living near River Falls, WI. For more information, visit alanlacer.com.

Fig. A
Lamp Profiles



SOURCES

- Craft Supplies USA, woodturnerscatalog.com, 800-551-8876, Henry Taylor 9/16" HSS Gouge, #962-0100, \$56.25.
- National Artcraft, nationalartcraft.com, 800-937-2723, Lamp Kit w/ 18" Pipe, #338-009-05, \$8.70; Cord Inlet Protector, #140-341-07, \$12.95 per 100.
- Home Depot, homedepot.com, Westinghouse 3-Way Lamp Kit, #7026800, \$11.97; GE 3-Way Lamp Kit, #50960, \$19.99; Everbilt 1-1/2" Anti-Skid Pads, #49645, \$2.68 per 4-pack.
- Factory Authorized Outlet, factoryauthorizedoutlet.com, 800-629-3325, DeWalt 7/16" x 24" B ell Hanger Bit, #DW1781, \$14.79.
- Dick Blick, dickblick.com, 800-828-4548, Speedball Super Black Waterproof India Ink, 1 pt., #21104-2006, \$7.80.
- Old Masters, myoldmasters.com, 800-747-3436, Pickling White Gel Stain, 1 pt., #81008, \$14.74.

4 Shops, 7 Decades and Still Going Strong

Woodworking through the best and worst of times.



Circa 1946



Circa 2014

MY WOODWORKING CAREER began at age 7, in 1935, cutting out lawn ornaments from grocery store boxes and crates with an old coping saw. Paint was the only expense. My inspirations were my father, who was a farmer (and by necessity a carpenter) and my older brother, who was an aspiring woodworker. I grew up reading *The Delta*, *The Home Craftsman*, *Popular Science*, *Popular Mechanics*, *Mechanics Illustrated* and *Science and Mechanics*. In those days, all of these magazines had woodworking articles in them—they were the woodworking magazines of that era. Even *Sports Afield* produced a boat-building annual.

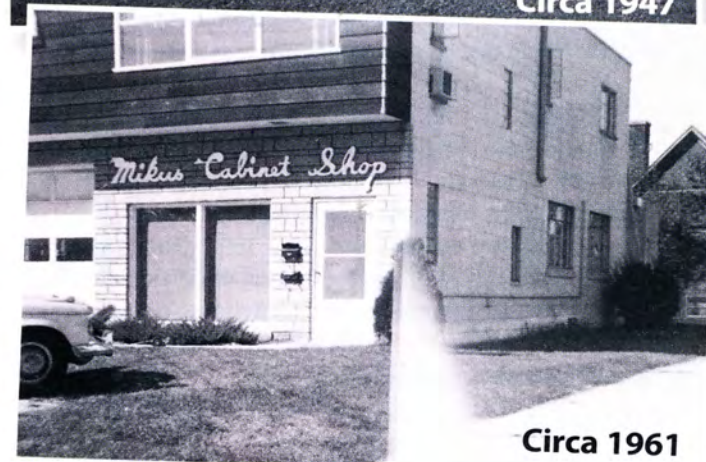
I bought my first woodworking machinery in 1946, shortly after graduating from high school. My father co-signed the loan. It was all Delta equipment—I have some of the machines to this day. I set up shop in a former chicken coop on my father's property in Aurora, Ill., and went into business building cabinets for the post-World War II housing boom. During this period I also built several wooden boats (see photo, left).

Business was good. Life was good. Then came the Korean War. After a stint in the army, I resumed the business and attended college. Then my shop caught fire and I lost almost everything.

I replaced all the machinery by buying out another woodworking shop and built a new 30' x 40' two-story building, with a shop on the first floor and living quarters on the second floor (see photo, page 25). Eventually, though, I went out of business, so I could pursue my vocation of architecture as well as other interests. I sold most of the machinery and converted the building into apartments.

When my two sons grew up and showed an interest in woodworking, I built a new house in a rural area outside of Yorkville, Ill., along with an adjacent 24' x 32' shop building (see shop layout, page 26, at top). Once again, I began to acquire woodworking machinery. There were many woodworking machinery auctions in the Midwest at this time, so it was easy to find good equipment at reasonable prices. The same could be said about walnut trees—I obtained one particularly large specimen and had it milled with a portable bandsaw mill. I continued woodworking, building mostly furniture, and selling through galleries and on commission.

In 2003, when my wife and I decided to move to Colorado, my first thought was to sell all of my equipment, as I was in my mid-70s. But I quickly learned that although many wood-

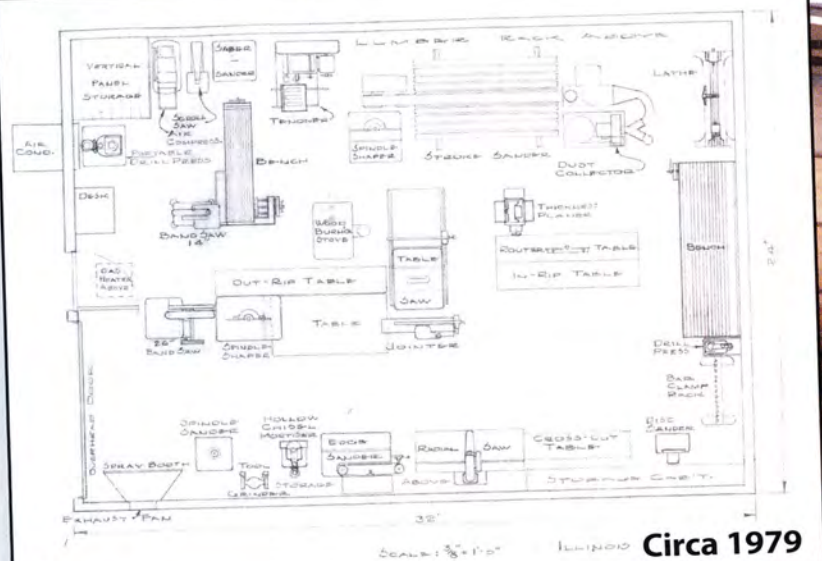


workers say they want the “good old” cast-iron machinery, few (if any) are willing to pay for it. So when we moved, the machinery came along. This turned out to be a good thing, because after we relocated I used the equipment for many home-improvement projects. I also discovered “The Creamery,” an arts-and-crafts gallery in a town only 10 miles away, where I could showcase my work.

We lived in our trailer while looking in vain for a suitable property with a house and a separate shop building. Eventually we settled for a house with an attached three-car garage. The vehicles could stay outside.

Although the space is slightly smaller, this shop has worked well (see shop layout, page 26, at bottom). One notable advantage is that the overhead door’s proximity to the tablesaw’s outfeed table has reduced the amount of lifting I have to do—an important consideration for aging woodworkers. After backing up to the overhead door, I simply slide the lumber and sheet goods out of my van, onto the outfeed table, across the saw table and onto the infeed table, ready for cutting.

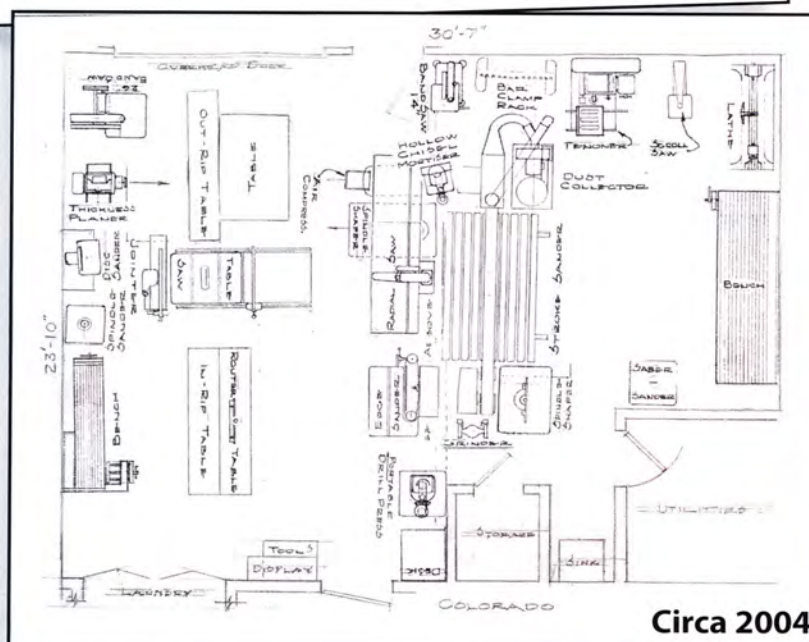
Since moving here I’ve built additional cabinets for the kitchen using hard maple from my daughter’s farm in Indiana, a bookcase



Circa 1979



Circa 1998



Circa 2004



Circa 2010

made of quartersawn white oak and numerous smaller projects. I also built a greenhouse/solarium using 2x6 and 4x6 Douglas fir. All of the components were cut and machined in the shop before being taken out and assembled. This was fine woodworking on a large scale!

Over the past 78 years I've built boats, cabinets, canoes, furniture, architectural millwork, knick-knacks and everything in between. I'm proud of the diversity of my work and that I never got into a rut doing just one thing.

At age 85 I sometimes think of retiring—but there's that stack of soft maple I have stashed, which would make a great bedroom suite for my granddaughter in Indiana. I also want to share my experiences by writing about all the jigs, fixtures and machines that I've built.

*William Mikus
Crawford, Colo.*

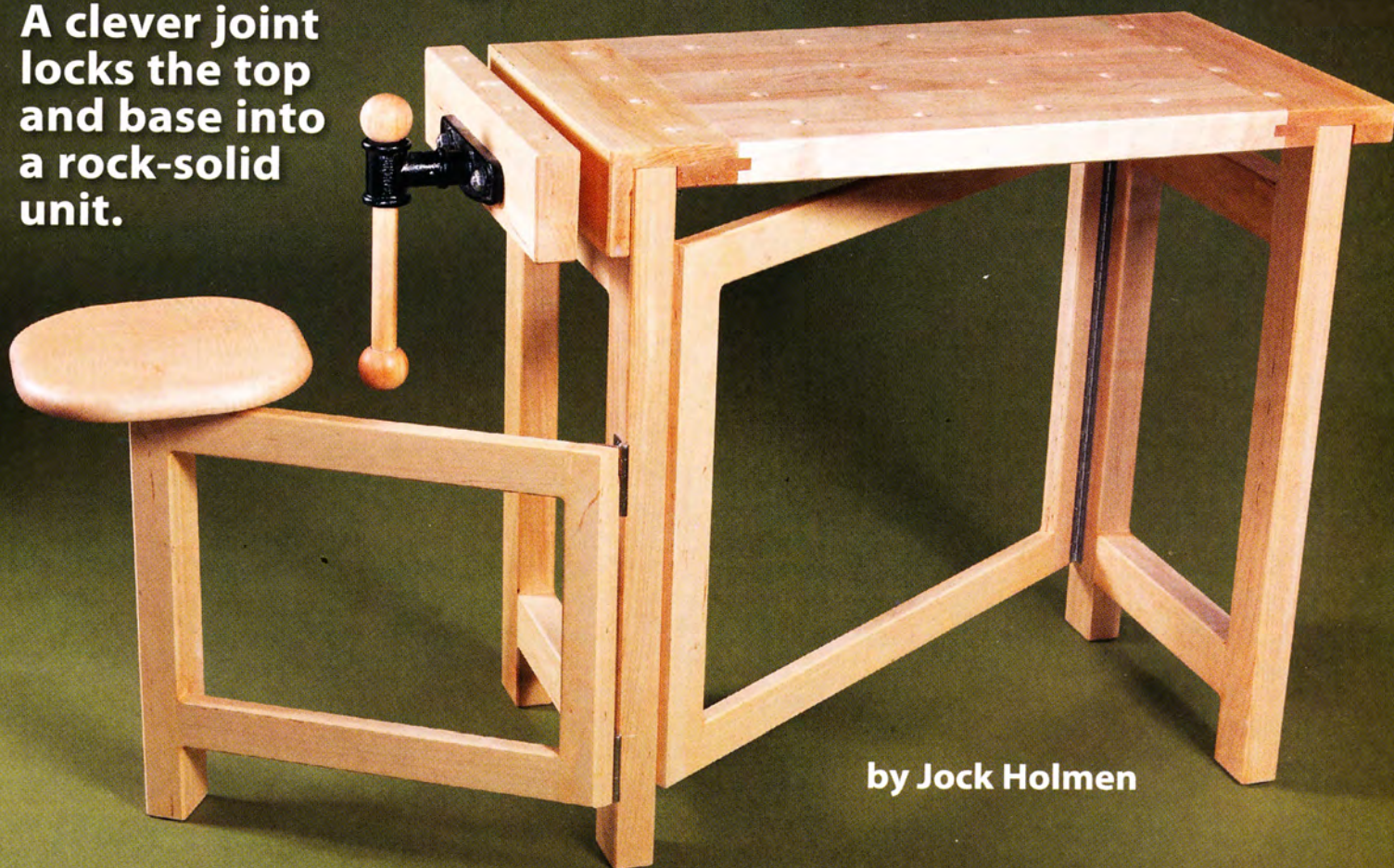
Tell Us About Your Shop

Send us photos of your shop, a layout drawing and a description of what makes your shop interesting. Tell us what you make in it and what makes your shop important to you. If "My Shop" features your shop, you'll receive \$100.

Email your entry to myshop@americanwoodworker.com with digital photos attached. Or mail your description with digital photos on a disk to My Shop, American Woodworker, 1285 Corporate Center Drive, Suite 180, Eagan, MN 55121. Please include your phone number. Submissions cannot be returned and become our property upon acceptance and payment. We may edit submissions and use them in all print and electronic media.

Folding Bench

A clever joint locks the top and base into a rock-solid unit.



by Jock Holmen



Sturdy construction

When set up, this bench is strong and stiff. Plus, it has a built-in seat!



Easy to disassemble:

To store the bench, fold the seat and lift off the top.



Fold the base...

All of the base's parts are hinged together to fold flat.



Then nest the top

Taken apart, the bench is ideal for storing in a closet.

Fig. A Exploded View

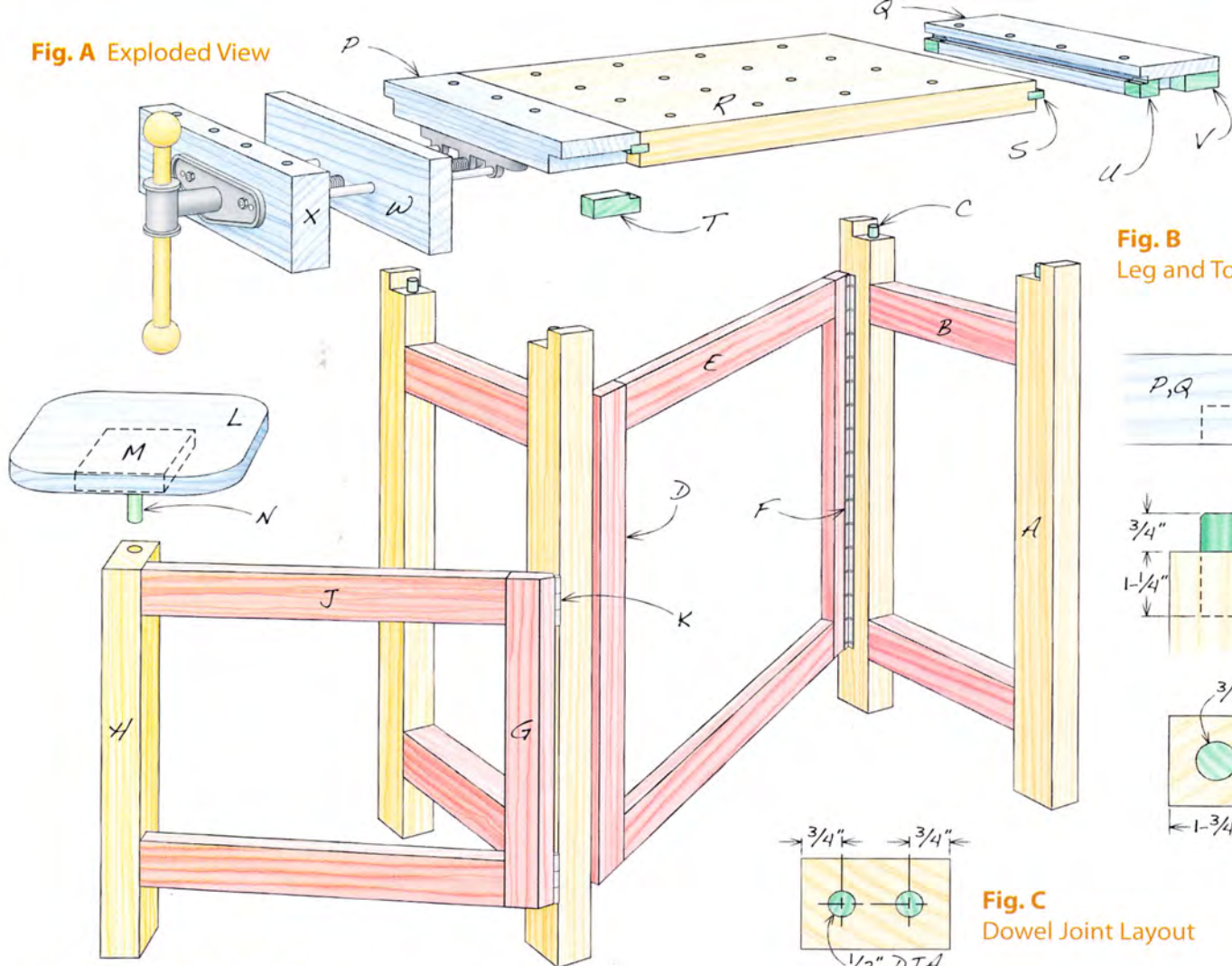


Fig. B Leg and Top Joint

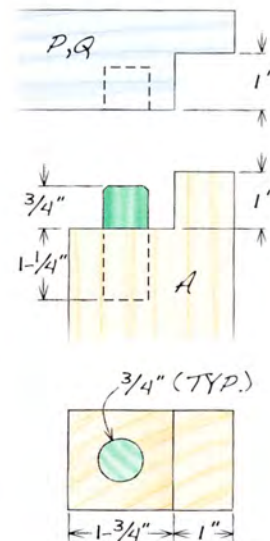


Fig. C Dowel Joint Layout

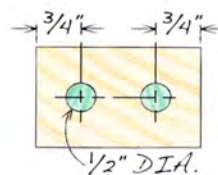


Fig. D Plan View of Base

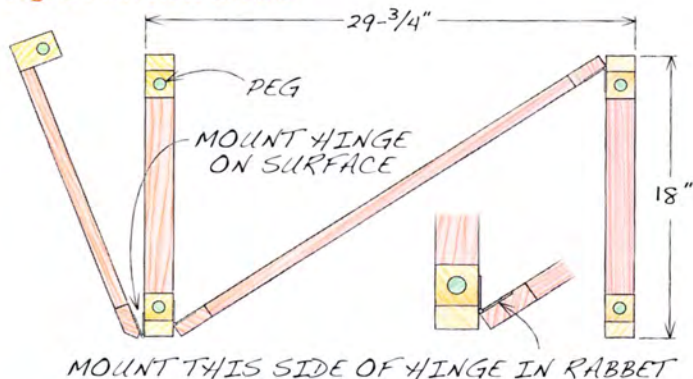
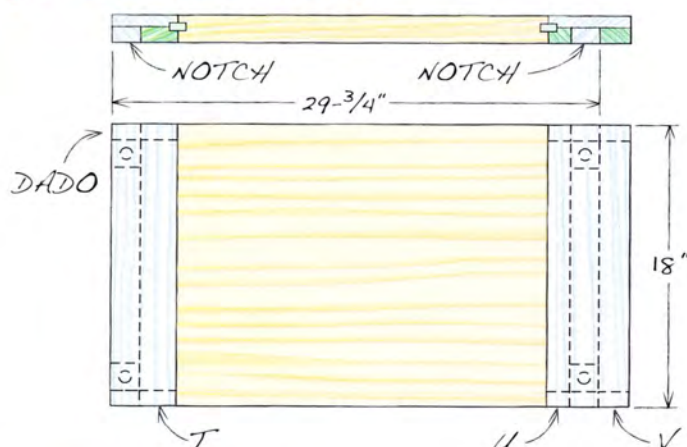


Fig. E Plan and Elevation of Top



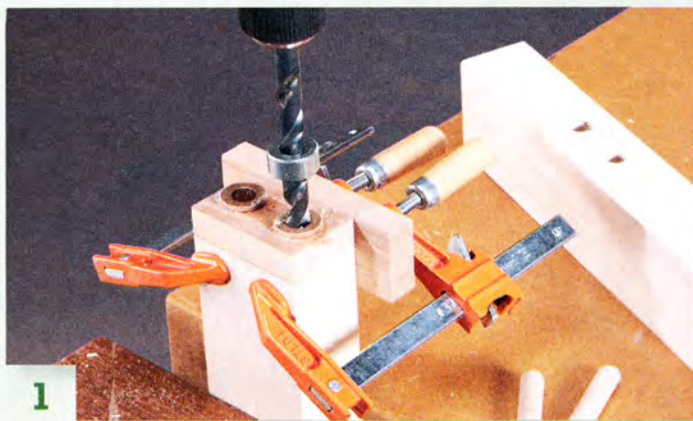
Cutting List

Overall Dimensions: 31-3/4" H x 34-1/4" W x 18" D

Section	Part	Name	Qty.	Th x W x L
End	A	Leg	4	1-3/4" x 2-3/4" x 31"
	B	Rail	4	1-3/4" x 2-3/4" x 12-1/2"
	C	Peg	4	3/4" dia. x 2"
Center frame	D	Stile	2	7/8" x 2-1/4" x 24"
	E	Rail	2	7/8" x 2-1/4" x 26-1/2"
	F	Hinge	2	1-1/2" (open) x 24"
Seat frame	G	Stile	1	7/8" x 2-1/4" x 16"
	H	Leg	1	1-3/4" x 2-3/4" x 19-3/4"
	J	Rail	2	7/8" x 2-1/4" x 16-1/4"
	K	Hinge	2	3" (open) x 3"
Seat	L	Platform	1	7/8" x 12" x 12"
	M	Subbase	1	7/8" x 4" x 4"
	N	Post	1	3/4" dia. x 6"
Top	P	Breadboard end 1	1	1-3/4" x 4" x 18" (a)
	Q	Breadboard end 2	1	1-3/4" x 5" x 18"
	R	Center portion	1	1-3/4" x 18" x 22-1/2" (a, b)
	S	Spline	2	1/2" x 1" x 18"
	T	Fill block 1	2	1" x 1" x 2-1/4"
	U	Fill block 2	2	1" x 1" x 1-3/8"
Vise	V	Fill block 3	2	1" x 1" x 1-7/8"
	W	Inner jaw	1	7/8" x 4-1/2" x 18"
	X	Outer jaw	1	1-3/4" x 4-1/2" x 18"

Notes:

a) Rough length or width is 18-1/2". b) Glue from boards 3" to 4" wide.



