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Jigs and fixtures are essential aids for woodworking. Some guide router or saw bases to ensure arrow-straight cuts, dadoes and grooves. Others enable repetitive machining for making precision joinery. Or, the right fixture can extend the functionality of simpler tools, such as clamps. Here are five great jig and fixture projects to add to your collection.

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While our woodworking project “to do” lists often focus on home furniture or gifts for family and friends, there are many things we can build to add value and practicality to our workshops. These six projects will help “supercharge” your workspace and shop time.

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THE HOME WORKSHOP: SUMMER 2013

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P.O. Box 6211, Harlan, IA 51593-1711.

E-mail: WWJcustserv@cdsfulfillment.com

The Home Workshop: Projects & Techniques

is published by Rockler Press Inc.,

4365 Willow Dr., Medina, MN 55340.

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Workshop Jigs and Fixtures

Back by popular demand, these five projects are some of our all-time reader favorites. Ralph Bagnall's Adjustable Box Joint Jig may be the last one you'll ever need and the simplest to use. Our Straightedge Jig does double duty for two machines, and Sandor Nagyszalanczy's Dovetail Sled delivers beautiful results from an unlikely source: your table saw.

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Adjustable Box Joint Jig

OVER THE YEARS, I'VE CREATED SEVERAL BOX JOINT JIGS. THIS TIME, I SET OUT TO CREATE ONE THAT IS BOTH ADJUSTABLE AND REUSABLE.

Soon after I started designing my new adjustable box joint jig, I figured out that having the pin precisely match the dado blade is unnecessary. The pin in my jig is quite thin, since only its leading edge is used to set the spacing. In addition, it's mounted on a sliding block, which allows me to make micro adjustments.

Machining the Parts

I cut the larger pieces of this jig out of 1/2" MDO (medium-density overlay). Shallow dado slots are milled into the base (piece 1) for the fence, braces, and sliding pin block (pieces 2 through 4). Two matching dadoes are cut into the rear face of the fence to receive the braces. The runners (pieces 5), which must fit snugly into your saw's miter slots, are cut next. I also cut openings in the braces to provide a nice, safe place for my hands (see the

Elevation Drawings on the [page 10](#) for the details).

The fence needs a wide slot to accept the replaceable backer (piece 6). The top of this slot is beveled to keep the backer in place. The bottom edge rides in the dado milled into the base. I used 1/4" hardboard for the backer. It is important that the face of the backer is flush with the face of the fence.

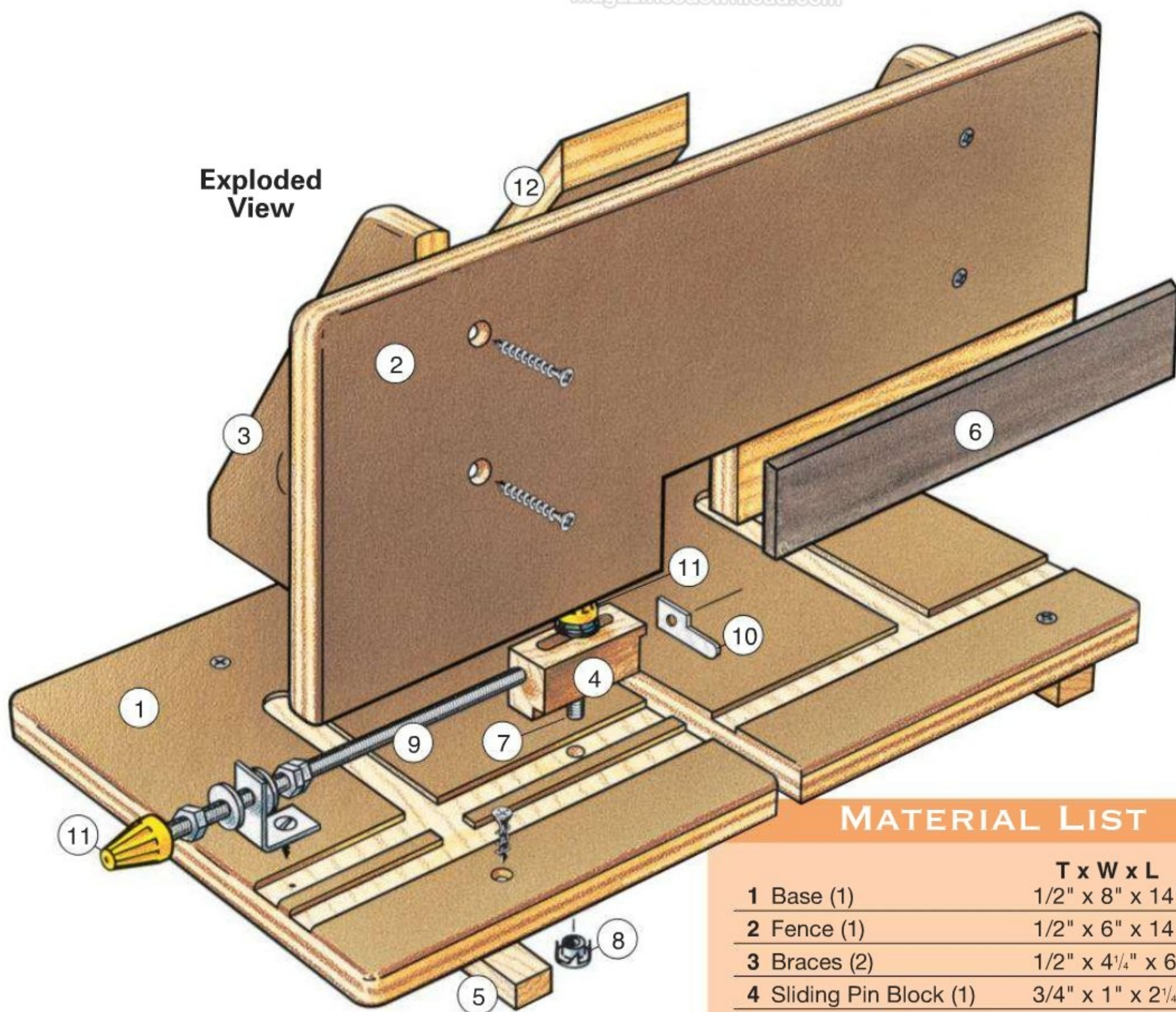
I made the hardwood parts out of maple. The sliding pin block has a rabbet on its bottom, creating a step that rides in the dado in the base; a 1/4" slot is milled through the block for the clamping screw (piece 7). Next, I drilled a 5/16" clearance hole in the base and counterbored it on the bottom. This hole houses the T-nut (piece 8), for the clamping screw. One end of the sliding pin block is drilled and tapped for the adjustment screw (piece 9), and the other

end is mortised to accept the pin (piece 10). I made these cuts on a longer stick and trimmed the block off.

For hardware, you need a 1/2" x 3" reinforcing strap (for the pin), a 1/2" x 1" corner strap, and about 12" of 1/4" #20 threaded rod with a few 1/4" #20 nuts. The corner strap simply holds the end of the adjustment rod, so one of the existing holes will need to be drilled out to 1/4". I opted to make my own knobs (pieces 11) for the threaded rods by screwing and gluing electrical connectors onto the ends.

If your dadoes are snug, you can dry-fit everything together. You are going to need to cut a notch in the fence to allow for index pin adjustment. Dry-fit all the parts except the pin, and mark the required opening. You also want to drill a hole in the right side brace for the threaded rod to pass through it.



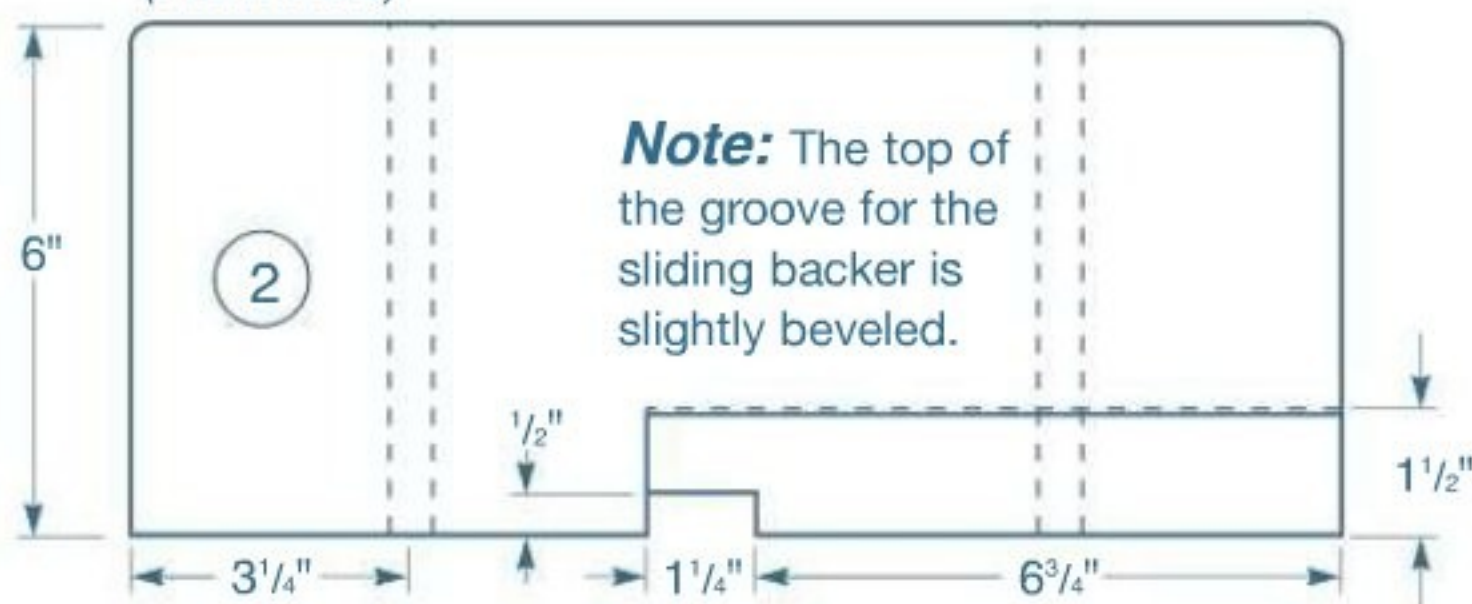


Exploded View

MATERIAL LIST

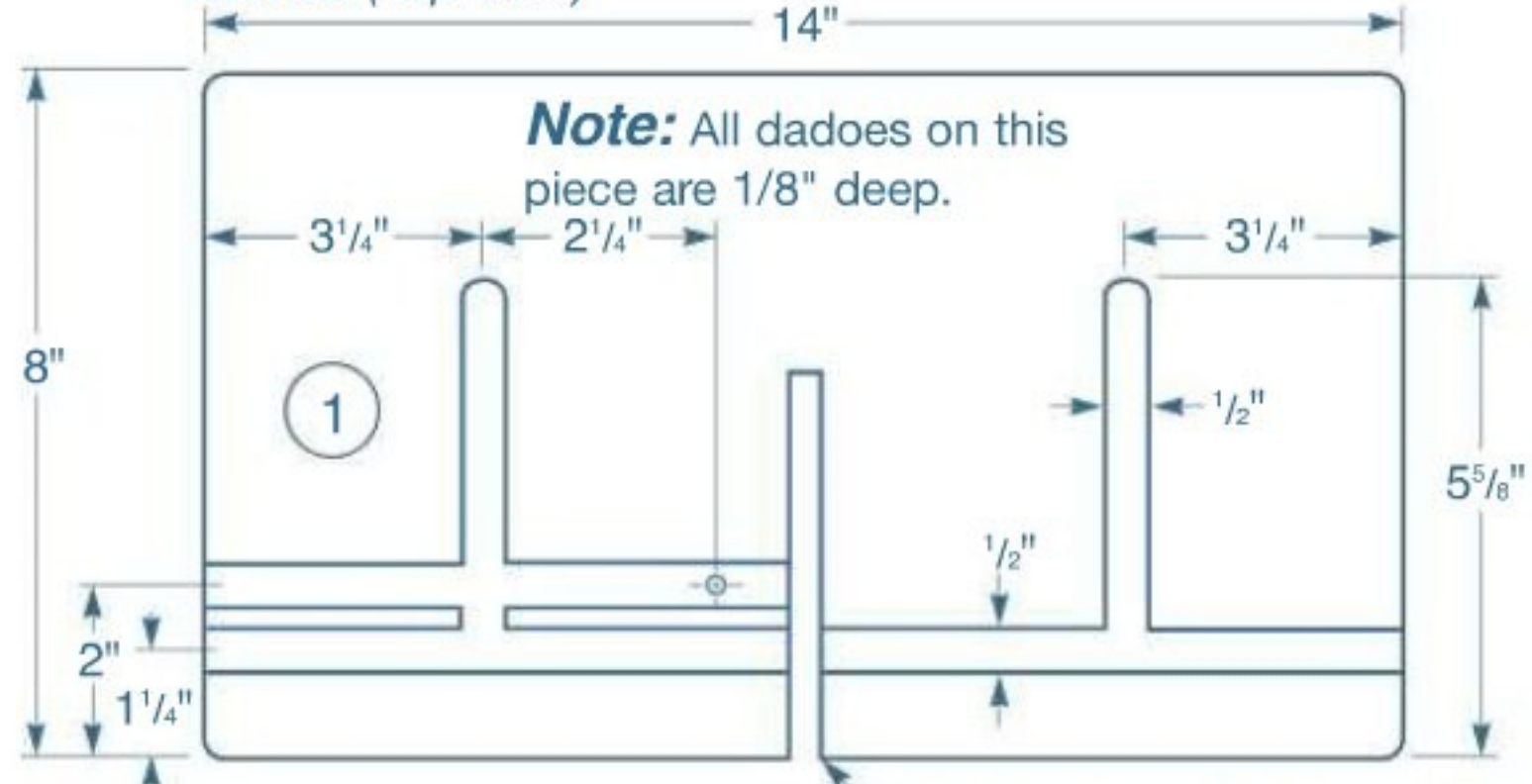
	T x W x L
1 Base (1)	1/2" x 8" x 14"
2 Fence (1)	1/2" x 6" x 14"
3 Braces (2)	1/2" x 4 1/4" x 6"
4 Sliding Pin Block (1)	3/4" x 1" x 2 1/4"
5 Runners (2)	3/8" x 3/4" x 8"
6 Replaceable Backer (1)	1/4" x 1 1/2" x 8"
7 Clamping Screw (1)	1/4" x #20 x 1 3/4"
8 T-nut (1)	1/4" x #20
9 Adjustment Screw (1)	1/4" x #20 x 5 3/4"
10 Pin (1)	Reinforcing strap
11 Knobs (2)	Electrical connectors
12 Guard (1)	1/2" x 2" x 4"

Fence
(Front View)



(End View)

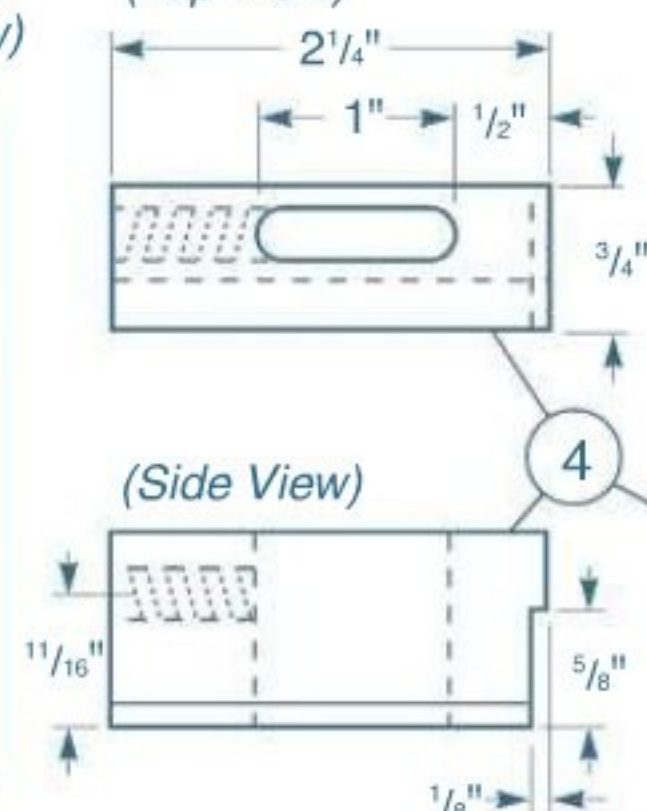
Base (Top View)



(End View)

A through cut is formed the first time the jig is used.

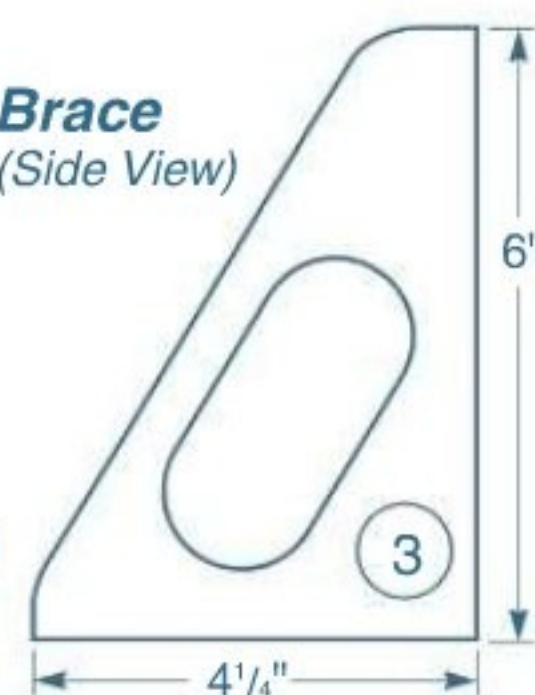
Sliding Pin Block
(Top View)



(End View)

(Side View)

Brace
(Side View)



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Once the pin is adjusted, the first series of box joints can be formed (left). After the last cut, this first piece is clamped in place and used to index the first cut on the joining side, as shown in the photo at right.

Assembling the Jig

Now you can glue and assemble the jig. This is the time to add the runners for the miter slots. Set them into the miter slots, and use a square against the saw's fence to ensure the jig and runners are square to the blade. For safety, I added a guard (piece 12) where the blade comes through the fence to keep the blade covered during use.

Woodworkers have different opinions about the need to add finish to everything they build, including jigs like this. I'm not sure it's necessary,

but if you care to add a protective finish, wipe- or spray-on varnish would be a good choice.

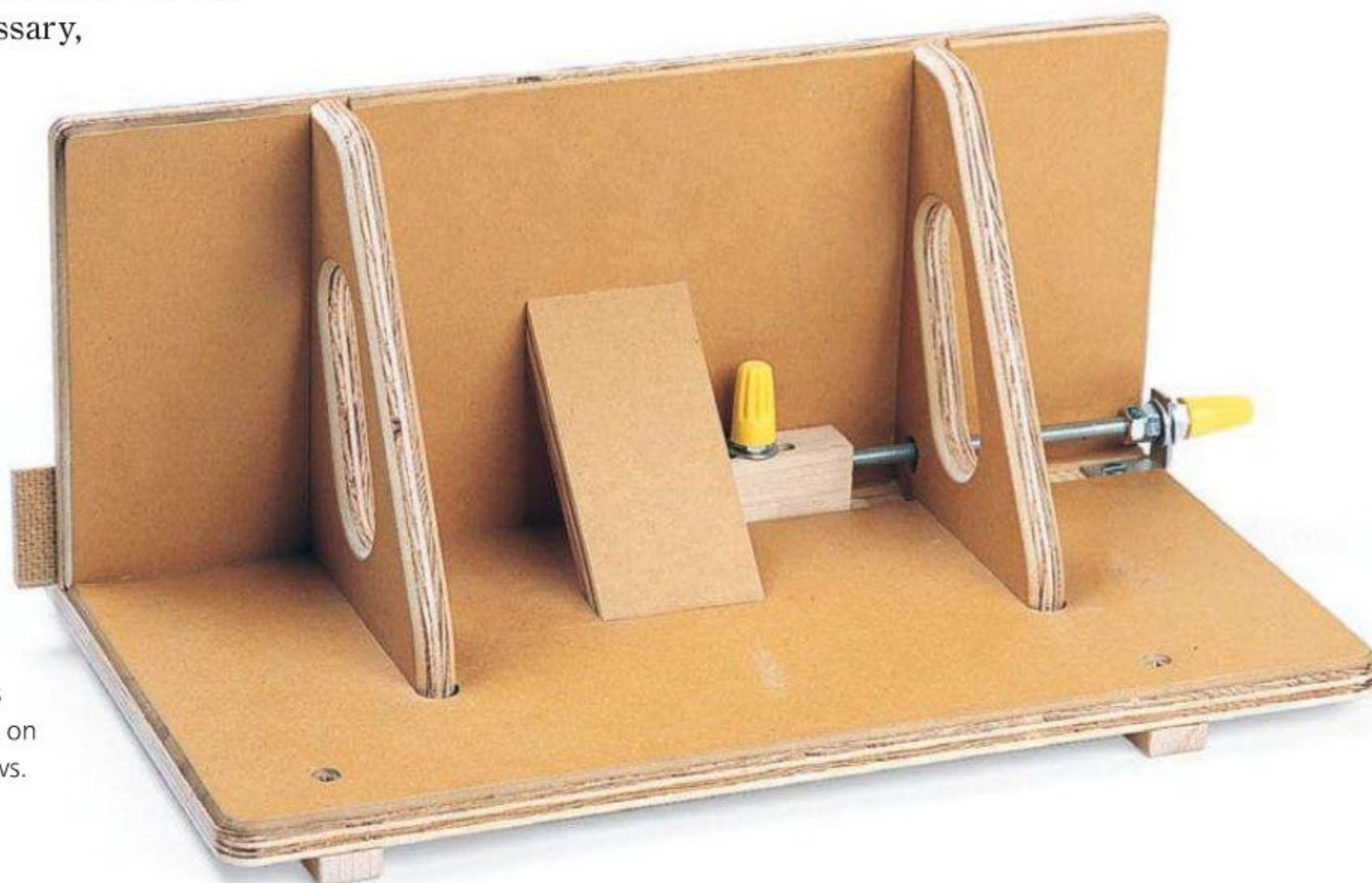
Putting the Jig to Use

Using the jig couldn't be simpler. Set up your dado blade to the desired width. Slide the backer out of the way, loosen the clamping knob on the pin block, and turn the adjusting knob until the pin is the proper distance from the dado blade. Retighten the clamping knob and slide the backer up to the pin. Cut a pair of test parts. If

the spacing is off, readjust the pin. From here on, the jig is used like any other box joint jig. When you use it again for a different spacing, simply trim off the cut end of the backer (you can do this several times) and slide it back into place.

Box joints add interesting geometry to your joinery, and now you make them with ease.

Ralph Bagnall is a contributing editor to Woodworker's Journal.



The author used electrical connectors (wire nuts) as knobs on his adjustment screws.

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Straightedge Jig

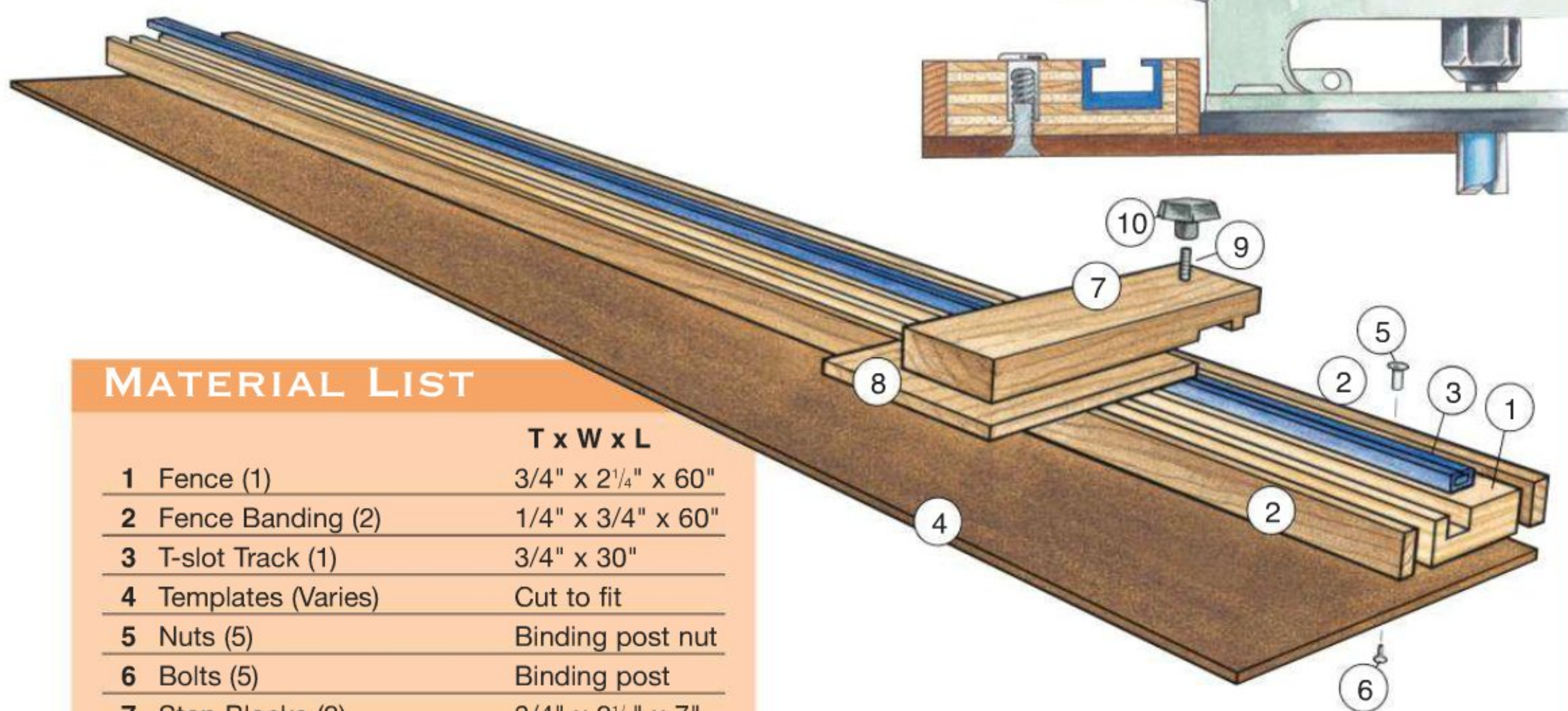
THIS VERSATILE STRAIGHTEDGE JIG TRIMS PLYWOOD, BUT IT ALSO BREEZES THROUGH RABBETS, DADOES AND GROOVES. IT'S A "MUST-BUILD" FOR YOUR SHOP.



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

The heart of the jig is a straight, jointed plywood fence (piece 1). Seal this along its two ripped edges with strips of solid hardwood banding (pieces 2). Then plow a groove in the top to house an aluminum T-slot track (piece 3).