1 Drill the base's legs and rails for dowels. Mortise and tenon or biscuit joints would work as well.



2 Notch the upper end of each leg to receive the bench's top.



3 Glue both ends of the base.



4 Connect the two ends with a rectangular frame. Fasten the frame with piano hinges.

Fig. F
End and Seat Frame

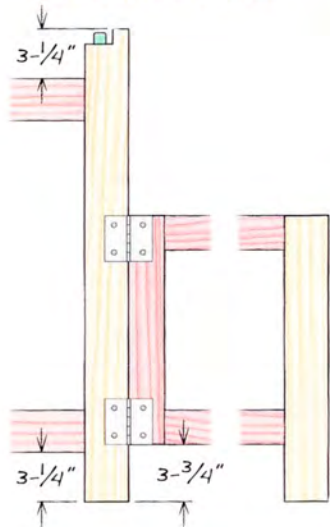


Fig. G
Center Frame

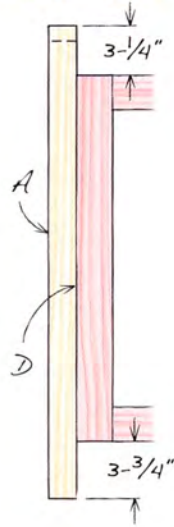
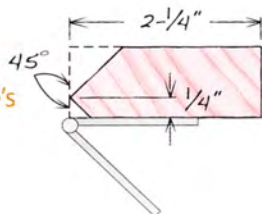


Fig. H
Seat Frame's
Stile



"HAVE CHISEL, WILL TRAVEL." As a traveling carver, teaching classes here and there, I've always wanted a bench that I could tuck into my car, carry around by hand and set up without any fuss. I wanted it to have a seat, too, so I could carve while sitting down.

This bench fits the bill in every way. It breaks down into two pieces: a top and a base. The base has an attached seat that swings around two sides of the bench, but it takes a little getting used to: The seat has only one leg. The seat won't tip over, of course, but I have to use my feet for balance. Carvers are used to that.

I'm sure that this bench would be suitable for all kinds of work. You can mount any type of vise on the bench's end—or none at all.

Make the base

I built the entire bench from soft maple, for durability. It's best to make the base first, then size and fit the top to match the base. Begin by milling the base's legs (A) and rails (B). Cut these pieces to final length, then mark the positions of the rails on the legs (Fig. F). Drill holes for 1/2" dowels (**Photo 1**; Fig. C—see "2 Dowelling Jigs," page 36.) Of course, dowels are just one of many options for joining the base. Mortise and tenon joints, or pairs of #20 biscuits, would work as well.

Using a dado set, cut notches in the top ends of the legs (**Photo 2**; Fig. B). Remove the wood in stages, cutting the same amount from each leg in turn. Glue dowels in the rails, then glue



5 **Mark** the distance between the leg notches on one of the top's breadboard ends.



6 **Cut** dados up to the marks in both breadboard ends. Test the fit of these pieces—they should fit snug in the notches.



7 **Rout** a groove in each breadboard end to receive a spline. Glue the main part of the top together and rout similar grooves across both ends.



8 **Glue** the breadboard ends to the top. Use an extra clamp to make sure that the ends are flush, side-to-side, with the top.

the legs and rails together, forming the two ends of the base (**Photo 3**).

Make stiles (D) and rails (E) for the frame connecting the ends. Drill holes for 3/8" dowels and glue the frame together. Cut a 48" long piano hinge into two pieces (F), then cut rabbets in the frame's stiles to receive the hinges. Note that the rabbets go on opposite sides of the frame (Fig. D). Fasten the hinges to the stiles, then fasten the frame to the bench's ends (**Photo 4**, Fig. G). Opened at 90°, the frame should be flush with each end.

While you're set up for dowelling, build the seat frame (G, H, J). Note that the frame's stile must be angled in order for the seat to swing around both sides of the bench (Fig. H). Build the seat, too (L, M, N). If you want to occasionally raise the seat for working on thick stock, make some plywood rings to fit under the seat's subbase.

Make the top

It's best to make the top the exact width of the base (Figs. D and E). The top's length isn't as critical—but measure the length of your base before you begin making the top. (To do this, open the base to form a rectangle, then measure from corner to corner, both ways. When these diagonal distances are equal, the base is square and ready for measuring its length.) If your base

is too long or too short, no problem: Just adjust the length of the center portion (R) to suit (Fig. E).

Mill pieces for both breadboard ends (P, Q) and the top's center portion. Glue the center portion from pieces that are 1" extra-long and about 2" or 3" wide. (Narrow pieces will help the top stay flat.) Use biscuits or spline to align them. Make the entire center portion at least 1/2" extra-wide, too.

Trim the breadboard ends so they're the same length as the base is wide. Place one of these pieces on top of the base and mark the locations of both of the leg notches (**Photo 5**). Cut dados in both breadboard ends to fit these notches (**Photo 6**; Fig. B). Cut all four dados at the same time. Use a stop block and start out a bit narrow, so the breadboard ends don't quite fit between the legs. Gradually move the stop block, again cutting all four dados, until the breadboard ends fit snugly between the legs.

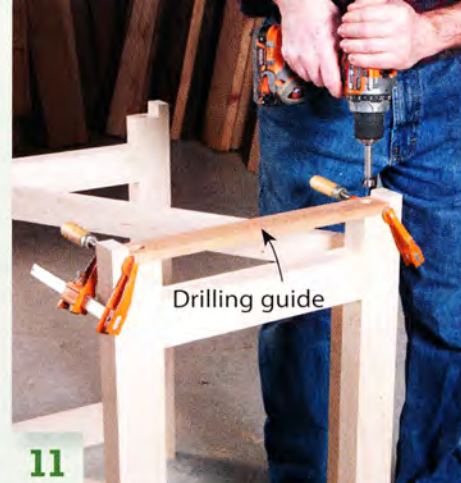
Rip the center portion of the top so its width is the same as the length of the breadboard ends. Trim the center portion to length. Rout a 1/2" x 1/2" groove in the middle of each breadboard end and matching grooves in the top's center portion (**Photo 7**). Clamp a scrap block to the far side of the center portion to prevent blowout. Make spline (S) to fit the groove. Glue the breadboard ends to the center portion, one at a time (**Photo 8**). Even up the joints with a sander or a plane.



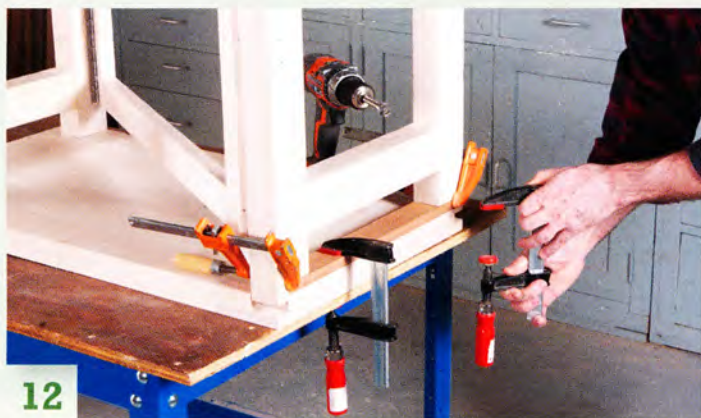
9 Turn over the top and place the base on it—upside down. Cut and glue a small block to fit into the breadboard end.



10 Make two blocks to trap the other end of the base. Glue these blocks to the top as well.



11 Drill holes for large pegs. These pegs will reinforce the joints between the base and top. Use a guide with pre-drilled holes.



12 Drill corresponding holes in the top, leaving the drilling guide in place. This method ensures that all the holes will line up perfectly.



13 Fasten the seat support to the base. Add any vise you want—or none at all—and you're done!

Fit top and base

Next, make "fill blocks" (T, U, V) to trap the legs in the breadboard ends. Cut the blocks from four pieces that are 12" long and notched to fit around the spline (Fig. A). Trim the blocks to fit, starting with the blocks that go in the narrower breadboard end (the vise end of the benchtop). Turn over the top and place the base in the breadboard ends' dadoes (**Photo 9**). Adjust the base flush with the breadboard end, then cut a pair of blocks to fill the remaining spaces in the dadoes.

Cut two more pairs of blocks to fill the spaces at the other end of the bench (**Photo 10**). Remove the base from the top and glue all of the blocks in place. Sand or plane them flush. Test how the base fits—it should drop into place without requiring any pressure. If the fit is too tight, sand or plane the legs.

Adding pegs (C) to the legs is optional. The pegs reinforce the joints between the top and base, but they're not strictly necessary. The peg holes in the base and top must perfectly align with each other (Fig. B). Make a drilling guide that's the same width as the legs (**Photo 11**). Trim it to fit tight between the leg notches, then use a stop block and fence on your drill press to drill the two holes in the guide. Clamp the guide to the base and use a Forstner bit to drill holes in the ends of the legs. Leave the guide clamped to the base, then place the base on the top (**Photo 12**). Clamp the guide to the top, remove the base and

drill the mating holes. Repeat the procedure for the opposite side of the base. Insert pegs into the legs, but don't glue them. With the pegs in place, test the fit of the top again. If the fit is too tight, shave or taper the pegs.

To finish the base, install butt hinges (K) and add the seat frame (**Photo 13**; Fig. F). You'll need to have a vise in hand to complete the top (see Source, below; a metal-jaw vise would work, too). Make the two jaws for the vise (W, X). Drill holes in the jaws as necessary for mounting the vise. In addition, drill holes in the outer jaw for bench dogs, if desired, making sure that the holes clear the vise's guide rods. (If the jaw is over 2" wide, drill from both sides.) Drill mating holes in the bench's top. (Do this on a drill press, but measure the distance from its column to the bit before you lay out the holes in the vise and benchtop, to make sure your drill press has enough reach.)

Glue the vise's inner jaw to the benchtop. (If you aren't mounting a vise, or if you're using a metal-jaw vise, glue on a 1-3/4" wide board.) Test the fit of the base again, because this piece also traps the base. Rout a chamfer or roundover on all the bench's parts so they're comfortable to handle.

SOURCE:

Woodcraft, woodcraft.com, 800-225-1153, WoodRiver Small Front Vise, #144804, \$69.99; Vise Handle, #17E46, \$6.99.

2 Doweling Jigs

Build the jig to suit the joint, not the other way around.

DOWEL JOINTS often get a bad rap—but if done right, they can be plenty strong. Industry has relied on them for generations, after all.

Dowel joints should be sized and spaced to handle the amount of stress they'll receive. Commercially made doweling jigs offer few layout options, so it often makes sense to build your own jig using whatever spacing you wish.

These two jigs will cover most of the situations you're likely to encounter. They're designed for flush joints, but they'll also work for joints that aren't flush. Just place a shim behind the jig's fence when you're drilling rails. The shim's thickness should be equal to the distance that the rail is set back from a leg or stile.

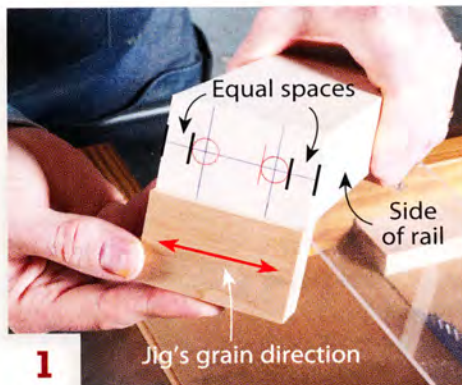
by Tom Caspar

Jig for Symmetrical Holes

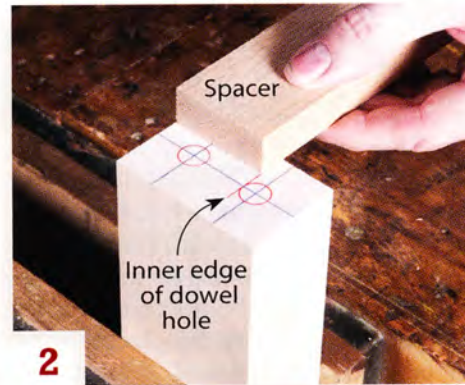
The shop-made jigs shown here aren't built to last forever—but they're quick and easy to make for an individual project. All you need are a few inexpensive flanged sleeve bearings. Sleeve bearings are made to exact specifications, come in many sizes, and are available at most hardware stores. You can also order them through the mail (see Source, next page). Sleeve bearings aren't hardened, like the bushings on a commercial jig, but they'll last quite a while.

This jig is designed for dowel holes that are spaced the same distance from each side of a rail. Joints that connect a rail to a leg are often laid out in this way. These holes are typically located halfway between the front and back faces of a rail, but you can also use this type of jig for holes that aren't centered front to back.

Building the jig is very easy, but it's essential that its holes are plumb and spaced just right. The method



1 Cut a block exactly as long as your rail is wide. This block will be the jig's main part.



2 Make a spacer whose width is the distance shown.



3 Use the spacer to set up two stop blocks on either side of a Forstner bit.



4 Drill holes for the doweling jig's flanged sleeve bearings.

shown here for drilling the holes is virtually foolproof. When you're done, use a caliper to measure the distance from the edge of each hole to the end of the block. Both measurements should be exactly the same. If they're not, shift one of the stop blocks and drill a new piece for the jig.

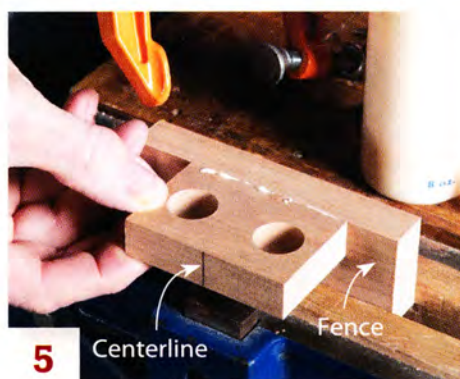
When you use the jig, make sure that its fence is clamped against the front face of your pieces. When you drill rails, line up both ends of the jig with the rails' sides.

This jig allows you to position the rail at any point on the leg. If the rail is flush with the top of a leg, align the end of the jig with the end of the leg. If the rail is lower on a leg, align the jig with a centerline on the leg.

To make the strongest joints, use compressed and fluted dowels (see "Dowels and Tenons with a Grip," Well-Equipped Shop, page 18.)

SOURCE

McMaster-Carr, mcmaster-carr.com, 630-833-0300, Bronze Flanged Sleeve Bearings of many sizes.



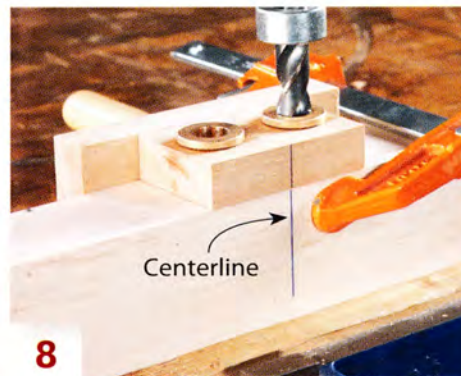
5 Glue the block to a fence. Mark a centerline on the block.



6 Push the sleeve bearings into the holes.



7 Clamp the jig flush with each side of a rail.



8 Align centerlines if the joint is offset from the end of a stile or leg.

Jig for Offset Holes

This jig is designed for dowel holes that are spaced asymmetrically (that is, located at different distances from each side of a rail). Joints that connect a stile and a rail—say, for a door—often need to be offset in order to accommodate a groove, rabbet or molding.

Unlike the symmetrical jig, you must drill from both sides of an offset jig. You'll drill from one side into a stile, for example, and from the opposite side into the matching rail. To use the jig from both sides, its holes must be counterbored so that the sleeve bearings are flush with the jig's surface. Drill these shallow holes first, then drill all the way through the jig with a smaller bit.

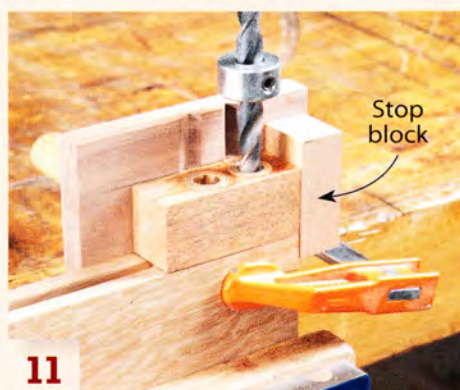
A stop ensures that you're registering the jig from the correct end. Screw the stop to the jig to reinforce the joint. If you need clearance for a stop collar on your drill bit, chop v-grooves in the fence with a chisel.



9 Lay out the dowel holes. They can be spaced any way you wish.



10 Counterbore shallow holes first, then drill all the way through with a smaller bit.



11 Drill the stiles. Butt the jig against the end of the stile. Flip the jig for the next step.



12 Drill the rails. Again, butt the jig against the outer edge of the rail.

Dovetail Station

This compact stand organizes and stores tools for making dovetails.



by Tom Caspar



Tools are close at hand

The station has a convenient home for every tool you'll need.



It's a storage box, too

Slide a cover over the station to protect your tools when you stow them away.



Secure latches

Sturdy window latches lock the cover in place for transport.

CUTTING DOVETAILS by hand is supposed to be an orderly, precise process. But when you're in the thick of it, it's all too easy to end up with a bench littered with stray tools and precious little free space left over for the actual work.

I built this station to keep all my tools in one place, neatly organized and out of the way. When I'm temporarily done with a tool, I place it right back in its home. I can reach most tools from the front of the station—the chisels are in front, while the layout tools are on top.

When I'm done with my work, I take apart my saw and store it in back of the station—along with some other tools—then slide and lock a cover over the station.

I'll admit it's a bit extravagant to dedicate a set of tools just for dovetailing, since some can be used for many other jobs, but I think it makes practical sense. When I'm ready to chop, the tools are ready, too.

Build two tool racks

Before you begin making this station, take stock of the tools you'll use for dovetailing. I designed the station to hold my favorites, but you'll probably need to alter the station's dimensions or configuration to accommodate your set. (See "Tools for Dovetailing," page 44, for a closer look at the tools I designed my station to hold.) Figuring out the most compact arrangement of your tools will take some experimenting. Here's how to go about it.

Start with the layout-tool rack (A). Make this from scrapwood first, so you can modify it as you go or make a fresh start if a completely different arrangement proves to be necessary. Lay out a series of notches or holes to hold your tools (Fig. B), then cut the notches on the bandsaw.



Use a miter gauge to make sure your bandsaw cuts are straight and square. If you attach a long fence to it, you can support work on both sides of the blade (**Photo 1**).

Cut a center panel (B)—also from scrapwood—and fasten the rack to the panel. Clamp the panel in a vise with the rack facing away from you. Place all of your tools in the rack and see if

Begin

building the station by designing a rack to fit your layout and cutting tools. Use a bandsaw and miter gauge to cut notches for the tools.



Baltic birch plywood

Round over the rack's edges with a solid-pilot bit. This bit is ideal for getting into narrow cutouts—the pilot is only 3/16" dia.

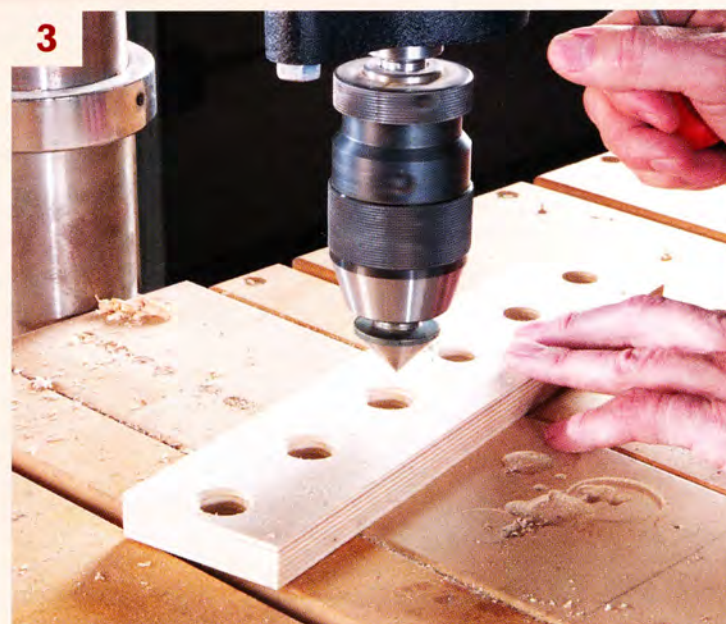
2



Solid pilot

Make a second rack for your chisels by drilling and countersinking holes sized to fit their sockets.

3



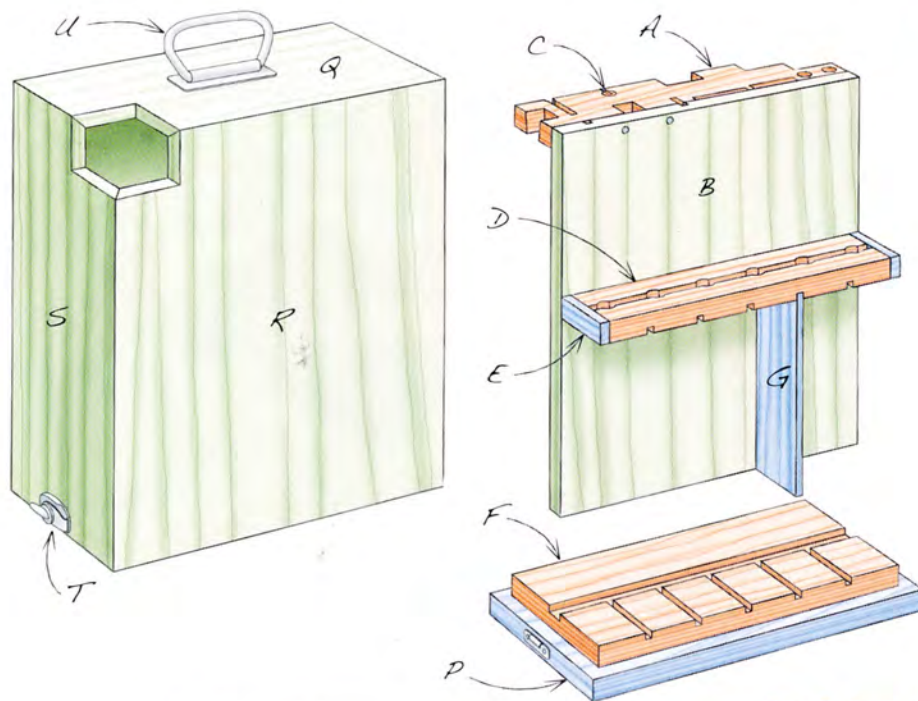


Fig. A Exploded View

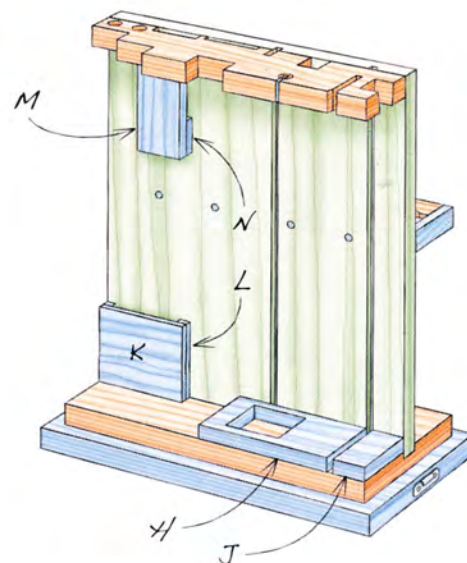


Fig. B Layout-Tool Rack, Center Panel and Chisel Rack

Fig. C
Front
Elevation

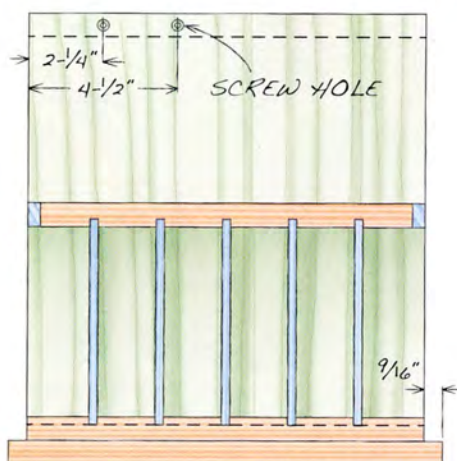
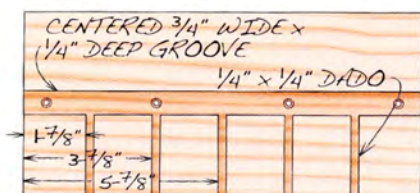


Fig. D
Plan of
Base



To download a full-sized, dimensioned version of this diagram, go to AmericanWoodworker.com/WebExtras

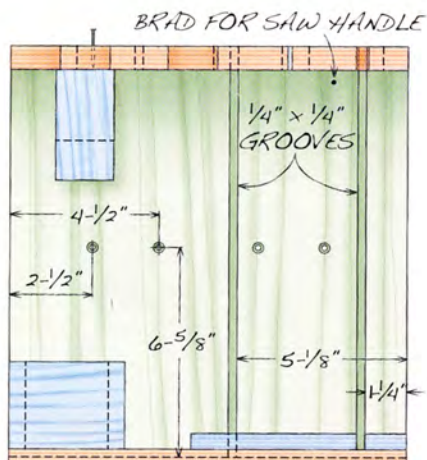
Cutting List

Overall Dimensions: 17-3/4" H x 13-1/8" W x 7" D

Section	Part	Name	Qty.	Th x W x L
Stand	A	Layout-tool rack	1	3/4" x 2-1/2" x 12"
	B	Center panel	1	3/4" x 12" x 13"
	C	Filler	1	1/16" x 5/16" x 3/4"
	D	Chisel rack	2	3/4" x 1-1/16" x 11-1/4" (a)
	E	End cap	2	3/4" x 3/8" x 2-1/2"
	F	Base	1	3/4" x 5-7/8" x 12"
	G	Divider	5	1/4" x 2-1/2" x 6-1/2"
	H	Mallet block	1	1/2" x 2-1/2" x 5"
	J	Saw blade holder	1	1/2" x 2-1/2" x 1-1/4"
	K	Shim pocket 1	1	1/4" x 3-1/2" x 2-3/4"
	L	Shim pocket 2	2	1/4" x 1/2" x 2-3/4"
Cover	M	Thin blade 1	1	1/2" x 1-3/4" x 3-1/2"
	N	Thin blade 2	1	1/2" x 1-3/4" x 1-1/4"
	P	Bottom	1	3/4" x 7" x 13-1/8"
Cover	Q	Top	1	1/2" x 7" x 13-1/8"
	R	Front and back	2	1/2" x 13-1/8" x 17"
Hardware	S	Side	2	1/2" x 7" x 17"
	T	Sash lock	2	
	U	Handle	1	

Note: **a)** Start with a single piece measuring 3/4" x 2-1/2" x 11-1/4".

Fig. E
Back
Elevation



there's enough space around each one. Ideally, you should be able to remove or replace each tool without disturbing its neighbors. In addition, no tool should stick out beyond the edges of the rack. (If any tools stick out, the station's cover won't fit.)

I had to take apart my trial rack and panel a few times in order to arrive at an optimal arrangement. Along the way, I found that I had to saw a short groove in the center panel to accommodate the blade of my small double square. I also sawed a long groove to hold the blade of my Dozuki saw (it comes apart for storage); see Fig. E. And I had to deeply countersink the hole for my striking knife—and add a filler (C)—so the knife would stand up straight. If you have any tools that need to hang on the back of the station for storage, such as a dozuki saw's handle, now's the time to work out their position. When you're done, every tool should have a secure home. Here's the acid test: No tool should fall off when you move the station.

Once you've got your own design worked out, make the actual rack and center panel from Baltic birch plywood. (All the other parts of the station are made from Baltic birch, too.) Round over the exposed edges of the rack on both top and bottom sides (**Photo 2**). A solid-pilot bit works best to get into tight spots (see Sources, page 43).

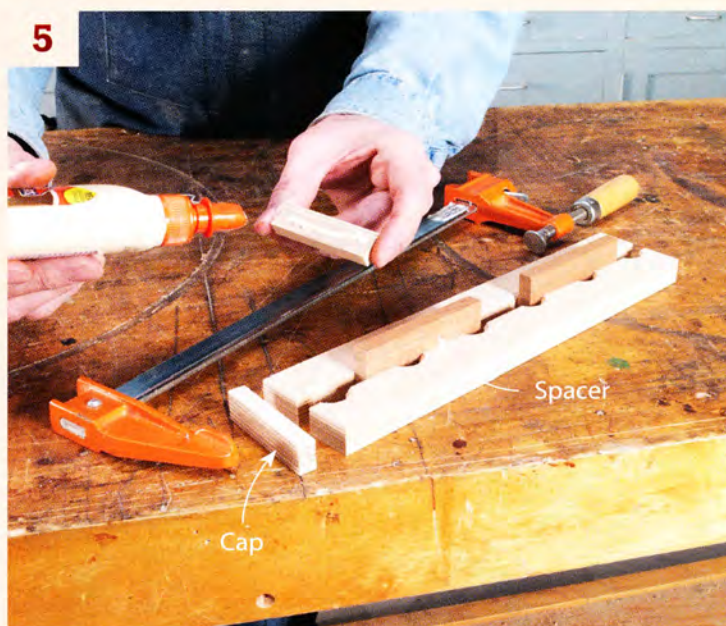
Next, design the chisel rack (D). I have a large set of chisels to choose from, depending on the size and type of dovetails I'll be working on, but a compact box can't hold all of them. That's OK, because I don't need the whole set for most projects—just a few will do. After making my layout-tool rack, I found that the station's width would accommodate six chisels spaced comfortably apart. For most jobs, that's just about right.

I often use wide chisels when dovetailing, and this rack is designed to hold them in any location. To build the rack, drill and countersink holes in a single piece of plywood (**Photo 3**). (Countersinking isn't required, but I found that my chisels stood upright more easily if the holes had deeply beveled sides. You'll need a countersink with an extra-large diam-

Rip the chisel rack 3/16" off the center of the holes. Make this cut from both sides.



Place 3/8" spacers between the pieces, then glue caps on both ends. The resulting slot between the holes accommodates wide chisels.



Cut dadoes in the stand's base and chisel rack to house dividers. Clamp a block to your saw to limit the length of the dadoes.





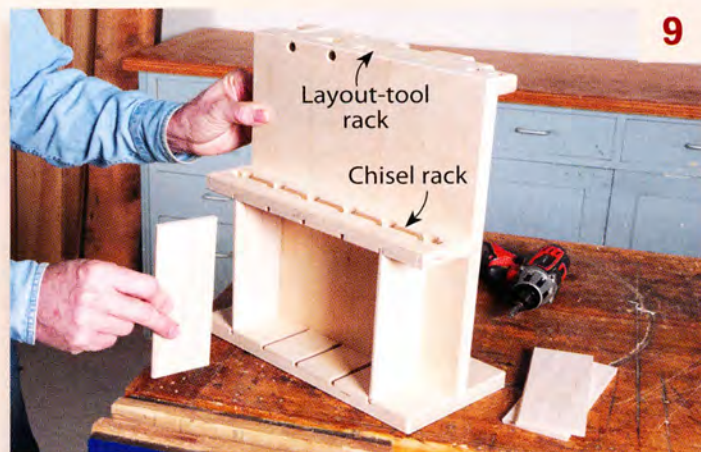
7

Cut a groove in the base to hold a vertical panel. For a tight fit, make multiple passes from both sides of the base, slightly moving the fence each time to widen the groove.



8

Fasten the base to the panel. Don't glue it—you may want to disassemble and modify the station later on to store new tools.



9

Fasten the layout-tool and chisel racks to the panel with screws. Place dividers under the chisel rack to hold it in place.



10

Begin making the station's cover by routing miters on each of its pieces. The miters shouldn't come to a point—leave a tiny blunt edge.

eter; see Sources.) Rip the piece of plywood 3/16" off the center of the holes (**Photo 4**). Make two end caps for the rack (E) and a couple of 3/8" thick spacers, then glue the rack together (**Photo 5**). Round over its exposed edges, top and bottom.

Make the station's base (F), then cut 1/4" x 1/4" dadoes in the chisel rack and base to accommodate dividers (G) for protecting the chisels' edges (**Photo 6**; Fig. D). Make the dividers from solid wood to fit tight in the dadoes.

Leaving the 1/4" dado set in the saw, cut a groove in the base to hold the center panel (Fig. D).



To make a strong joint when using plywood, a groove or dado should be just wide enough for a tight fit. Most plywood is thinner than its nominal size, so the groove or dado must be undersized, too. To make an undersized cut with a tablesaw, you can either add shims to your dado set or make multiple passes. The second option is faster for making just a single dado. It also allows you to center the groove or dado in the middle of your stock, which is what's required here.

Here's how to do it: Start by sawing a groove slightly off center, then spin the base around and saw a second groove. Shift the fence about 1/8" farther away from the blade and repeat the procedure (**Photo 7**). Continue in this manner to widen the groove, moving the fence a bit less each time, until the groove fits the panel.

Fasten the base to the panel (**Photo 8**). (Make sure the screw holes are offset from the dadoes in the base.) Fasten the layout-tool rack to the panel (Fig. C). Place the dividers in position, then fasten the chisel rack to the base (**Photo 9**).

I made a few additional pieces (H–N) to hold my tools and nailed them in place with short brads. I also hung some tools on brad nails. After hammering in the nails, I bent them slightly upright with a pair of pliers as insurance that the tools wouldn't slide off when I moved the station.

Make the cover

Saw the cover's bottom (P), top (Q), front and back (R) and sides (S) to

final size. Check these dimensions before you saw, of course. Allow 1/16" clearance between the inside of the cover and the outside of the station's base, all around. In addition, make sure the cover is tall enough to accommodate all your tools when they're stowed away.

Rout miters on the front, back, sides and top pieces using a chamfer bit (**Photo 10**). Take at least two passes, removing a little more each time. To guarantee that the panels stay full size (since their dimensions are critical), leave a 1/64" wide blunt edge on the last pass. After you're done routing, run your fingers over each miter to make sure it's smooth and free from lumps. This will ensure that your joints fit tight.

Gluing together a mitered box isn't difficult; usually, you don't need clamps, just tape. Using the "blunt edge" strategy, however, the tape must have a little bit of stretch in it. I used 1" wide Gorilla tape. It stuck well, with just enough stretch, but didn't yank out the wood's fibers when I removed it.

To prepare the cover for gluing, arrange the front, back and sides in order, face up. Butt the pieces tight together and align them with a straightedge. Join the pieces with 6" long pieces of tape (**Photo 11**). Turn over the assembly and apply glue (**Photo 12**). Fold the pieces together and tape the remaining sides (**Photo 13**). Tape alone should keep the joints tight, but I added a couple of band clamps to make sure. Glue and clamp the top (**Photo 14**). Rout a 3/16" wide chamfer all the way around the cover—this will "erase" the blunt edges of the miters. Add two sash locks (T), one on each side and a handle (U; see Sources). You're all set! 

SOURCES

- MLCS, mlcswoodworking.com, 800-533-9298, 1/4" radius roundover, carbide cutter, 3/16" dia. solid brass pilot, 1/4" shank, #6602, \$17.
- Lee Valley, leevalley.com, 800-871-8158, Large 82° countersink, #44J21.01, \$25.50.
- Home Depot, homedepot.com, 800-466-3337, Cam Action Window Sash Lock, Model U 9924, \$3.27 ea.; Storage Chest Handle, Model 15135, \$3.99.

Place the pieces against a straightedge, face up, and join them with tape. Use tape that can stretch a bit.



Turn over the pieces and apply glue to the miters.

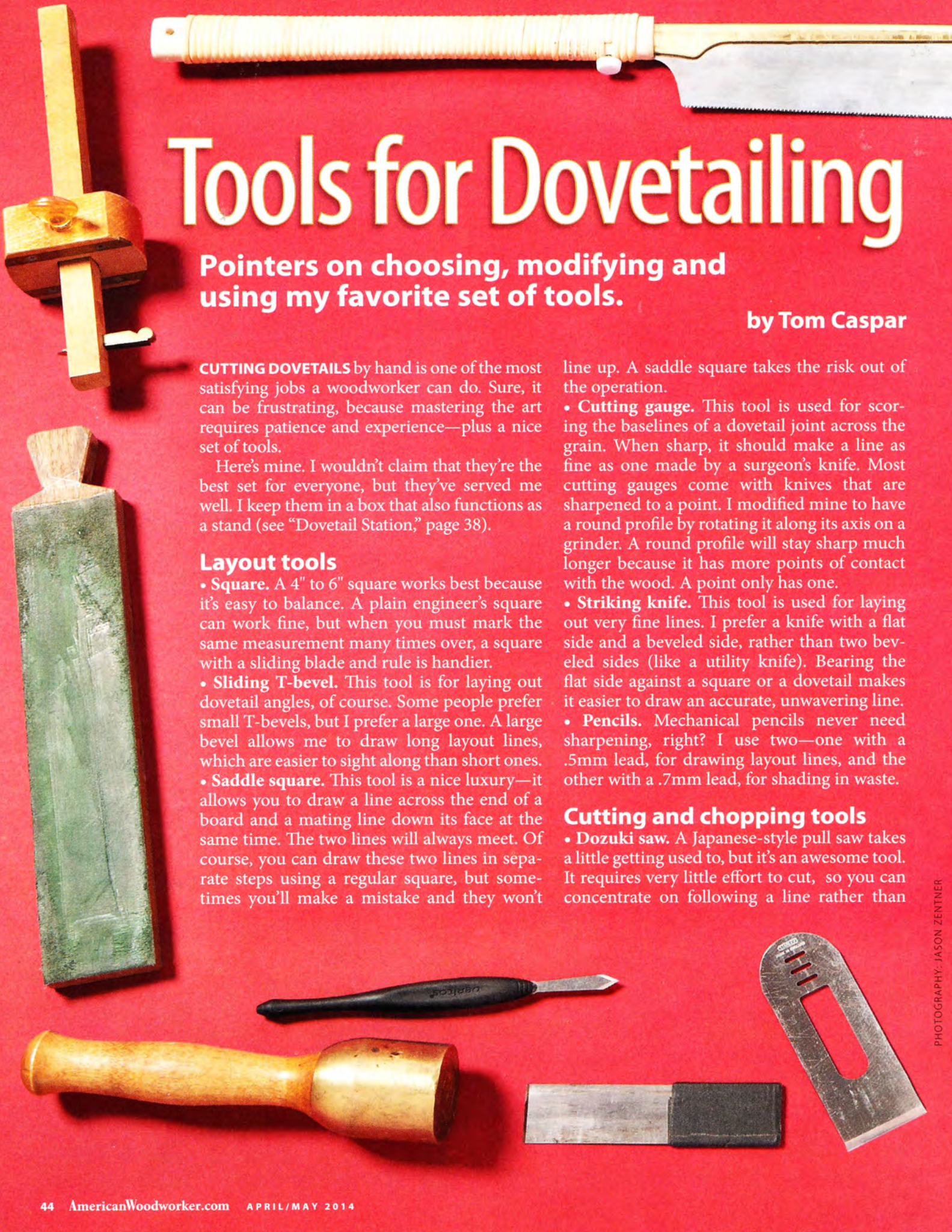


Fold the pieces into a box. Add band clamps to ensure that the joints come tight.



Glue the cover to the box (its edges are mitered, too). Once the glue is dry, rout a large chamfer around all of the cover's edges.





Tools for Dovetailing

Pointers on choosing, modifying and using my favorite set of tools.

by Tom Caspar

CUTTING DOVETAILS by hand is one of the most satisfying jobs a woodworker can do. Sure, it can be frustrating, because mastering the art requires patience and experience—plus a nice set of tools.

Here's mine. I wouldn't claim that they're the best set for everyone, but they've served me well. I keep them in a box that also functions as a stand (see "Dovetail Station," page 38).

Layout tools

- **Square.** A 4" to 6" square works best because it's easy to balance. A plain engineer's square can work fine, but when you must mark the same measurement many times over, a square with a sliding blade and rule is handier.
- **Sliding T-bevel.** This tool is for laying out dovetail angles, of course. Some people prefer small T-bevels, but I prefer a large one. A large bevel allows me to draw long layout lines, which are easier to sight along than short ones.
- **Saddle square.** This tool is a nice luxury—it allows you to draw a line across the end of a board and a mating line down its face at the same time. The two lines will always meet. Of course, you can draw these two lines in separate steps using a regular square, but sometimes you'll make a mistake and they won't

line up. A saddle square takes the risk out of the operation.

- **Cutting gauge.** This tool is used for scoring the baselines of a dovetail joint across the grain. When sharp, it should make a line as fine as one made by a surgeon's knife. Most cutting gauges come with knives that are sharpened to a point. I modified mine to have a round profile by rotating it along its axis on a grinder. A round profile will stay sharp much longer because it has more points of contact with the wood. A point only has one.

- **Striking knife.** This tool is used for laying out very fine lines. I prefer a knife with a flat side and a beveled side, rather than two beveled sides (like a utility knife). Bearing the flat side against a square or a dovetail makes it easier to draw an accurate, unwavering line.

- **Pencils.** Mechanical pencils never need sharpening, right? I use two—one with a .5mm lead, for drawing layout lines, and the other with a .7mm lead, for shading in waste.

Cutting and chopping tools

- **Dozuki saw.** A Japanese-style pull saw takes a little getting used to, but it's an awesome tool. It requires very little effort to cut, so you can concentrate on following a line rather than



fighting the saw. I've got nothing against a good Western-style saw, which cuts on the push stroke, but it will require occasional sharpening and setting. Both operations can be quite difficult. Most Japanese saws don't need to be sharpened—ever. When a blade gets dull, you replace it with a new one. Japanese saws come with short or long blades; I prefer a long blade because it requires fewer strokes to cut to the same depth. Each stroke introduces the possibility of error, so the fewer strokes you make, the straighter your cut will be.

• **Coping saw.** This saw is used to remove the bulk of the waste from a joint before the remainder is chopped away. A fancy model certainly isn't necessary, but you should use a high-quality blade with the appropriate number of teeth for the work at hand. I prefer a blade with 15 teeth per inch—not too fine, but not too aggressive, either.

• **Chisels.** I use two sets of chisels. One set has square sides, while the other has sides that taper to a sharp point. I use the first set for paring and hone them at 25°. (A low angle makes a chisel easier to push.) I use the second set for chopping and hone them at 30°. (The steeper the angle, the longer an edge will last.) The tapered edges of the second set allow me to get into angled corners, so I rarely have to use a skew chisel to clean out a dovetail. The tapers are angled at 12° and run back about 3/4". I created the tapers by using a grinder.

• **Mallet.** I prefer a round mallet to one with a square head. Both will work fine, of course, but you have to pay more attention to how you hold a square mallet to avoid a glancing blow. A round mallet is more forgiving. I like a mallet with some heft—about 16 to 20 oz. The

extra weight means you don't have to strike a chisel with so much force. Just dropping a heavier mallet on a chisel often does the job.

• **Strop.** Stropping a chisel renews its edge in just a few seconds. Stropping is easiest when a chisel's edge is hollow-ground—you just balance the edge on heel and toe and go for it. I hone my dovetail chisels the same way, without a jig, to make them easier to strop.

• **Thin blades.** I use these blades for paring the sides of skinny sockets. One of the blades is just a block-plane iron; I made the other from a broken-off power hacksaw blade, wrapping tape around one end to make it more comfortable to hold.

• **Shims.** These are the set of playing cards below, in case you were wondering. Years ago, while in business, I made dovetails by the artisan's quick method of sawing and chopping to a line. These days, I slow down. I saw and chop away from a line, then pare to a line using a guide block and shims. The block is clamped right on the line. I place a few shims against the block and remove one after each shaving. My rule of thumb: The thinner the shaving, the more accurate the paring. 

SOURCES

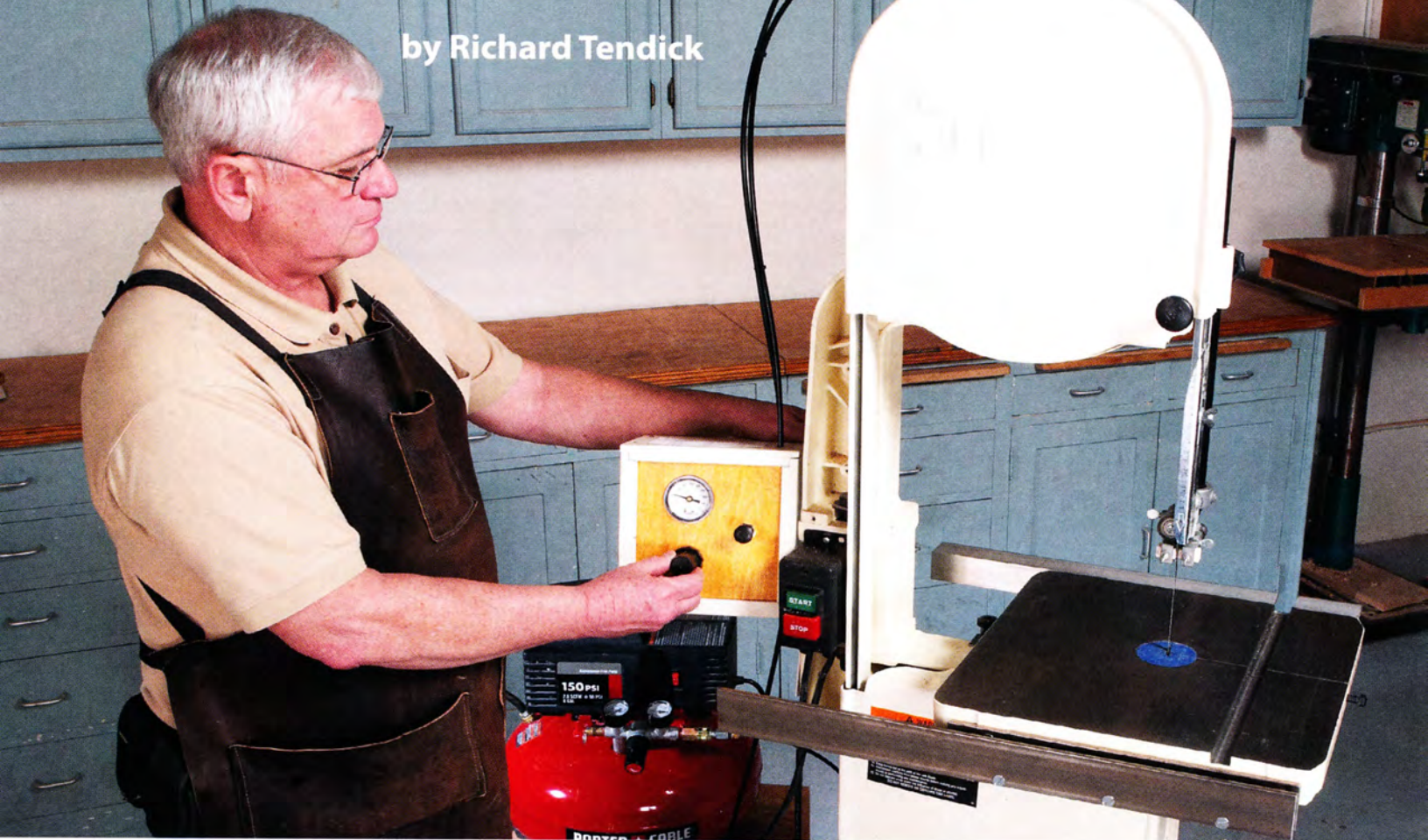
Lee Valley, leevalley.com, 800-871-8158, Veritas Workshop Striking Knife, #05D20.05, \$10.95; Veritas Saddle Square, #05N56.01, \$14.50; Japanese Standard Dozuki Saw, #60T03.01, \$52.50; Veritas Journeyman's Brass Mallet (not pictured), #05E14.01, \$32.50.