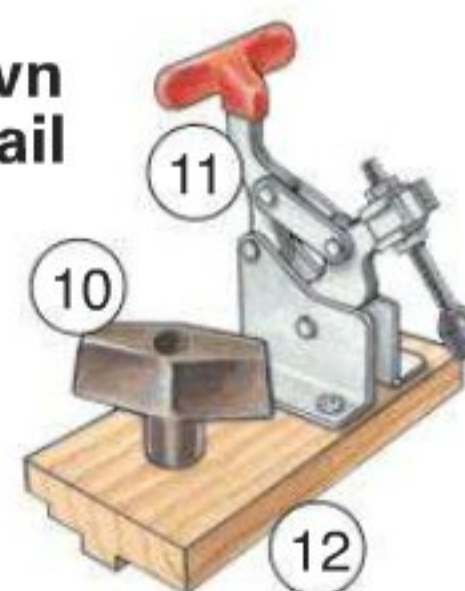
Straightedge Jig Exploded View



MATERIAL LIST

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

Hold-down Back Detail



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

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

The adjustable stops are simply short lengths of stock (pieces 7),

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

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

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

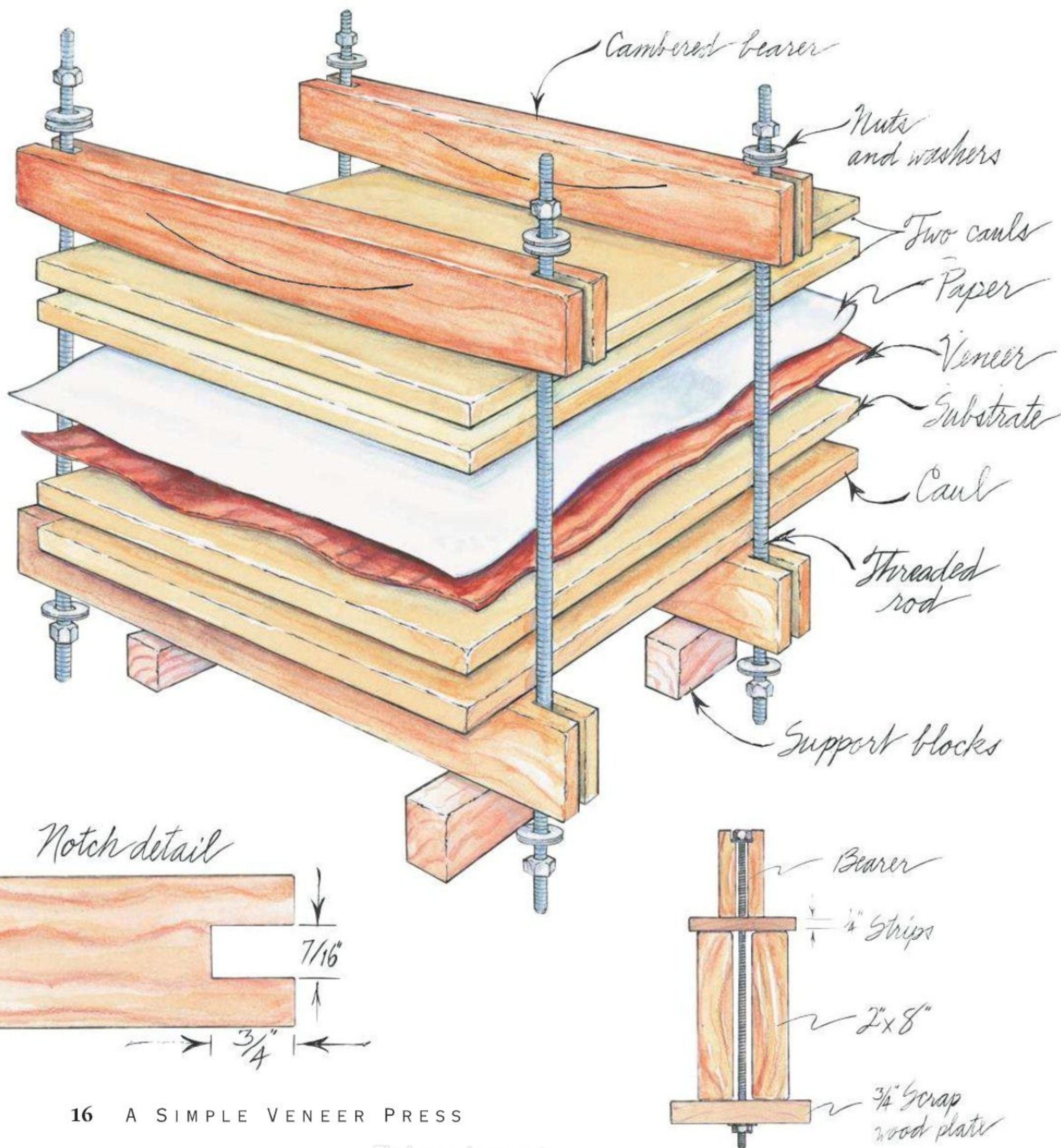
Rick White is a contributing editor to Woodworker's Journal.

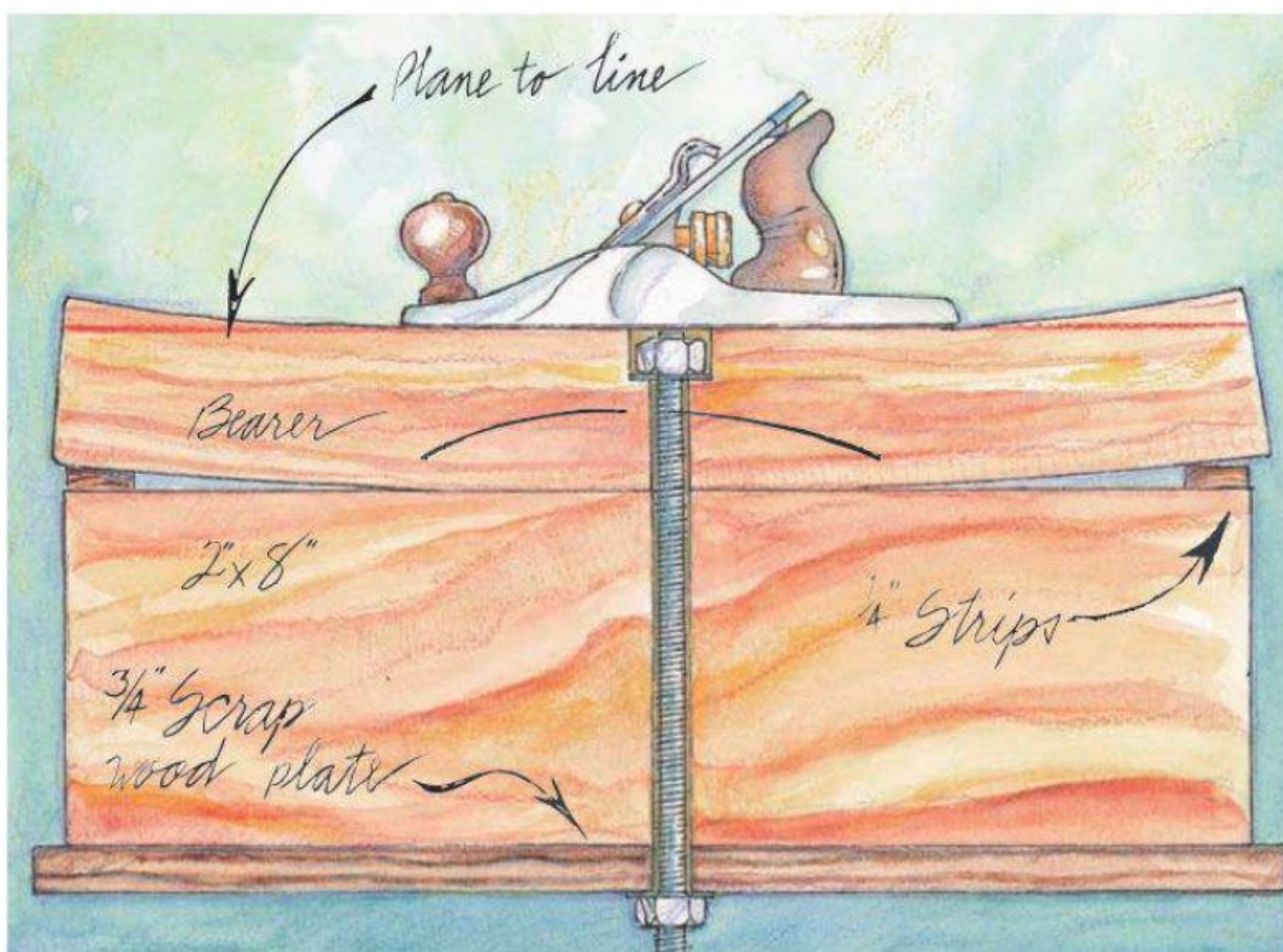


The hold-down option on this jig allows you to slice straight edges on rough stock without fear of binding or kickback.

A Simple Veneer Press

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





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

These days, many woodworkers in production shop situations use a vacuum bag system for veneering, and certainly that approach works just fine. But for those of us who only lay up veneer for the occasional project, there's still plenty of merit for using a well-designed veneer press: it's effective, you can make one to most any size you need, and it costs practically nothing — save for some threaded rod and a handful of fasteners.

Here's a simple one that you can put together in about an hour. The heart of the design is a set of curved, or cambered, bearers. They distribute pressure evenly onto the veneer with the help of three cauls. Our design incorporates a method for curving the bearers so they provide continuous contact along their full length. All the measure-

ments given here will create a press that accommodates panels up to 24" wide. If you change the dimensions, add 4" for supporting the hardware.

To begin, you'll need to build a stand onto which you can bolt a bearer and distort it into the curved shape required. Select a 2" x 8" x 8' piece of knot-free Douglas fir. Crosscut the board into three 24"-long sections. Select the best piece and rip it in half for making the three bearers. Mill these halves down to 1 1/4" x 2 1/2", then mark the edge on one piece at its center and drill a 1"-diameter x 1 1/2"-deep counterbore and a 3/8" pilot hole all the way through. Set the bearers aside.

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

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

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

Take the assembly apart, then rip and mill the other 2 x

8s like you did the first one. Trace the shape of the first bearer onto each of the other pieces and band-saw them close to the finished profile. Now screw the first bearer to the others and rout identical curves using a long flush-cutting laminate bit. Head back to the band saw, or use your table saw to cut 7/16"-wide by 3/4"-

deep notches in both ends of each bearer (see bottom left *Drawing*, [page 16](#)). Nail support blocks to half of the bearers to raise the press off your workbench and provide clearance for the bottom ends of the threaded rods. Generally, you'll want a pair of bearers pressing on your veneer every four to six inches, so be sure

to make enough for your anticipated needs.

Round up four MDF or melamine cauls in matching sizes, and you're ready to put your press to use. For those details, see the sidebar below. Happy veneering!

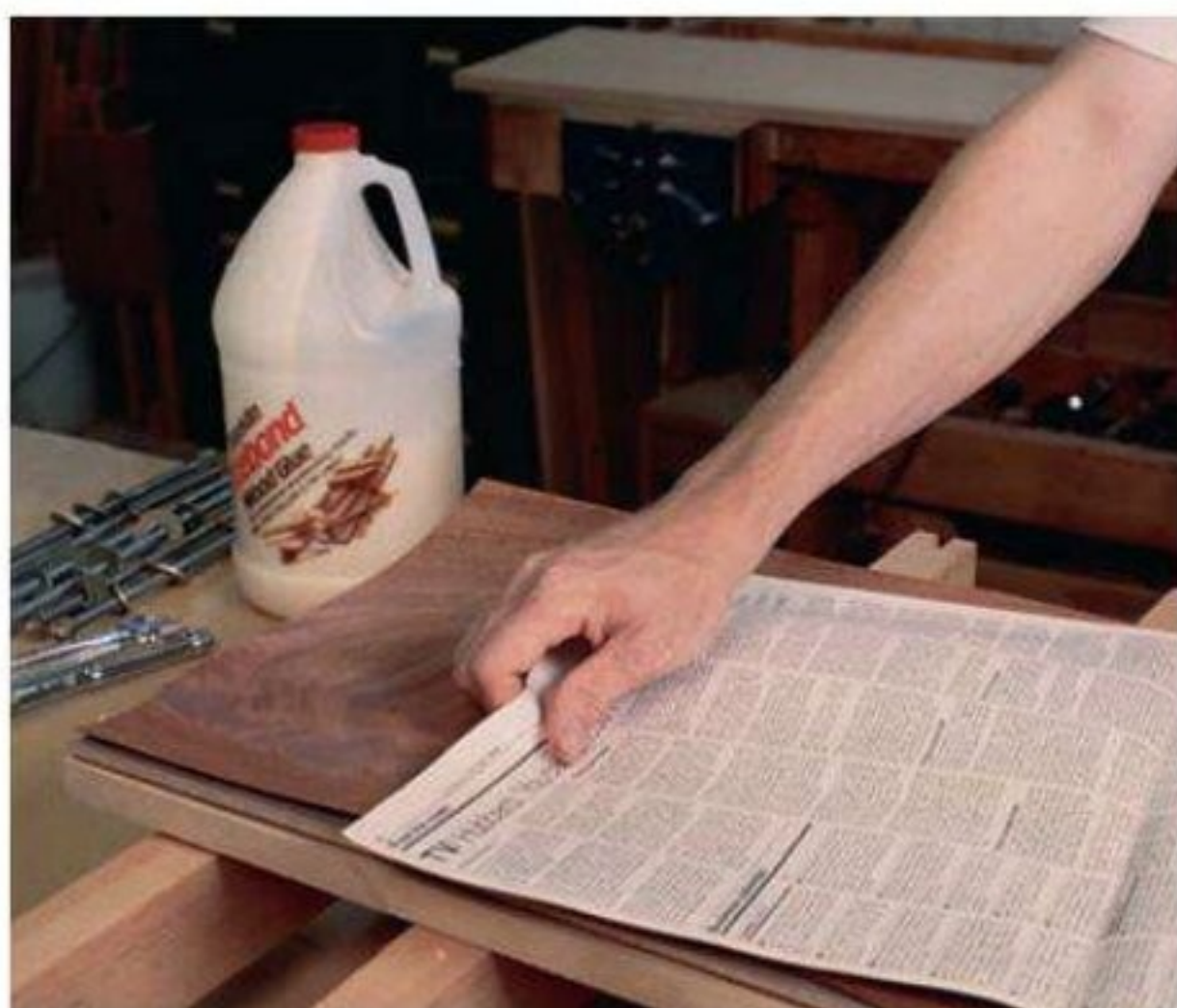
Bruce Kieffer is a contributing editor to Woodworker's Journal.

USING YOUR VENEER PRESS

Before spreading any glue, try a dry run to familiarize yourself with the mechanics of the press. Set it up on a level surface, spacing the bottom bearers evenly. Now lay down the cauls, substrate, veneer and paper, as shown in the drawing on [page 16](#). Add the top bearers and the hardware, then begin tightening the bearer nearest to the center of the panel. Tighten one end about 3/4 of the way, then completely tighten the other end. Return to the first end to finish tightening the nut. Work your way through the other bearers to the ends of the press.



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



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



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

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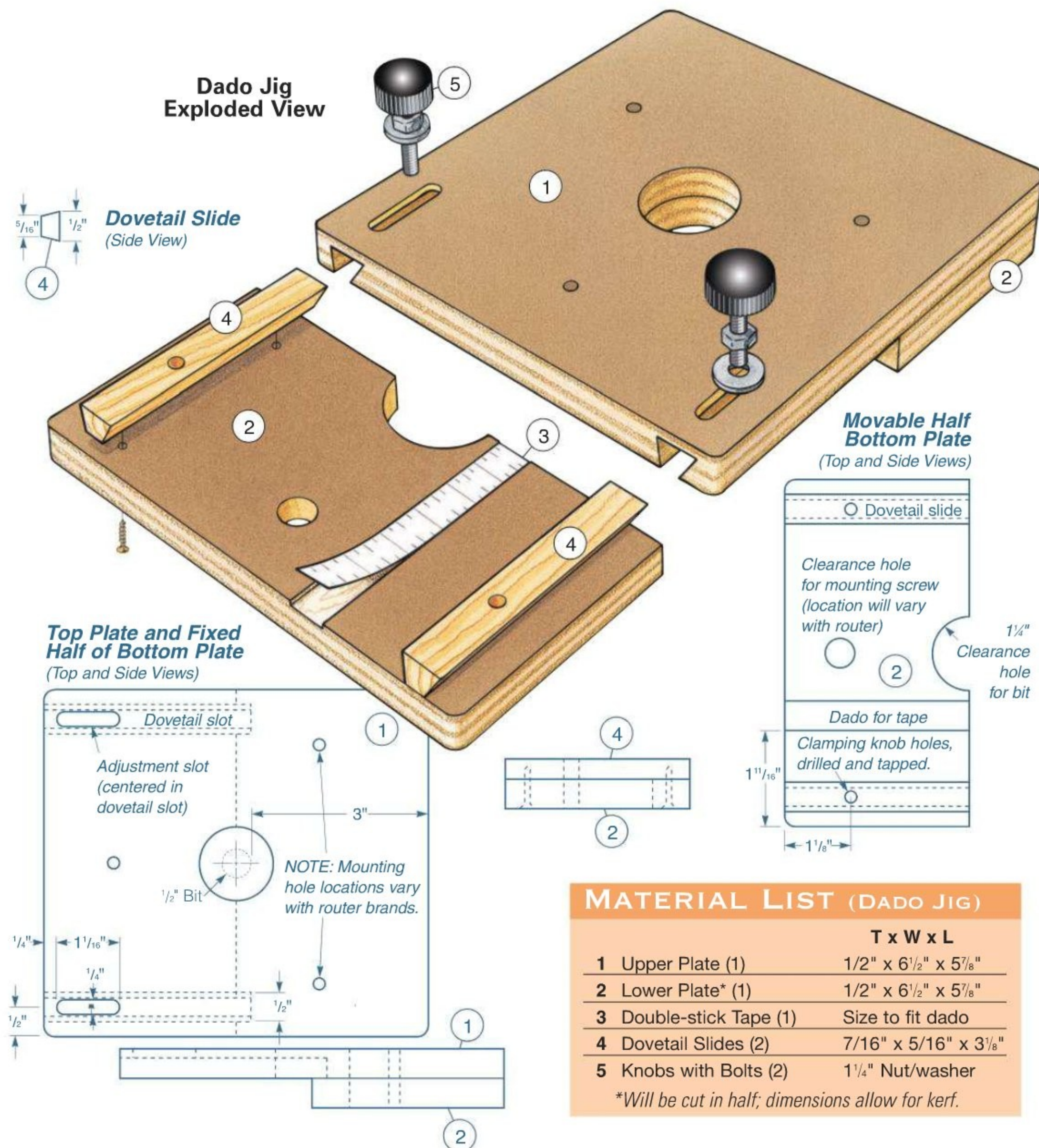


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Adjustable Dado Jig

THIS ADJUSTABLE AUXILIARY ROUTER BASE GIVES YOU TOTAL CONTROL OF DADO DIMENSIONS. IT'S PERFECT FOR TODAY'S UNDERSIZED PLYWOODS.



Every woodworker knows that 3/4" plywood is not really three quarters of an inch thick, and virtually no two boards are exactly the same thickness either. This makes milling snug-fitting dados difficult, and it was the impetus for designing this adjustable dado jig.

While there are a number of tried-and-true methods for cutting perfectly sized dados, we wanted to be able to set a single straightedge and mill most any size dado needed — in just two passes. Our solution involves running two of the auxiliary base's edges along the straightedge. One edge is a fixed distance from the cutting edge of the bit, and the second can easily move in and out to adjust the final dado width.

Milling the Base Pieces

Begin by cutting 1/2" sheet stock to form the two plates (pieces 1 and 2) of the auxiliary base. It is important that the next step is exactly matched top to bottom, so stick the two parts together with double-sided tape. Lay out the mounting hole locations for your router on the face of the top plate so the cutting edge of your 1/2" straight bit will be exactly 3" from the fixed edge of the jig (see *Elevation Drawings* at left). Drill the mounting holes and the clearance hole for the bit through both layers. Separate the two parts and turn the top plate over to countersink the mounting holes and mill the dovetail slots. Next, mill the 1/4" adjustment slots through the top plate, along the dovetail slots' centerlines.

Next, cut the lower plate in half, and bore the mounting holes out to 1/2" to provide

clearance for the mounting screws. Glue the front half to the top plate to create the fixed edge of the jig. Then mill a shallow 1/2"-wide dado in the movable base for a stick-on ruler (piece 3).

For safety, mill the hardwood dovetail slides (pieces 4) along one edge of a wider 1/2" board to fit the slots. Once they slide smoothly in the slots, trim them off on the table saw. To attach them, slip them into the slots, clamp the second half of the bottom plate to the rest, and screw (no glue) the half plate to the slides. Finally, with the movable base set flush, drill and tap the holes for the clamping knobs (pieces 5).

Using the Jig

Let's say you need a tight-fitting 19/32" dado, and you've got a 1/2" bit chucked in your router. To use the jig, first clamp your straightedge 3" from the desired

edge of the dado. Use the tape measure to set the movable edge to 3/32" (the difference between the bit and the desired width of the dado). Tighten your knobs and make the first pass with the movable edge riding along the straightedge. Spin the router around so the fixed edge is along the straightedge, and form the other wall of your dado — exactly 19/32" wide! Perfect dados every time.

Ralph Bagnall is a contributing editor to Woodworker's Journal.



The second pass with this jig widens the dado for a perfectly snug fit.



Table Saw Dovetail Sled

THERE ARE SEVERAL AVENUES AVAILABLE TO FORM THROUGH DOVETAILS, BUT HERE'S AN INGENUOUS SHOP-MADE JIG FOR THE TABLE SAW.

If you like the look of hand-cut dovetails, but don't have time (or patience) for all the meticulous work it takes to create them, then try this table saw method that uses a sliding dovetail sled to cut 90 percent of each joint. The jig cuts dovetails far faster than you can cut them by hand, and you can size the pins and tails and customize their spacing to suit just about any project — join drawer sides, build a box or small chest, and so forth.

With care and a bit of practice, you can produce large or medium sized, “furniture grade” 8° dovetails in both hard and soft woods. However, I think the jig is best for quickly cutting workmanlike joints that are serviceable for jobs like joining parts for tool chests and totes, drawers for kitchen or shop cabinets, and so on.

The *Drawing* on [page 24](#) shows the basic dimensions and construction of the dovetail sled, which you can make from either MDF or a high quality plywood, such as Baltic birch. Most of the jig is made from 1/2"-thick stock. As shown, this jig is capable of handling stock up to about 12" wide (you can build a jig to handle larger work: simply increase all dimensions proportionally to build a bigger jig — just keep all the angles the same).

Making the Jig

Start by cutting out the jig base (piece 1) and a pair of 1/2" pin fences (pieces 2) that align and support the pin boards. Bevel the inside-facing end of each pin fence at 82°. Glue and nail two triangular braces (pieces 3), cut at 45°, to the inside face of each pin fence, then attach them to the baseplate, as shown in Figure 1. Position each at an 8° slant relative to the front edge of the base.

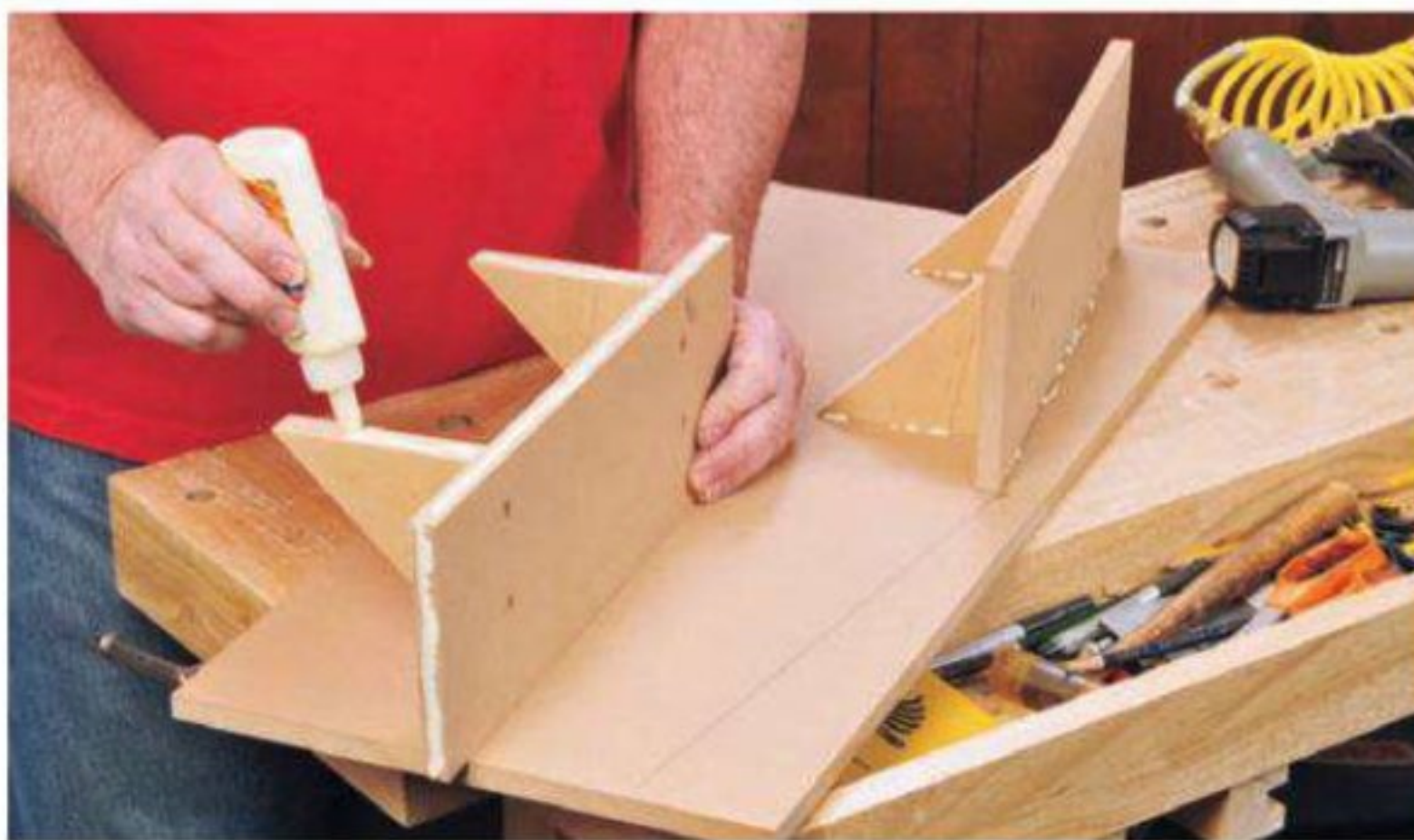


Figure 1: Attach the pin fences to the base at an 8° angle.



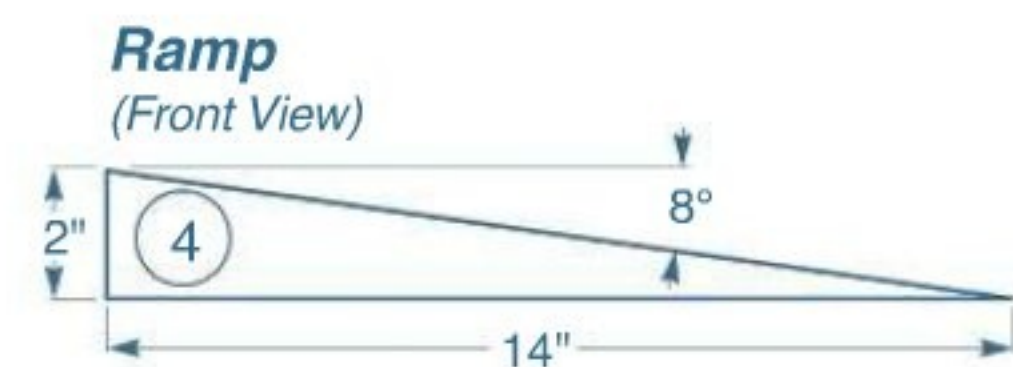
Figure 2: The 8° wedge ramp is formed from two 3/4" pieces.