Calvo, Davidcalvo.com, 978-283-0231, 1.5 lb. Bronze Wood Carver's Mallet (pictured), \$70.

Air-Tensioned Bandsaw

Accurate tension = better results.
Here's how compressed air can
replace the crank!

by Richard Tendick



Simple modification

Replacing your saw's spring-tension system with an air-powered piston is quite simple. No special skills are required.



Off-the-shelf components

All of the parts for the air system are easy to obtain and assemble. The total cost is about \$275.

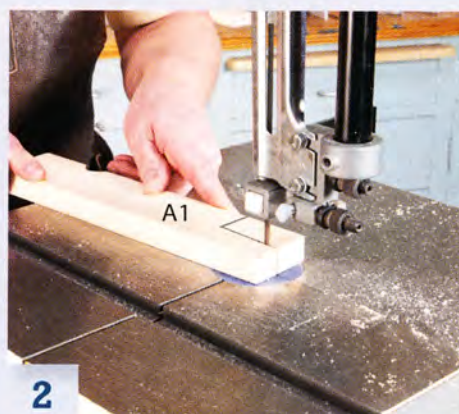


Accurate tension control

With an air-powered system, you just turn a knob to adjust blade tension. No more guessing if it's right!



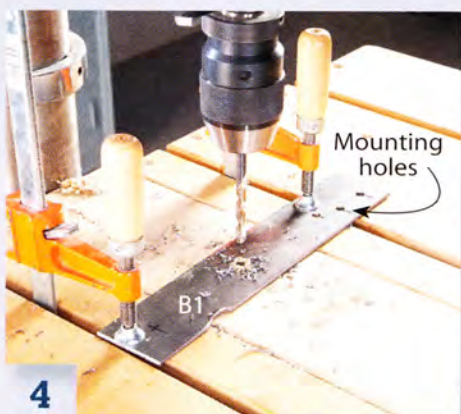
1 Trace around the contours of your saw to make a pattern.



2 Draw the pattern on two blocks and cut them out. These parts—called riser blocks (A1)—will support the air cylinder.



3 Chop a recess for the bandsaw's sliding bracket (see photo 5). The bracket will rise into this recess as the blade is tensioned.



4 Drill holes for fastening a steel plate (B1) to each riser block and for mounting the plates and riser blocks to the saw.



5 Fasten the plates to the riser blocks, then mark the location of the mounting holes on the saw.



6 Drill and tap the mounting holes.

I'M AN ENGINEER by trade—when a woodworking machine needs help, I often modify it to make it better. Perhaps I've gone over the edge in upgrading my bandsaw, though. You be the judge.

I've always thought of my bandsaw as the shop's prima donna. Like a temperamental opera singer, it required way too much time and attention to perform well. Changing blades, setting tension, adjusting guides—all these tasks were so time-consuming that I'd often leave the wrong-size blade in the machine, or use a dull one, rather than go through the bother of replacing it. Sound familiar? These problems are common to most bandsaws.

I've turned to air power for help. On my modified machine, a piston driven up or down by compressed air gradually raises or lowers the bandsaw's upper wheel. The piston is housed in an air cylinder—a device commonly used in industry—and is driven by a small air compressor. Air pressure cushions any shock to the blade, just

like the saw's original spring.

Raising the upper wheel tensions the blade, of course, and lowering the wheel creates enough slack to remove the blade. I don't have to turn a crank anymore to move the wheel in either direction—I just push a button. In addition, I can tension the blade very precisely by using a gauge that measures air pressure. More air pressure equals more tension: It's that simple.

Add new hardware

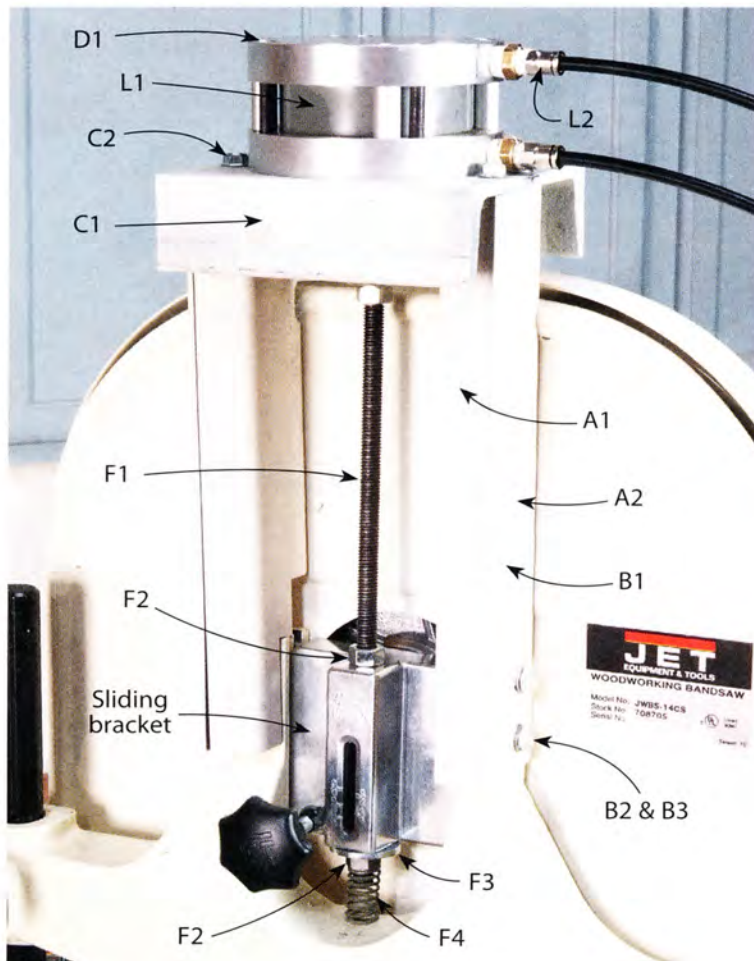
The first items you'll make are two brackets for supporting the air cylinder. Each bracket is composed of two parts: a wood riser block (A1) and a steel stiffening plate (B1; Fig. A, p. 48). The riser blocks must be shaped to fit the back of your saw. Make a pattern (Photo 1), transfer the pattern to the riser block blanks, then cut the blanks (Photo 2). Chop a recess in each blank to receive the saw's sliding bracket (Photo 3; Fig. A). The bracket moves up and down as the saw is tensioned.

To make the stiffening plates, cut two pieces of flat steel the same length as the riser blocks. Cut or file the steel to fit the bandsaw, then drill holes in the plates for attaching them to the riser blocks (Photo 4). Drill more holes for attaching the plates and riser blocks to the saw.

Fasten the plates to the saw with screws (A2), then mark the location of the holes you'll need to make for bolting the assemblies to the saw (Photo 5). Mark the holes with a center punch, then drill 1/8" holes about 5/8" deep. Enlarge the holes with a #8 bit (a 13/64" bit will work OK, too), then tap the holes for 1/4-20 threads (Photo 6). Fasten the riser block/stiffening plate assemblies to the saw with bolts and washers (B2, B3). Note: The tops of the assemblies must be level with each other. If one sticks up higher than the other, remove and shorten it before you proceed.

The air cylinder will sit on a mounting plate (C1), which is simply a piece of channel iron. You can order this channel iron precut to the length you need (see

Fig. A The Tensioning System



Watch the air-tensioning system in action and get some tips on how to set it up at AmericanWoodworker.com/WebExtras

Bandsaw Hardware

Part	Name	Qty.	Material	Th x W x L (a)
A1	Riser block	2	Painted hardwood	3/4" x 2" x 10-1/2"
A2	" screws	6	Flat head screw	1" #6
B1	Stiffening plate	2	Steel	1/8" x 2" x 10-1/2"
B2	" " bolt	4	Bolt	1/4-20 x 1/2"
B3	" " washer	4	Lock washer	1/4"
C1	Mounting plate	1	Channel iron	5" wide x 5-1/2" (b)
C2	" " screws	4	Lag screw	1/4" x 1-1/2"
D1	Air cylinder screw	4	Socket head cap screw	1/4-20 x 3"
D2	" " nut	4	Lock nut	1/4-20
E1	Adapter bolt	1	Grade 5 bolt	5/8-18 x 2"
F1	Rod	1	All-thread rod	3/8-16 x 12"
F2	" nut	3	Nut	3/8-16
F3	" washer	1	Washer	3/8"
F4	" spring	1	Spring	5/8" OD x 1-1/2"

Notes:

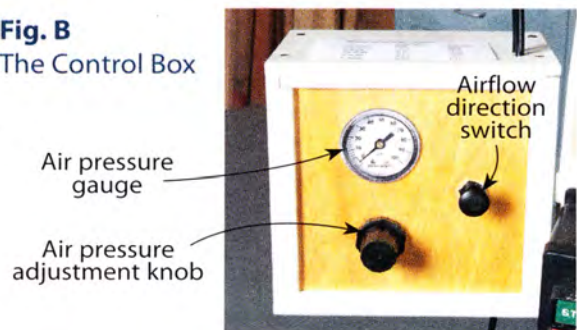
a) The part dimensions given in this chart are only for a Jet bandsaw. Your bandsaw may require parts of different lengths and widths.

b) Source: Metalsupermarkets.com, 866-867-9344.



For full-sized schematics of all the parts of this system, go to AmericanWoodworker.com/WebExtras

Fig. B
The Control Box



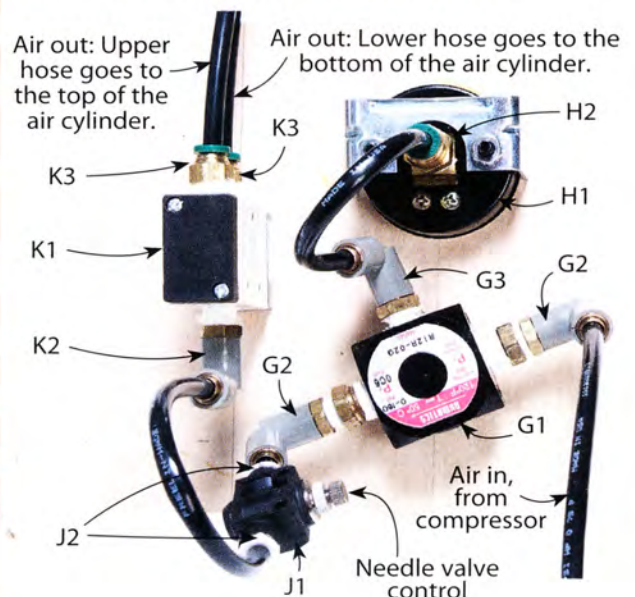
Pneumatic Parts

Part	Name	Qty.	Specs.	Source, Part No., Price (ea.)
G1	Air regulator	1		JHF, Numatics R12R-02, \$22.89
G2	" " fitting	2	1/4" NPT, 90° push-in	McMaster-Carr, 51025K137, \$4.07
G3	" " fitting	1	1/8" NPT 90° push-in	McMaster-Carr, 51025K136, \$3.65
G4	" " nut	1		JHF Numatics PN12, \$1.99
H1	Air gauge	1	2", panel mount, 0-100 PSI, 1/8" NPT	McMaster-Carr, 3846K451, \$14.84
H2	" " fitting	1	1/8" female, push-in	McMaster-Carr, 51025K243, \$2.39
J1	Needle valve	1	1/4", single-direction flow control	McMaster-Carr, 7824K12, \$30.76
J2	" " fitting	2	1/4" NPT straight, push-in style	McMaster-Carr, 51025K178, \$1.98
K1	Air valve	1	1/4" NPT, 5-port, 2-position	JHF, MFD Pneumatics M4L310-08, \$29.33
K2	" " fitting	1	1/4" NPT, 90° push-in	McMaster-Carr, 51025K137, \$4.07
K3	" " fitting	2	1/4" NPT straight, push-in style	McMaster-Carr, 51025K178, \$1.98
L1	Air cylinder	1	3" Dia. piston with 1" stroke	McMaster-Carr, 1691T17, \$130.15
L2	" " fitting	2	1/4" NPT straight, push-in style	McMaster-Carr, 51025K178, \$1.98
M1	Tubing	25'	1/4" OD, nylon, black	McMaster-Carr, 5548K64, \$.60/ft.
N1	Air fitting	1	1/4" NPT straight, push-in style	McMaster-Carr, 51025K178, \$1.98

SOURCES:

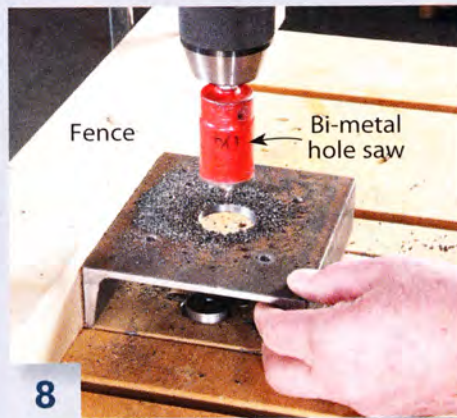
JHF, jhfooster.com, 800-582-5162 (call to place order); McMaster-Carr, mcmaster.com, 630-833-0300.

Fig. C
Pneumatic Parts Inside the Control Box

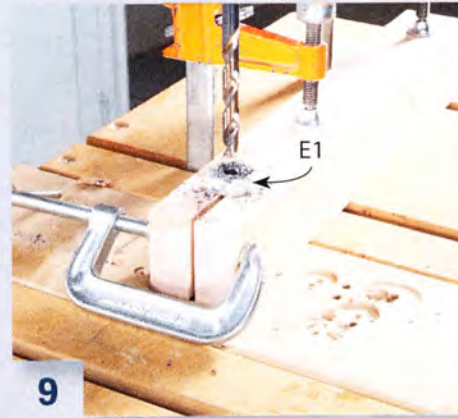




7 Center the air cylinder (L1) on a mounting plate (C1). Drill holes for attaching the cylinder with cap screws (D1).



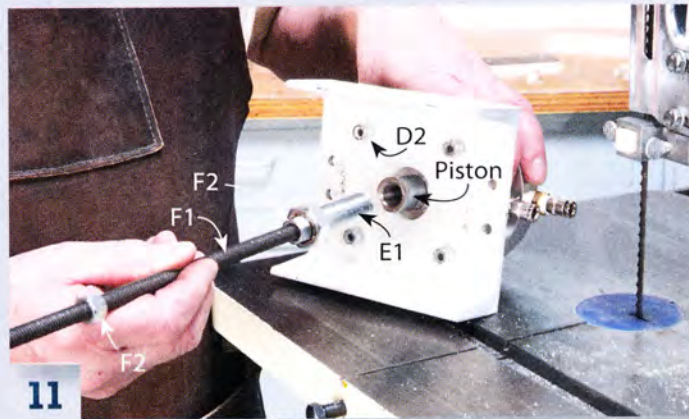
8 Drill a large hole through the mounting plate to accommodate the air cylinder's piston. Fasten the cylinder to the plate.



9 Drill a hole in the head of a short bolt (E1). This "adapter bolt" will connect the piston to a long all-thread rod.



10 Tap the hole. Use the drill press to keep the tap vertical.



11 Thread the adapter bolt (E1) and all-thread rod (F1) into the air cylinder's piston. Add two nuts (F2) to the rod.

"Bandsaw Hardware," page 48). Mark the center of the plate with a punch, then draw a 3-3/4" dia. circle around the mark. Place the air cylinder over this circle, piston pointing up, and make sure you can see the circle through all four of the cylinder's mounting holes. Clamp the cylinder to the plate. Drill holes through the plate for mounting the cylinder (**Photo 7**). After you drill the first hole, drop a cap screw (D1) through the hole to lock the cylinder in position for drilling the remaining holes.

Remove the cylinder and drill a 1/4" hole through the center of the plate. Use this hole to guide a 1-1/4" hole saw with bimetallic teeth (**Photo 8**). The enlarged hole will accommodate the air cylinder's piston. Hold the plate against a fence, or clamp it to your bandsaw table, to prevent it from moving as you drill. Drill two pairs of holes through the plate for mounting it on top of the riser blocks with lag screws (C2). Paint the mounting plate and riser block assemblies to match your saw. Fasten the air cylinder to the

plate with lock nuts (D2).

Next, make an "adapter bolt" (E1) for connecting the air cylinder's piston to a 3/8-16 all-thread rod (F1). Use a 2" thick block to hold the bolt for drilling and tapping (**Photos 9 and 10**). Drill a 5/8" dia. hole near the end of the block, then use your bandsaw to cut a 1/4" wide slot 3/4" beyond the hole. Place the bolt in the hole and clamp the slot. Use a 5/16" bit to drill a 1-1/2" deep hole into the head of the bolt. Tap the hole for 3/8-16 threads, using the drill press and a prick punch to hold the tap vertical.

Spin two nuts (F2) onto the all-thread rod. Position the first nut about halfway down the rod; position the second one about 2" from the rod's end. Turn this end of the rod into the tapped hole in the adapter bolt. Tighten the second nut against the head of the bolt. Thread the adapter bolt into the air cylinder's piston (**Photo 11**).

Remove the old tensioning system from your saw (**Photo 12**). To do this, unscrew the adjusting bolt (the long rod

with a knob on top). A square nut, red washer and spring will fall out of the sliding bracket. Set all of these parts aside—you won't need them for the new system.

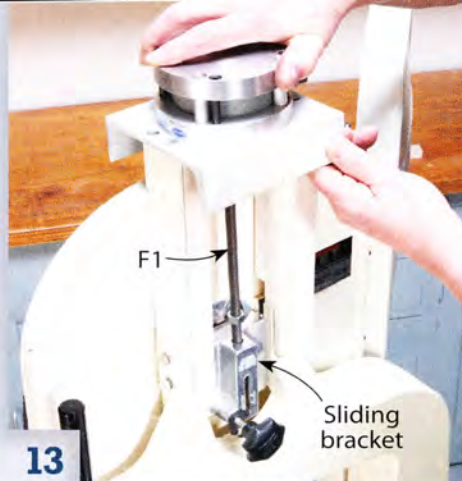
Lower the all-thread rod into the sliding bracket (**Photo 13**). Rest the air cylinder's mounting plate on top of the riser blocks. Adjust the plate's position so the rod is plumb and centered in the sliding bracket. Mark the position of the plate's mounting holes on the tops of the riser blocks, then drill holes into the riser blocks for the lag screws. Insert and tighten the lag screws (**Photo 14**).

Holding onto the rod, pull the piston out of the cylinder and push it back in half way. Put a washer (F3) and nut on the bottom of the all-thread rod. Push up the bandsaw's wheel until it comes in contact with a blade. Hand tighten the bottom nut against the sliding bracket. Rotate the upper nut until it contacts the sliding bracket, then gently tighten the nut.

Place a spring (F4) under the nut on the bottom of the rod. The spring will



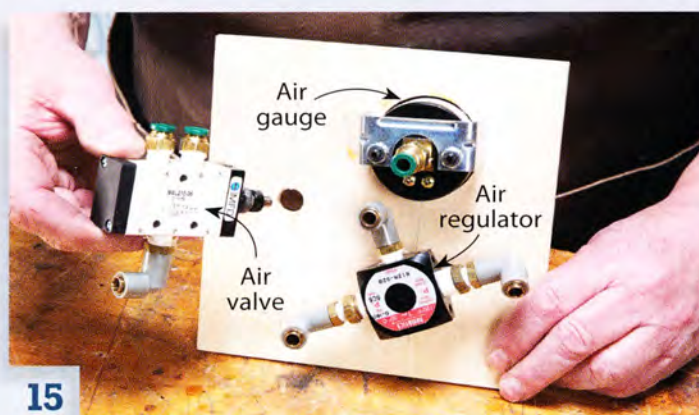
12 Remove the existing tensioning system from your saw. Unscrew these pieces and remove them separately.



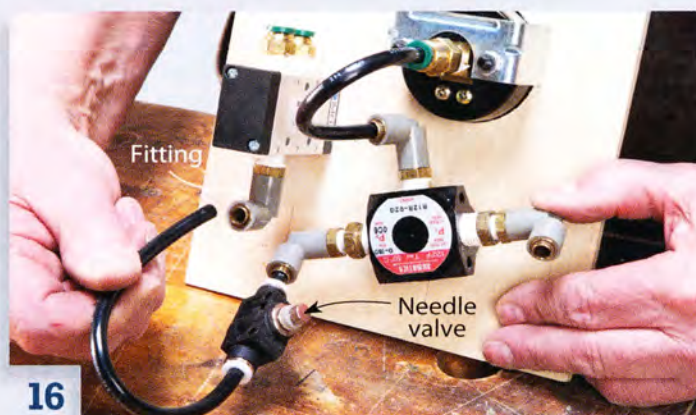
13 Fasten the riser block/stiffening plate assemblies to the saw, then position the mounting plate.



14 Secure the mounting plate to the riser assemblies with lag screws (C2).



15 Build a box to hold the components that will regulate the flow of air to the cylinder. Mount the components to a plywood panel.



16 Add a needle valve, then connect the components with tubing. All you have to do is push the tubing into each fitting.

prevent the sliding bracket from sliding down too far when you relax the tension on the blade. This completes the tensioning mechanism.

Install the pneumatics

Build a wooden box to hold the pneumatic controls. My box is 8" wide by 8" tall by 6" deep. It has a removable top and a front panel that slides in from above for easy access to the components inside. Drill one 15/64" dia. hole in the bottom of the box for air in and two similar holes in the top of the box for air out. Also, make a bracket for securing the box to your saw. Mine is made from flat steel stock, bent at an angle and bolted to the saw. Fasten the box to the bracket.

Drill holes in the panel for an air regulator (G1), air gauge (H1) and air valve (K1). Gather the fittings you'll need (see "Pneumatic Parts," page 48), then wrap Teflon tape around their threads and screw them into the components (Fig. C). Install the components on the panel (Photo 15). Connect a needle valve to

the air regulator, then cut short lengths of nylon tubing (M1) to connect the components (Photo 16). The ends of the tubing must be cut square, but all you have to do to install the tubing is to push the ends into the fittings.

Cut two pieces of tubing to go from the box to the air cylinder. Connect them to the air valve (Fig. C). Cut another piece of tubing to go from the box to your air compressor. Connect this tubing to the air regulator. Run the tubing through the holes in the box, then slide the front panel and top of the box into place, but don't fasten the top yet (Photo 17).

Install fittings in the air cylinder, then hook up the tubing (Photo 18). Install a fitting on the hose that goes to your compressor, then thread the fitting into a second, larger fitting—one that fits your particular type of compressor. Turn the air regulator knob counterclockwise, all the way, to deliver the least amount of air to the cylinder. Also, push in the airflow direction switch on the front of the control box (Fig. B).