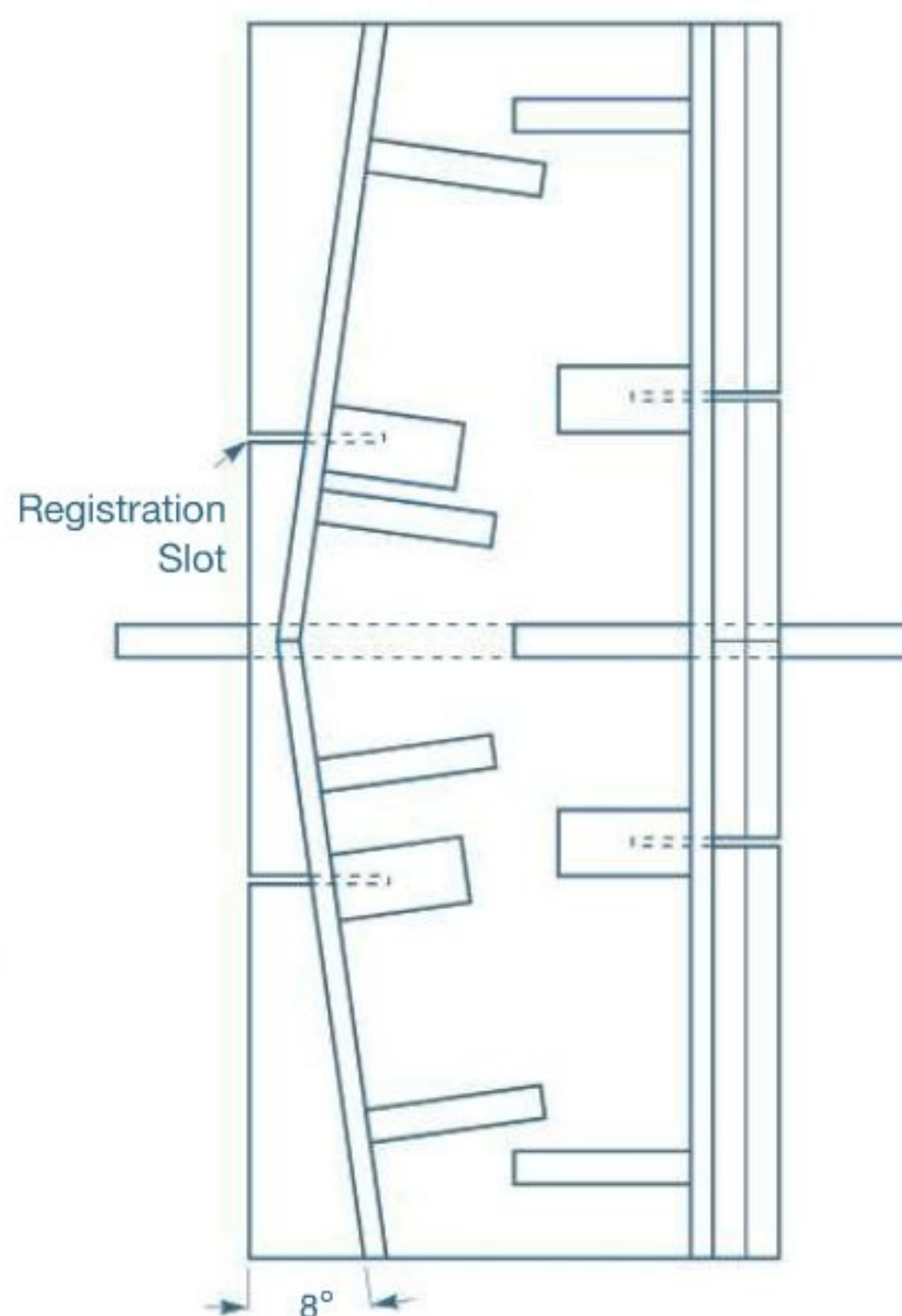
Figure 3: Braces keep the tail fence perpendicular to the base.



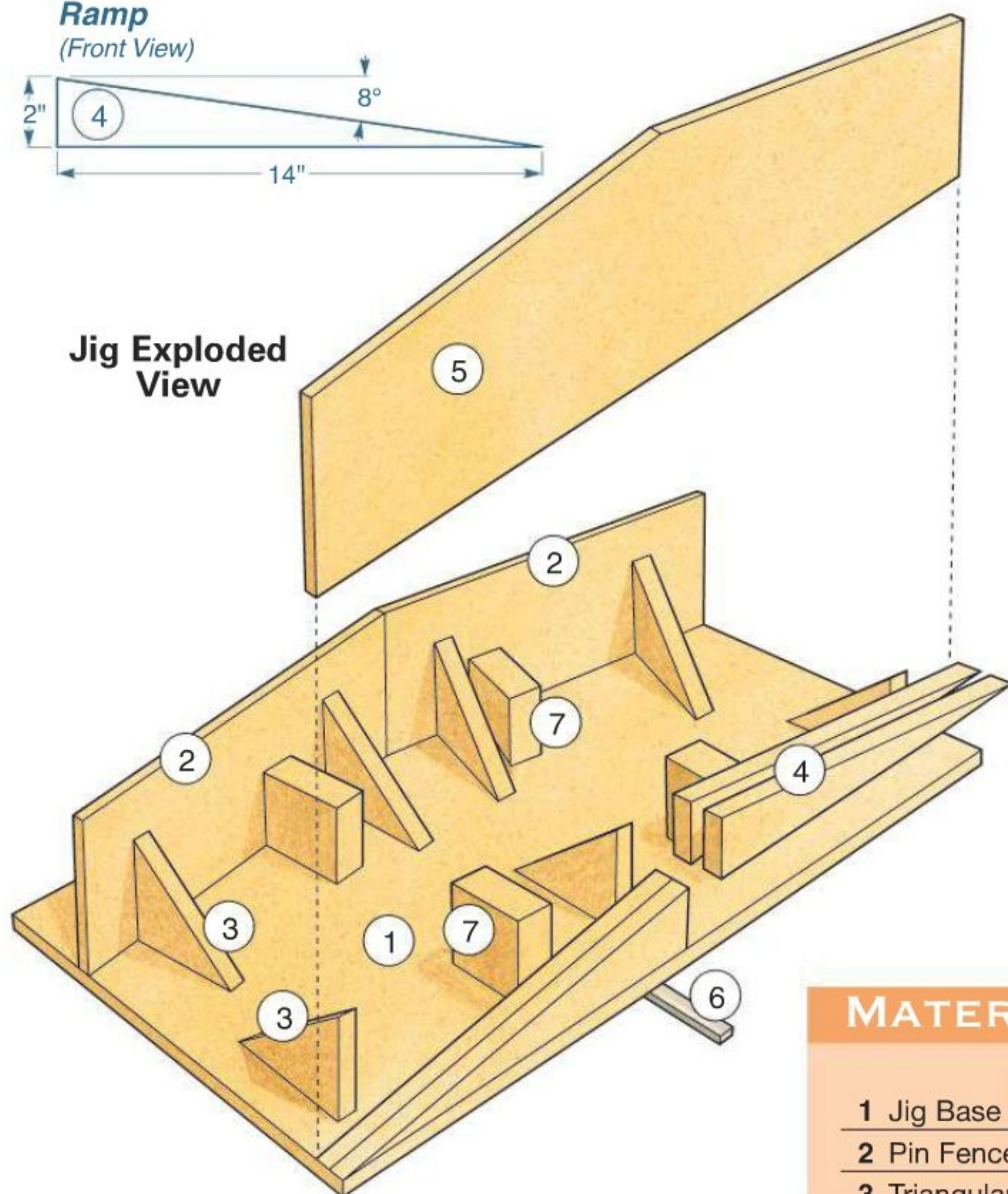
Figure 4: Attach an 18"-long miter bar to the bottom of the jig. Make sure it's square, relative to the base.



Dovetail Sled
(Top View)



Jig Exploded View



MATERIAL LIST

	T x W x L
1 Jig Base (1)	1/2" x 12" x 28"
2 Pin Fences (2)	1/2" x 5 1/2" x 14 1/4"
3 Triangular Braces (7)	1/2" x 4" x 4"
4 Ramps (4)	3/4" x 2" x 14"
5 Tail Fence (1)	1/2" x 7 1/2" x 28"
6 Adjustable Miter Bar (1)	Rockler #22987
7 Exit Blocks (4)	1 1/2" x 4" x 4"



Figure 5: "Cutting in" a registration slot on all four of the jig's fences is essential for locating your dovetail cuts. Note the freshly glued-in blocks of wood: these cover the saw blade's exit points and protect your fingers.

Using a taper jig on the table saw, cut two pairs of 8° wedges out of 3/4" stock. Glue each pair together to form the wide ramps (pieces 4) that will support the tail boards at an 8° angle. Glue and nail each ramp flush with the long edge of the base, as shown in Figure 2 (don't drive nails in the area around the middle section of the ramps, where the table saw blade passes during use). Butt the tail fence (piece 5) up to the inside of the ramps and fasten it in place, using three more triangular braces to keep it perpendicular to the base, as shown in Figure 3. Set the jig

aside to let the glued parts dry overnight.

To guide the jig, I fastened an adjustable miter bar (piece 6) to the underside of the jig's base with short washerhead screws, as shown in Figure 4. Center the bar and use a large try square or framing square to set it dead square to the base's long edges. Set the finished sled's bar into one of your table saw's miter slots and adjust the bar so it's free of side play, yet slides smoothly. With a regular — not thin-kerf — blade fitted, start the saw and carefully "cut in" a registration slot on the pin fence

as shown in Figure 5 on the previous page. Move the bar to the other miter slot and cut in the second slot, then flip the sled around and cut in both registration slots on the tail fence side. To make the jig safer to use, glue square 2x4 exit blocks (pieces 7) to the base at the back of each slot, directly over the saw kerfs you just cut. To keep the jig from sliding beyond the point where the saw blade passes through the exit blocks, clamp a stop block into both of the saw's miter slots (see the lead photo, [page 22](#)).

Cutting Dovetails

To use the jig, start by marking out the width and spacing of the dovetail pins on the outside-facing side of all your project's pin boards (label the outside face, to help you orient the board for cutting later). Remember, you're drawing the "narrow" side of the pins. Figure 6 on this page shows the angle of the pins in red for illustration; no need to mark pin angles on your boards, since those are set by the fence angles. Draw an "X" to indicate the waste areas between the pins. Use a square to draw a line across the end of each pin board to indicate pin depth — just a thin hair deeper than the thickness of the tail boards.

Now set the jig in the table saw's right-hand slot. Hold the stock firmly against the left-hand pin fence, with the pin board's inside face against the fence. Set your table saw's depth of cut to just reach the depth line on the pin board. Now cut on the waste side of each mark that delineates the right-hand edge of the pin (Figure 7). For accuracy, use the saw kerf in the jig to line up your cuts. When all the right-hand cuts are done, move the jig to the saw's left-hand slot and



Figure 6: Here the angles of the pins are marked in red simply to illustrate the pin shape. Remember that you must mark out the "narrow" sides of the pins on the board's outside face. The "X"s indicate the waste areas.



Figure 7: Start the process by carefully cutting the right side of each pin.



Figure 8: After establishing the left side of the pins, you can take multiple passes to remove the waste.



Figure 9: Mark out the tails on the tail board using the pin board as shown in the photo. Use a square to mark the depth of the tails. The process is similar to marking out for hand-cut dovetails.



Figure 10: Spin the jig around front to back and cut the tails, using the ramps on each side of the jig to make the right- and left-hand cuts.



Figure 11: An efficient way to remove the waste between tails is to use your band saw equipped with a narrow saw blade. Set the fence to the proper distance and carefully saw away the waste.

repeat the process, this time cutting on the waste side of the left-hand edge of each pin. (If you have trouble keeping your lefts and rights straight, try labeling each pin mark “right” or “left.”) You can remove the remainder of pin waste by taking multiple closely spaced saw passes, as shown in Figure 8.

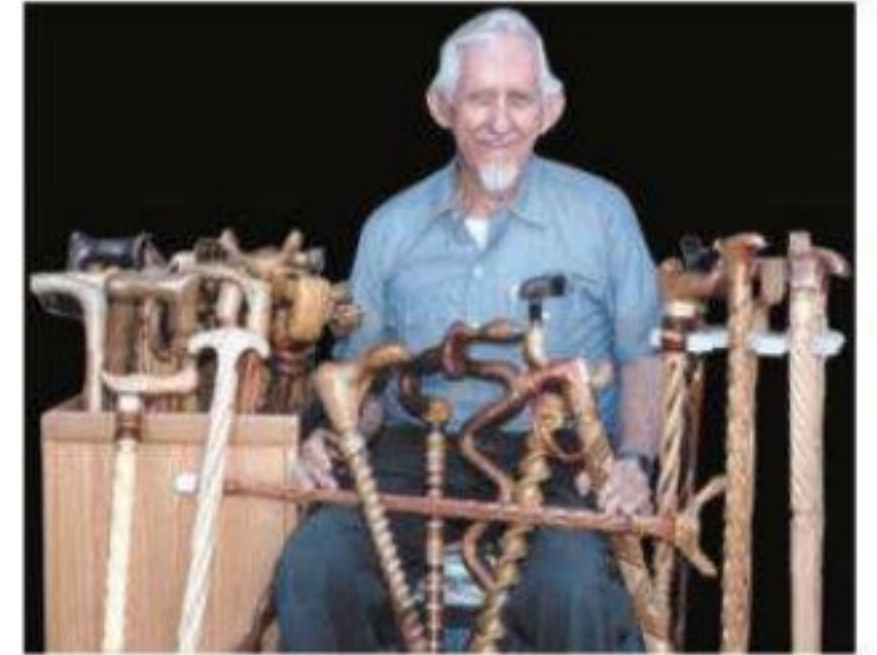
Once pin boards are cut, use the pins themselves to transfer the dovetail layout to the inside face of each corresponding tail board (Figure 9). Label the inside face of each tail board and mark the waste side of each line. Then, draw a square line across each joint to indicate tail depth.

Now flip the jig around front to back and use the tail-cutting ramps to saw out the tails (Figure 10). First, reset the saw’s depth of cut so that the blade just nicks the joint depth line. Use the left- and right-hand ramps to cut along the right- and left-hand tail marks just as you did with the pins, moving the jig from one miter slot to the other as necessary. Hold the outside face of each tail board against the fence and make sure to cut on the waste side of each line.

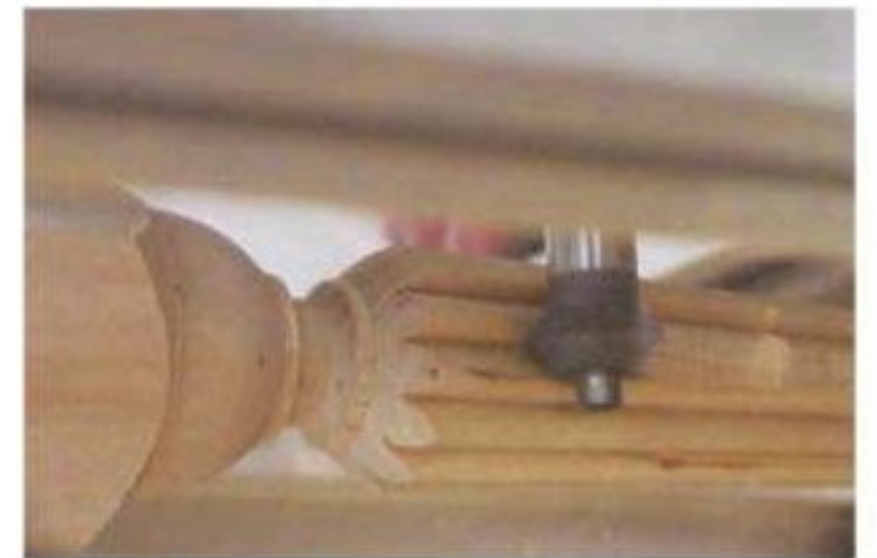
Rather than chopping out the waste between tails by hand, it’s quicker and neater to saw the waste out using a band saw (or scroll saw). I use a 1/8" wide, 14 tpi blade in my band saw, setting the saw’s fence to guide the stock so that the blade cuts just shy of the joint depth line (Figure 11). Use a chisel and/or knife to clean up the inside corners of the tails and pins, as necessary, and to trim them for a tight, clean fit.

Sandor Nagyszalanczy is a contributing editor to Woodworker’s Journal. His books are available at Amazon.com.

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Whether you want an heirloom quality workbench plan (ours was designed by an Arts & Crafts master), a way to keep lathe tools sharp and at the ready or just some sturdy cabinets to tame the clutter in your busy workshop, you'll find answers in this project collection. All six include measured drawings and step-by-step directions to ensure your success.

<i>Kirby Workbench</i>	30-40
<i>Clamp-on Router Table</i>	42-46
<i>Sharpening Cart</i>	48-54
<i>Drum Sanding Station</i>	56-62
<i>Storage Cabinets</i>	64-68
<i>Adjustable Roll-off Stand</i>	70-71



Arts & Crafts Workbench

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

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

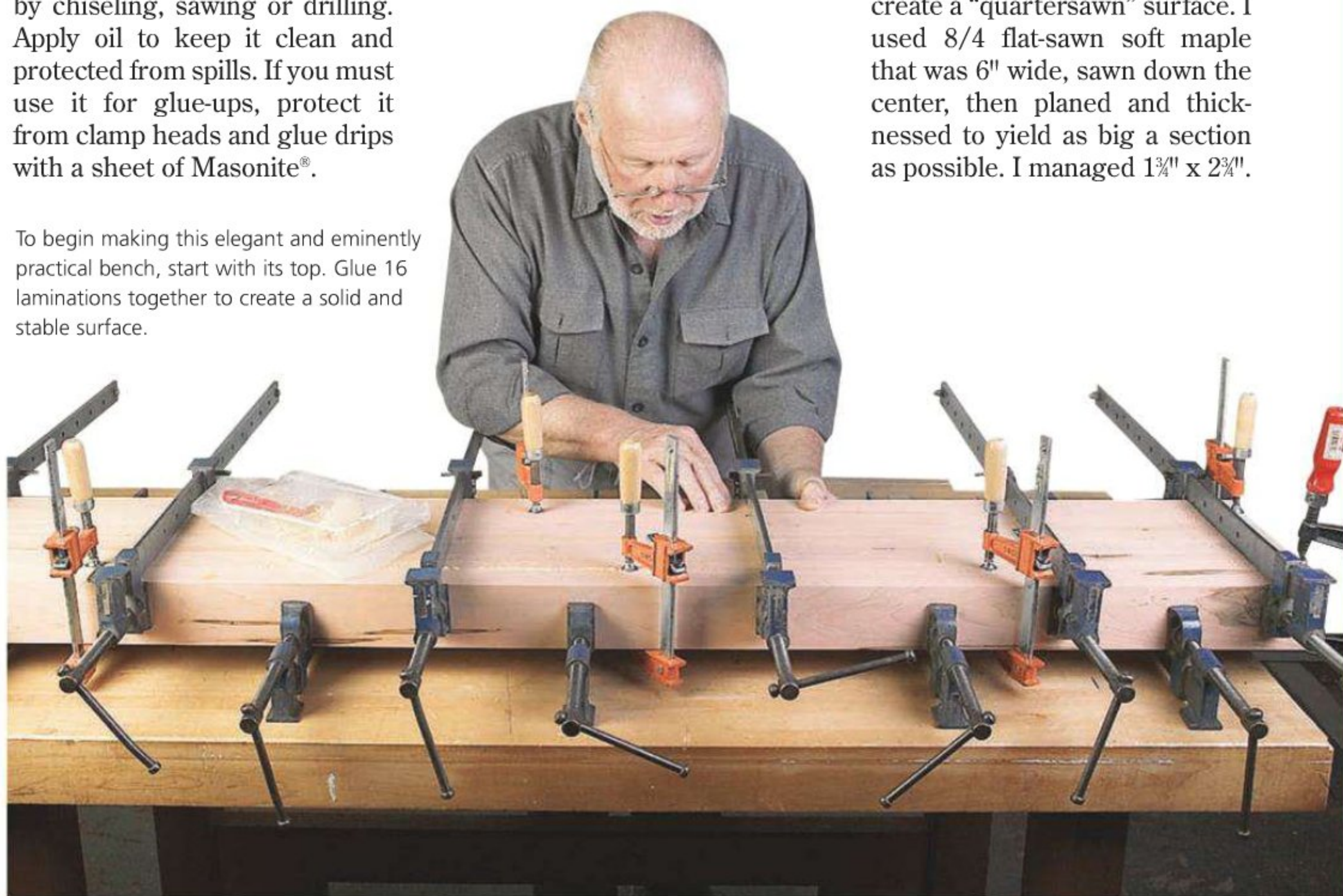
To begin making this elegant and eminently practical bench, start with its top. Glue 16 laminations together to create a solid and stable surface.

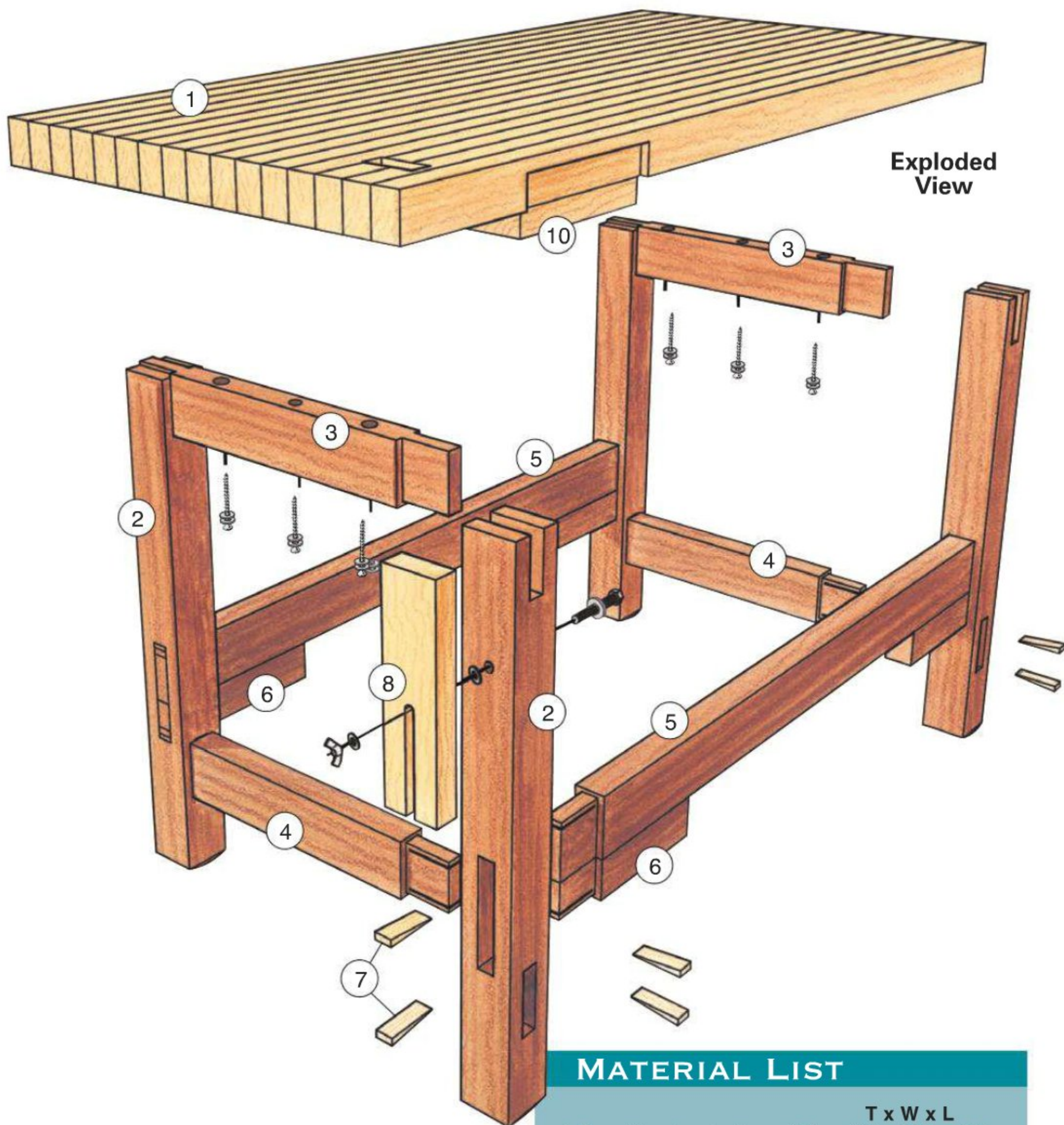
Benchtop Characteristics

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

Structure: In the past, benchtops were made of two or three thick slabs of readily available

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





Exploded View

Wedge
(Side View)



The wedges are custom fit to each tenon. See the sidebar on [page 38](#) for details.

MATERIAL LIST

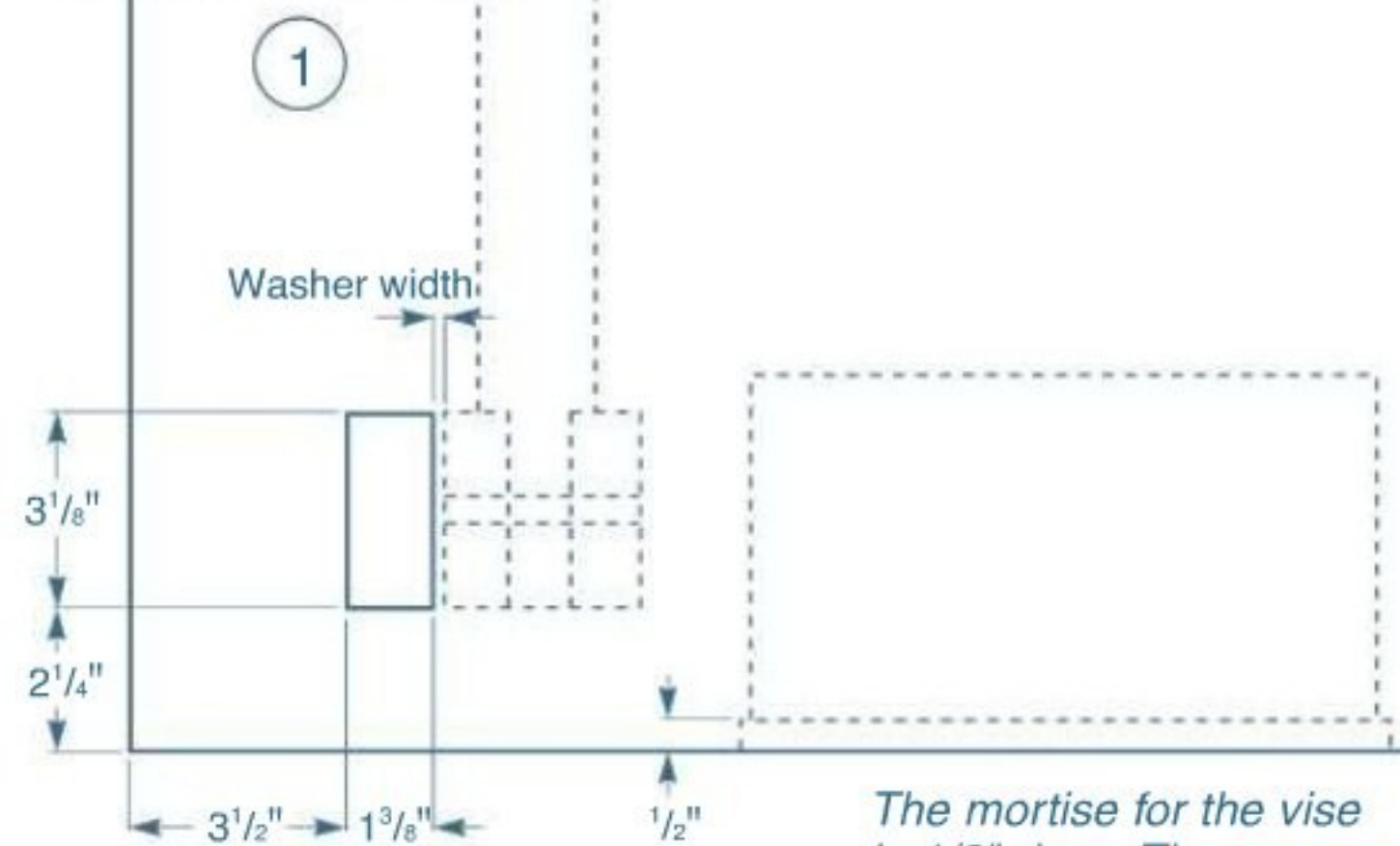
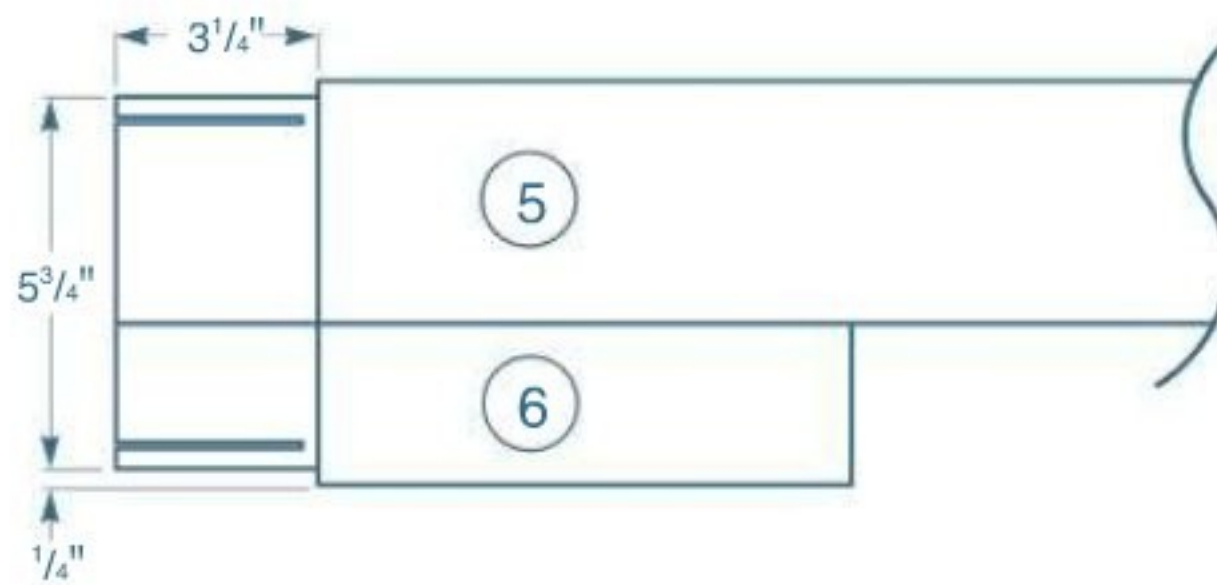
	T x W x L
1 Benchtop Laminations (16)	1 ³ / ₄ " x 2 ³ / ₄ " x 60"
2 Legs (4)	3 ¹ / ₈ " x 3 ¹ / ₈ " x 32 ¹ / ₄ "
3 End Top Rails* (2)	1 ⁷ / ₈ " x 3 ³ / ₄ " x 23 ¹ / ₂ "
4 End Bottom Rails* (2)	1 ⁷ / ₈ " x 3 ³ / ₄ " x 23 ¹ / ₂ "
5 Long Rails** (2)	1 ⁷ / ₈ " x 3 ³ / ₄ " x 50"
6 Long Rail Blocks (4)	1 ⁷ / ₈ " x 2 ¹ / ₂ " x 11 ³ / ₈ "
7 Wedges (16)	Cut to fit
8 Bench Stop (1)	1 ³ / ₈ " x 3 ¹ / ₈ " x 12"
9 Vise Cheeks (2)	1" x 4 ¹ / ₄ " x 14"
10 Vise Spacer Block (1)	1 ¹ / ₂ " x 5 ¹ / ₂ " x 10"

* Distance between shoulders is 17".