Connect the tubing to the compressor and turn it on (Photo 19). Adjust the compressor to deliver 100 psi. Turn the air regulator knob to gradually increase the amount of air flowing to the cylinder. The piston, rod and sliding bracket should move up; if they move down, reduce the air pressure to zero and switch the hoses that run to the air cylinder. Adjust the rate at which the piston moves (slow is better than fast) by turning the needle valve (Photo 20). Assemble the control box.

To fine-tune the air mechanism, increase the air pressure to the amount appropriate for your blade (Photo 21; see "Tensioning by the Numbers," next page). At this point, the air cylinder's piston should extend about halfway out. If it isn't, reduce the air pressure to zero and adjust the nuts on the all-thread rod.

In order to change blades, pull out the airflow direction switch. Air pressure will now push the piston down, lowering the upper wheel and removing all tension from the blade. 



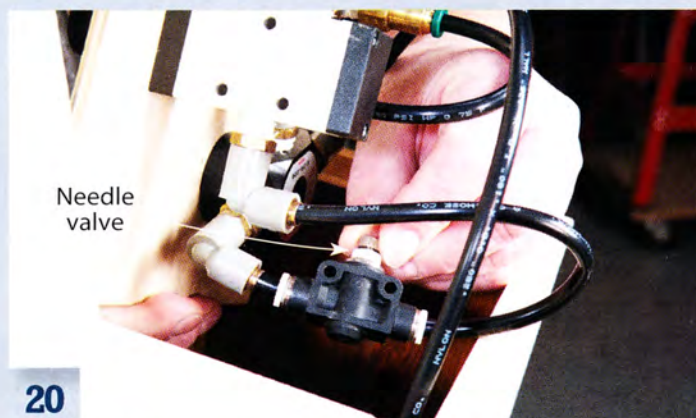
17 Slide the panel into the box, which is fastened to the bandsaw. Add a lid on top of the box.



18 Connect two lines to the air cylinder. The lower one pushes the piston up; the upper one pushes the piston down.



19 Attach a line to your compressor. A small compressor will work fine—this system doesn't require a large volume of air.



20 Turn on the compressor and adjust the needle valve. This valve controls the rate at which the piston moves up or down.



21 Adjust blade tension by increasing or decreasing air pressure. This system is quiet, precise and easy to operate.

Tensioning by the Numbers

By converting your bandsaw to an air pressure system, you can precisely adjust the amount of tension on your blade simply by turning a knob and reading a gauge. The knob adjusts the amount of air pressure; the gauge reads it. Both are conveniently located on a control box next to your saw.

Referring to a chart taped to the top of the control box, you can easily tell how much pressure is necessary for a particular blade. Creating a chart specific for your saw and blades will require some experimentation.

Use the table at right as a starting point. Some types of blades require more tension, some require less. To narrow down the numbers for your particular set of blades, you'll have to set tension for each one the old-fashioned way, using the "flutter test." Here's how it works:

1) Spread the upper and lower blade guides apart 1/8" or so and raise the guide post as far as it will go. Install the blade.

2) Raise the upper wheel just enough to provide minimum tension to the blade.

3) Track the blade so it's centered on the upper wheel.

4) Turn on the saw and observe the blade's behavior. With tension this low, the blade should slightly flutter side to side.

5) Gradually increase tension by raising the upper wheel until the blade stops fluttering. Increase the tension a bit more, and you're good to go. Reset the blade guides and lower the guide post.

This method isn't exactly scientific, is it? But it's good enough.

Once you find the ideal amount of tension for a particular type of blade, record the amount of air pressure it required. Every time you change blades, or put on a new blade, you'll be able to dial in the proper amount of tension quickly and easily. You won't ever have to repeat the flutter test again, unless you change to a different brand of blade. From here on out, you can set tension by the numbers.



Blade Tension in PSI*

Blade Width	Tension Range
1/8"	6 - 14
3/16"	8 - 21
1/4"	10 - 25
3/8"	17 - 43
1/2"	27 - 60
3/4"	50 - 100

* For 3" dia. air cylinder

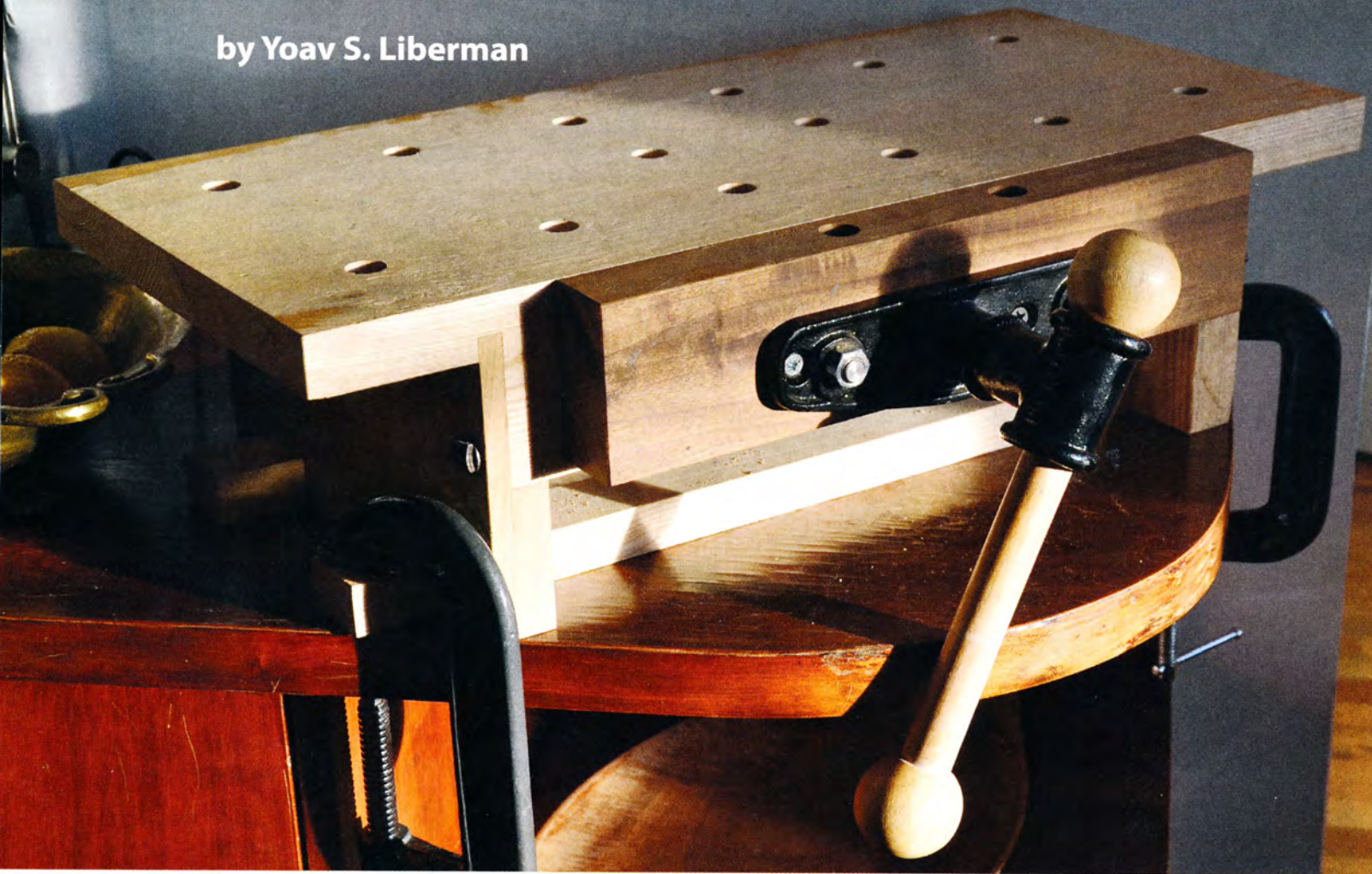


See how to set tension using the flutter test at AmericanWoodworker.com/WebExtras

Portable Workbench

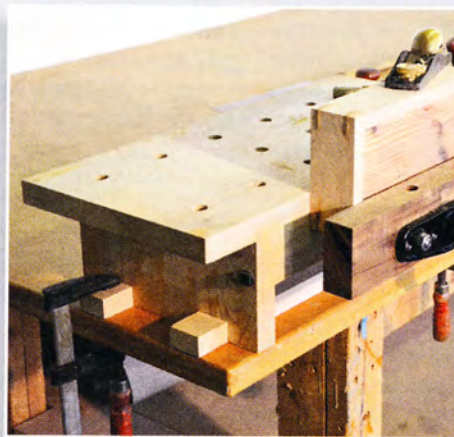
You can take it with you.

by Yoav S. Liberman



Carry it anywhere

Add a strap or handle, use a cart or just pick it up; this bench weighs only 31 lbs.



Clamp it anywhere

Protruding feet on both ends allow clamping on virtually any surface.



Save your back

This bench elevates your work so you can carve or plane with less fatigue and better control.

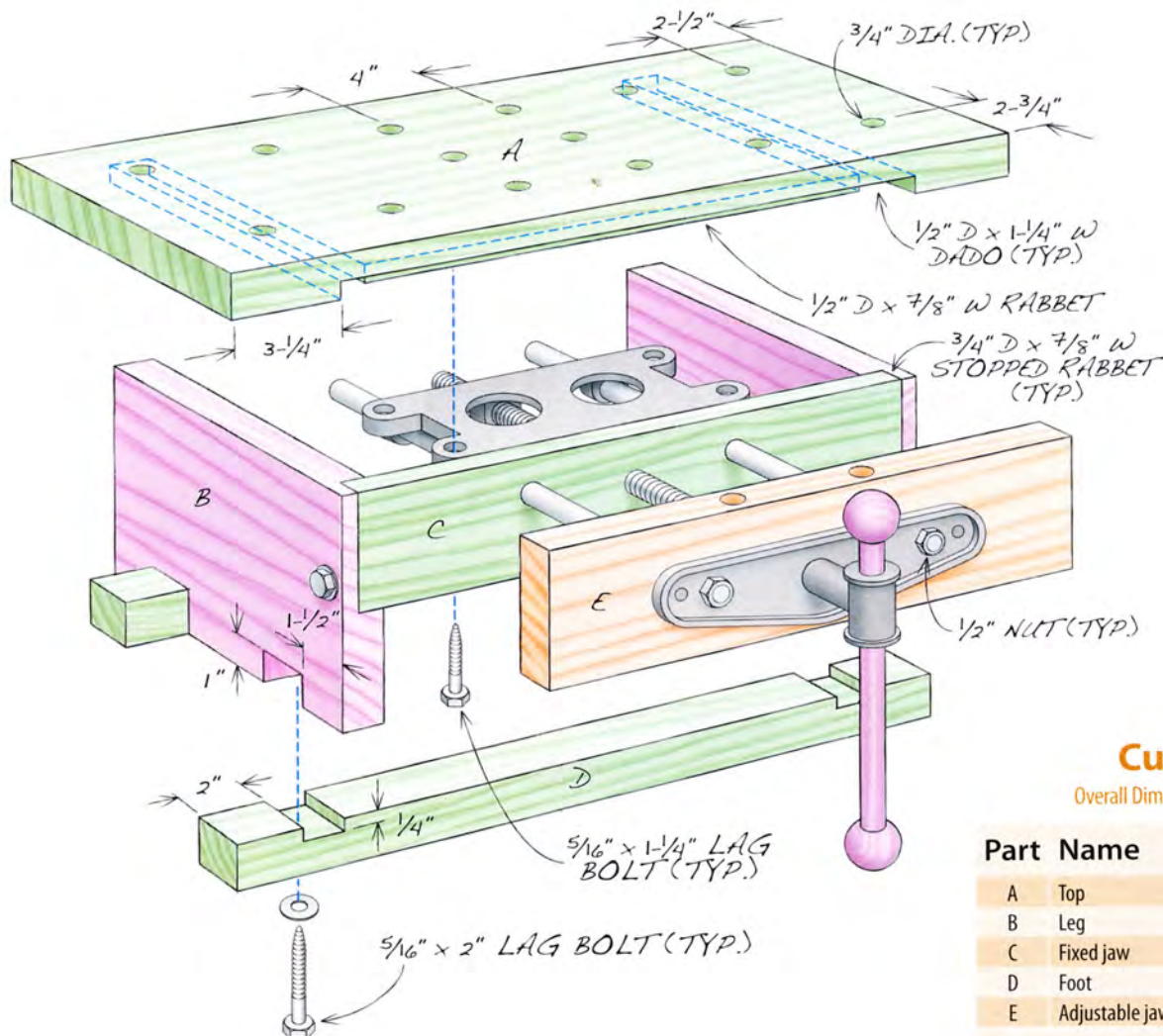


Fig. A
Exploded View

Cutting List

Overall Dimensions: 7-1/8" x 12" x 25"

Part	Name	Qty.	Th x W x L
A	Top	1	1-1/4" x 12" x 25"
B	Leg	2	1-1/4" x 12" x 6-3/8"
C	Fixed jaw	1	7/8" x 3-1/4" x 17-1/2"
D	Foot	2	1-1/4" x 1-3/4" x 22-1/2"
E	Adjustable jaw	1	1-1/2" x 3-5/8" x 15-1/4"

EVEN THOUGH you can carry this bench in one hand, it has the same desirable features as a full-size workbench: a thick top, solid construction, a quick-release vise and dog holes that make it easy to securely hold work. Suitable for small to medium projects, this bench is perfect for an apartment dweller like me. I simply clamp it to a table or countertop and turn my kitchen or living room into an "urban" workshop. I've acquired several clamping devices that are perfect for use with this bench (see Sources, at right).

In a traditional shop, clamp this bench onto a standard-height workbench to create a higher, more comfortable working position for carving, planing or hand-dovetailing. This bench travels well, too. Take it to club meetings, craft fairs or even on your next vacation. Let's face it: Sometimes you just need to do some woodworking on a beach underneath a coconut tree.

Easy to build

Start by gluing up a blank of hardwood such as maple or ash and milling it to

1-1/4" x 12" x 40". Cut the blank into three pieces to create the bench's top and legs (A, B, Fig. A and Cutting List, above). Dado the top to house the legs and rout a rabbet between the two dados to house the vise's fixed jaw (C). Similarly, rout a stopped rabbet in each leg for the fixed jaw. After routing, use a chisel to square the corner of each rabbet. Cut complementary notches in the legs and feet (D), using a tablesaw or hand tools.

Install a small vise (see Sources). Lay the top bottom-side up and temporarily install the legs and fixed jaw. Place the vise's base flush against the jaw and use a pencil to locate the holes for the screw and the two steel bars. Disassemble the parts and use a drill press to drill these holes. Drill the holes for the steel bars slightly oversize.

Lay out and drill the bench dog holes on the top, using the drill press. Then glue and screw together the bench, using lag screws to secure the fixed jaw and the feet. Make sure to drill adequately sized pilot holes for the lag screws and wax each screw to ease installation.

Place the vise's adjustable jaw (E) flush with the bench's fixed jaw and a little proud of the bench's top. (You'll hand-plane this jaw flush later.) Use a pencil to transfer the location of the holes drilled in the fixed jaw to the adjustable jaw. Drill these holes and then insert the jaw over the vise's bars. Assemble the vise and anchor it to the bench using 1-1/4" lag bolts. Then fasten the adjustable jaw.

SOURCES

- Lee Valley & Veritas, leevalley.com, 800-871-8158, Veritas Surface Clamp, #05G19.01, \$74.50; Wonder Pup, #05G10.02, \$36.50; Set of Bench Dogs, #05G10.03, \$44.
- Rockler Woodworking and Hardware, rockler.com, 800-279-4441, Heavy-Duty Quick-Release Front Vise, #27838, \$103.99.

Yoav S. Liberman is a studio furniture maker, teacher and writer residing in New York. He manages the woodshop at Robert Lighton Furniture and teaches woodworking at the Rudolf Steiner School in Manhattan.

Flip-Top Mortiser Cabinet

No more lifting your heavy mortiser. To store it, just tip it over.

WHEN I MAKE MORTISES, my benchtop mortiser is the go-to tool because it's fast and accurate. I used to store the mortiser out of the way, underneath a counter. To use it, I had to crawl under the counter, drag out the machine, then lift it onto my bench. That's way too much work! To save my back, I designed a flip-top cabinet that supports the mortiser and stores the machine inside. This cabinet could easily be adapted to fit other benchtop tools as well.

by Darrell Kalmes



See how the cabinet works at
AmericanWoodworker.com/WebExtras



Rotating top

When you're ready to mortise, open the cabinet and flip up the machine.



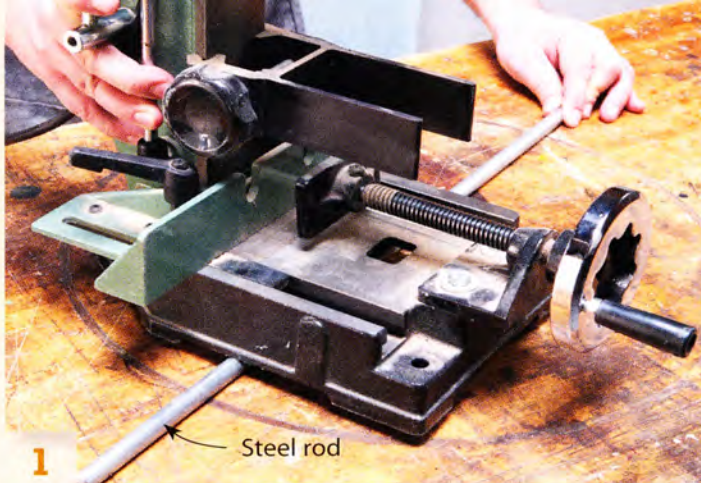
No chance of tipping

A pair of hinged supports holds the top level. Closing the door automatically locks the supports in place.

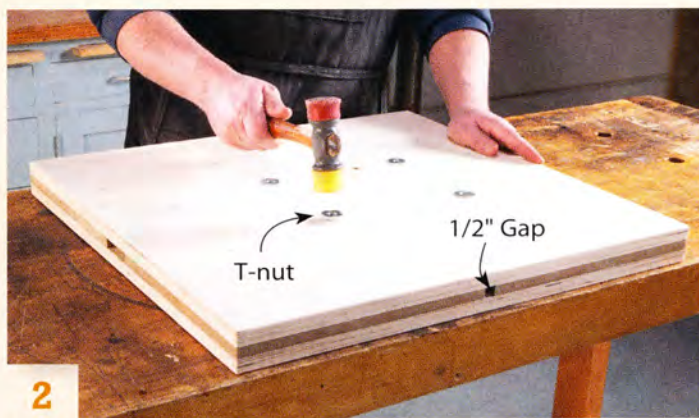


Stow it away

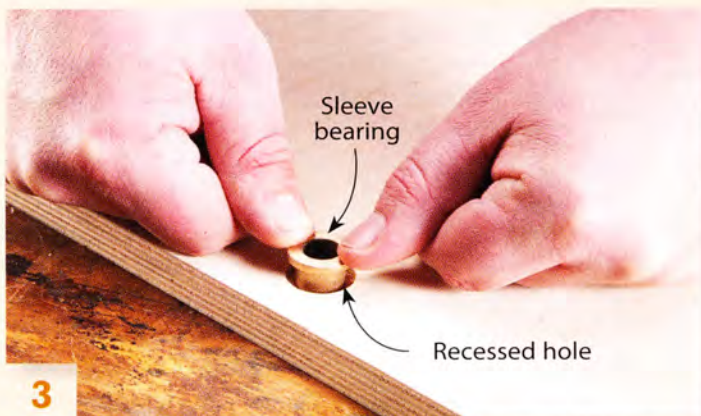
When you're done, flip over the mortiser and wheel the cabinet into a corner or park it under a shelf.



1 Find your mortiser's balance point. Place a 1/2" steel rod under the tool's base and carefully roll the mortiser back and forth until it balances. Save the rod—it will become part of the cabinet.



2 Assemble the cabinet's top and install T-nuts in the underside. The middle portion of the top is composed of two pieces 1/2" thick. Leave a gap between them—the rod goes through here.



3 Insert two flanged sleeve bearings into the cabinet's sides. These bearings receive the 1/2" steel rod—the "pivot rod"—that will allow the cabinet's top to rotate. Slide the rod through the top.



4 Position hinged supports on the cabinet's sides. Place the top on a side, slide the pivot rod through the side's sleeve bearing, then butt the support tight against the top. Fasten the support's cleat.

Before you begin building, you'll need to figure out whether or not your mortiser will fit inside this cabinet. If it doesn't, you'll have to adjust some dimensions. I'll walk you through the steps.

First, determine how much space you need on each side of your mortiser, taking into account anything that protrudes beyond the base's footprint, such as handles and fences. Second, measure your mortiser's height and add 2" to 3". This is how much vertical space you need inside the cabinet.

Lastly, find your mortiser's balance point by setting your machine on a steel rod—the "pivot rod." Roll the machine back and forth until it balances on the rod (**Photo 1**); close is OK. Make a note of the distance from the balance point to the front edge of the machine's base. Mounting the mortiser with its balance point over the pivot rod (Q) will make it easier to rotate.

Once you've found the balance point, determine the cabinet's depth. For ease of use, when the tool is upright it should be as close as possible to the front of the cabinet. Figure out how close you want the base's front edge to the cabinet's front. Add this dimension to the distance from the base's front edge to the balance point, then double it. This number will be the depth of the cabinet's top—the "tool platform." For example, if the balance point is 5" back from the base's front edge, and you want the front edge of the base 6" back from the cabinet's front, you'll need a total of 11" from the balance point to the cabinet's front.

Since you'll mount the mortiser's balance point directly over the pivot rod in the center of the cabinet, your platform needs to be 22" deep.

The platform assembly needs to be beefy to support the weight of the tool. Use two layers of 3/4" Baltic birch for the platform's outer layers (A) and 1/2" MDF for the core (B). (MDF is better than plywood for the core because the pivot rod is exactly 1/2" in diameter. Baltic birch plywood is slightly less than 1/2" thick, whereas MDF is a full 1/2" thick.) Make the core in two pieces, leaving a 1/2" gap between them for the pivot rod.

Before attaching the core pieces to the plywood, make a 1" deep x 2" wide cutout in the middle of one long side of each core piece. When the platform is assembled, the cutouts form recesses for the platform lock (K).

Use glue and brad nails to assemble the platform parts. Attach one core half to one of the outer platform layers. Place the pivot rod in position. Apply glue to the second core half, slide it against the rod and then nail it. Glue and nail the other outer platform piece.

Mark your machine's mounting holes on the platform. Use your drill press to drill all the way through the platform. Install T-nuts in the underside of the platform (**Photo 2**). Use the largest bolts and T-nuts that your tool's base will accommodate.

Cut the sides (C), bottom (D) and sub-bottom (E) to size.