** Distance between shoulders is 43¹/₂".

Note: Cut the rails slightly long and trim flush with legs after glue-up.

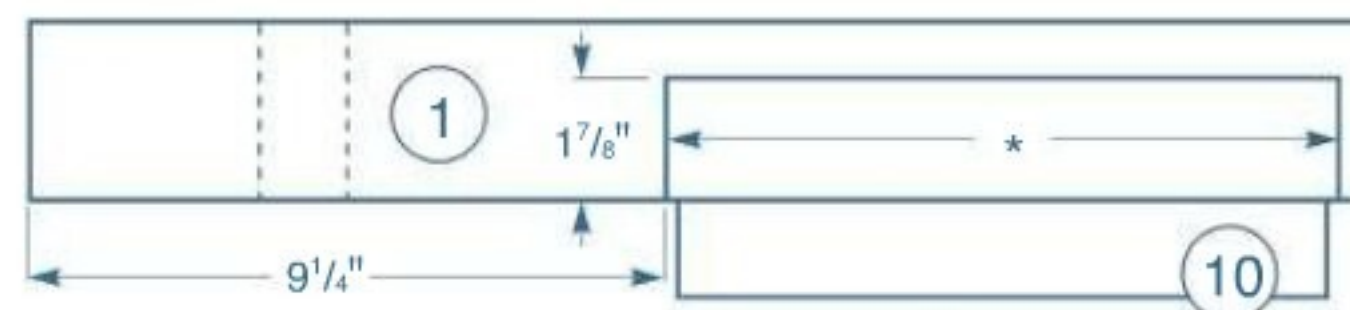
Long Rail and Long Rail Block Assembly (Side View)



Workbench Top
(Top View)

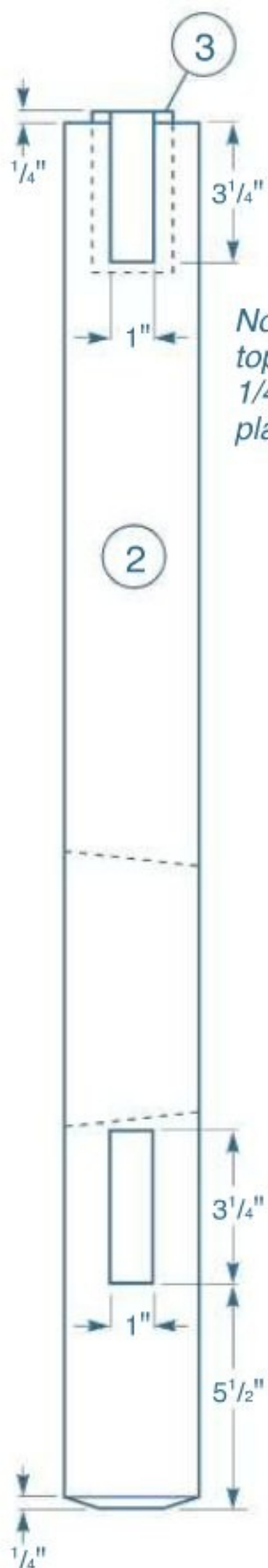
The mortise for the vise is 1/2" deep. The spacer block is mounted right behind the mortise.

Workbench Top
(Side View)



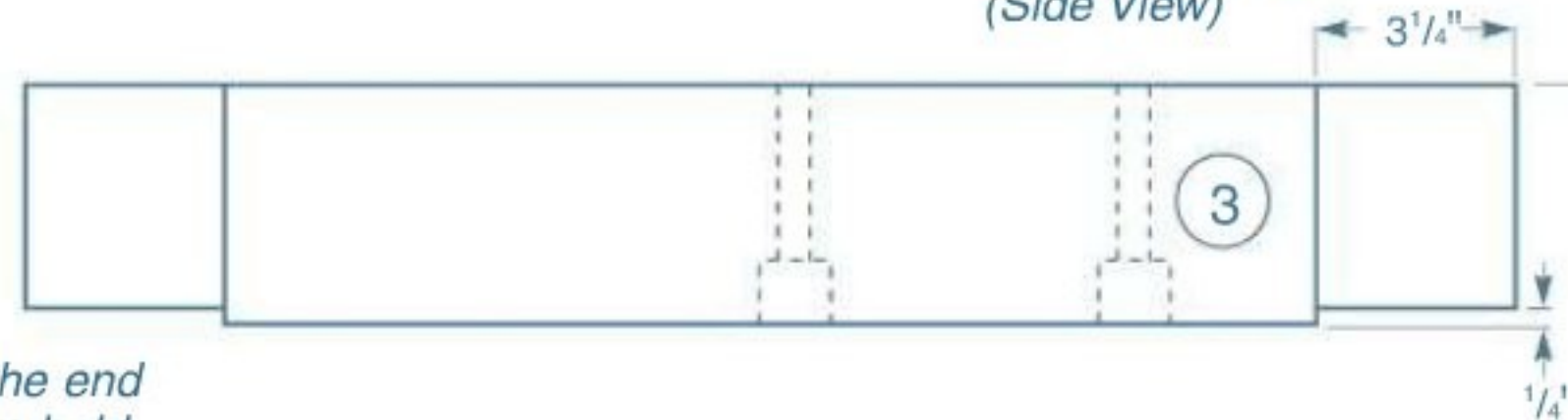
* NOTE: The vise mortise is cut once you have your vise selected and on-hand.

Bench Underframe Top Leg Joint Detail (Front View)

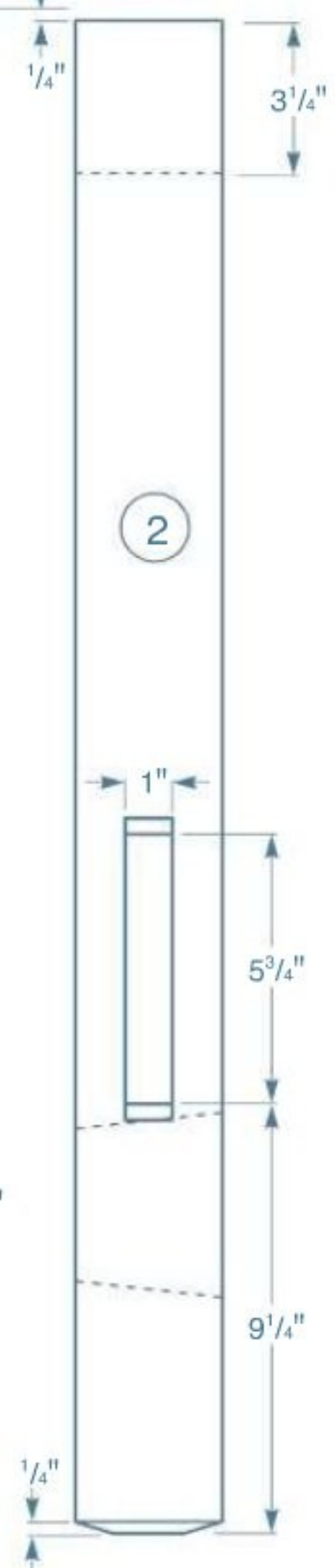


Note that the end top rails are held 1/4" above the top plane of the legs.

End Top Rail
(Side View)

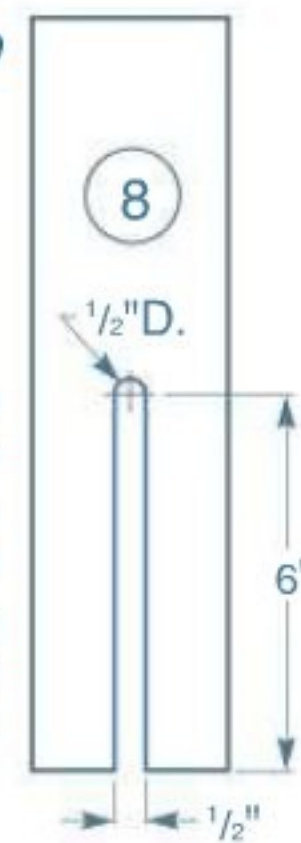


Leg
(Side View)



Bench Stop
(Front View)

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



End Bottom Rail
(Side View)



Making the Top

Lay the strips out to choose the best color and grain pattern, then number them for an orderly glue-up. I used 16 strips to make a top 28" wide. Gluing this many strips together requires a flat, solid surface on which to work, such as an existing bench or sheet stock supported by battens and sawhorses. I used 11 bar clamps, augmented by upwards of a dozen fast-acting clamps to align the edges. I applied Titebond® II glue with a 3" paint roller. Pressing firmly to wet the surface, roll a light coat on each face. The squeeze-out should show as small beads, not drips. Between jobs, store the roller and tray in a plastic bag, folded over to make an airtight seal. How many strips you glue in one clamp-up depends on whether you work alone or with a helper. The real dividend of a helper is having someone at the

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

other end of the board to lift and shift and at the other end of a clamp to attend to its positioning and other tasks. Working as two, you could begin with as many as six center strips. Working alone, begin with three center strips. Position five clamps equally spaced on the work surface. The remaining six clamps sit on top of the work, spaced between the bottom five. Using fast-acting clamps, align the surface of the

laminates by keeping both heads of the clamp centered on the glue line. Also align the ends. After the first glue-up dries, add one strip to each side to allow ample time for precise alignments before the glue cures. By carefully managing the assembly this way, I needed to remove only 1/16" to flatten the top. It's possible to make three glue-ups a day: morning, noon and evening.

Flattening the Top

Make the top flat by planing across the grain. This may seem counterintuitive, but it's the best way to remove the slight but inevitable unevenness in the laminations. All woods plane well across the grain with minimal tearout. It's important to follow a planing pattern. Begin at one end and concentrate on a band 6" to 9" wide. Move to the next band as flattening occurs. After

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



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

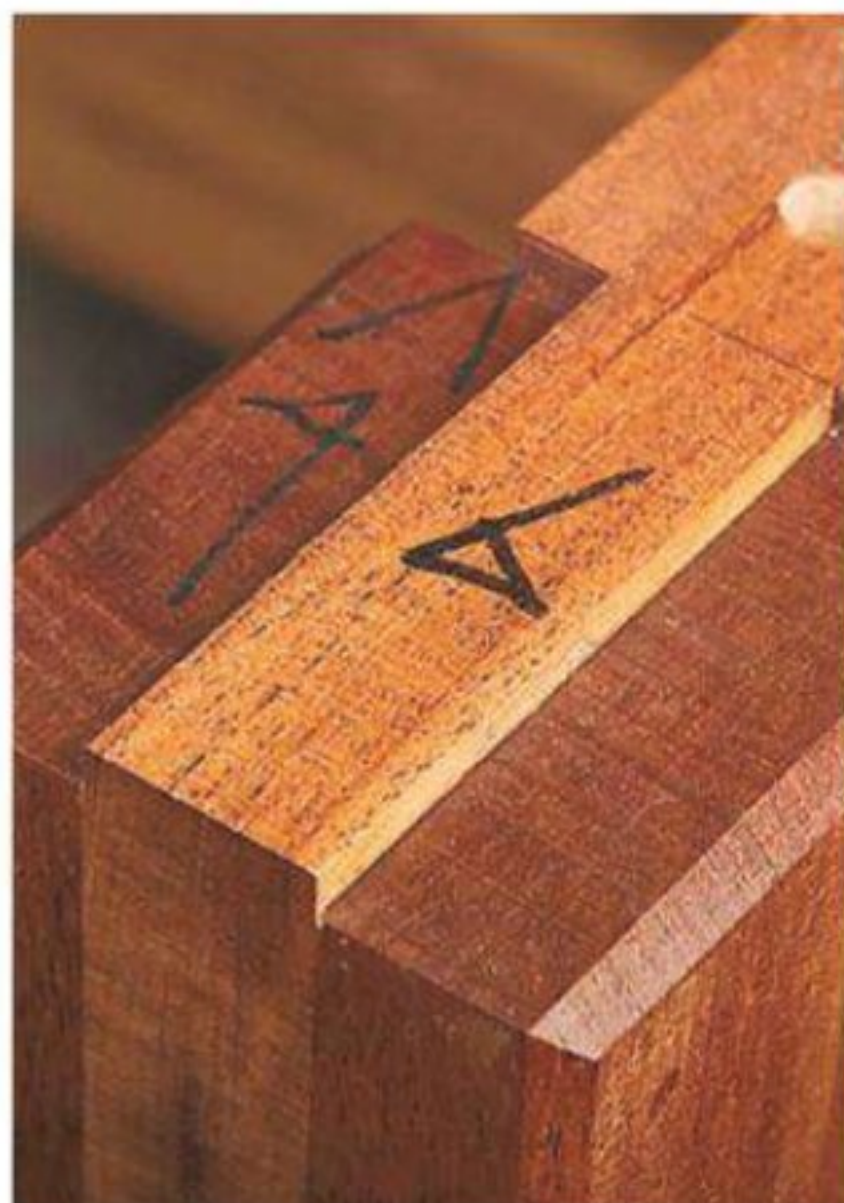


flattening the final band at the other end of the top, set the blade finer and start again. Use your straightedge from the very beginning and check every direction. Use a bench brush repeatedly to avoid planing over shavings. And keep the blade sharp. As the surface becomes more refined and the depth of cut is reduced, the shavings become like duck down and the planed surface is left very smooth. Don't sand the bench-top because the residual abrasive grit will dull your blade after only a few plane strokes when the occasional re-flattening is required.

The top must be flat in length, flat in width and out of winding. Use a two-foot straightedge to check your flattening progress at close intervals across the top. I also used a six-foot extruded aluminum level to assess the flatness of the overall length. Use winding strips end to end, middle to end, and across the top to make sure there is no twist.



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



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



Remove the waste in the leg's open mortise with a coping saw.

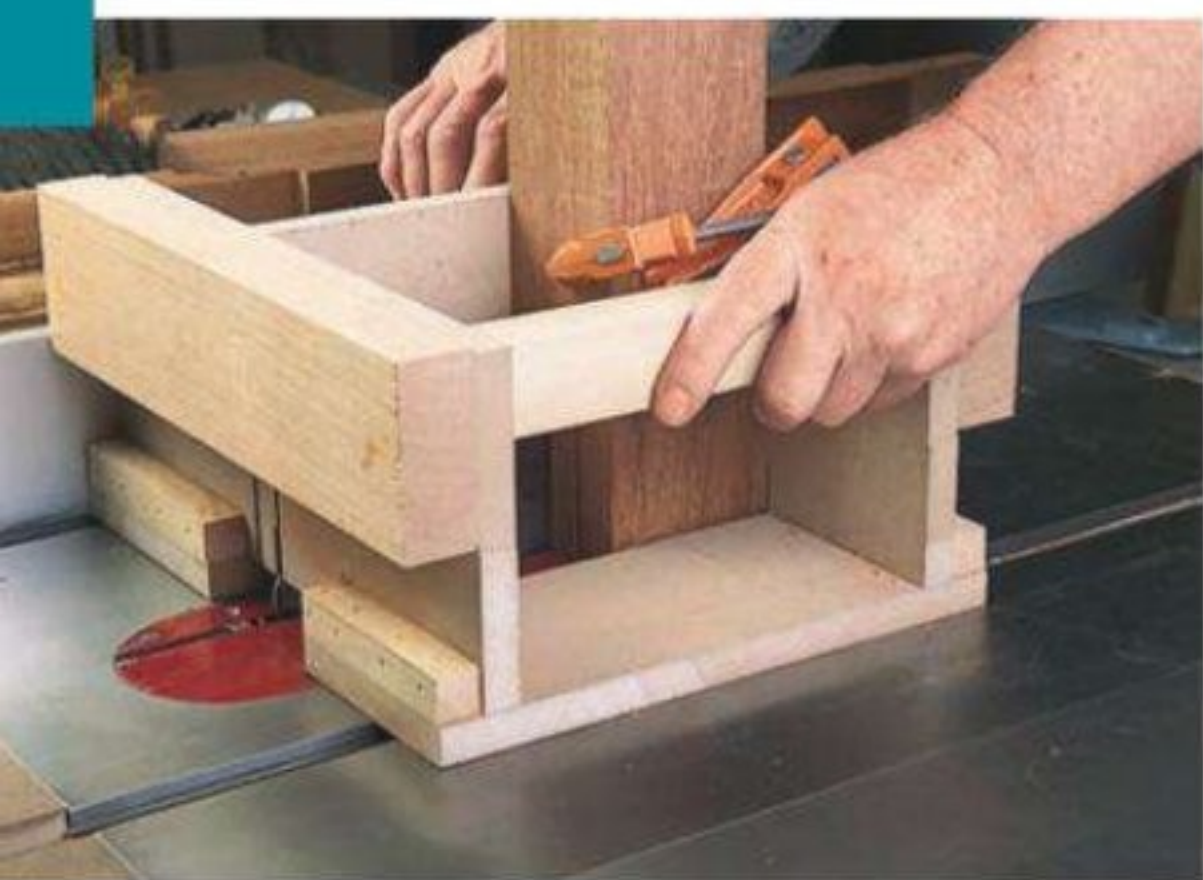
Glue the rail blocks to the long rails and, once the glue has dried, clean up with a smoothing plane.



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

Goals for the Underframe

The bench underframe must be sturdy enough to support the mass of the top and any of the work that goes on the top, and it must resist racking when it's moved or during bench operations such as planing. Almost any softwood or hardwood will fit the bill. The one shown here is



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

made of mahogany and put together using through-wedged mortise-and-tenon joints and bridle joints. It calls for legs over 3" square with rails almost 2" thick.

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

Attaching the Top to the Underframe

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



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

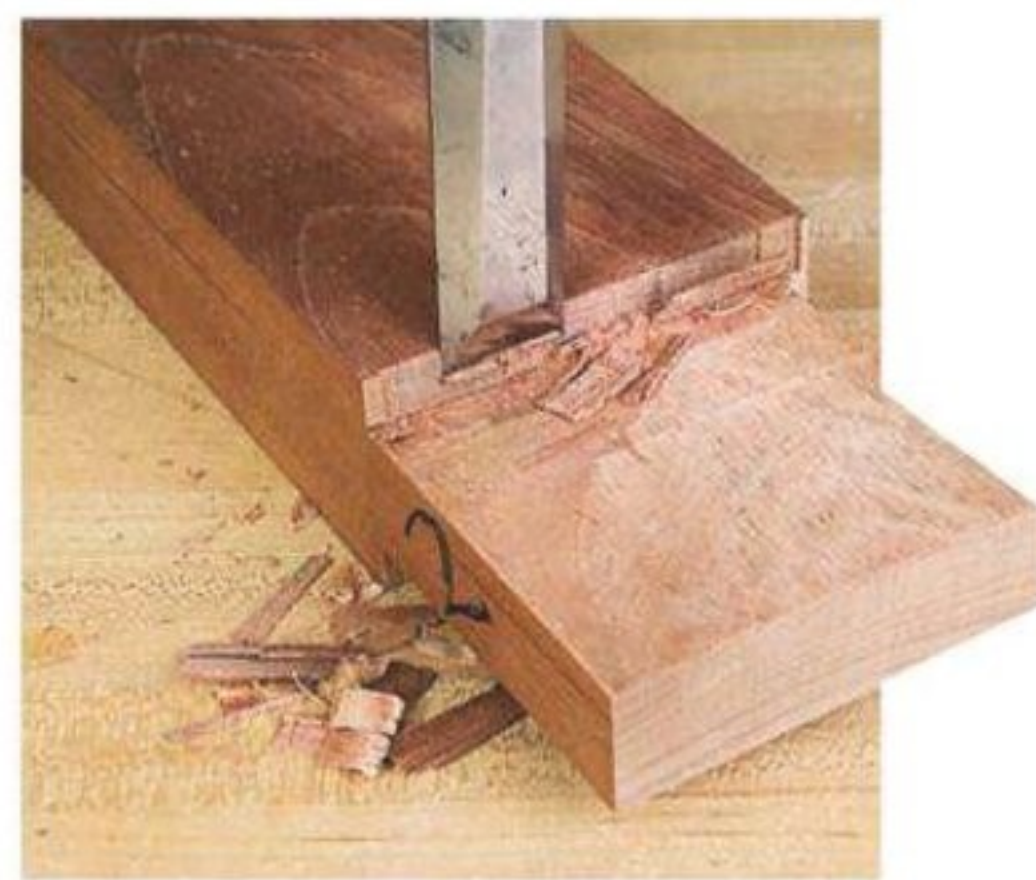
outer ones have a 5/8" clearance hole to allow the top to move unhindered through its shrink and expand cycles.

Mortise-and-Tenon Underframe

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

Making the Underframe

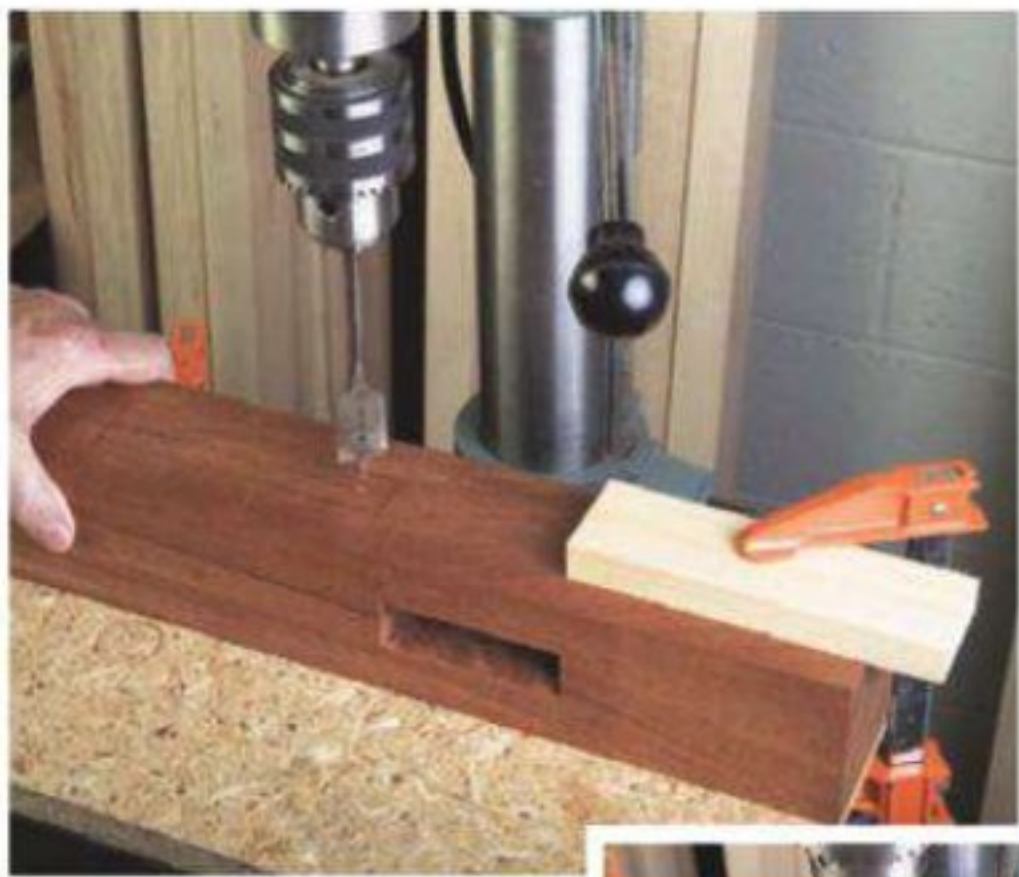
Start off by marking out each joint as though it were to be made by hand. I had to dodge some growth defects in the mahogany stock, so the first thing to do once



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

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

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



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



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



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

Cutting Leg and Rail Joints

I cut the leg mortises first using a shop-made tenoning jig. In each case, the rectangular peg and the rectangular hole are centered, so after you cut one side, turn the part around and cut the other side. This procedure can only produce cuts that are correct and alike if the parts have exactly the same thickness. That's why careful preparation of your stock is so important. Clean up the bottom of the joint with a chisel. Cut from each side shoulder line to leave a mound in the middle. Once you have established both shoulder lines, remove the mound by horizontal paring. My jig is guided by the fence and advanced by hand, safely distant from the saw blade. The rip fence controls the setting. To affect a slight adjustment when setting up the cut, I slacken the fence locking handle, then lightly tap the fence with a hammer. Because the saw is set at full height, it would cut deeply into the jig, so I glued on the thick bridge pieces front and back to stiffen its structure. Because the rail thickness differs from the leg thickness, you must change the settings. However, the tenon is centered on the rail, so this

setting stays unchanged. Turn the workpiece around to make the second cut. The tenon should fit tight. Offer the uncut rail to the completed leg part of the joint and assess how close you need to be to the mortise gauge line. Set the blade only 1/2" high. Set the work in the tenoning jig so the cut will err on the rich side. Saw both faces. Clamp the work in the miter gauge and set the blade to the correct height to remove the newly cut face. Now test the 1/2" stub tenon against the mortise. If the tenon is too rich, release the fence lock handle halfway, adjust the fence with hammer taps, and retest.

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

Mortise-and-Tenon Joints

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

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

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

Making the Mortises

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

MAKING THE WEDGES



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



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



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



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

bottom of the hole, and then withdraw the bit when it stops. Result: a perfect hole. By clamping the workpiece, the hand that would normally hold it is free to safely hit the "Off" switch while the hand on the drill press handle holds the bit at full depth.

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

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

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

Remove the jig, set the trim bit to depth and clean out the waste remaining in the center.

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



ward pressure from paring cuts and mallet blows, and the work is easily returned to level and height after checking.

Making the Tenons

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

Final Details

Sawing the Leg Ends:

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

Holes for the Lag Screws:

I used 4 1/2" lag screws to hold the top to the underframe. Drill 1 1/8" counterbore holes in the top end rail for the heads. The two center

clearance holes are 3/8" and the four outside clearance holes are 5/8" to allow the top to shrink and expand.