Fig. A Exploded View

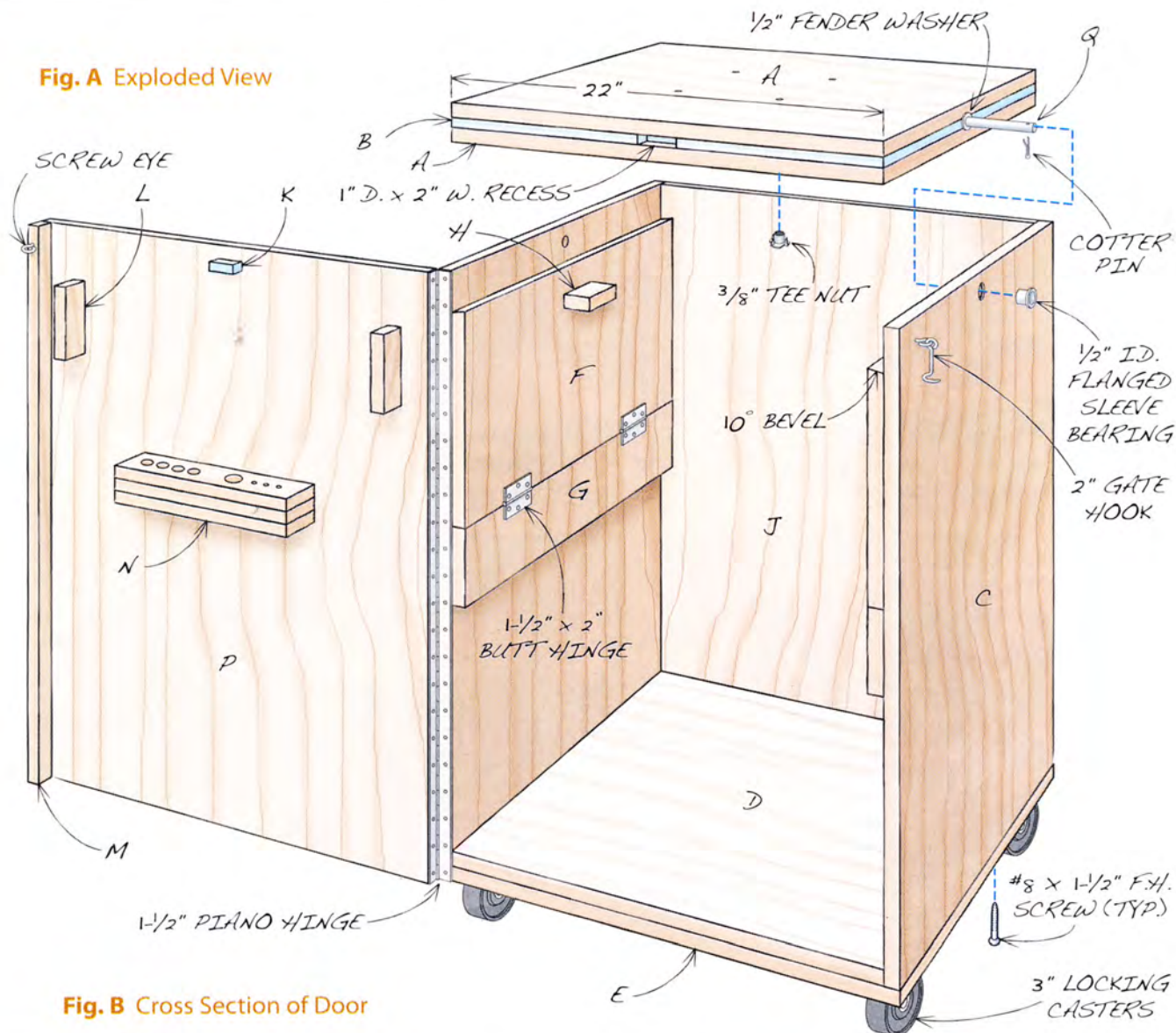


Fig. B Cross Section of Door

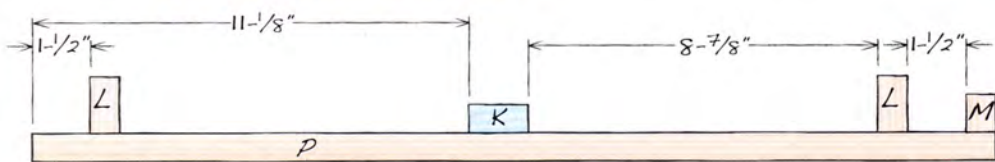
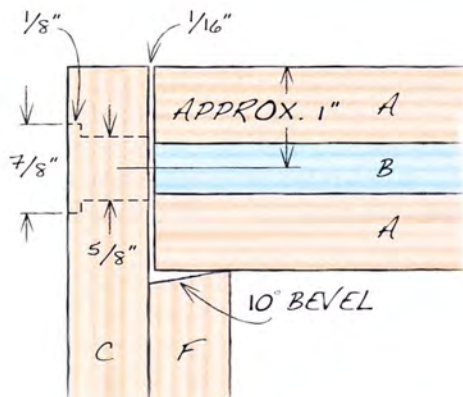


Fig. C
Sleeve Bearing
Hole Detail



SketchUp

To download free plans for this project, go to
AmericanWoodworker.com/SketchUpPlans

Cutting List

Overall Dimensions: 34" H x 24-1/2" W x 24-1/2" D

Part	Name	Qty.	Material	Th x W x L
A	Tool platform	2	Baltic birch	3/4" x 22" x 22-7/8"
B	Platform core	2	MDF	1/2" x 22" x 11-3/16"
C	Side	2	Baltic birch	3/4" x 23-11/16" x 30-1/4"
D	Bottom	1	Baltic birch	3/4" x 23" x 22-1/4"
E	Sub-bottom	1	Baltic birch	3/4" x 23-5/8" x 23-5/8"
F	Support	2	Baltic birch	3/4" x 11" x 22-3/4"
G	Support cleat	2	Baltic birch	3/4" x 4" x 23"
H	Support pull	2	Baltic birch	3/4" x 1-1/2" x 3"
J	Back	1	Baltic birch	3/4" x 22-1/4" x 30-1/4"
K	Platform lock	1	MDF	1/2" x 3/4" x 1-1/2"
L	Support lock	2	Baltic birch	3/4" x 1-1/2" x 4"
M	Door lip	1	Baltic birch	3/4" x 1" x 31"
N	Storage block	3	Baltic birch	3/4" x 2" x 11" (a)
P	Door	1	Baltic birch	3/4" x 24-1/4" x 31"
Q	Pivot rod	1	Steel	1/2" Dia. x 25-1/8"

Note: (a) Glue up three thicknesses of 3/4" Baltic birch. Size to suit.



Download cutting diagrams for the plywood at
AmericanWoodworker.com/WebExtras



5 **Glue** and screw the cabinet. Use #20 biscuits to align the back and sides. Clamp these parts, then use screws to attach the two-piece bottom assembly.



6 **Drill** a 1/8" dia. hole through each end of the pivot rod for a cotter pin. The distance between these holes must be the exact width of the cabinet.



7 **Install** the top. Flip up the supports, then slide in the pivot rod. Insert fender washers between the top and the cabinet's sides as you push the rod. Add cotter pins to both ends of the pivot rod.



8 **Mount** the casters and the door, then bolt the machine to the top. It's ready to flip!

Before assembling the cabinet (Fig. A, page 56), drill stepped holes in the sides for the flanged sleeve bearings in which the pivot rod turns (see Source, below). Measure the distance from the front edge of the tool platform to the center of the platform's gap to position the holes front to back. Measure half the thickness of the platform to position the holes top to bottom (Fig. C). To make the holes, use a Forstner bit to drill a 7/8" dia. x 1/8" deep recess. Next, drill a 5/8" dia. through hole centered in the 7/8" recess. Press the bearings into the holes (**Photo 3**).

Glue the bottom to the sub-bottom. The bottom is smaller than the sub-bottom, forming rabbets equal to your material's thickness at the assembly's back and along both sides.

Cut the supports (F) and support cleats (G). Saw a 10° bevel on the upper edge of each support to provide clearance when swinging them into position (Fig. C). Glue and screw the support pulls (H) to the supports.

Attach the supports to the support cleats using butt hinges. To position these assemblies to the cabinet's sides, first place one of the sides on your bench. Slide the pivot rod through the platform and into the side's sleeve bearing. Level the platform flush to the side's top edge. Push the support assembly tight up against the platform, then glue and screw the assembly to the side (**Photo 4**). Repeat this process for the other side of the cabinet.

Cut the back (J) and attach it to the sides using #20 biscuits, glue and clamps (**Photo 5**). Use the bottom assembly as a guide to keep the glue-up square and level. When the glue is dry, glue and screw the back and sides to the bottom assembly.

Drill 1/8" dia. holes through the pivot rod's ends using your drill press and a V-block (**Photo 6**). The distance between the holes must be the exact total width of the cabinet. That's important because the cabinet has nothing connecting its front upper corners; the pivot rod and cotter pins keep the cabinet square.

To install the platform, flip up both supports and set the platform in place. Slide the pivot rod through the platform (**Photo 7**). As you do this, place a 1/2" fender washer between each side and the platform. Install cotter pins to secure the rod.

Make the platform lock (K), support locks (L), door lip (M) and storage block (N). Make the door (P), then mount these pieces to the door (Fig. B). Mount the door to the cabinet using a piano hinge, then install a gate hook to secure the door. When the door is closed and latched, the platform can't rotate by accident. Mount locking casters and bolt your machine to the platform (**Photo 8**). Apply whatever finish you like. Enjoy! 🛠️

SOURCE

McMaster-Carr, mcmaster-carr.com, 630-833-0300, 1/2" i.d. Bronze Flanged Sleeve Bearings, #6338K419, \$1 each.

Stacking Sawhorse Bench

Make this two-part bench in an afternoon.

THIS SAWHORSE/WORKBENCH COMBO is built from dimensional construction lumber. It's rugged and inexpensive, with no complicated joinery—just butt joints, glued and screwed together. It's perfect for taking along to a jobsite, but its versatility makes it equally handy in the shop.

Sawhorses and workbenches are not a one-size-fits-all deal. For working comfortably and efficiently, they should be customized to the individual. Before making any cuts, you'll need to figure out the correct heights of your sawhorses and assembled bench. Correct for you, that is.

by Chad Stanton



Jobsite friendly

This small workbench is portable, sturdy and customized to your height. When assembled, it even sports a tool tray.



Easy to break down

When you need to move the bench, it simply lifts apart to form two units—no tools required.



Becomes two sawhorses

Converting the workbench into two sawhorses of the same height just takes a minute.



1

Determine a comfortable sawhorse height. Lift one foot so your shin is parallel to the floor and make a mark 1" below your knee. This will be the height of each unit.



2

Determine the workbench height. Measure from the floor to 1" below your palm with your wrist bent. This will be the total height of the units when they're stacked together.



3

Rip 2x12s in half to make the bench. Trim their edges square and then reglue them outer edge to outer edge. Rearranging each board in this way prevents them from cupping in the middle.



4

Screw and glue tops to ends using simple butt joints. The screws are close to the ends of each top, so you should drill pilot holes to prevent splitting.

To find these heights, stand next to a wall or board that you can mark. Bend your knee so your shin is parallel to the floor. Make a mark right beneath your knee. Measure 1" down from this mark to find your ideal sawhorse height (**Photo 1**). The reason for the 1" gap is to allow room for a board of average thickness to lie on top of the sawhorse while you push down on the board with your knee. That's how you will steady your work, right? Make both upper and lower units this height.

Now determine the ideal height for your bench. Stand by the same wall or board, bend your wrist so that your palm is parallel to the floor and make a mark directly under your palm. Measure 1" below this mark (**Photo 2**). This 1" difference takes into account the thickness of a board placed on the bench.

When I made these measurements, I figured out that my sawhorses need to be 18" high and my bench needs to be 33" high. But 18" plus 18" equals 36", not 33". Stacked on top of each other, the sawhorses would make a bench that's 3" too tall. Now what?

I needed to lower the combined height of the sawhorses without shortening either one. I did this by making the flared legs of the lower unit 3" shorter than the unit itself. When the upper unit slips down onto the

lower unit, it rests on top of those legs. Voila! The total height is 33" (Fig. A, page 60).

I'm 6'1", so if you're my height, the dimensions in the cutting list will probably work for you. But we're all proportioned differently, so you should go through the exercise of making the measurements I discussed above. You may find that the difference between them is 2", or 4"; adjust the length of the flared legs accordingly.

I used standard dimensional lumber for my bench. You'll need about 18' of 2x12 material, 12' of 2x4 material and 6' of 1x4. The nice part about using dimensional lumber is that it's readily available and inexpensive. The downside is that it's not necessarily dry and stable.



Wide boards like 2x12s are notoriously prone to cupping, but you can minimize this risk with a little extra work. Here's what to do: After cutting the boards to rough length, rip them in half (**Photo 3**). Joint the outer rounded edges until they're square (or remove them by sawing), then glue the boards back together, outer edge to outer edge. You've now taken the material that's most prone to cupping (the center of the board), divided it in two, and placed it on the outer edges of the reglued board.

Fig. A Exploded View

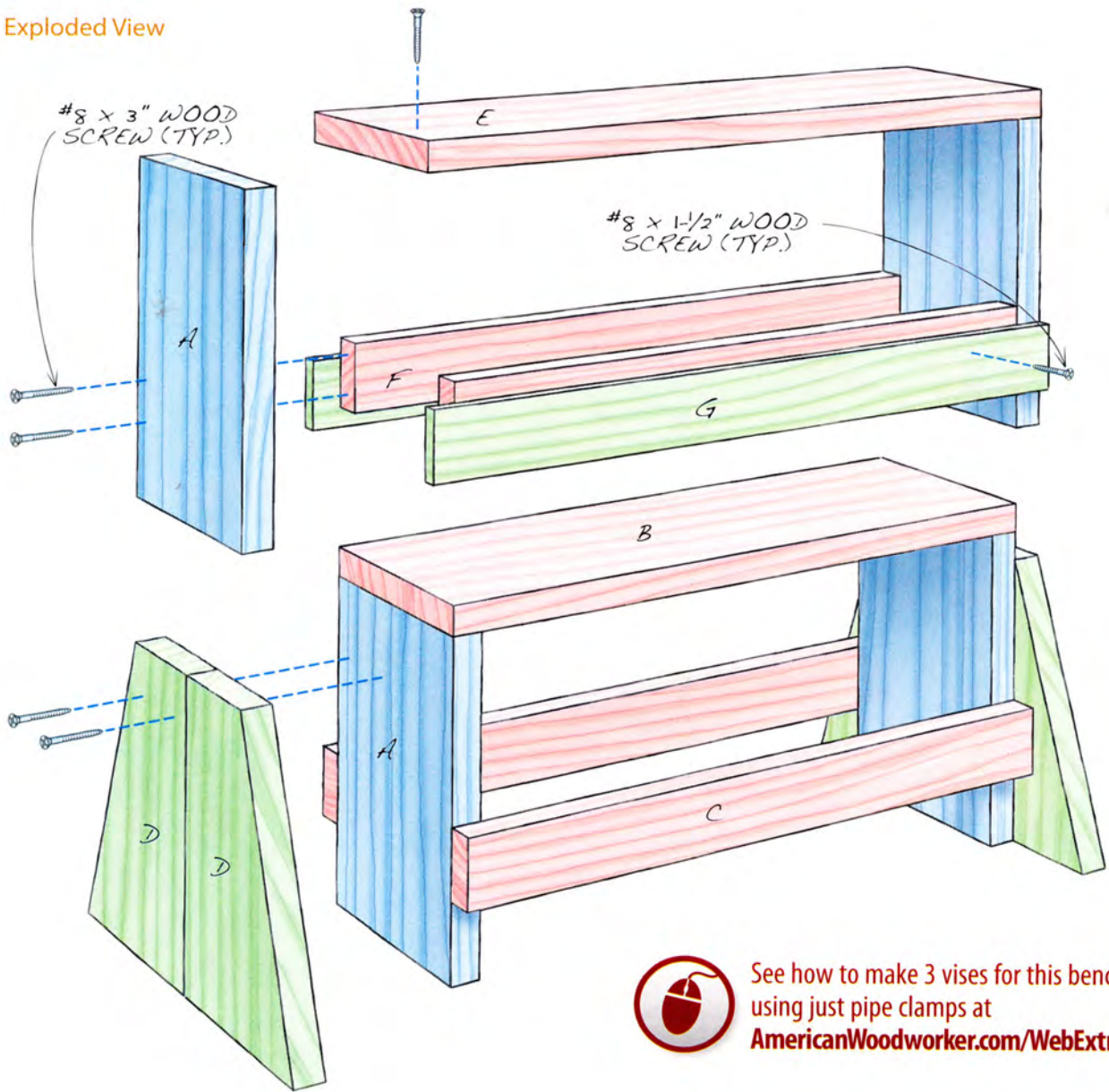


Fig. B Leg Detail

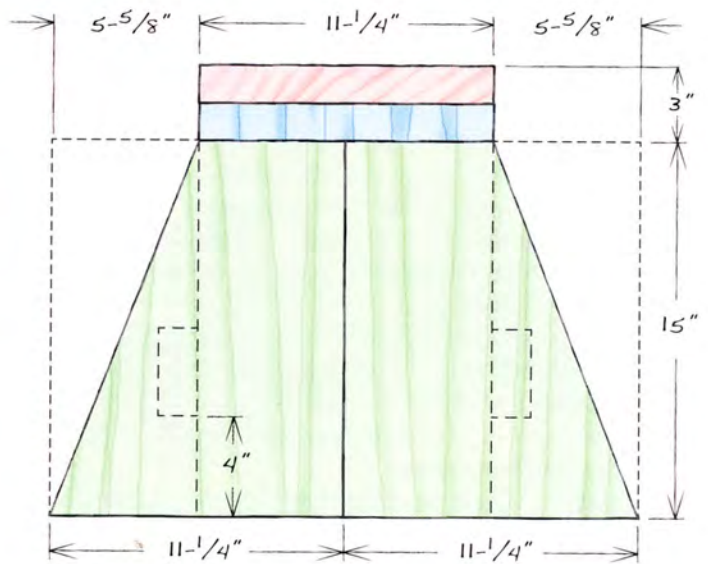
Cutting List

Overall Dimensions: 33" H x 36" W x 22" D

Part	Name	Qty.	Material	Length
A	End	4	2x12	16-1/2" (a)
B	Lower unit top	1	2x12	33"
C	Lower unit stretcher	2	2x4	33"
D	Leg	2	2x12	15" (a, b)
E	Upper unit top	1	2x12	36"
F	Upper unit stretcher	2	2x4	33"
G	Batten	2	1x4	36"

Notes

- a) Cut length to suit your height.
- b) Legs are made by edge-gluing two 2x12s.





5 **Saw** the legs of the lower unit from two 2x12s glued together. Freehanding is OK—the cut doesn't have to be perfectly straight.



6 **Fasten** the legs to the lower unit. When the two units are stacked, the flared legs provide a wide, stable base.



7 **Place** the upper unit on the lower unit, then fasten stretchers to the upper unit. They stiffen the upper unit and form a tool tray.



8 **Fasten** battens to the stretchers. The battens lock the upper unit in place by preventing it from shifting side to side.

It's well worth the effort to dig through a stack of boards at the lumberyard to find the straightest and driest of the bunch. Short of bringing a moisture meter with you to the lumberyard, the simple way to determine dryness is by weight; the heavier the board—in relation to other boards the same size—the wetter it is. Go for the light ones. Whenever you're using construction lumber it's always a good idea to let it sit in your shop for a few weeks and dry out a bit before milling it.

Now that you've determined the units' ideal sizes, cut the ends (A) and tops (B and E) for both units. Fasten the tops to the ends of both units using glue and screws (**Photo 4**). Since you're driving screws close to the end of the board, make sure you drill pilot holes first. The pilot holes through the top should be equal to the screws' major diameter (the diameter including threads). The pilot holes going into the ends should equal the screws' minor diameter (the diameter minus threads). Countersink the bottom sides of the top's pilot holes. This creates small recesses for wood fibers to expand in when you drive in the screws. It ensures that the glued joint will be as tight as possible.

Next, fasten the lower-unit stretchers (C) 4" from the floor to create a toe space. Use a framing square to ensure that the unit stays square during assembly.

To make the flared legs of the lower unit (D), start by edge-gluing two 2x12s, forming a single piece about 22-1/2" wide (or less, if you've ripped and reglued these boards). Taper the legs to match the lower unit's ends (**Photo 5**; Fig. B). Glue and screw the legs to the lower unit (**Photo 6**).

Set the upper unit on top of the lower unit. Cut the upper-unit stretchers (F) to length and then glue and screw them inside the legs so they're sitting directly on top of the lower unit (**Photo 7**). These stretchers provide extra support and stability to the workbench. They also create a tool storage tray when the units are assembled.

Lastly, fasten the battens (G) to the upper unit stretchers (**Photo 8**). Chamfer the inside lower edges of the battens so you can stack the sawhorses with ease. 

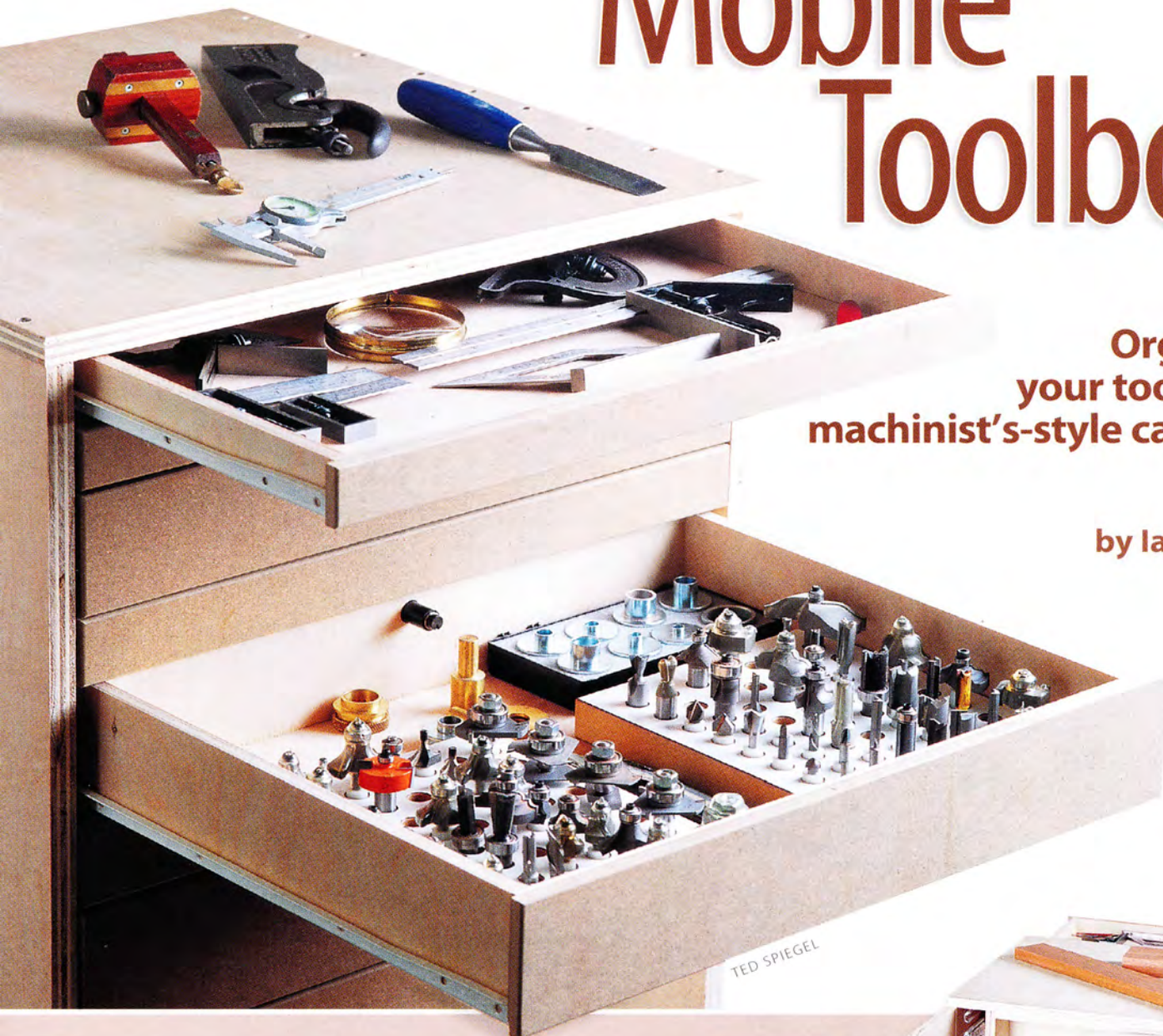


Chad Stanton is a licensed contractor and a professional furniture builder. He is also the host of the web show Wood Choppin' Time.com, where serious woodworking and light comedy come together. "Watch, laugh and learn," says Chad.

Mobile Toolbox

**Organize
your tools in a
machinist's-style cabinet.**

by Ian Kirby



TED SPIEGEL



Instant support

Build this toolbox the same height as your workbench, so you can roll it into position to support long stock.



Hidden storage

Longer tools fit in the strongback, a shallow box mounted inside the cabinet. The drawer slides pass by the strongback, so the drawers extend fully without the expense of full-extension slides.



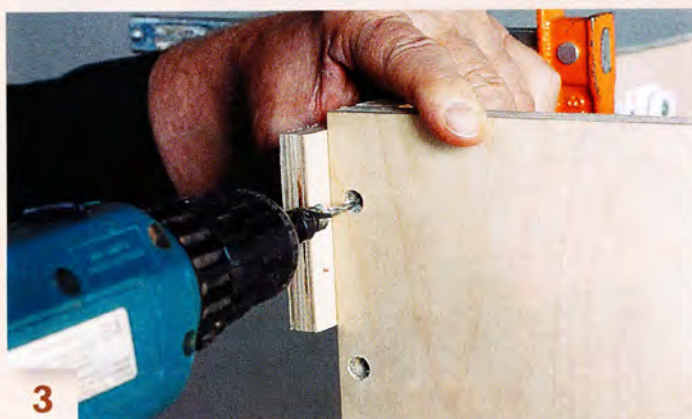
1

Size the drawers to hold the tools you have. A piece of plywood or cardboard the same size as the drawer bottom helps.



2

Mount the drawer slides before assembly, using a plywood jig to ensure they're square and at the same height on both sides.



3

Drill pilot holes for the screws used to assemble the cabinet. Clamp on a piece of scrap to keep each joint flush.



4

Hang the back doors with surface-mount hinges. Screw the hinges to the doors first, then screw the doors to the box.

DESIGNED TO WORK CLOSELY with your bench, this toolbox keeps your tools organized and close at hand, but out of the way of your project. Make it the same height as your bench and this box also works as an outrigger for breaking down plywood and supporting large work.

The strongback, a shallow compartment installed behind the drawers, stiffens the structure. Accessed through the doors on the back of the cabinet, the strongback also accommodates tools up to 28" long. Budget-friendly full-extension drawers are another nifty feature.



To create full-extension drawers without the cost of full-extension slides, simply install ordinary bottom-mount slides that are 4" longer than the drawers.

The drawers are equipped with touch latches—push in and they spring open. Pulls or handles are the old-school option.

This toolbox isn't meant to be a showpiece. It's a tough, utilitarian piece of shop furniture with exposed screwheads and exposed plywood edges. The big advantage to this design is that it doesn't take a lot of time or money to make. Of course, you could edge-band the plywood, use biscuit joints instead of screws and apply finish, but there's no functional reason for any of that.

Custom drawers

You're the only one who knows what tools you have, so you have to design your own drawer layout. If you take a little time to do it, you'll be able to fit an incredible number of tools into the box, and you'll have them grouped to suit your needs. Quick access is important, and workshop space is precious, so think about which tools you use together, which ones you use all the time and which rarely see daylight. Make a drawer template out of plywood or cardboard, so you can lay out each group of tools (Photo 1).

I like to keep my measuring tools handy, so I put them in the top drawer, with gauges and layout tools in the next drawer lying down. Some things aren't compatible in the same drawer—chisels with files, for example. Spade bits and drill bits can lie in a shallow drawer, but router bits should stand up in holes drilled into a block, so they can't knock together. Group similar tools together in shallow trays, with dividers to maintain order.



Maximize useful space in drawers by running dividers from front to back instead of from side to side.

Once you've planned your layout, it's easy to dimension the drawer parts. To determine the distance from the bottom of one drawer to the next, measure the height of the contents and add

Fig. A Exploded View

Cutting List

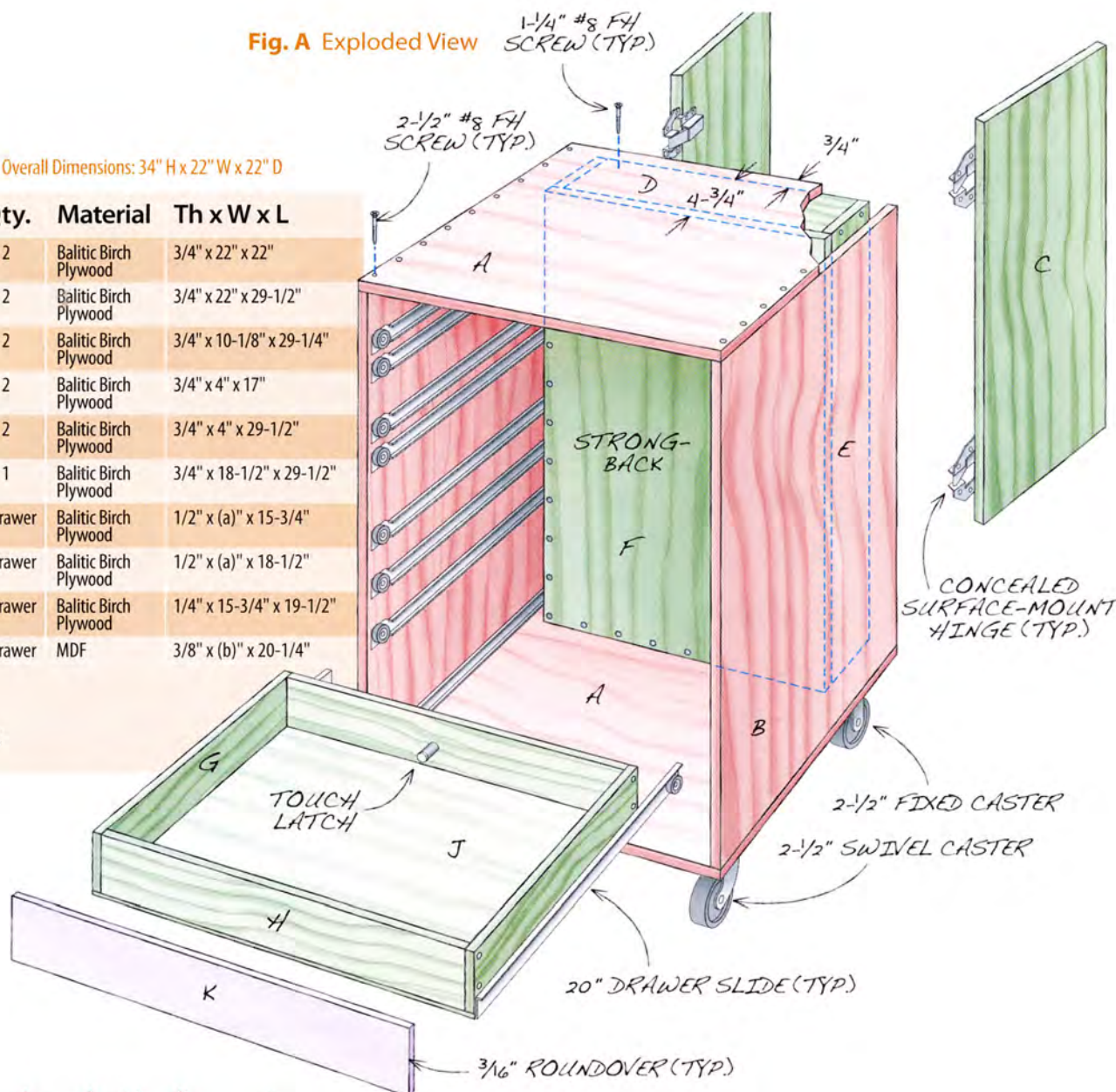
Overall Dimensions: 34" H x 22" W x 22" D

Part	Name	Qty.	Material	Th x W x L
A	Cabinet top/bottom	2	Balitic Birch Plywood	3/4" x 22" x 22"
B	Cabinet side	2	Balitic Birch Plywood	3/4" x 22" x 29-1/2"
C	Door	2	Balitic Birch Plywood	3/4" x 10-1/8" x 29-1/4"
D	Strongback top/bottom	2	Balitic Birch Plywood	3/4" x 4" x 17"
E	Strongback side	2	Balitic Birch Plywood	3/4" x 4" x 29-1/2"
F	Strongback back	1	Balitic Birch Plywood	3/4" x 18-1/2" x 29-1/2"
G	Drawer side	2/drawer	Balitic Birch Plywood	1/2" x (a)" x 15-3/4"
H	Drawer end	2/drawer	Balitic Birch Plywood	1/2" x (a)" x 18-1/2"
J	Drawer bottom	1/drawer	Balitic Birch Plywood	1/4" x 15-3/4" x 19-1/2"
K	Drawer front	1/drawer	MDF	3/8" x (b)" x 20-1/4"

Notes:

a) Drawer height.

b) Drawer height plus 1/8".



View the plywood cutting diagram at
AmericanWoodworker.com/WebExtras

at least 1/2" (for the 1/4" plywood drawer bottom and a little clearance). The drawer sides and ends can be as wide as the depth of the contents they'll contain, but they don't have to be; routers and other big tools sit very well on shallow trays. The top drawer should have sides that are about 1/2" narrower than the drawer opening, so the drawer can be tipped up for installation.

Draw before you saw

Have all the hardware on hand—drawer slides, hinges, touch latches and casters (see Sources, page 65)—before you start to build, so you can adjust your design, if necessary, to work with the hardware you have. This is much easier than reconfiguring metal hardware to work with wood pieces you've already cut. Plan to make a full-size sectional drawing to show how the drawers fit inside the box. This will help you avert hardware conflicts. Pay close attention to the hinges on the back doors. You might have to rearrange the drawers to make room for them.

The threaded magnetic touch latches bypass the need for drawer pulls and keep the drawers closed while you roll the cabinet around the shop. Single latches won't have enough oomph to open deep drawers full of heavy tools, though, so plan to install two or more, as necessary.

Assemble the box

You can cut all the parts for the cabinet from one sheet of 3/4" plywood (A-F, Fig. A and Cutting List, above). Plan to cut the sides, rear doors, strongback sides and back to the same height. Then shorten the rear doors by 1/8", so they'll close easily.

Mount the drawer slides on the cabinet sides prior to assembly (Photo 2). Use a simple jig consisting of a piece of plywood with a cleat at one end to locate the slides. Position the slides tight against the plywood end of the jig. After mounting each pair of slides, shorten the jig to prepare it for mounting the next pair—remove the exact distance from the bottom of one drawer



5 Insert the strongback, center it and set it back 3/4", so it acts as a stop for the doors. Then fasten it with screws on the cabinet's top and bottom.



6 Install two swivel and two fixed casters. This arrangement provides easy steering and some rigidity when using the cabinet as a work support.



7 Assemble the drawers. They're simple boxes, glued and nailed, with plywood bottoms. Gluing on the bottom makes the drawer rigid and square.



8 Glue on the drawer fronts, using clamps, nails or screws to hold them until the glue sets.

to the bottom of the next.

Assemble the cabinet with 2-1/2" No. 8 construction screws spaced about 3" apart. Lay out the location of the screw holes on the plywood top and bottom, so you can drill and countersink clearance holes with the plywood flat on the bench. Set up the first joint with the aid of clamps (**Photo 3**). Be sure to drill the pilot holes into the second piece of plywood. If you skip this step, the entering screw will make the plywood bulge, interfering with a tight connection. Make the strongback the same way.

Mount the hinges on the doors and screw them to the cabinet sides (**Photo 4**). Then slide in the strongback (**Photo 5**). Its edge should sit 3/4" inside the cabinet so the doors can close against it. Make sure everything is correctly positioned before you screw the strongback to the cabinet. Complete the assembly by installing casters (**Photo 6**).

Make the drawers

The drawers are simple boxes with applied fronts (G-K). Make the box sides and ends from 1/2" Baltic birch plywood; use 1/4" plywood for the bottoms. Drill holes in the back pieces for the threaded touch latches. Screw or nail the sides and ends together. Then glue on the bottom to square the box and add strength. Apply glue on the bottom edges of the box. Then position the bottom, align the corners and nail it all around (**Photo 7**).

Close-fitting drawer fronts help keep shop dust out of the box. The drawer fronts shown here are 3/8" MDF with a 3/16" roundover. The fronts are 3/4" longer than the drawer box. (Standard drawer slides require 1/2" on each side of the box, so this provides 1/8" clearance.) Each drawer front fits flush with the bottom of the drawer box and is 1/8" wider. (This leaves a gap of about 1/8" between the drawer fronts.)

Starting near the middle of the cabinet, glue and clamp the drawer fronts to the drawer boxes (**Photo 8**). Position the first one by measuring and you'll be able to do the rest by eye. If you have a brad nailer, you won't have to bother with clamps. Use the touch latch holes in the back of the drawer boxes to locate the strike plates on the strongback. Then install the touch latches and make adjustments as necessary, so they function properly. 🛠️

SOURCES

- Woodworker's Hardware, www.hardware.com, 800-383-0130, Surface Mount Concealed Hinge, #LAXX1, \$5.11 ea.; Epoxy-Coated Drawer Slides, #KV1284 P20 WH, \$6.08 per pair; 2-1/2" Swivel Caster, #JH25 S, \$4.64 ea.; 2-1/2" Rigid Caster, #JH25 R, \$4.08 ea.
- Rockler Woodworking and Hardware, rockler.com, 800-279-4441, Magnetic Touch Latch with Threaded Insert, #98568, \$7.49 ea.

Finishing Cabinet

Organize all your tools and safely store solvents and stains.

by Kevin Southwick

YOUR FINISHING TOOLS deserve the same careful treatment you give your most precious woodworking tools. After all, they're just as important for successfully completing your projects. Like chisels and router bits, finishing tools pose special problems when it comes to storage and organization. Finishing chemicals are often flammable, brushes must be kept in tip-top condition and rags need to be kept clean or carefully disposed of (see "Avoid A Devastating Fire," page 72).



Flammables cabinet

It shields solvents and other flammable liquids long enough for you to escape a fire.



Full-extension drawers

Dividers allow custom storage of finishing supplies and personal protection gear.



Pull-out mixing tray

This tray provides a clean work surface for pouring and mixing materials. Contains spills, too.

This three-box cabinet is designed to organize and store finishing supplies ranging from flammable liquids to cotton swabs in ways that make them easy to access and (just as important!) easy to put back. To avoid clutter, each box is designed to limit whatever is being stored to one layer deep.

Pro Tip Safely storing flammable liquids (a requirement in professional settings) is a good idea for any home shop. In this cabinet, the bottom box is constructed to meet the code requirements of the National Fire Protection Association for a wooden flammables storage cabinet (Photo 1). It's built with 1" AC exterior fir plywood, using shouldered joinery that's glued and screwed, applied door seals, spring hinges and cupboard latches, fire-retardant paint and special signage.

After reading about its heavy-duty construction, you may be surprised to learn that a flammables cabinet is not meant to contain a fire. Its real purpose is to keep fire away from flammable liquids as long as possible, for the benefit of both you and firefighters. This cabinet is designed to keep flames away from your flammables for 10 minutes, so you have time to escape. Keeping all your finishing supplies in one highly visible spot allows firefighters to quickly isolate a danger zone.

The middle box in this cabinet has drawers with over-travel slides to allow full access. The bottom drawer is deep enough to store clean rags, tack cloths, gloves, dust masks, and even a respirator. The center drawer is just right for sandpaper sheets, sanding blocks, steel wool and other abrasives. Both drawers feature movable dividers.

The top drawer is actually a shallow tray for preparing and mixing stains and finishes. When the tray is fully open, installing a simple stabilizer virtually eliminates the side-to-side movement caused by the drawer slide mechanisms.

The cabinet's upper box has shallow shelves for storing small containers of glue, dye, putty, touch-up materials, measuring cups and such. Long screws installed on both sides allow hanging tape and lightweight tools such as a spray gun.

The left door stores tools the old-school way, on screws.



Assemble the flammables cabinet with glue and screws. The parts are made of 1" exterior fir plywood, and all the joints are shouldered, glued and screwed, per NFPA code.



Magnetic tool holder

Steel and magnets create a versatile holder for brushes and other tools.



Adjustable task lighting

A box on the top holds clamp-on lights and provides additional storage.

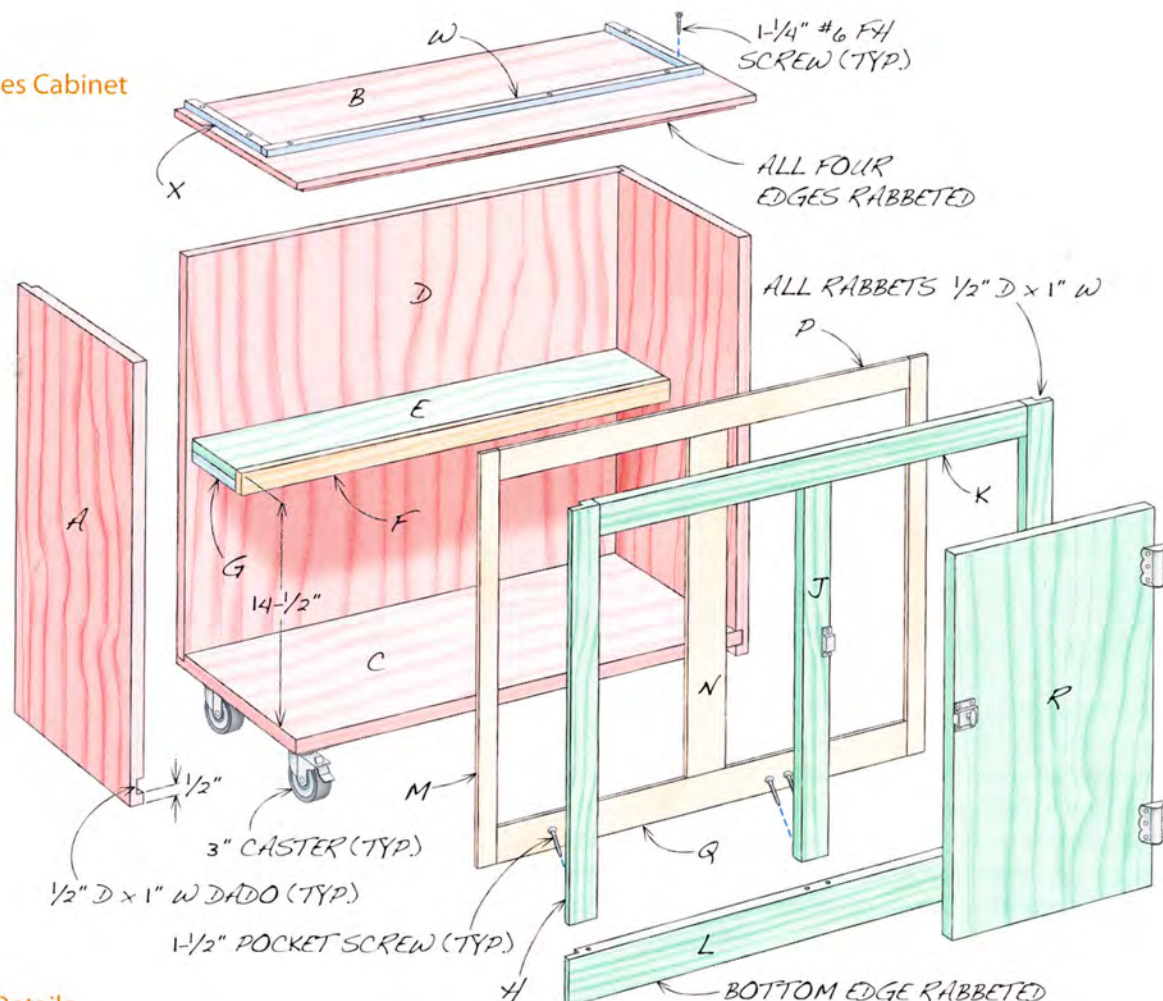


Easy mobility

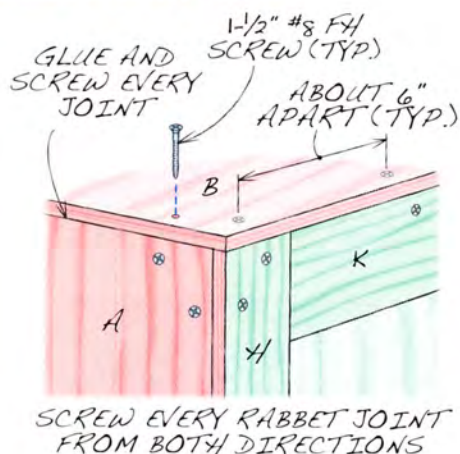
Heavy-duty swivel casters allow this cabinet to lock and roll!

Fig. A Flammables Cabinet

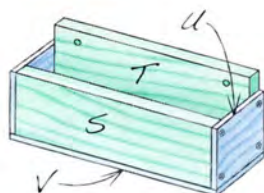
This cabinet has been designed to meet the National Fire Protection Association's requirements for a wooden flammable liquids storage cabinet established in Section 9.5 of the 2012 edition of NFPA 30, *Flammable and Combustible Liquids Code*. For more information, visit nfpa.org.



Detail 1 Joinery Details



Detail 2 Door Rack



Flammables Cabinet Cutting List

Overall Dimensions: 33-1/8" H x 36" W x 17-1/2" D (a,b)

Part	Name	Qty.	Material	Th x W x L
A	Side	2	Exterior fir plywood	1" x 16" x 29"
B	Top	1	Exterior fir plywood	1" x 16-1/2" x 36"
C	Bottom	1	Exterior fir plywood	1" x 16" x 35"
D	Back	1	Exterior fir plywood	1" x 28" x 35"
E	Shelf	1	Exterior fir plywood	3/4" x 6" x 34-3/4"
F	Lip	1	Poplar	3/4" x 1-1/2" x 34-3/4"
G	Cleat	2	Exterior fir plywood	1/2" x 3/4" x 5-7/8"
H	Face frame stile	2	Exterior fir plywood	1" x 2" x 25-1/2"
J	Face frame middle stile	1	Exterior fir plywood	1" x 2" x 23-1/2"
K	Face frame top rail	1	Exterior fir plywood	1" x 2" x 32"
L	Face frame bottom rail	1	Exterior fir plywood	1" x 3" x 36"
M	Door seal stile	2	Hardboard	1/4" x 1-1/2" x 27"
N	Door seal middle stile	1	Hardboard	1/4" x 3" x 22-1/2"
P	Door seal top rail	1	Hardboard	1/4" x 2" x 31"
Q	Door seal bottom rail	1	Hardboard	1/4" x 2-1/2" x 31"
R	Door	2	Exterior fir plywood	1" x 14-13/16" x 23-5/16"
S	Door rack front	4	Exterior fir plywood	3/4" x 3" x 10-3/4"
T	Door rack back	4	Exterior fir plywood	3/4" x 4" x 10-3/4"
U	Door rack side	8	Exterior fir plywood	1/4" x 3" x 4-1/4"
V	Door rack bottom	4	Exterior fir plywood	1/4" x 4-1/4" x 11-1/4"
W	Front retainer	1	Exterior fir plywood	3/8" x 3/4" x 34-1/4"
X	Side retainer	2	Exterior fir plywood	3/8" x 3/4" x 14-1/2"

Notes:

a) Calculated using full plywood thicknesses, as stated.

b) Overall height includes casters, but not the retainers; overall depth includes hinges and cupboard catch.