Assembling the End Frames

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

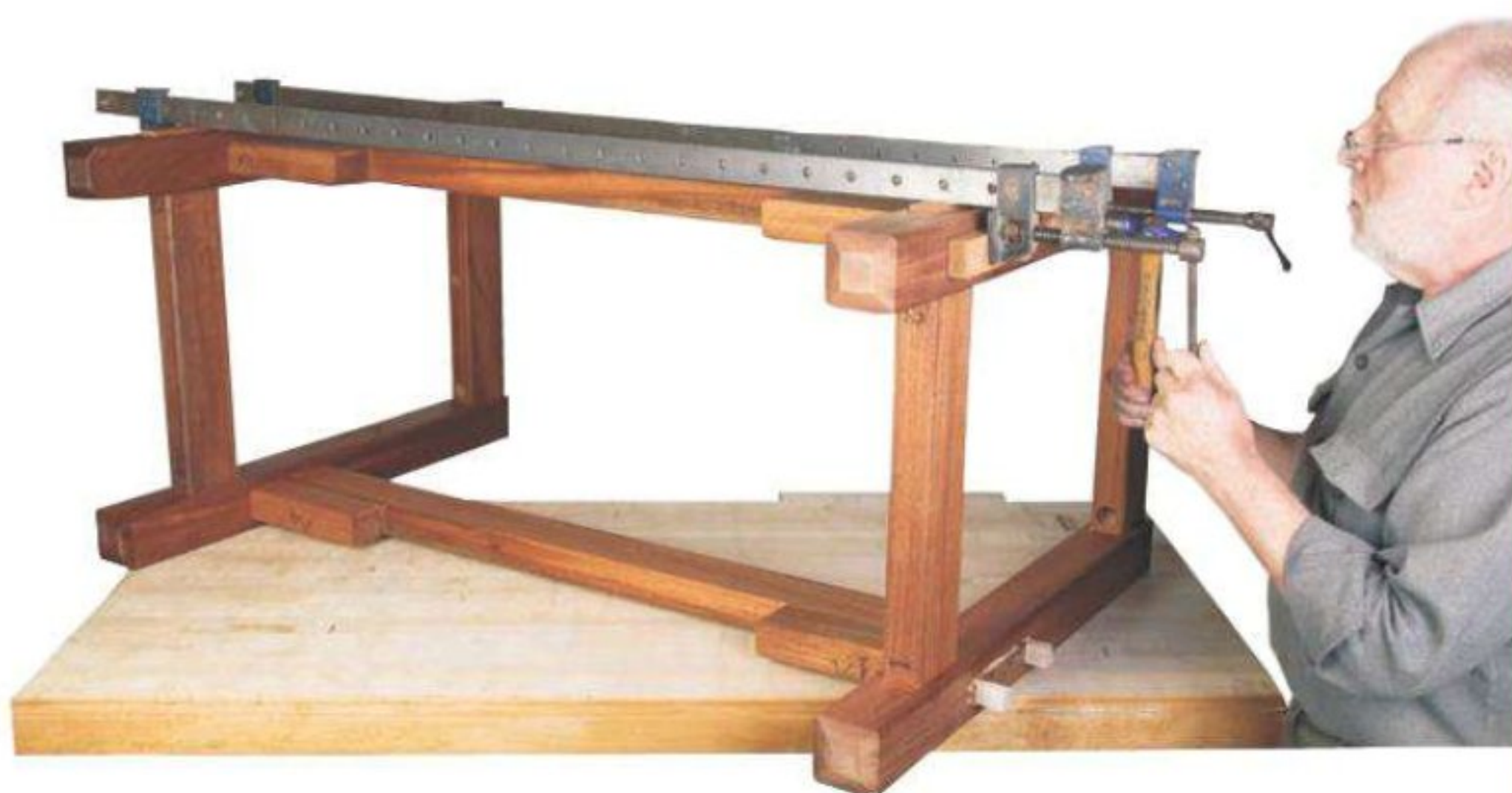
You'll need to mount the vise to the top before your work is done (see next section). Attach the bench stop to its leg and

engage it as you mount the top to the underframe.

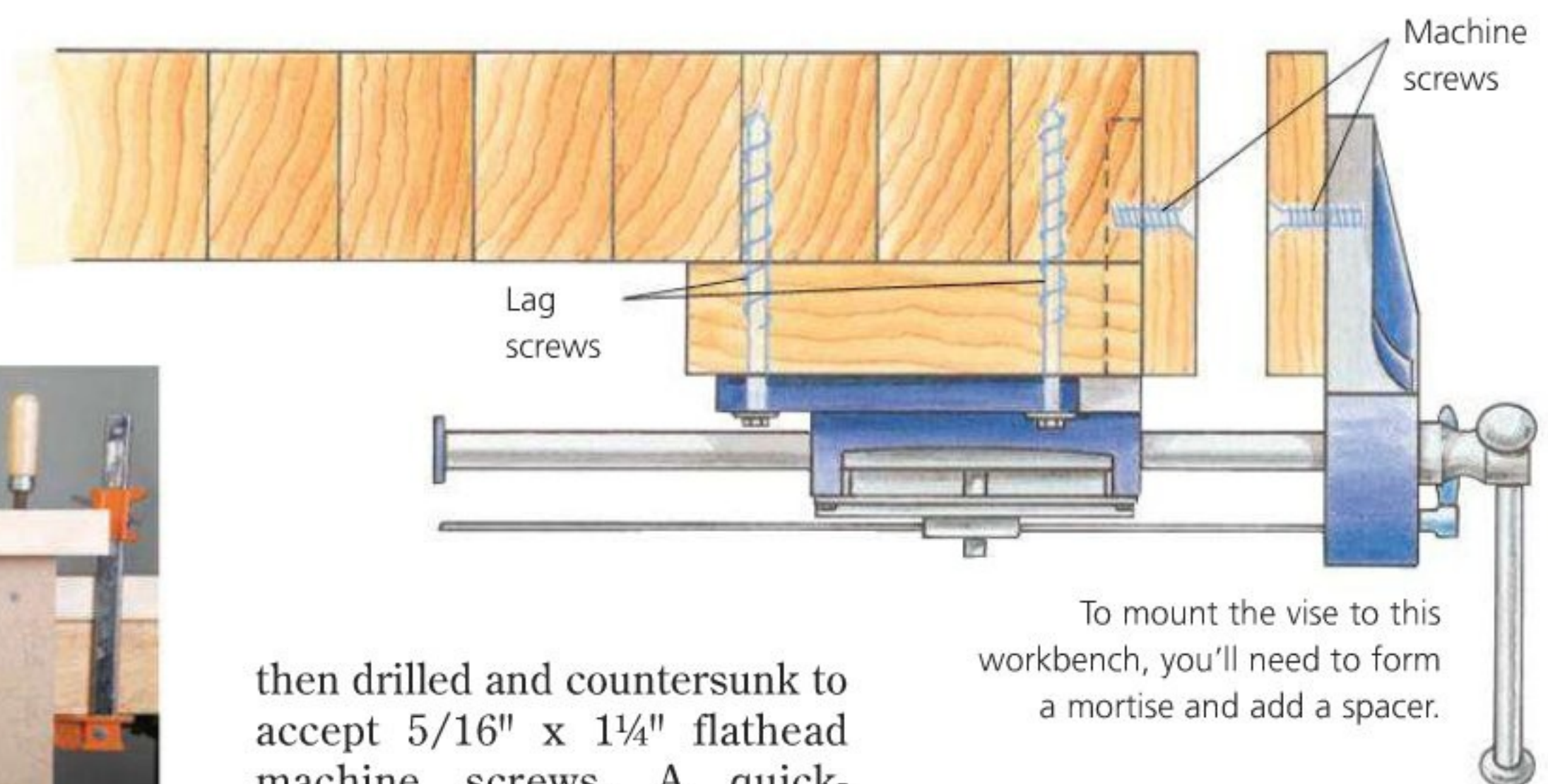
Clean up and oil all the unfinished areas, and you are ready to put this new and essential tool to work in your shop. If you've built it carefully, it will serve you well.

Installing the Vise

As I write this, the Record 53ED is the best woodworking tool investment I know of. Its jaws are 10 1/2" wide and open to 13" (editor's note: *rockler.com* has a similar quick release 9" model: item #33487). Start the installation by removing the metal dog that is intended for use when the vise is mounted at the end of a benchtop with a series of lengthwise dog holes. English hand tool woodworkers did not clamp work this way. Using the vise dog on a side-mounted vise against an opposing dog could split the benchtop in two. The metal jaws each have two 1/4" holes so that wood cheeks can be bolted in place. Later models no longer come with threaded holes, so you will need to thread your own with a 5/16" x 20 tap. The cheeks are



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



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



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



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



then drilled and countersunk to accept 5/16" x 1 1/4" flathead machine screws. A quick-release trigger disengages the screw so that work can be held in one hand while the vise is quickly adjusted. The trigger turns a bar that lifts a half nut in the fixed jaw casting. The half nut is held in place by a metal plate fixed to the casting with two 1/4" bolts. Lock them down tight when you get the vise, and that is about all that you will ever have to do other than keeping the bars and buttress thread clean and lightly oiled.

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

Hang the vise 9" to 10" from the working end of the top and so it is clear of the underframe. You can mark out and cut the jaw mortise by hand or you can use a router, 1/2"-diameter pattern bit and a pattern jig. Clamp the jig into position, locating the opening with a batten screwed to the back of the jig that puts it 5/8" from the top edge of the bench. Stand the top on edge. Prepare eight spacer strips 1/4"

x 1/4" x 20" and stand them all on edge against the fence at the top of the jig. Set the router bit to full depth and ride the router base against the strips to make a cut 1/4" wide. Remove a strip each time you make a cut. On the final pass the pattern bit bearing rides against the jig.

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

Ian Kirby is a contributing editor to Woodworker's Journal.

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Easy-to-Build Clamp-on Router Table

OUR AUTHOR'S WORKBENCH ROUTER TABLE BREAKS DOWN IN A HURRY AND FEATURES A CLEVER HOMEMADE LIFT SYSTEM OF HIS OWN DESIGN.

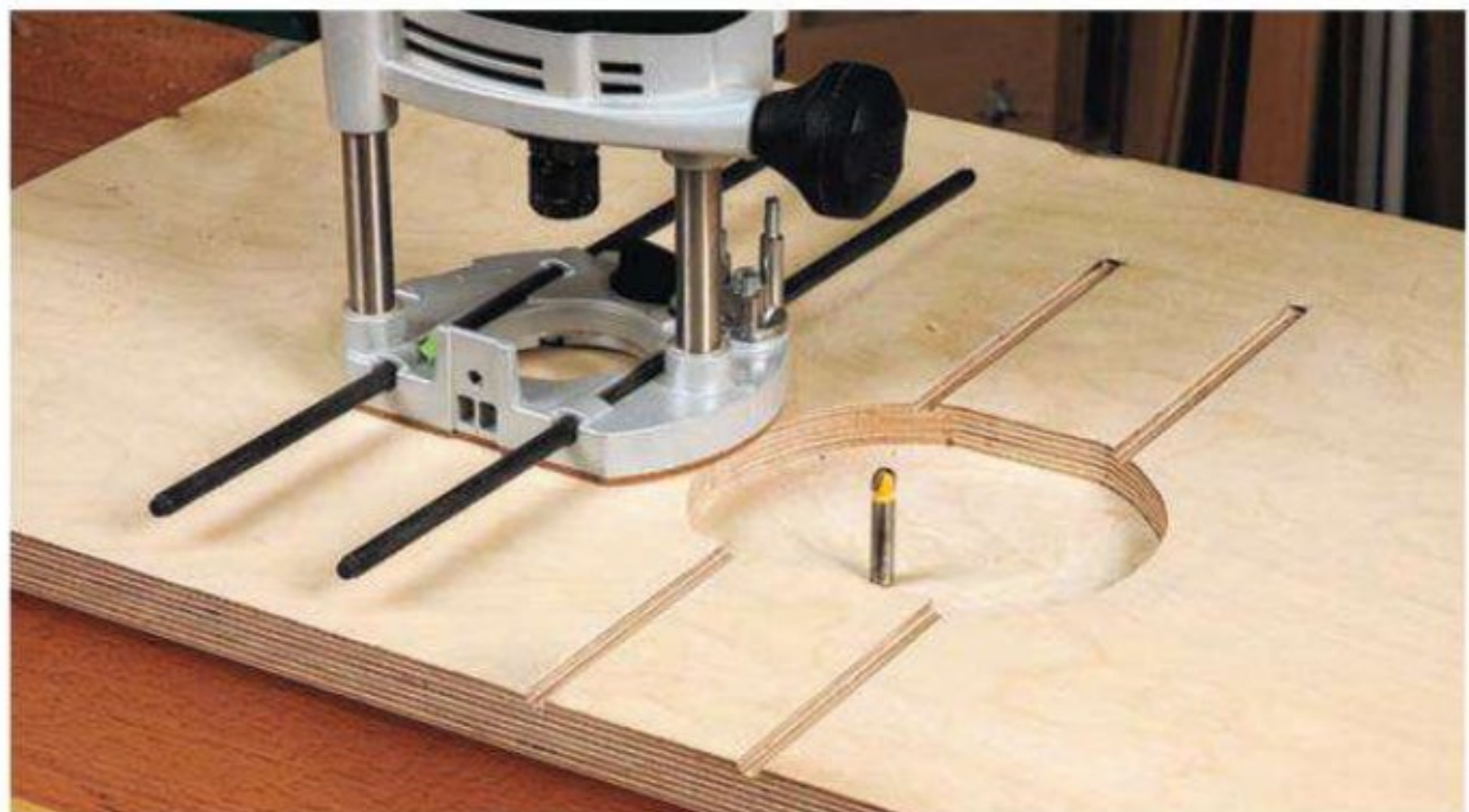
A router table doesn't have to cost a fortune or weigh a ton to deliver professional results. My version's 1"-thick top doesn't even require a cabinet base or legset — it simply clamps to my workbench. The project features an adjustable split fence with dust collection, plus a router lift made from ordinary home-center hardware. By removing three pairs of carriage bolts and wingnuts, I can remove the lift, router and fence easily for convenient storage.

I designed my router lift to suit my Festool OF 1400 plunge router, because it plunges without the need to engage a release lever. The lift may work with other routers, too, but study the *Drawings* on [page 44](#) carefully to verify the compatibility with your machine.

Installing the Router in the Table

Get started on the project by ripping and crosscutting the tabletop and two mounting blocks (pieces 1 and 2) to size. Notice in the *Drawings* and the photos at right that, instead of hanging the router from a removable plate, I make use of the two metal edge guide rods that come standard with the tool. My router sits in a 3/4"-deep recess milled into the table's bottom face. The mounting blocks clamp the guide rods in grooves on the table, and that's what holds the machine in place instead of screws.

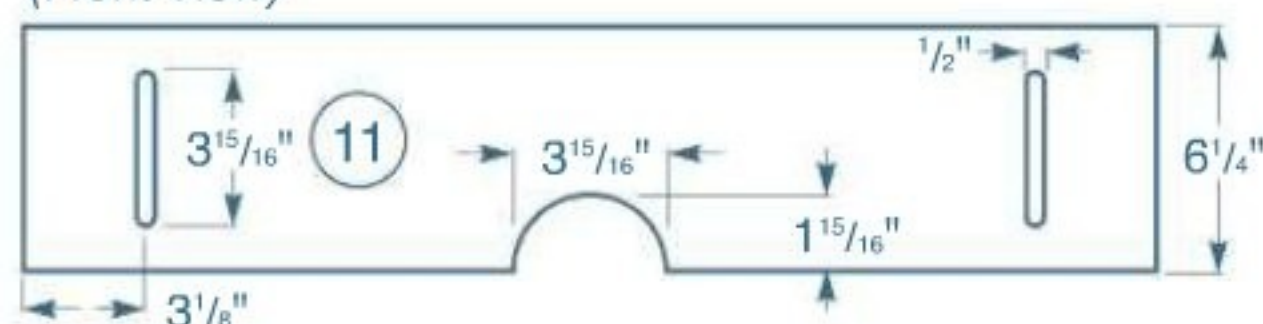
If your router does not have guide rods, then you will need to modify the tabletop to accept a router table plate or simply mount the base to the table with screws.



Once you've marked the router and guide rod positions on the table blank, rout a 3/4"-deep recess into the table for the router base (top photo). Switch to a core box bit to mill shallow grooves for the guide rods. Make the groove depths half the rod diameter (center photo). Rout matching slots into both mounting blocks that fix the rods against the table. Fasten the blocks to the table with carriage bolts, washers and wingnuts to complete the router installation (bottom photo).

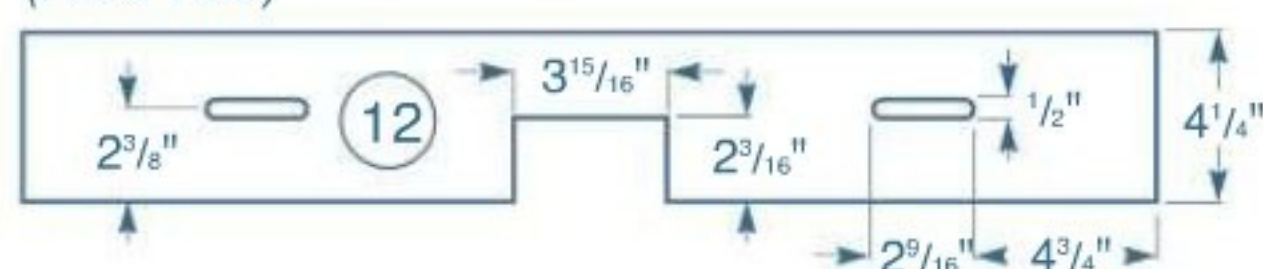
Fence Base

(Front View)



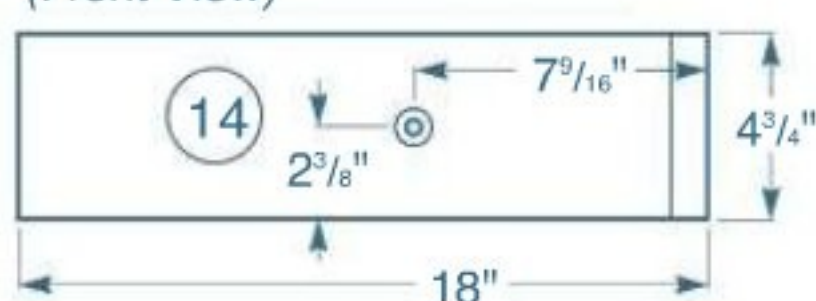
Fence Back

(Front View)



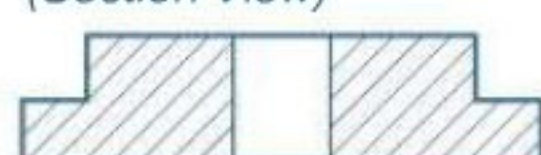
Fence Facing

(Front View)



Insert Ring

(Section View)

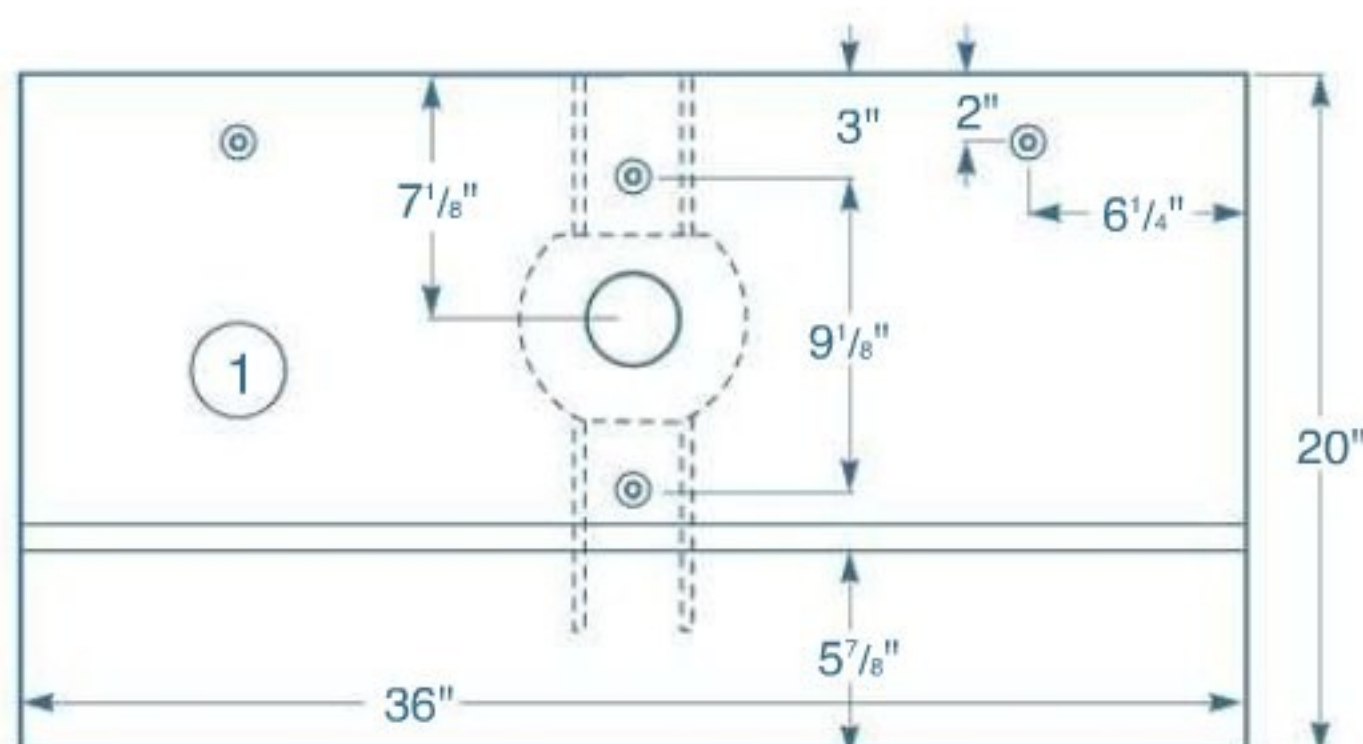


The author uses shop-made, interchangeable insert rings to suit different router bit sizes. The rings have a rabbeted edge that fits into a matching rabbet milled around the bit opening. The rings are captured and held firm by the base of the router. These rings are optional — you may be happy with a single hole bored through the top.

Insert Ring

Tabletop

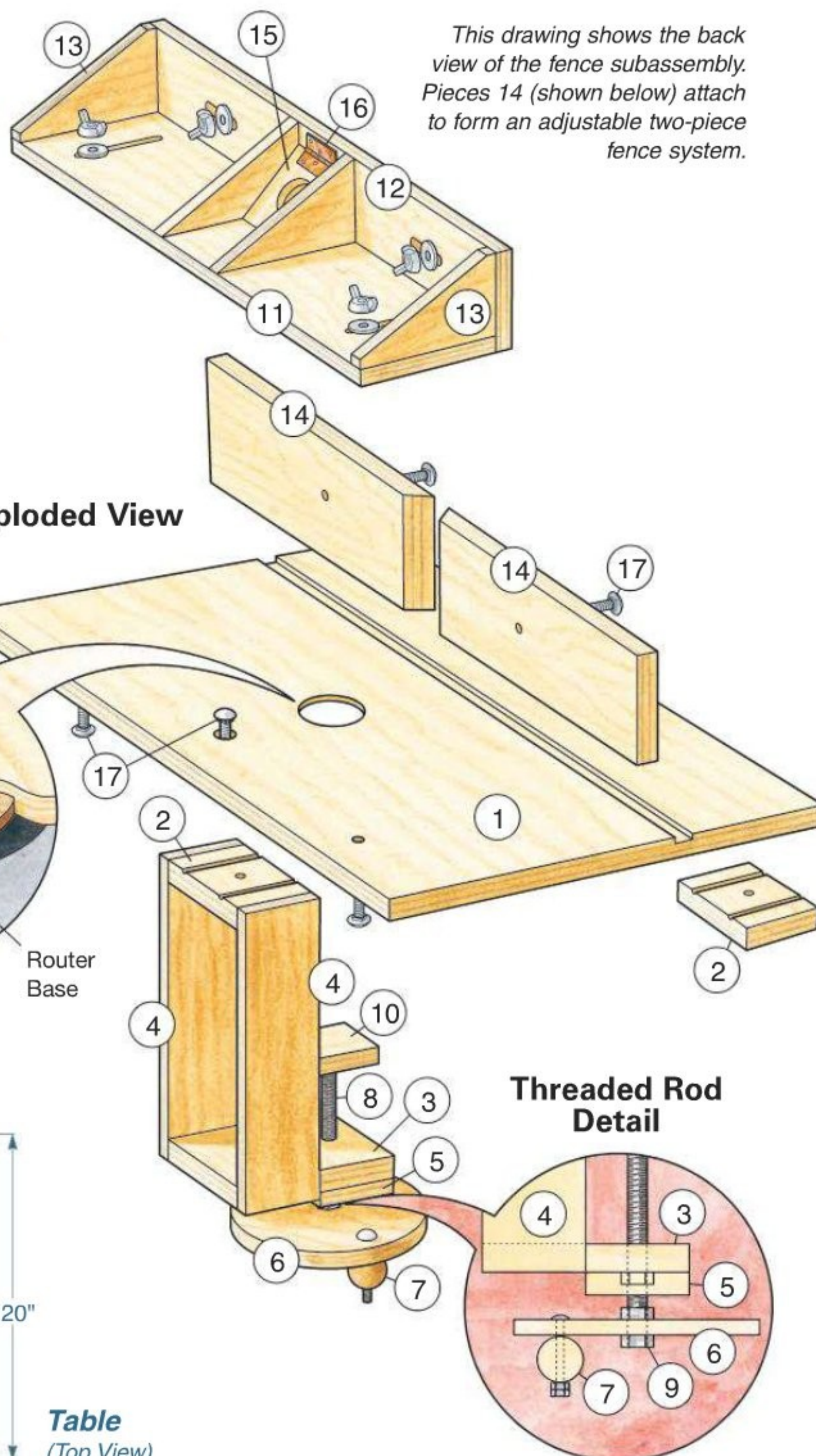
Router Base



Table

(Top View)

Exploded View



This drawing shows the back view of the fence subassembly. Pieces 14 (shown below) attach to form an adjustable two-piece fence system.

Threaded Rod Detail

MATERIAL LIST

	T x W x L		T x W x L
1 Table (1)	1" x 20" x 36"	10 Router Lift Plate (1)	3/4" x 3" x 3"
2 Rear Mounting Blocks (2)	1" x 3 3/8" x 6"	11 Fence Base (1)	3/4" x 6 1/4" x 29"
3 Lift Base (1)	1" x 6" x 6 3/4"	12 Fence Back (1)	3/4" x 4 1/4" x 29"
4 Lift Sides (2)	3/4" x 3 3/8" x 13"	13 Braces (4)	3/4" x 3 1/2" x 6 1/4"
5 Lift Bracket (1)	3/4" x 3 3/8" x 6"	14 Fence Facings (2)	1" x 4 3/4" x 18"
6 Crank (1)	1/2" x 8" Dia.	15 Dust Port Plate (1)	3/4" x 4" x 4"
7 Crank Knob (1)	1 1/2" Dia. Wood Ball	16 Hinge (1)	2" x 2 1/2"
8 Threaded Rod (1)	5/8" Dia. x 8"	17 Carriage Bolts, Washers, Nuts (6)	3/8" Dia. x 2 1/2"
9 Nuts (3)	5/8"-11		

For those routers with guide rails, mount them by first centering and locking the guide rods on the router's base. Position the router on the table blank (see the *Drawings*), and trace the base and rod shapes onto it. Rout the router base recess freehand with a straight bit in a series of deepening passes. Now, switch to a core box or a straight bit with a cutting diameter that matches the guide rod diameter. Run your router against a clamped straightedge to rout a pair of shallow grooves for the guide rods into the table. Make their depth match the radius of the rods. Mill pairs of matching rod slots across the mounting blocks. Space these to line up perfectly with those on the table. Finally, set the router into place, fit the mounting blocks over the rods and drill a single, centered 3/8"-diameter bolt hole through both blocks and the table.

Drill 1/4"-deep counterbores in the tabletop to recess the heads of the carriage bolts (pieces 17) that will attach the mounting blocks. Bolt the router in place, and use a 1/4" straight bit to plunge a hole through the table. It marks the centerpoint of your bits.

Assembling the Router Lift

My router lift's open framework uses the rear mounting block as its top piece. It has a round crank that turns a threaded rod through a nut captured between the lift's base and bracket. The rod pushes against a small lift plate to move the router. Begin building the lift frame by cutting pieces 3, 4, 5, 6 and 10 to size and shape.

Align the lift bracket flush with one end of the lift base, and mark the centerpoint of these parts. Use a drill press to bore a 5/8"-diameter hole through both workpieces at their centerpoints to fit the threaded rod (piece 8). Drill a 5/8" centered hole through the round crank, too. Then switch to a 1"-diameter Forstner bit to drill a counterbore into the inside face of the lift bracket. Its depth should match the thickness of the captured nut (piece 9). Tap the nut into this counterbore.

Biscuit and glue the mounting block, lift sides and base together to form the lift framework. Orient the mounting block so the slotted side faces out. Next, bore a 5/16"-diameter hole through the center of your crank knob (piece 7) and another hole through the round crank, 3/4" in from its edge. Assemble the knob and crank with a 5/16" x 2 1/2" carriage bolt and a pair of nuts tightened together. Use the remaining two big nuts to attach the crank to the end of the threaded rod. Wind the rod through the captured nut and fit it into the lift base hole. Fasten the lift bracket to the base with glue and screws.

The motor cap on my Festool router has four deep machine screw holes molded into the top. In order to prevent the router lift plate (piece 10) from spinning around when I turn the lift crank, I drove four wood screws partially into the plate, aligning their heads with the hole pattern on the motor cap. That way, the protruding screw heads engage the router without actually



Use biscuits and glue to assemble the router lift frame. Notice that the top piece of the frame is actually the rear router mounting block.



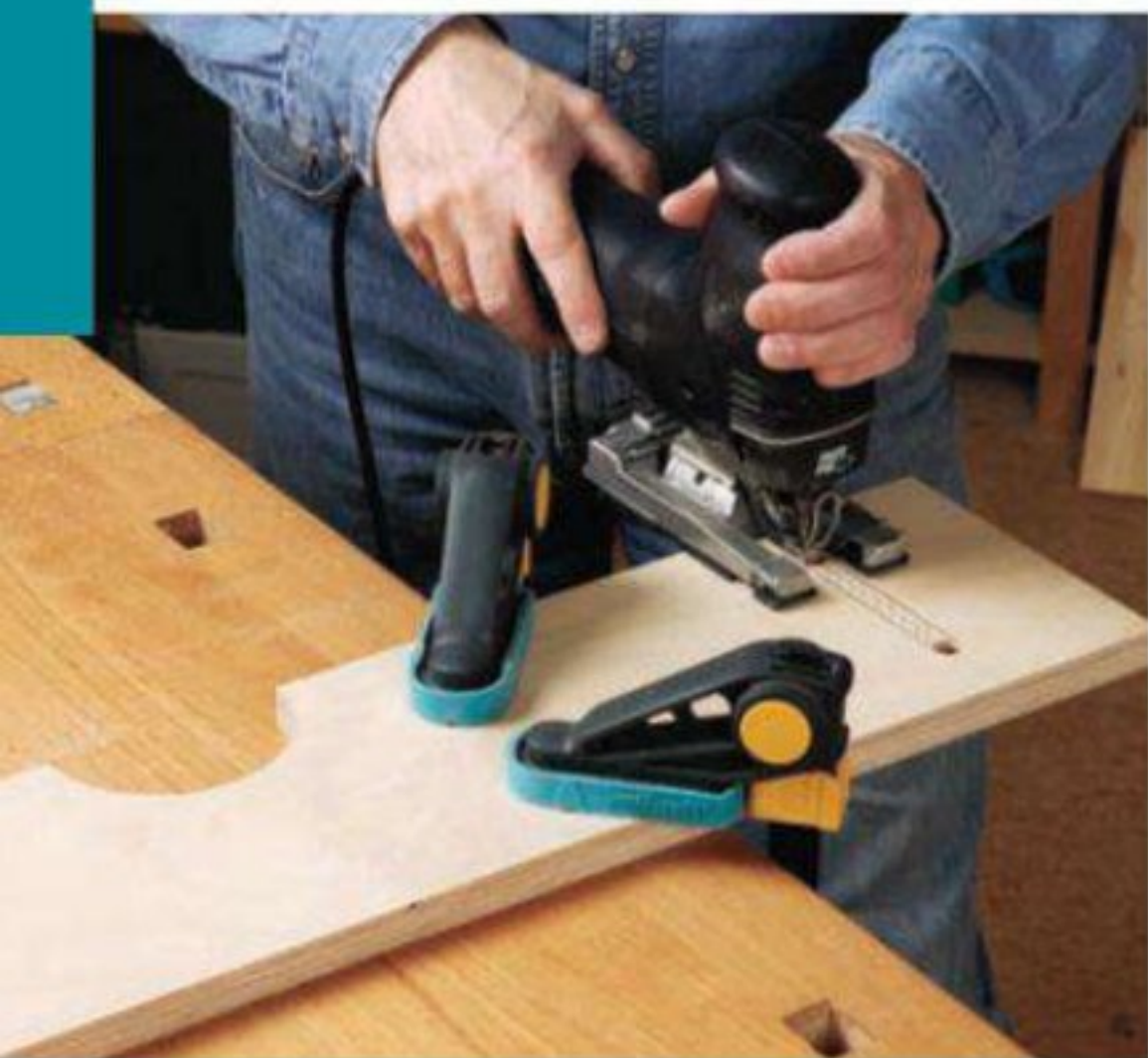
Thread the crank assembly through the captured nut in the lift bracket, fit the rod through the lift base hole, and screw these parts together.



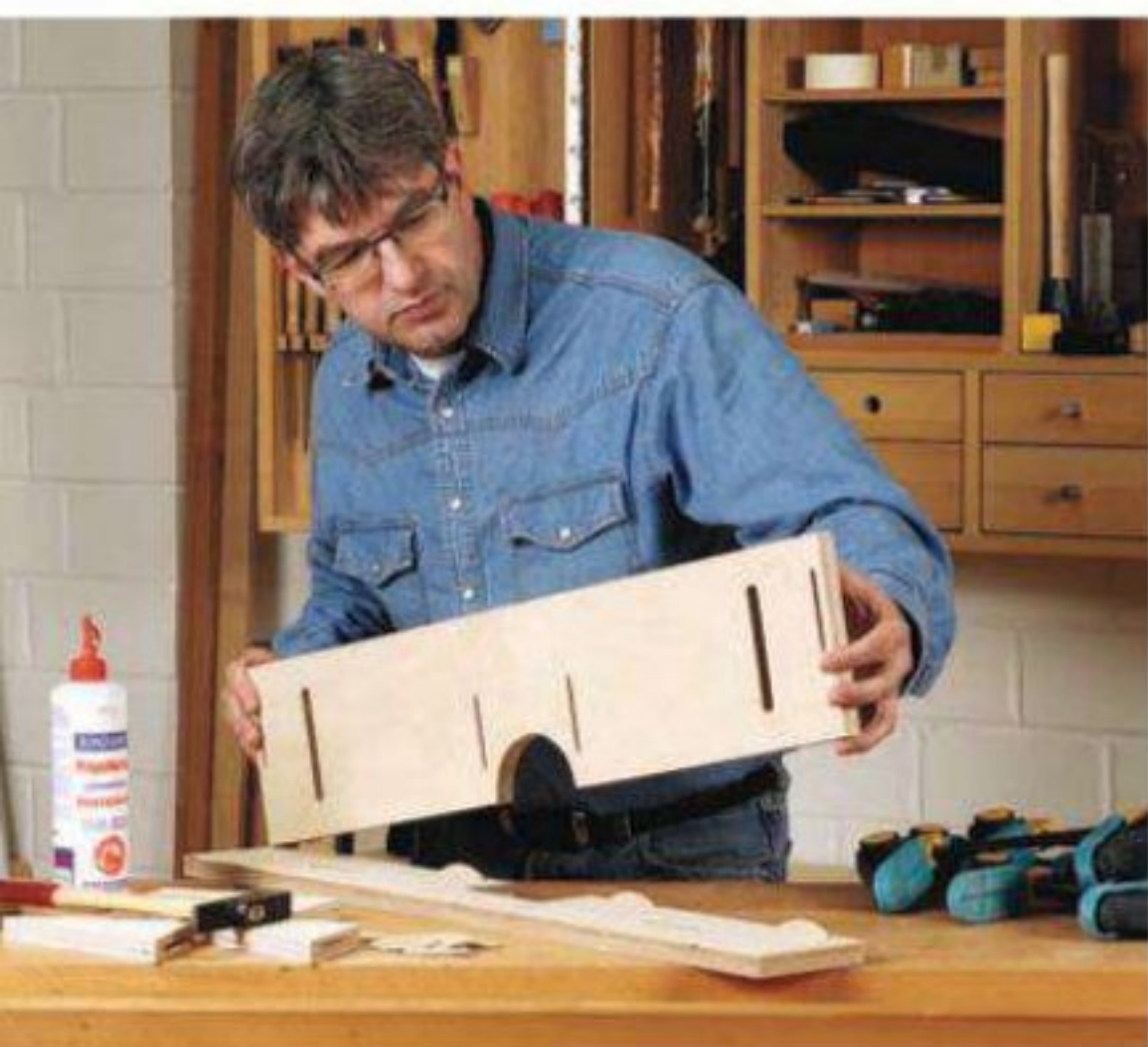
The author uses short wood screws, nested in the holes of his router's motor cap, to keep the router lift plate from spinning when cranking it up and down. Here, he's marking the screw positions on the lift plate.



The router lift attaches to the table using the same carriage bolt as the rear mounting block. Tighten the wingnut to secure the lift, then crank the threaded rod until it seats against the router lift plate.



Cut two elongated slots through the fence base, one near each end. These slots will accept through bolts to mount the fence to the table and make it adjustable, relative to the router bit.



Once you've cut #20 biscuit slots for the four support braces, attach the fence base to the fence back with more biscuits and glue. Clamp up the parts, making sure the base and back meet at 90°. Install the braces.



Drill a counterbored hole through each fence facing, centered on the horizontal slots in the fence back. Attach the facings to the fence with carriage bolts, washers and wingnuts.

attaching to it. (Note: You may need to modify how the lift plate makes contact with your router if your motor cap is designed differently or if the tool's internal cooling fan must vent through it.)

Drill a shallow 5/8"-diameter hole in the lift plate to fit over the end of the threaded rod. Set the lift plate on top of the router, and bolt the router lift to the table. Crank the rod until it seats in the lift plate hole.

Making the Fence

My split-fence is easy to build. Cut the fence base and back (pieces 11 and 12) to size, and follow the *Drawings* to lay out pairs of attachment bolt slots in both of these parts. Use your drill and jigsaw or a router and a 3/8"-diameter straight bit to form these slots. Mark and cut the fence's large router bit openings now, too.

Four triangular braces (pieces 13) stiffen the fence back and square it to the base. Make these braces now.

You're ready to assemble the fence. Pull out your biscuit joiner and cut #20 slots in the base, back and braces. Glue and clamp the back to the base, making sure they're square. Then, glue on the braces.

Next come the fence facings (pieces 14). I suggest that you cut them from one long strip of plywood to ensure that their thicknesses will match perfectly. Miter-cut the ends that will meet in the middle to 45°. Carefully lay out and drill a 3/8"-diameter through-bolt hole and counter-bore in each fence facing.

Mount the facings on the fence back with carriage bolts, washers and wingnuts (pieces 17). Drill two carriage bolt holes through the table to fasten the fence through its slots.

Last comes the dust port plate (piece 15). Cut it to size, and bevel-miter the ends. Cut a hole through it that fits your shop vac hose nozzle. Fasten the plate to the fence back between the middle braces with a hinge (piece 16).

Completing the Final Details

You still need to cut a larger opening in the tabletop for router bits to pass through. Use a hole saw equipped with a 1/4" center mandrel to enlarge the bit pilot hole you created earlier. Depending on your bit collection, a single hole may work with every bit you own. A 1½"-diameter hole will accommodate many bit styles. Or, you can make insert rings as shown in the detail *Drawings* on [page 44](#). Disassemble the table and cut a 3/4"-wide slot along the front edge to fit your table saw's miter gauge bar. Mill it with a straight bit in your router or using a dado blade. Give all the project parts a thorough sanding, and apply a few coats of durable finish. When the finish dries, I recommend adding a safety power switch so you can turn the router on and off easily or quickly in an emergency. Now, bolt the parts together, clamp the table to your bench, and you're all set for routing.

Guido Henn is a contributing editor to Woodworker's Journal.

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Sharpening Cart

THIS HANDY ROLLING CART
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Sharpening your chisels, plane irons and turning tools is not the glamour task that usually brings a person to woodworking. You almost never hear someone say “Dang, I just can’t wait to get out into the shop to slap a new bevel on that roughing gouge!” But one thing is certain: even though sharpening is not at the top of my “fun things to do” list, woodworking in general is much more fun, not to mention productive and safe, when you are using sharp tools.

So when I was asked to help create a mobile sharpening center for the *Journal*, I was happy to get to the task. While this specific cart has a couple of tool holders hanging on the sides that favor woodturning, it will be equally useful for woodworkers who don’t own a lathe. (It just seemed right to accommodate turners — they sharpen constantly.)

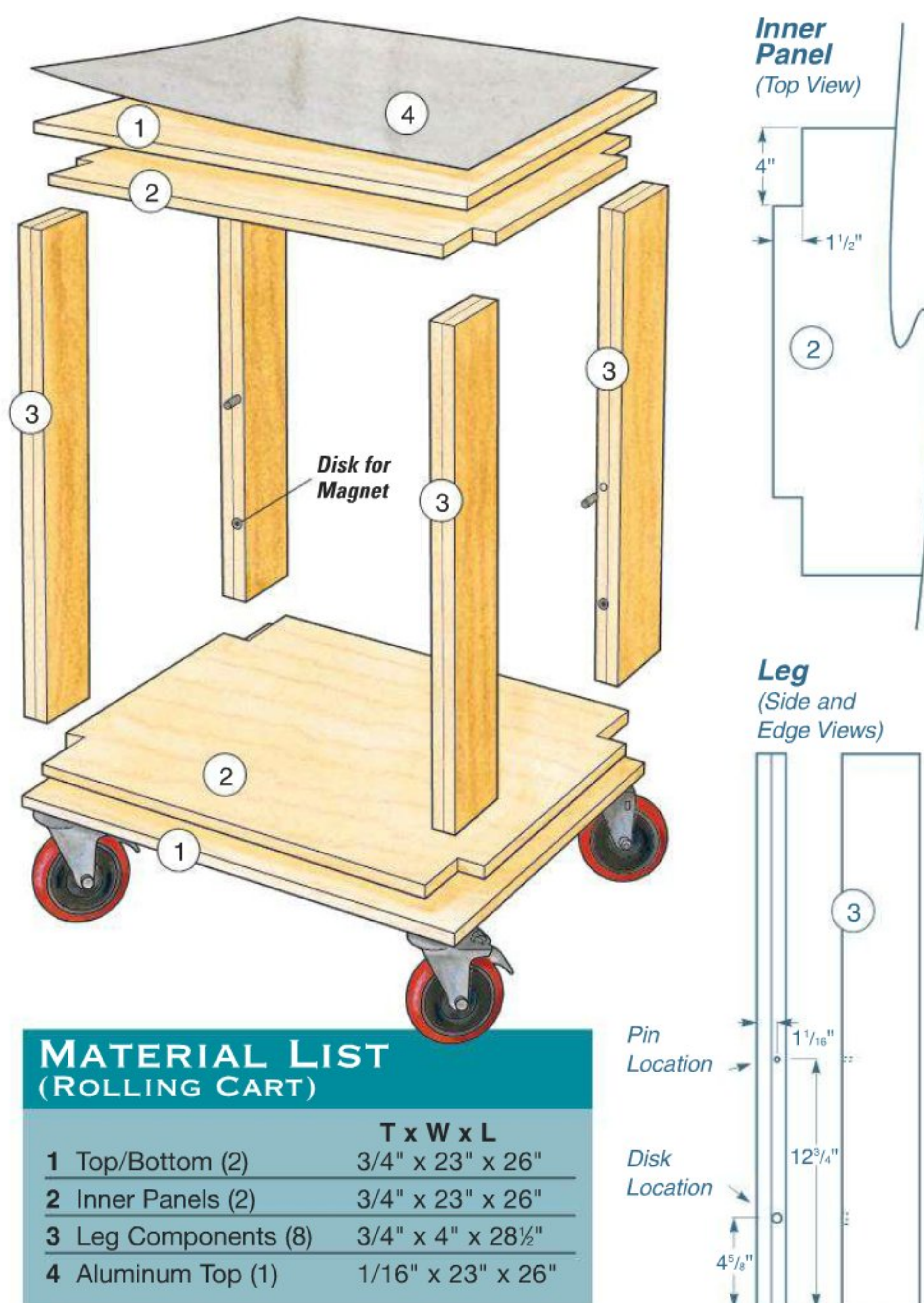
Designed with Solid Construction

We chose to make the cart from Baltic birch plywood. The vast majority is 3/4" thick, with the drawer boxes and bottoms formed from 1/2" material. You could use any plywood, or even solid lumber for your cart, but the voidless composition of the Baltic birch was a big plus in my mind. Just sand the edges smooth and you’ve got a good-looking and durable surface to finish. No need to face the edges. It also glues up great and handles screws (for drawer slides and other hardware) well.

I made the leg components,



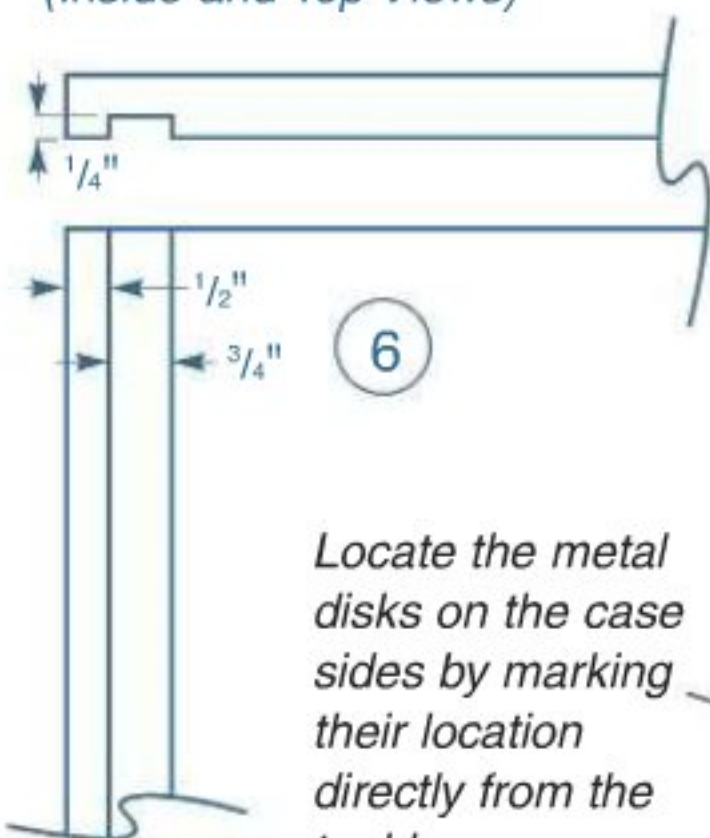
After roughing out the notches on the inner panels, the author pattern-routed the final shape with a 1/2"-diameter pattern routing bit. Its radius perfectly matched the 1/4" roundover bit used on the legs.



Stretcher (Edge View)



Side Panel (Inside and Top Views)



MATERIAL LIST (DRAWER CASE)

	T x W x L
5 Top (1)	3/4" x 18" x 15 7/8"
6 Sides (2)	3/4" x 17 1/4" x 23 1/4"
7 Back (1)	3/4" x 15" x 23 1/4"
8 Stretchers (4)	3/4" x 4" x 14 1/2"



The stretchers are located flush to the bottom and top edges and the outside corners of the sides.

inner panels and the top and bottom first (pieces 1 to 3). The legs and the top/bottom are just cut from the Baltic birch stock. Glue and clamp the leg components together to build up the legs. While that glue is curing, move on to the inner panels, which have notches to accept the legs at each corner. I roughed out the notches using a band saw, but then I used a simple hardboard template to pattern-route the exact dimensions (see *Drawings*). One neat trick here is that I used a 1/2"-diameter pattern routing bit. It left the perfect radius in the notched corner to match my legs — because I then used a 1/4" roundover bit mounted in my router table to

soften the long edges of the legs.

When those tasks were in the rearview mirror, I glued the inner panels to the top/bottoms in order to form two 1 1/2"-thick pieces. I waited for that glue to cure and then joined the legs to the top/bottom subassemblies with glue and screws. I clamped up the whole unit as well, checking and adjusting for square.

Making the Drawer Case

The drawer case is as simple a bit of bread-and-butter woodworking as you are likely to find. The sides, back, top and stretchers (pieces 5 through 8) are just cut from the plywood to the sizes indicated in the Material List. Plow a couple of 3/4"-wide by

1/4"-deep dadoes into the back edges of the sides to capture the back. Look to the *Drawings* for their locations. Here I must confess that I used a Festool Domino joining system to locate floating tenons to join the stretchers to the sides. Why? Because I have a Domino machine, and my cart was going to get photographed for a magazine. If those things were not true, I would have simply glued and screwed the entire case together. Either method works, and the dimensions of the parts remain the same either way. (See the *Drawings* for the stretcher locations.)

Once you have the sides, back and stretchers assembled, the

top is secured to that subassembly using glue and screws driven up through the stretchers. Simply made but sturdy, it could hold an NFL lineman and his coaches. Take a few minutes to sand the drawer case smooth and then mount it to the rolling cart subassembly using screws driven down through the stretchers. You are really making progress now.

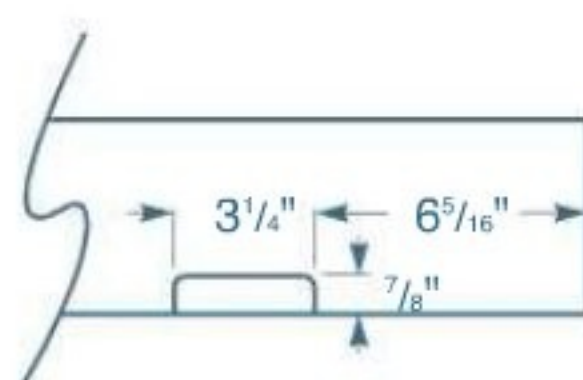
Adding Three Strong Drawers

The drawer boxes (pieces 9 through 18), as mentioned earlier, are constructed from 1/2"-thick Baltic birch plywood, but the drawer fronts are made of 3/4" material. Cut the box parts to size and then step to your table saw and replace the saw blade with a dado set installed to cut a 1/2" groove. Lock the fence 3/8" away from the blade, and test the setup to be certain that the plywood fits properly in the groove you are plowing. Go ahead and plow grooves for the drawer bottoms in all four pieces of each drawer box. Next, with the same dado head in the saw, use your miter gauge with an auxiliary fence and stop to form the rabbets at the ends of the drawer sides. Test-fit your drawer boxes, and when you are satisfied, glue and clamp the pieces together. Because these parts are all made of rock-steady plywood, you need not make accommodations for seasonal wood movement.

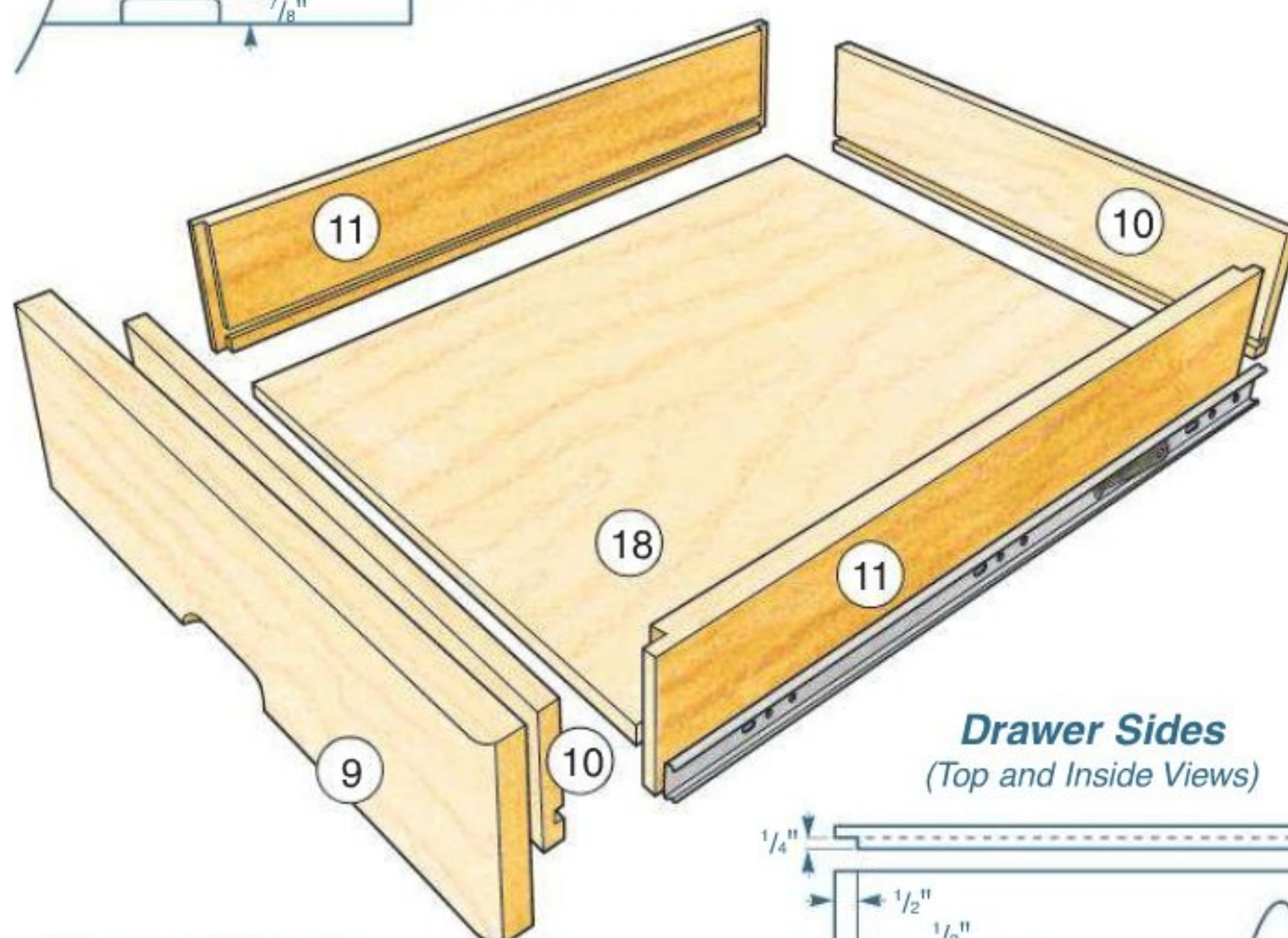
I made my three drawer fronts from a single piece of Baltic birch plywood so that the wood grain would flow through all three drawer fronts. Hey, just



Glue and clamp the drawer box pieces together. Made of plywood, the bottoms can be captured without wood movement concerns. They're constructed from 1/2" Baltic birch plywood and mounted with full-extension drawer slides strong enough to hold all of your sharpening supplies.