See how to build a flammables cabinet at AmericanWoodworker.com/WebExtras

The door on the right employs a steel sheet and rare earth magnets—a versatile storage system that's easy to rearrange.

The doors mount on free-swinging hinges, so they don't snap shut. Instead, an old-fashioned elbow catch and cupboard latch keep them closed. Rather than a decorative cornice, the top of the cabinet has a box that I use to store clean, empty containers. It's also perfect for holding clip-on lights.

To build this three-box cabinet, which measures 73-1/8" x 36" x 17-1/2" overall, you'll need one 4x8 sheet of 1" AC exterior fir plywood, two 4x8 sheets of 3/4" AC exterior fir plywood, one 4x8 sheet of 1/4" exterior fir plywood and a 2x4 piece of 1/4" tempered hardboard. You can custom-order 1" AC exterior fir plywood at most home centers. Full-service lumberyards typically keep it in stock.

When building this project, keep in mind that plywood thicknesses are almost always undersize. Because this thickness can vary, the dimensions in the cutting lists are based on full thicknesses—1" plywood is considered to be 1" thick, for example. Make any necessary adjustments as you build, according to your plywood's thickness.

Flammables cabinet

Cut the cabinet's 1" plywood sides, top, bottom and back to final dimensions (A–D, Fig. A and Cutting List, page 68). Next, cut a 1/2" deep x 1" wide dado in each side piece for the bottom. Cut 1/2" deep x 1" wide rabbets on the back edges of the side pieces and the bottom piece, and on all four edges of the top. Then assemble the box, using glue and screws spaced about 6" apart (**Photo 1**). Predrill countersunk pilot holes for all the screws and screw all the rabbet joints from both sides (Fig. A, Detail 1).

Cut the shelf (E) to size and glue on its lip (F). Note that the shelf is made using 3/4" plywood. Screw the cleats (G) in position inside the cabinet. Then screw the shelf to the cleats, so there's no chance for it to fall when you move the cabinet around.

Cut the face-frame stiles and rails (H–L) from 1" plywood. Note that the bottom rail is wider than the top rail. Assemble the face frame using glue and 1-1/2" pocket screws. Then cut 1/2" deep x 1" wide rabbets on the edges of both sides and the bottom.

Cut the hardboard door seal pieces (M–Q) to size and test-fit them on the back of the face frame to make sure they extend beyond each door opening on all four sides (**Photo 2**). When correctly positioned, the assembled seals should rest slightly more than 1/2" below the top of the face frame and just inside all three rabbets. Make adjustments as necessary. Then fasten each door seal piece with glue and nails.

Turn over the face frame and size the doors (R) to fit with 3/32" gaps all around. Then fasten the face frame to the cabinet with glue and screws, as before.

Apply fire-retardant paint (see Sources) to every exterior surface. Then shim the doors in the openings and install the surface-mounted spring hinges (**Photo 3**; see Sources). Build the door racks (S–V; Fig. A, Detail 2) and attach them, making sure they don't interfere with the doors' automatic closing (**Photo 4**). Install the casters to complete the cabinet. Plan to fasten the retainers (W, X) after you've built the drawer cabinet.

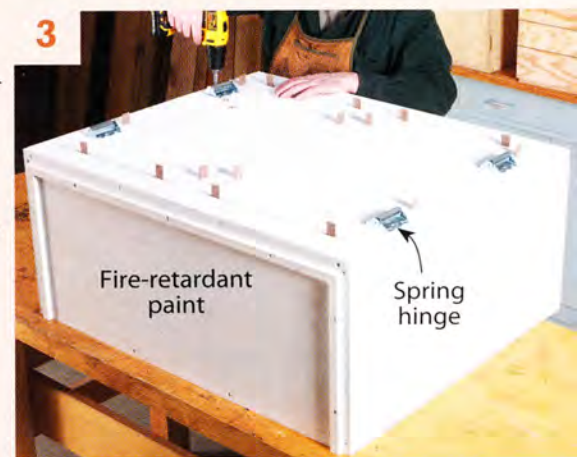
Cabinet boxes

The two cabinets above the flammables cabinet aren't intended to store flammable liquids, so they're built using 3/4" plywood.

Install the door seal parts on the back of the flammables cabinet's face frame. By overlaying the door openings, the seal minimizes airflow through the gaps around the doors.



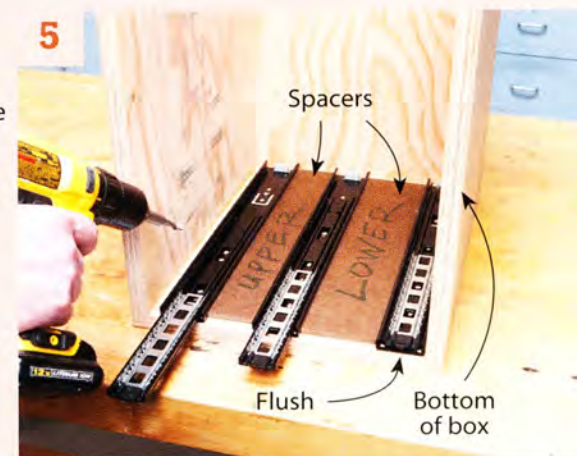
Mount the doors on the cabinet after applying fire-retardant paint. Use shims to center the doors in the openings and spring hinges to mount the doors.



Screw storage racks on the doors to hold aerosol cans and other small containers.



Install drawer slides in the drawer cabinet box. Spacers make this job easy.



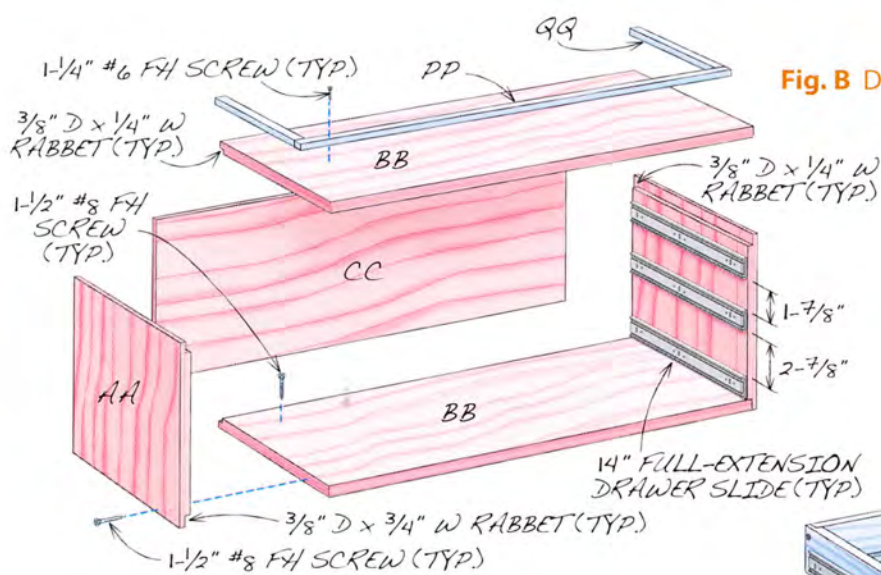


Fig. B Drawer Cabinet



Detail 1 Drawers

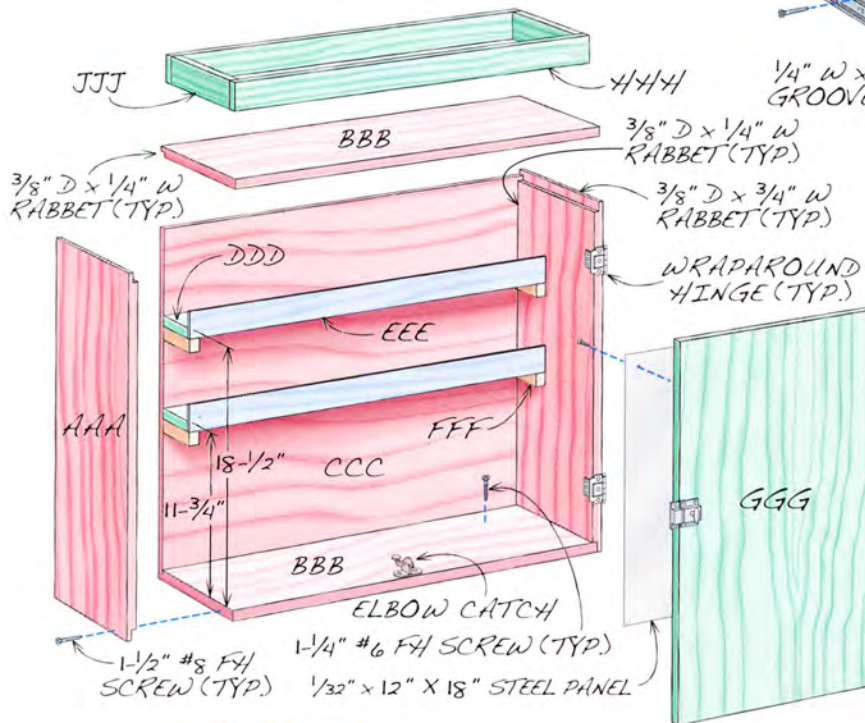
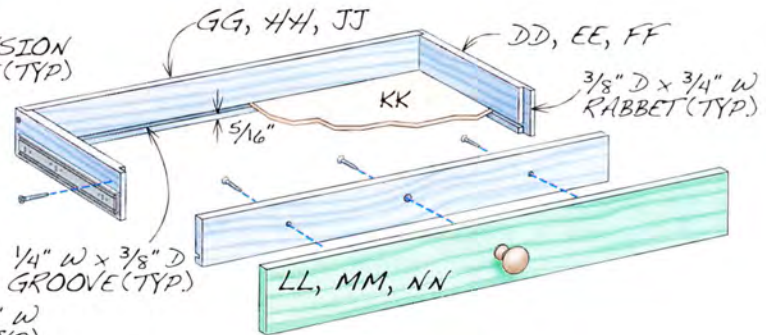


Fig. C Door Cabinet



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Drawer Cabinet Cutting List

Overall Dimensions: 12\"/>

Part	Name	Qty.	Material	Th x W x L
AA	Side	2	Exterior fir plywood	3/4\"/>
BB	Top/bottom	2	Exterior fir plywood	3/4\"/>
CC	Back	1	Exterior fir plywood	1/4\"/>
DD	Upper drawer box side	2	Exterior fir plywood	3/4\"/>
EE	Middle drawer box side	2	Exterior fir plywood	3/4\"/>
FF	Lower drawer box side	2	Exterior fir plywood	3/4\"/>
GG	Upper drawer box front/back	2	Exterior fir plywood	3/4\"/>
HH	Middle drawer box front/back	2	Exterior fir plywood	3/4\"/>
JJ	Lower drawer box front/back	2	Exterior fir plywood	3/4\"/>
KK	Drawer bottom	3	Hardboard	1/4\"/>
LL	Upper drawer front	1	Exterior fir plywood	3/4\"/>
MM	Middle drawer front	1	Exterior fir plywood	3/4\"/>
NN	Lower drawer front	1	Exterior fir plywood	3/4\"/>
PP	Front retainer	1	Poplar	3/8\"/>
QQ	Side retainer	1	Poplar	3/8\"/>
RR	Divider	4	Exterior fir plywood	3/4\"/>
SS	Divider rail	4	Hardboard	1/4\"/>
TT	Stabilizer bar/rail	2	Exterior fir plywood	3/4\"/>

Notes:

a) Calculated using full plywood thicknesses, as stated. b) Overall height does not include the retainers.



View plywood-cutting diagrams at
AmericanWoodworker.com/WebExtras

Door Cabinet Cutting List

Overall Dimensions: 28\"/>

Part	Name	Qty.	Material	Th x W x L
AAA	Side	2	Exterior fir plywood	3/4\"/>
BBB	Top/bottom	1	Exterior fir plywood	3/4\"/>
CCC	Back	1	Exterior fir plywood	1/4\"/>
DDD	Shelf	2	Exterior fir plywood	3/4\"/>
EEE	Lip	2	Exterior fir plywood	1/4\"/>
FFF	Cleat	4	Exterior fir plywood	3/4\"/>
GGG	Door	2	Exterior fir plywood	3/4\"/>
HHH	Box front/back	2	Exterior fir plywood	3/4\"/>
JJJ	Box side	2	Exterior fir plywood	3/4\"/>

Notes:

a) Calculated using full plywood thicknesses, as stated.

Although one has drawers and the other has doors, both cabinets are built the same way, so you can assemble them at the same time.

Cut to final dimensions the sides, top and bottom for both cabinets (AA, BB, Fig B; AAA, BBB, Fig C; Cutting Lists, page 70). Cut 3/8" deep x 3/4" wide rabbets on both ends of the cabinet sides and a 3/8" deep x 1/4" wide rabbet on the back edge of every piece for the cabinets' backs. Cut the cabinet backs (CC, CCC) to final size. Then assemble each cabinet with glue and screws. As before, predrill countersunk pilot holes. Assemble and install the box on top of the door cabinet (HHH, JJJ) with glue and screws.

Drawers

Start by mounting the drawer slides in the drawer cabinet (**Photo 5**; see Sources). Fasten the first slide flush against the bottom of the cabinet. Then install spacers to locate the other slides. Mount all the slides flush with the front of the cabinet.

The drawers are simple boxes with applied fronts (Fig. B, Detail 1). The shallow upper drawer functions as a pull-out mixing tray. The drawer box sides (DD, EE, FF) are rabbeted to house the box fronts and backs (GG, HH, JJ).



Save time when making rabbeted drawer parts by starting with a wide blank. Cut the blank to the length of the parts. Rabbet the ends of the blank; then cut the parts to width.

Cut a groove to house the drawer bottom (KK) in every drawer box part. Then assemble each drawer box with glue and screws (**Photo 6**). Cut the drawer fronts (LL, MM, NN) to final dimensions. They run full-width across the cabinet and mount flush with the bottom of the drawer boxes.

Use the drill press to drill a screw hole for mounting the knob through the center of each drawer front. Then, working on a flat surface, clamp each drawer front in position and drill countersunk pilot holes through the box for the mounting screws. Next, extend the knob's screw hole from the drawer front through the box. Then remove the drawer front and increase the hole in the box to 1/2" dia., so the knob's short screw will pass through and anchor against the back of the drawer front.

Screw on the drawer fronts (**Photo 7**). Then attach the knobs (see Sources) and make the sliding drawer dividers (**Photo 8**; RR, SS, Fig. B, Detail 2). Butt the drawer slides against the drawer fronts and mount them flush with the bottom of the drawer boxes. Make the pull-out tray's stabilizer (TT, Fig. B, Detail 3) after you install the drawers. It should fit snugly between the back of the tray and the cabinet (**Photo 9**). Make adjustments as necessary.

Center the drawer cabinet on top of the flammables cabinet and anchor it with screws. Then install the flammable cabinet's retainers (W, X).

Shelves and doors

Cut the door cabinet's shelves (DDD) to final size and glue on the lips (EEE). Screw cleats (FFF) to the cabinet sides and then screw the assembled shelves to the cleats, so they won't fall.

Cut the doors (GGG) to final dimensions. Mount wrap-around hinges (see Sources) on each door, located 2-1/2" from

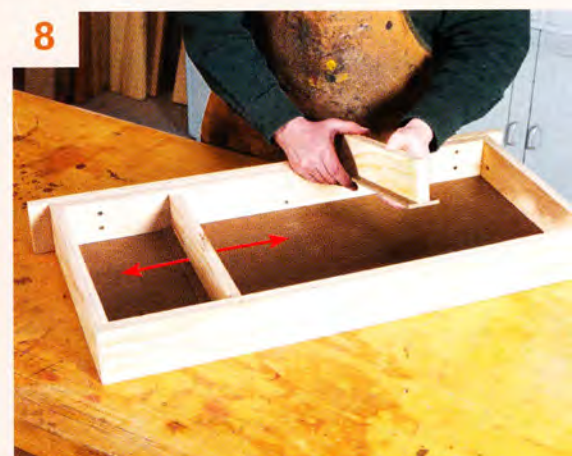
Assemble the drawer boxes after cutting rabbets in the side pieces and grooves for the bottom in every piece. The pull-out mixing tray is simply a shallow drawer box.



Install each drawer front flush with the bottom of its drawer box. Only the pullout tray's front extends above the box.

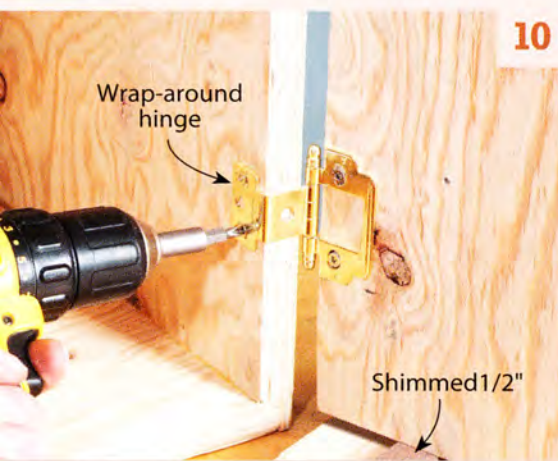


Build T-shaped dividers that slide from side to side to maximize the drawers' versatility.



Stabilize the pull-out tray for use by installing an L-shaped assembly that eliminates wobble caused by the drawer slides.





10

Mount each door using wrap-around hinges. Stand the door on shims to position it flush with the top of the cabinet, so it won't rub against the retainer when the cabinet is installed.



11

Mount a steel sheet on the door for holding brushes and other lightweight tools with magnets.

the top and bottom. Then attach each door to the cabinet (**Photo 10**). Install a cupboard latch on the outside and a catch behind the left door on the inside (see Sources). Fasten a steel sheet to the right-side door (**Photo 11**; see Sources). Before mounting the sheet, lay it flat and use an awl or a nail to punch holes for the screws.

As before, center the door cabinet on top of the drawer cabinet and anchor it with screws. Then install the retainers (PP, QQ). 

SOURCES

- Menards, menards.com, 612-645-1295, Full Surface Screen Door Spring Hinge, #60853, \$5.90, 26-ga. Galvanized Steel Sheet, 12" x 18", #2284044, \$4.47.
- Firefree Coatings, Inc., firefree.com, 888-990-3388, Firefree Class A (non-toxic water-based retardant paint), 1 gal., \$58.
- emedco, emedco.com, 866-222-4743, "Flammable Keep Fire Away" Sign, 10" x 14", adhesive vinyl, # 33591, \$14.69.
- Rockler Woodworking and Hardware, rockler.com, 800-279-4441, Overtravel Drawer Slide, 14", #44375, \$14.49 per pair (3 req.); Cupboard Catch, #33332, Brass, \$6.99 ea. (3 req.); Elbow Catch, #33175, \$2.49; Partial Wrap-Around Hinge, Brass, #31456, \$8.99 per pair (2 req.); Rare Earth Magnets, 3/4" x 1/8", #37554, \$21.99 per 10-pack; 1/2" x 1/8", #30810, \$14.99 per 10-pack; Brass Knob, #1006178, \$1.19 ea. (3 req.); 3" Swivel Caster, #33868, \$34.99 per pair; 3" Locking Swivel Caster, #38865, \$44.99 per pair.

Kevin Southwick is a wood finishing specialist and furniture restorer/conservator. Learn more at southwickfurnitureconservation.com.

Avoid A Devastating Fire

Here's a recipe you should never try: Pour some boiled linseed oil on a rag, wad it up and cover it with more rags or sawdust. Then wait a few hours.

Fire is often the result. Every year, oily finishing rags are cited as the cause for disastrous, even deadly, fires. Every woodworker is taught that such rags can spontaneously combust. But perhaps not everyone understands that there's an important difference between an oily rag that can burn only when ignited by a flame or spark and an oily rag that can catch fire all by itself.

The curing process that occurs in some wood-finishing oils—especially boiled linseed oil—is a heat-producing chemical reaction that can easily lead to a spontaneous-combustion fire. Because boiled linseed oil can be an ingredient in oil-based stains and finishes without being listed on the label, the best practice is to be careful with all oily rags.

Fortunately, the danger of a fire caused by oily finishing rags is easy to avoid: Simply lay every oily rag out flat to dry, so there's no chance for heat to build up as the oil cures (see photo at right). If there's any chance that a breeze could move the rag, place a weight on top to make sure it stays put. Hanging an oily rag over a rail or the edge of a garbage can is very safe as long as you secure it with



a clothespin or spring clamp. When the rag feels stiff and dry, it's safe to throw in the garbage.

Putting oily rags in water or storing them in a steel fireproof container are often recommended for temporary storage. These methods will effectively prevent a fire—but only until the rags are removed. These rags are very likely to contain uncured oil, so the risk of fire remains.

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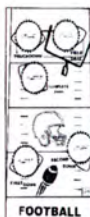
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Tipsy Tablesaw

PLANNING TO RIP several boards to width on his tablesaw, my friend stacked them on the extension wing to the left of the blade. After cutting each board, he placed it on the saw's right-side extension table. Sometime during this process he unknowingly knocked loose the extension table's support leg.

The last board had to be cut wider than the others, so he slid the fence to the right. From what he can remember, that subtle shift in weight was all it took:

The saw tipped to the right. My friend dove for cover as the board he was about to cut slid into the spinning blade and shot across the shop. Meanwhile, the stack of lumber on the extension table tumbled to the floor and knocked over all the boards that were leaning against the wall. Fortunately, the commotion didn't cause any serious damage to the shop—or my friend. Lucky guy!

Bob Kraby



Cabinet Door Demo

WHILE STUDYING the painted kitchen cabinets in her new house, my girlfriend said, "Refinishing these cabinets is going to be our first project." As I'm a reluctant handyman, she recruited a friend to help. After some research, they decided to use a power washer to strip the paint from the doors. They carefully

removed the doors, took them into the back yard and set up the first one. Then they turned on the power washer. In a matter of seconds, the water blasted holes right through the door's thin panel. Boy, was I glad I opted out of that project!

Larry Dulock



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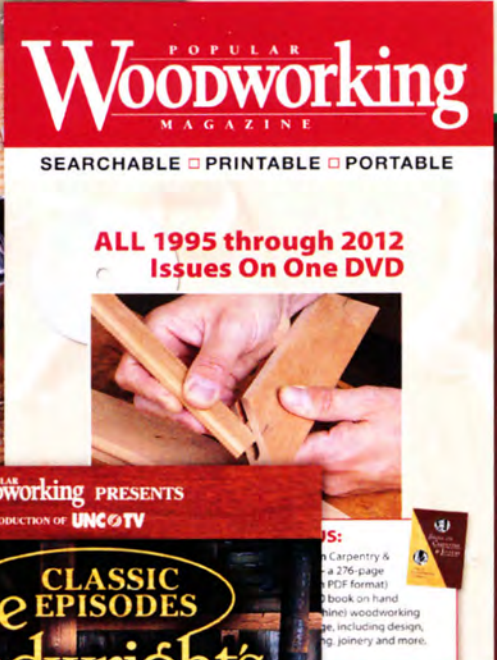


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