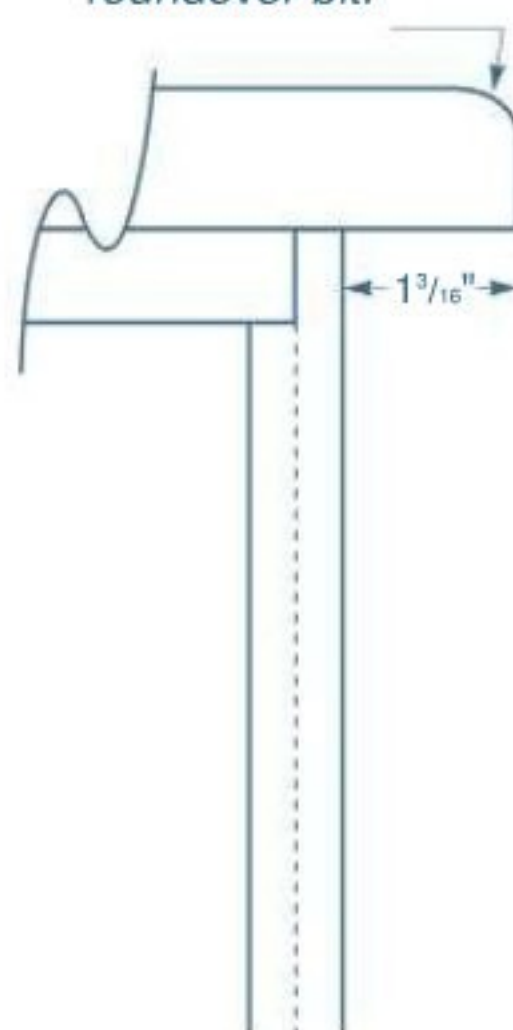
Drawer Handle Cutouts
(Front View)



Drawer Sides
(Top and Inside Views)

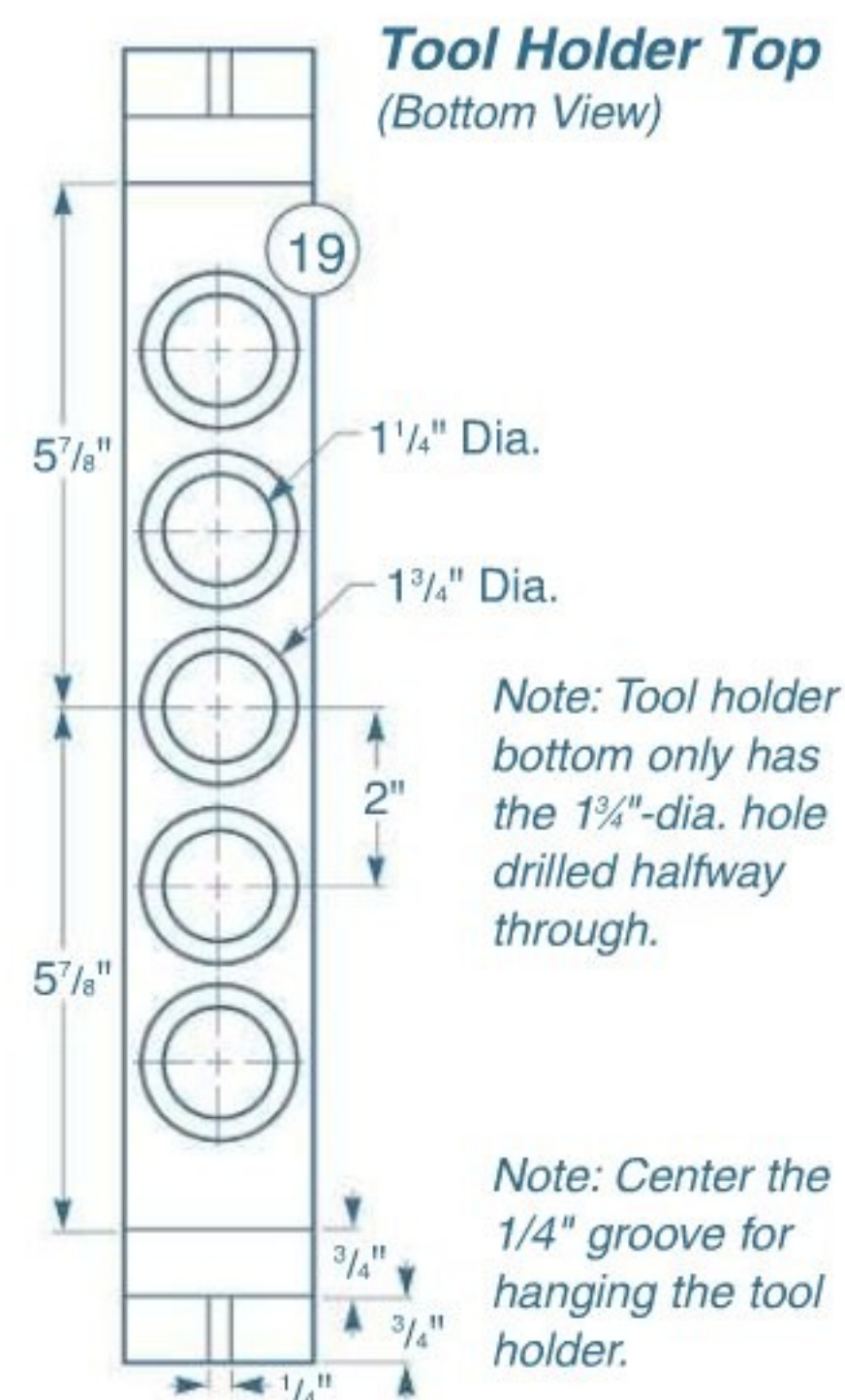
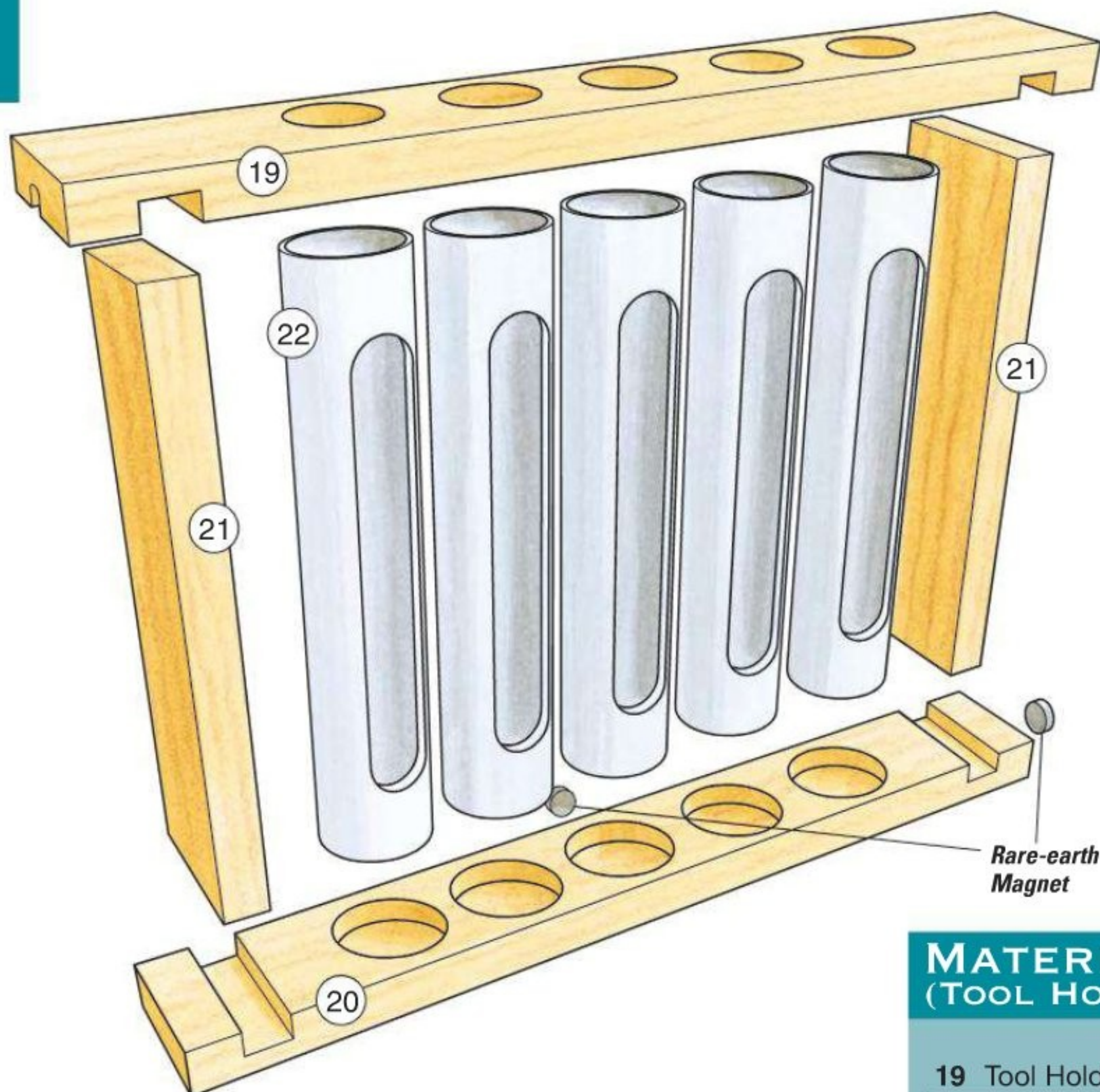
Drawer Joinery

Ease the drawer face edges with a 1/2"-dia. roundover bit.



MATERIAL LIST (DRAWERS)

	T x W x L
9 Top Drawer Face (1)	3/4" x 4 1/2" x 15 5/8"
10 Top Drawer Front/Back (2)	1/2" x 3 1/4" x 13"
11 Top Drawer Sides (2)	1/2" x 3 1/4" x 16"
12 Middle Drawer Face (1)	3/4" x 7 3/4" x 15 5/8"
13 Middle Drawer Front/Back (2)	1/2" x 7 3/4" x 13"
14 Middle Drawer Sides (2)	1/2" x 7 3/4" x 16"
15 Bottom Drawer Face (1)	3/4" x 10 1/4" x 15 5/8"
16 Bottom Drawer Front/Back (2)	1/2" x 10 1/4" x 13"
17 Bottom Drawer Sides (2)	1/2" x 10 1/4" x 16"
18 Drawer Bottoms (3)	1/2" x 13" x 15 1/2"



MATERIAL LIST (TOOL HOLDERS)

	T x W x L
19 Tool Holder Tops (2)	3/4" x 2 1/8" x 14 3/4"
20 Tool Holder Bottoms (2)	3/4" x 2 1/8" x 14 3/4"
21 Tool Holder Sides (4)	3/4" x 2 1/8" x 8 1/2"
22 Tool Tubes (10)	1 5/8" Dia. x 8 1/2"

because this is a shop project doesn't mean that we should get sloppy here! Use a 1" core box bit to form the handle cutouts on the drawer fronts. You could mount regular drawer pulls here; it is really a matter of personal preference.

I attached the drawer fronts to the drawer boxes after I used full-extension drawer slides to mount the drawers into the drawer case. That way, if I was a hair off in my drawer location north or south, I could adjust the drawer faces to accommodate for that miscue. (Not that such a thing would happen to me ...)

Making Tricky Tool Holders

Even though they are just a

small part of this pretty substantial project, the tool holders (pieces 19 to 22) took the most thought and design work. They are easy to make: after you cut the pieces to size, both plywood and PVC, take the plywood pieces over to your drill press. Lay out and drill the holes in the top and bottom pieces. First, drill the shallow borings that will capture the PVC pipe tubes. Then, on the top, switch bits and bore the access holes all the way through the plywood. On those same pieces, plow the dados that will capture the side pieces. You have one more task on these parts: form the little grooves that capture the shelf pins (from which the whole assembly hangs

on the rolling cart). I used a 1/4" core box bit to make the little groove, but you could just as easily carve it with a chisel. Finally, drill a hole to hold a rare-earth magnet on one end of the tool holder bottom. This magnet will hold the tool holder upright when the cart is not in use. Epoxy that magnet in place.

The tubes, while simple in concept, are a little tricky to make in practice (mostly because I decided it would be cool to create a "window" in each tube, so you can see your tool without pulling it all the way out of the holder). To rout that opening, I made a jig that controlled the process. Take a look at the *Drawing* (page 54) for

details on constructing the jig. I used a 1" bowl-carving bit in my plunge router. I attached a round 1/4" MDF piece to the base plate of my router and then glued the sliding top of the jig right to my router. It worked really slick. I clamped the PVC pipe in place and routed the opening in a single operation. The length of the sliding top of the jig allows you to register the length of the cut.

Once all the tubes are machined, you are ready to assemble the tool hangers. Secure the PVC in place using clear silicone adhesive and glue, and clamp the hangers together, checking to make sure they're square.



Drilling the two-step borings in the top pieces of the tool holders is most easily completed on a drill press. It can be done with a handheld drill, but it's just a bit trickier.

Completing the Final Details

The sharpening cart is nearly finished at this point; there are just a few fun details yet to be completed. First, locate (from the *Drawings*) and drill the holes to hold the shelf pins on the legs of the rolling cart. After you have done that, mount the casters on the bottom of the rolling cart. I used short lag screws with washers to hold the casters in place. I put the two locking casters on the front side of the cart.

Now hang the tool holders in place. Mark on the leg the location for the metal disk that will align with the rare-earth magnets you installed earlier. Once the hole is drilled, mount the metal disks. At this point, go ahead and

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The metal disk shown at right aligns with a rare-earth magnet epoxied into the bottom end of each tool holder (hidden from view). This keeps them upright when you roll the cart around the shop. The author uses a jig (right) to rout the little windows in the PVC tubes.

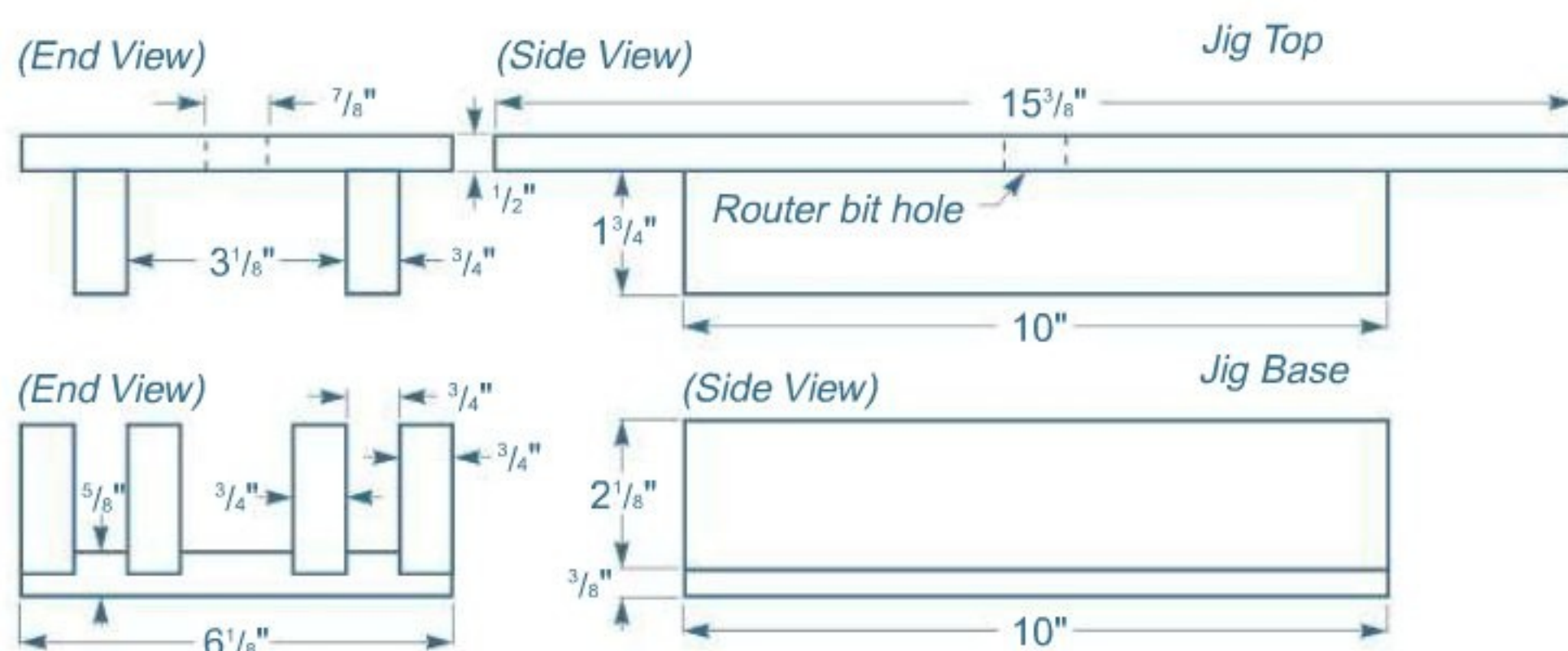
SHARPENING CART HARDWARE

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

5" Casters (locking) #37138	\$46.99 pr
5" Casters (swivel) #39507	\$34.99 pr
1/2" Magnets (10-pack) #30810	\$14.99
16" Drawer Slides (3 required) #21619	\$10.49 pr
Shelf Pins (16-pack) Nickel #22278	\$4.29

To purchase any of these products online, please visit
www.woodworkersjournal.com and click on the "WWJ Store" tab.
Or, to order by phone, call **800-610-0883** and mention code **WJ1384**.

Tube Routing Jig Elevations



This jig controls the "window" cut on the PVC tubes. Clamp the pipe in place (photo at right). With the router secured to the jig top, align one end of the top to one end of the base. Plunge the bit into the pipe and push the router until the other end of the top aligns with the other end of the base — stop the cut and raise the router.



mount a rare-earth magnet on the long side of the tool holder bottom and a matching disk on the side of the drawer case (see photo, top left). They will hold the tool holder at an angle when the rolling cart is in use.

I also mounted a power strip to the back of the drawer case. That allows me to plug in my sharpening machine and magnifying glass — which is ringed with LED lights. While it may seem a bit over-the-top, that lighted magnifier makes a huge difference when putting an edge on a tool. (It's really great when you can see what you are doing.)

Because I use various sharpening systems, everything from a machine to a slip stone, I wanted

the top of the rolling cart to be bulletproof. So I purchased a 1/16"-thick sheet of aluminum (from Lowe's®) and secured it to the top of the cart with contact cement. Cut the aluminum a bit oversized using your table saw and a carbide-toothed saw blade. The process of securing it is just like applying plastic laminate — which also would have worked well here. Apply the contact cement to the aluminum and the plywood top. Allow the cement to dry. Then lay a few 1/4" dowels across the width of the top to help control the process of sticking the aluminum down. Position the glued faces toward each other, and start pulling out the dowels and sticking the two parts together. Be

careful: once they touch, you are not getting them apart. Press the aluminum down with a J-roller and then trim off the excess with a carbide 45° trim bit in your handheld router. It will cut the aluminum like butter. Once it was in place, I used some steel wool to texture the top — I have to say, it looked pretty good when I was done.

Now apply three coats of a durable finish to the plywood, let it cure, and you are ready to load the cart up with all of your sharpening paraphernalia and roll it to wherever you wish to use it. In my shop, it will be hanging out near the lathe.

Frank Grant is a contributing editor to Woodworker's Journal.

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

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

My sanding station satisfies all these needs. Essentially, it's a two-compartment cabinet with an oversized top and a base that clamps to your drill press. The top compartment serves as a dust extraction chamber with an adapter port that attaches to a 2½" -diameter shop vacuum

hose. The lower compartment houses a storage drawer just big enough to hold a healthy collection of sanding sundries. Although I could have cut an oversize hole in the worktop to make room for the sanding drum, I installed a router table plate instead. Because it lifts off, it gives you plenty of access to the dust collection chamber whenever a sanding drum or drill bit accidentally slips down inside. Plus, most plates, including the Rockler aluminum router plate I use for my setup, come with interchangeable inserts. Just bore one out to fit around each size of sanding drum you own.

One other benefit to this

project is that you can use it for either sanding or routine drilling. I never take mine off the drill press. The worktop overhangs provide plenty of room for clamping a fence or drilling jigs in place. You should know that I've sized this project to suit my drill press's large table. If it's too big, as is, for your drill press table, just bolt a piece of plywood to your machine's table and clamp the station to that. Or, adjust the dimensions in the Material List on the facing page to make a smaller station.

Basic Building With Baltic Birch

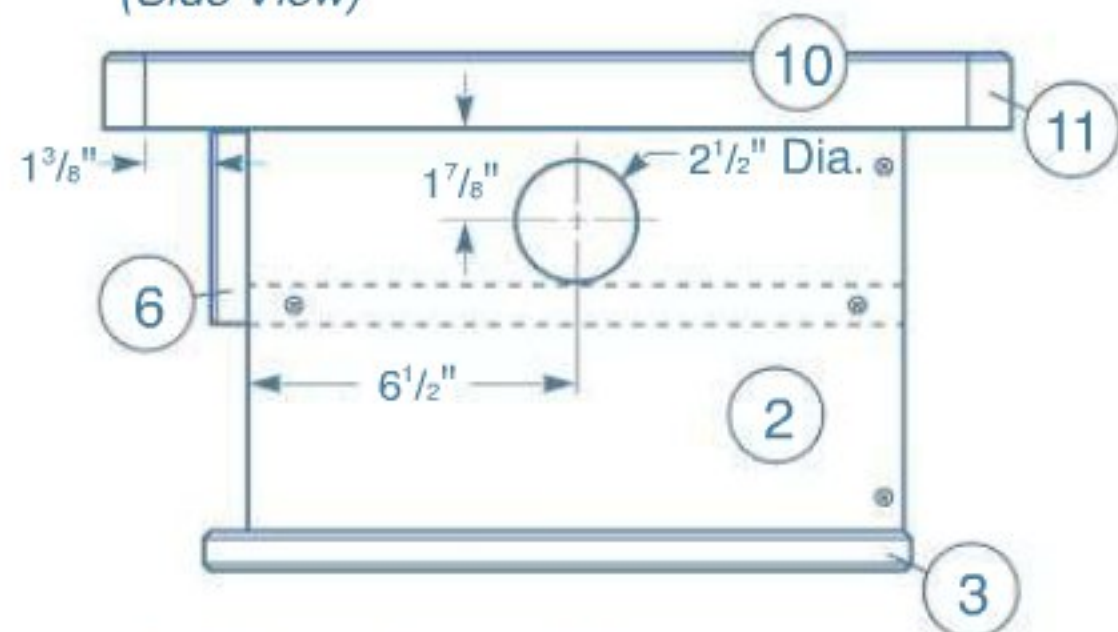
Get construction underway by cutting the back, sides, base and divider (pieces 1 through 4) to



The author slips a pair of 4¼" -wide spacers inside the cabinet to position the divider while installing it. The spacers ensure that the 4" drawer sides will slide smoothly.

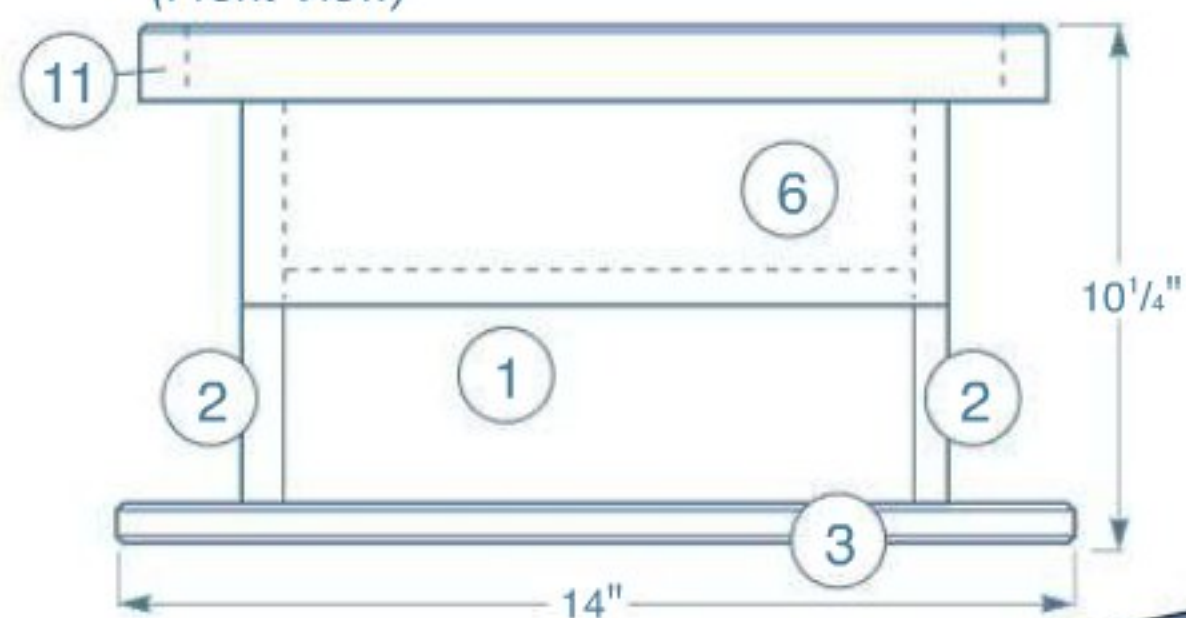
Cabinet Assembly

(Side View)



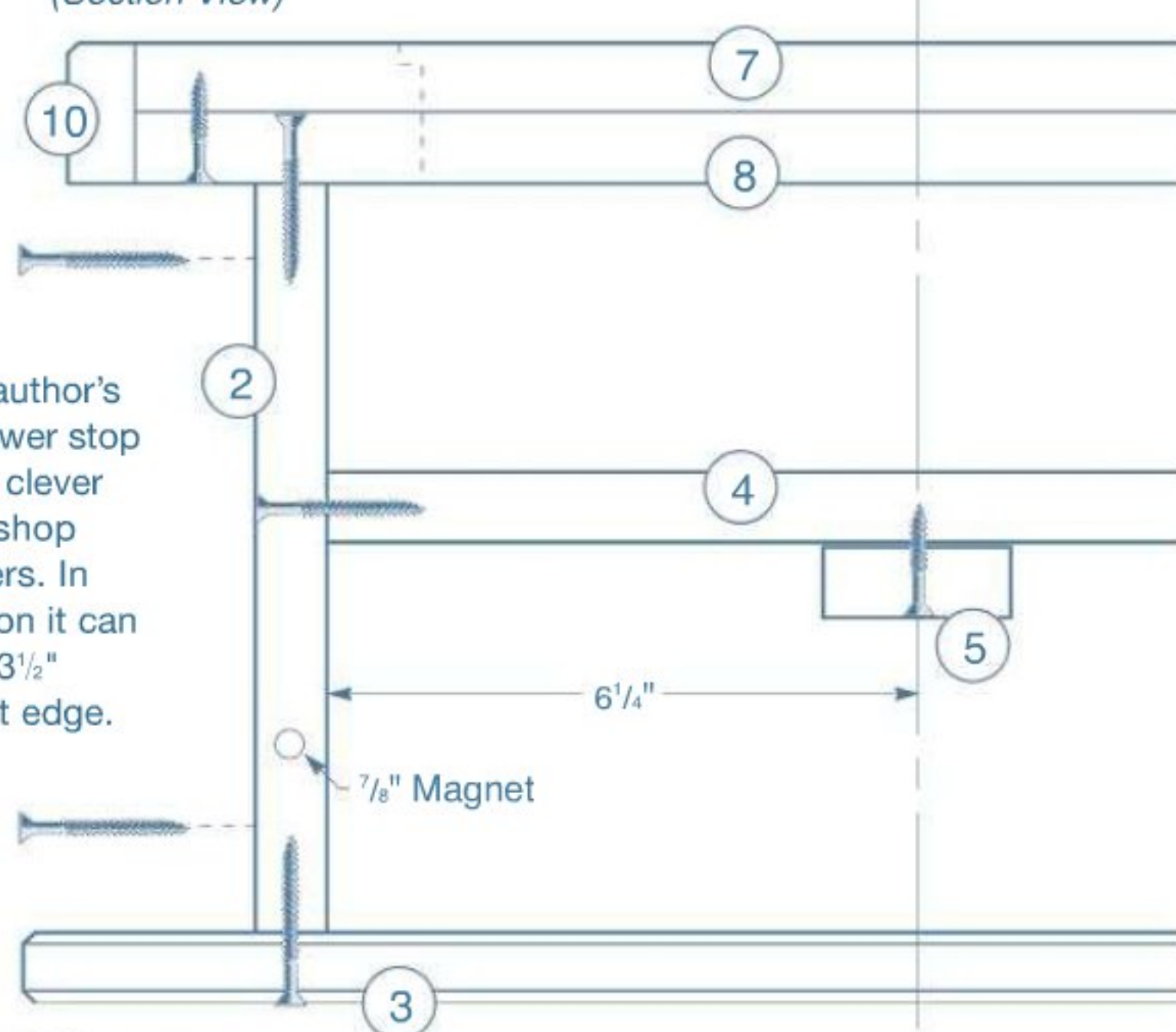
Cabinet Assembly

(Front View)

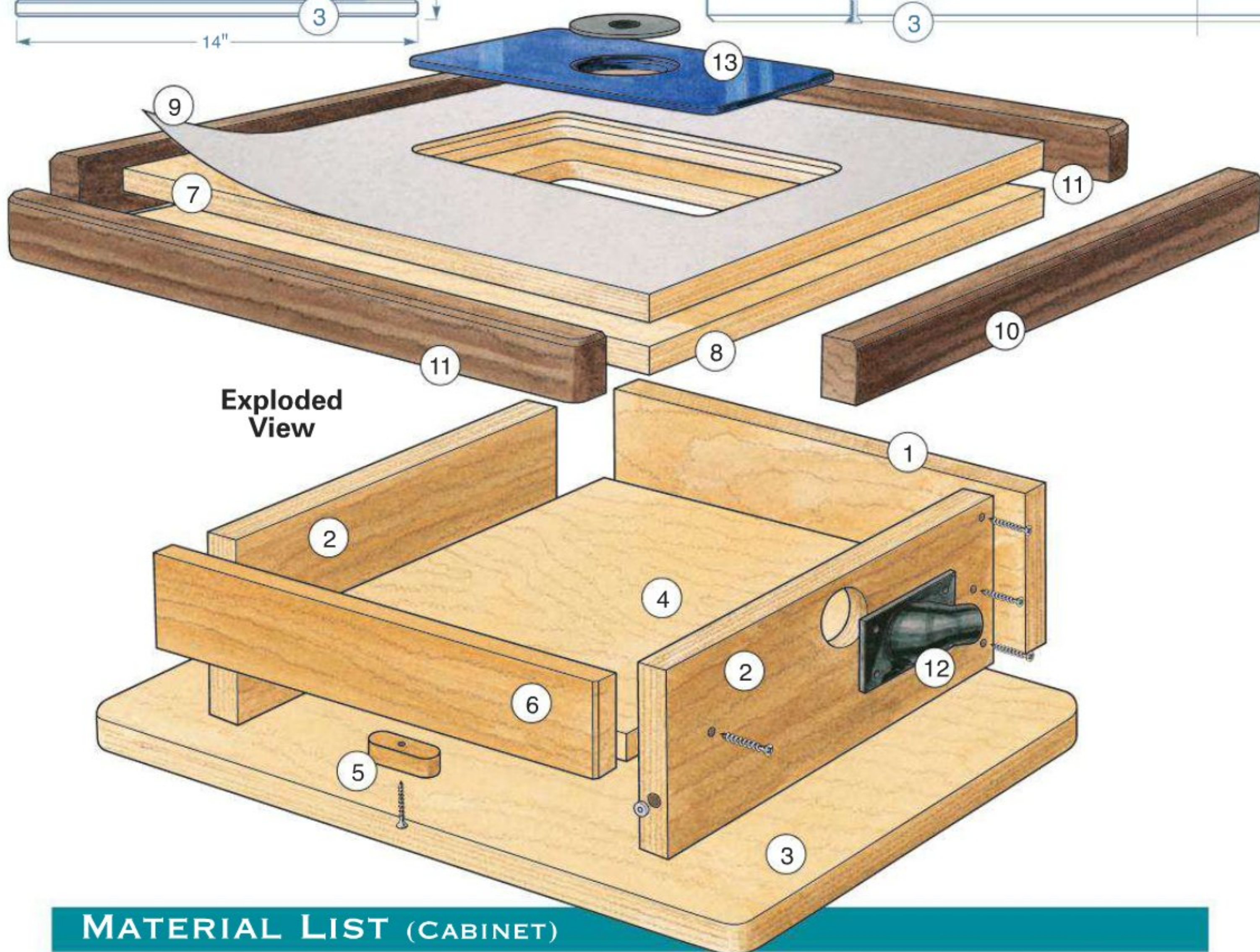


Cabinet Assembly

(Section View)



Note: The author's swiveling drawer stop (piece 5) is a clever solution for shop fixture drawers. In this application it can be mounted 3 1/2" from the front edge.



MATERIAL LIST (CABINET)

	T x W x L		T x W x L
1 Back (1)	3/4" x 8" x 12 1/2"	8 Subtop (1)	3/4" x 16 1/2" x 16 1/2"
2 Sides (2)	3/4" x 8" x 13"	9 Plastic Laminate (1)	Larger than work surface
3 Base (1)	3/4" x 14" x 19"	10 Side Edging (2)	3/4" x 1 1/2" x 16 1/2"
4 Divider (1)	3/4" x 12 1/4" x 12 1/2"	11 Front/back Edging (2)	3/4" x 1 1/2" x 18"
5 Drawer Stop (1)	3/4" x 1" x 2"	12 Vacuum Port (1)	2 1/2" Dia. opening
6 Front Panel (1)	3/4" x 3 7/8" x 14"	13 Router Table Insert Plate	1/4" x 8" x 11"
7 Work Surface (1)	3/4" x 16 1/2" x 16 1/2"		

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

To limit the travel of the drawer, I fashioned a swiveling stop (piece 5) that functions like a turnbuckle. As you can see in the *Drawing* on [page 62](#), a notch in the drawer back allows the drawer to slide past the stop for removal when the stop faces front to back. Turning the stop sideways locks the drawer in the cabinet. Make the stop and install it on the divider with a single flathead wood screw. Drill the countersunk screw hole in the stop slightly oversized so the stop swivels easily on the screw. With the stop in place, fasten the divider to the carcass assembly. I used 4⅞"-wide spacers to hold the divider in place during installation (see

photo, [page 57](#)). It needs to be positioned carefully so it will clear the top edges of the drawer. Wrap up the carcass assembly by cutting and nailing the front panel (piece 6) to the carcass.

Preparing the Worktop

The worktop consists of a build-up of plastic laminate and two layers of plywood. Cut the work surface and subtop to size (pieces 7 and 8), making sure the proportions match. Apply a few dabs of hot melt or ordinary wood glue to the center of these panels, confining the glue to about a 4" area. Sandwich the panels and fasten them together with four screws, one at each corner.

Apply an oversized piece of plastic laminate (piece 9) to the worktop with contact cement, and trim it to size with a router (see photo, right).

Once that's done, wrap up by marking the worktop to locate the router insert plate.

Routing the Insert Plate Recess

I recommend using an MDF template to rout a perfectly sized recess for the router plate. You'll



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

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



DRUM SANDING STATION SUPPLIES

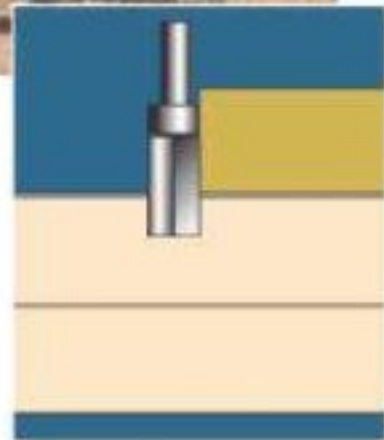
The following supplies are available from Woodworker's Journal to complete this project (note: prices subject to change):

Standard Plate Installation Template #20956.....	\$10.99
8" x 11" Blank Plate #49150*	\$59.99
Insert (with no openings) #28552	\$8.49
1/2" Pattern Bit #33536.....	\$18.99
1 1/2" Face Grain Knob #61692.....	\$5.69
Universal Dust Port #92031.....	\$7.99
25 pc. Drum Sanding Kit #20859	\$26.99
Non-slip Router Mat #58960.....	\$11.49

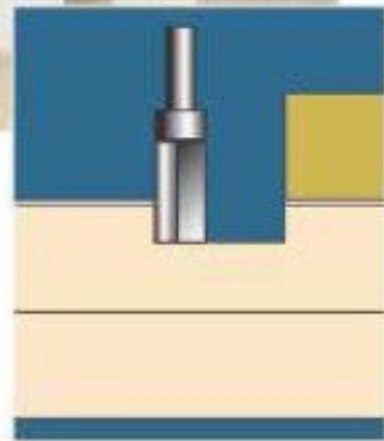
*The blank plate comes with 2 inserts (a blank and a 1 1/2"). **Please call 800-610-0883 and mention code WJ1383.**



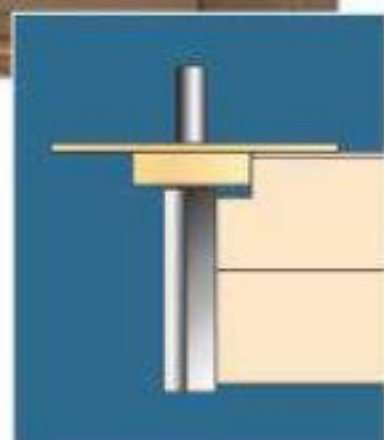
Using a template and a bearing-guided pattern bit (bearing on top), the author cuts a 1/4"-deep groove to form the lip for the plate.



With the first step completed, the author uses the same bit to widen the groove to 1 1/4" taking multiple passes.



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



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

Step-by-Step Routing

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

Installing the Worktop

Once you've cut the router plate recess into the work surface and subtop, remove the screws that hold these parts together and attach the subtop to the cabinet with screws. Unscrew and

remove the base. Then line up the work surface and subtop, and reattach these parts with glue and screws. Install the base permanently with more screws and glue. Position the worktop in place, wrapping it with hardwood edging (pieces 10 and 11). Round the outer corners of the edging and chamfer the top edges.

Making the Drawer

There are no surprises in the drawer construction. The front joints are sliding dovetails and the rear joints are rabbet-and-dadoes. The biggest challenge is sizing the drawer width to leave just enough slip space so it slides in the cabinet without binding but doesn't feel sloppy. Start by cutting the drawer front and sides (pieces 14 and 15) to shape. Before you make the front joints, determine the precise drawer width by clamping a drawer side to each inside wall of the cabinet. Slip a scrap of plastic laminate in between the cabinet sides and drawer sides to serve as a spacer. With everything clamped, set the drawer front in position and mark the locations of the drawer sides on it. Lay out and cut these sliding dovetail joints with a 3/8" dovetail bit on the router table (see sidebar, [page 62](#)).

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

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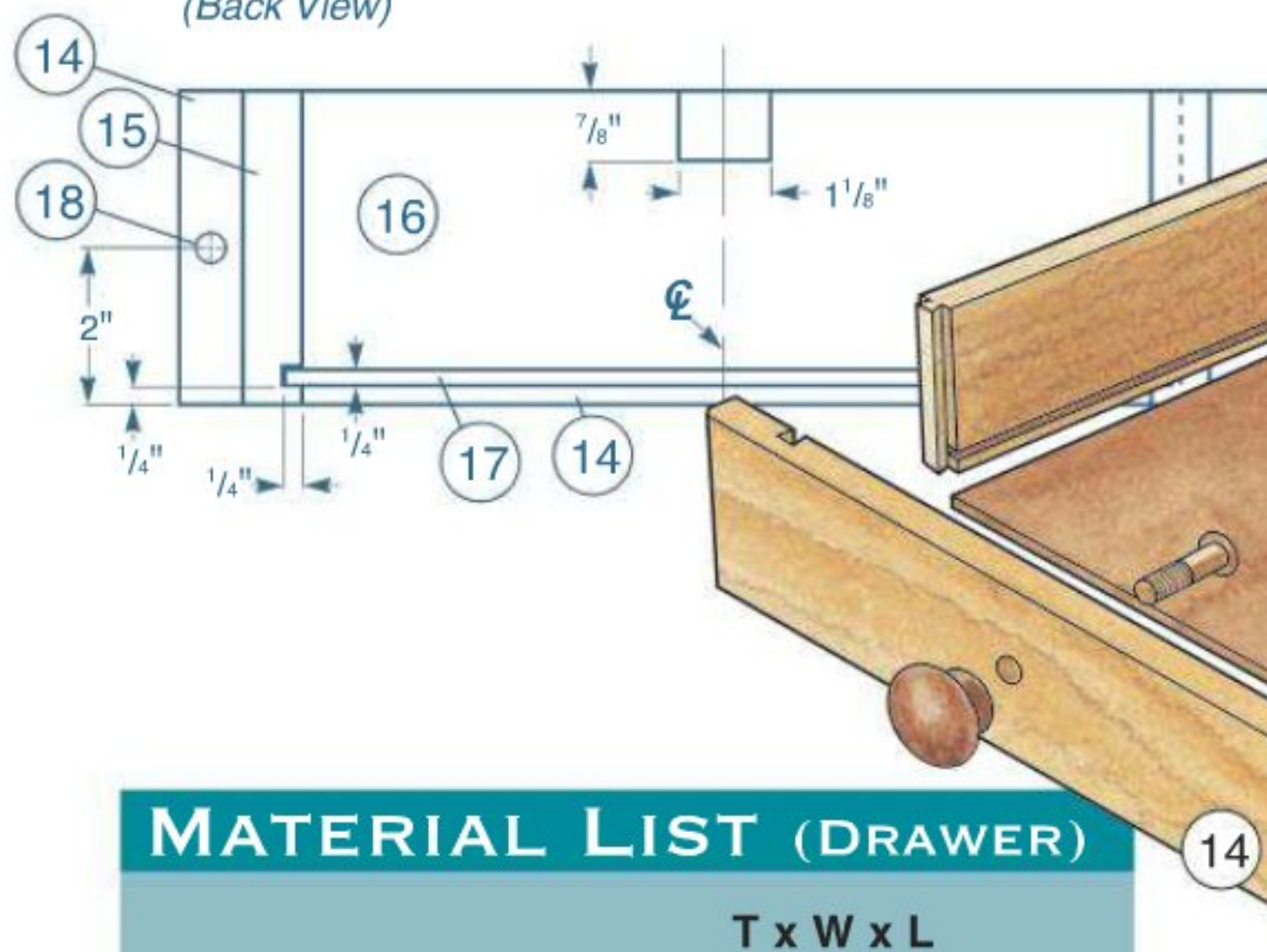
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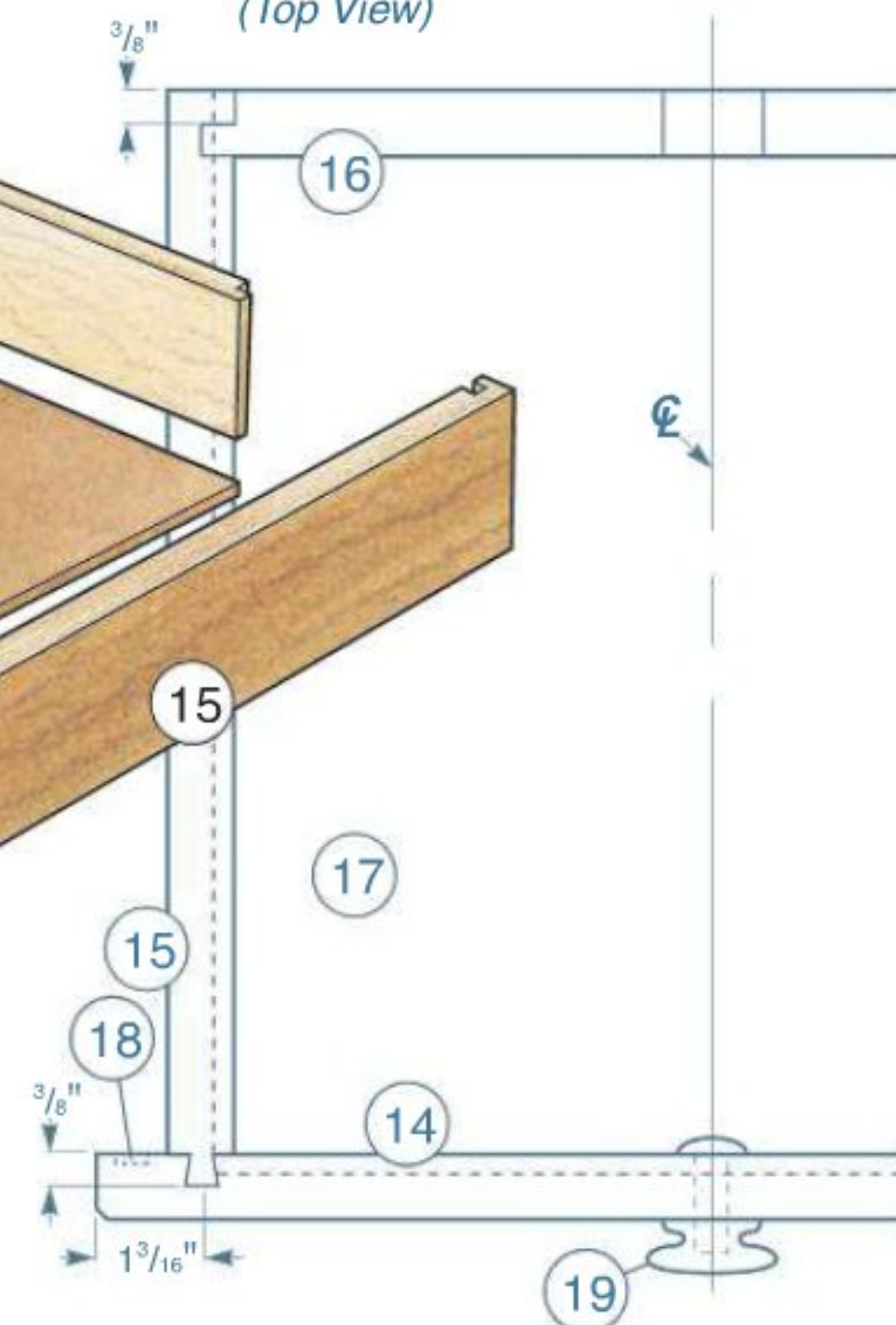
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Drawer Assembly
(Back View)



Drawer Assembly
(Top View)



MATERIAL LIST (DRAWER)

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

Drawer Exploded View

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

I used four 3/8"-diameter rare earth magnets (pieces 18) to hold the drawer closed. Install one pair in the back face of the

drawer front at the overlaps and a second pair in the cabinet sides where they meet the drawer. Drill shallow holes with a Forstner bit, add a drop of epoxy in each and press the magnets into place (make sure to check for correct polarity between each pair first). Now glue up and clamp the drawer box joints, and check the drawer for square by measuring the diagonals. When the glue cures, slide the drawer bottom in dry

and tack it to the drawer back. Complete the drawer by installing the pull (piece 19).

Finishing Up

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

Chris Marshall is a contributing editor to Woodworker's Journal.

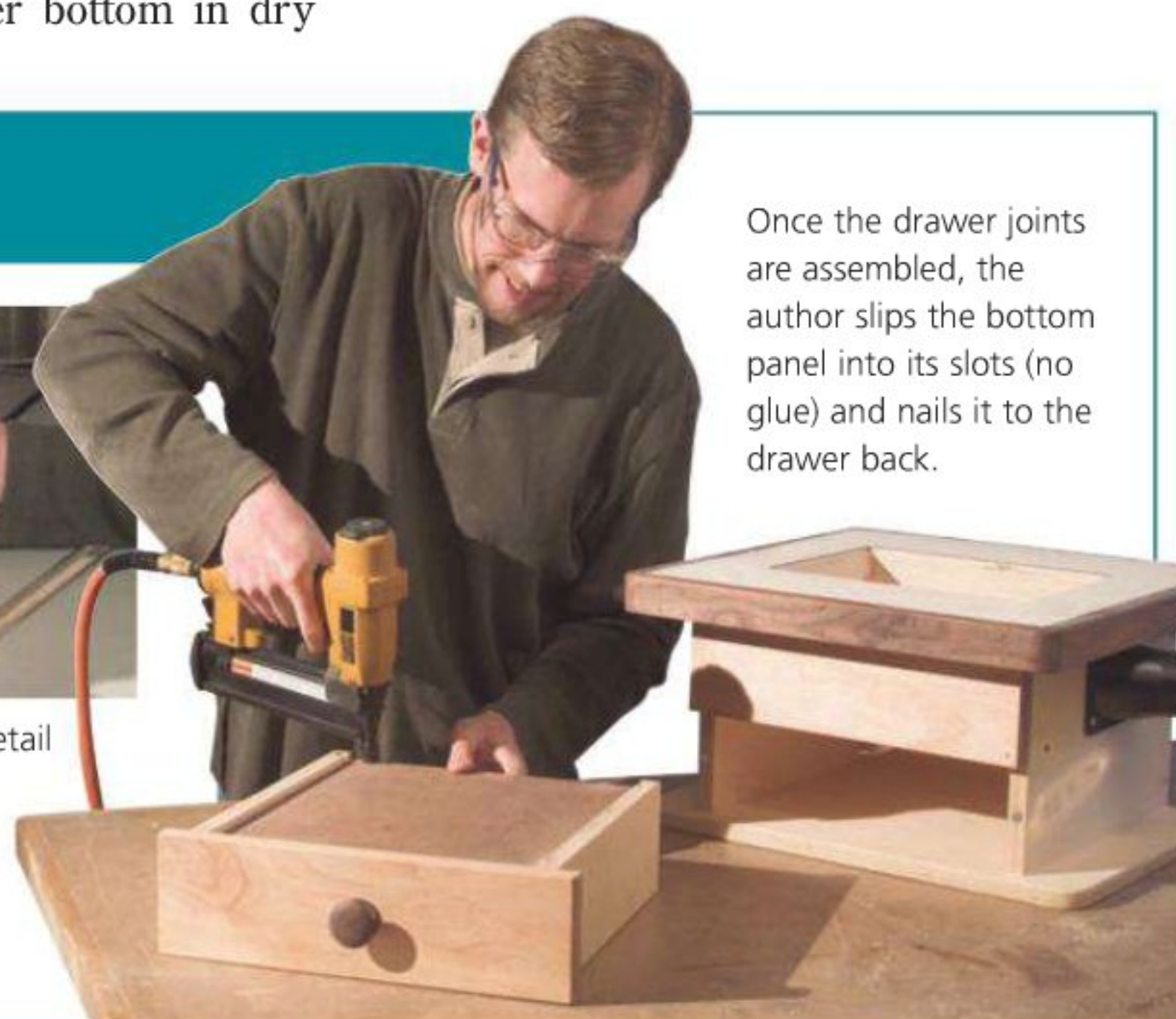
MECHANICAL JOINTS FOR ADDED STRENGTH



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



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



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

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WHY MELAMINE?

Melamine is a slightly less durable version of the standard plastic used in countertop laminates. It is made by impregnating paper with resins, hence there is a wide variety of colors and patterns available. The paper is thermally fused to a core, such as medium-density fiberboard (MDF). What makes melamine board such a great choice for utility cabinets is that the panels come with plastic finished faces on both sides. Aside from the aesthetic benefits, this makes for a very stable product. Your local lumberyard should stock the standard 49" x 97" panels in 3/4" thickness — exactly what you'll need for this project. Be aware that freshly machined melamine panels have very sharp edges. Take care not to cut yourself when handling them. Curiously, the edges are also a bit fragile. Always protect any exposed panel edge with either matching hot-melt tape or hardwood trim. When you begin cutting your melamine material, be sure to trim off any damaged factory edges so you get nice clean edges on your cabinet parts.



Easy-to-Build Storage Cabinets

THESE ADAPTABLE AND MODULAR CABINETS CAN STOW WHATEVER YOU HAPPEN TO HOARD.

My woodworking mentor, Rick White, preaches the old maxim “A place for everything and everything in its place.” And while I agree with him in principle, in practice I’ve always had a bit of a problem with this old saw. Like most folks, whether it was the garage, family room, basement or even the woodshop, I just never seem to have enough space for storage.

The time finally came for me to do something about the dearth of storage space in my life. I teamed up with art director Jeff Jacobson from *Woodworker’s Journal*, and we created this dead-easy cabinet design that’s remarkably flexible.

I started with a modular system for building basic melamine cabinets that can be adapted to suit just about any storage need. The melamine panels come finished on both sides with a plastic laminate (see tint box, previous page), so they’re stable, sturdy and easy to clean. Depending on what the cabinets are to be used for, you can build drawers or shelves to fit and cover the opening with doors as required. Use a bit of imagination and you’ll have storage even Rick will envy.

Building the Basic Box

The basic unit in this modular system is a small cabinet that can be outfitted as needed. For me, the key was to keep it simple as well as versatile.

First, measure your available space and determine how many units you need to build. The cab-

inet that is described here (about 22½" wide) is a perfect compromise: it’s narrow enough so that shelves won’t sag, yet wide enough to offer plenty of storage.

Start construction by cutting the sides (pieces 1) to size. The factory edge may not be perfectly straight, square or clean: it’s a good idea to trim about a blade width off of it, so you’re sure to start with a crisp edge.

Handling large sheet goods on the table saw is easy if you have help. When I’m alone, I like to set a sheet on a pair of saw horses and use my circular saw to cut parts slightly oversize. Then I

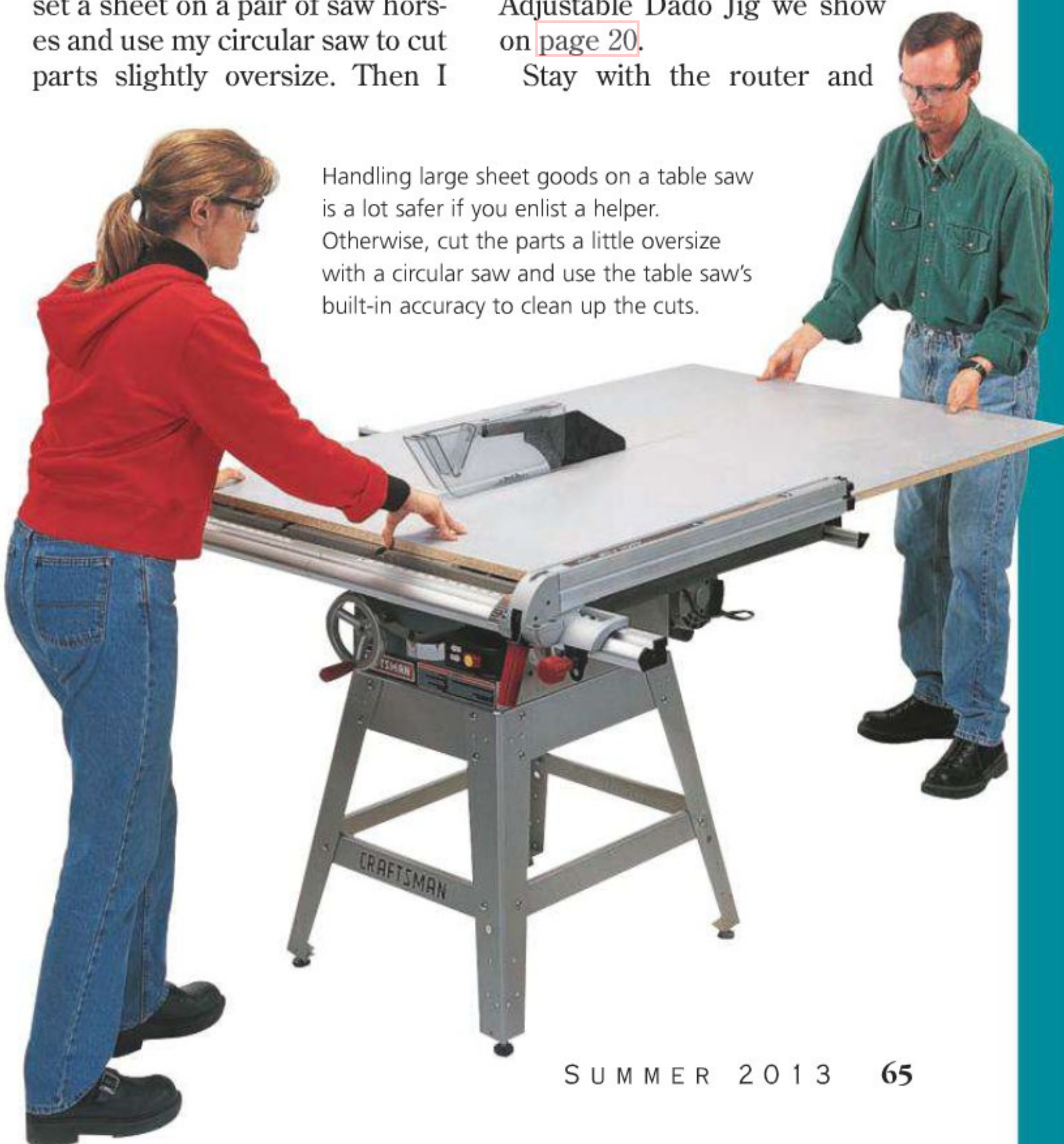
can safely trim them to finished dimensions on the table saw.

Use a jigsaw to remove the toe kick cutout from each side (see the *Elevation Drawings*, [page 66](#)), then clamp a straightedge in place and use a straight bit in your router to plow the dado in each side for the cabinet’s bottom panel (piece 2). Note that some melamine sheet stock is not exactly ¾" thick. You can get around this with a special router bit designed to cut undersized dados and grooves for sheet goods, or build the Adjustable Dado Jig we show on [page 20](#).

Stay with the router and

Handling large sheet goods on a table saw is a lot safer if you enlist a helper.

Otherwise, cut the parts a little oversize with a circular saw and use the table saw’s built-in accuracy to clean up the cuts.



MATERIAL LIST

	T x W x L
1 Sides (2)	3/4" x 23 1/4" x 34 1/2"
2 Bottom (1)	3/4" x 23" x 21 1/2"
3 Spacer (1)	3/4" x 3" x 21"
4 Rails (2)	3/4" x 3" x 22 1/2"
5 Toe-kick (1)	3/4" x 3" x 22 1/2"
6 Cabinet Back (1)	1/4" x 22" x 32 1/4"
7 Countertop (1)	3/4" x 24" x *
8 Countertop Build-up (1)	3/4" x 5/8" x *
9 Hardwood Edging (1)	1/2" x 1 1/2" x *
10 Melamine Hot-melt Tape (1)	1/32", Trim to fit

* Length is determined by number of storage cabinets desired.

Side
(Inside View)

(Top View)

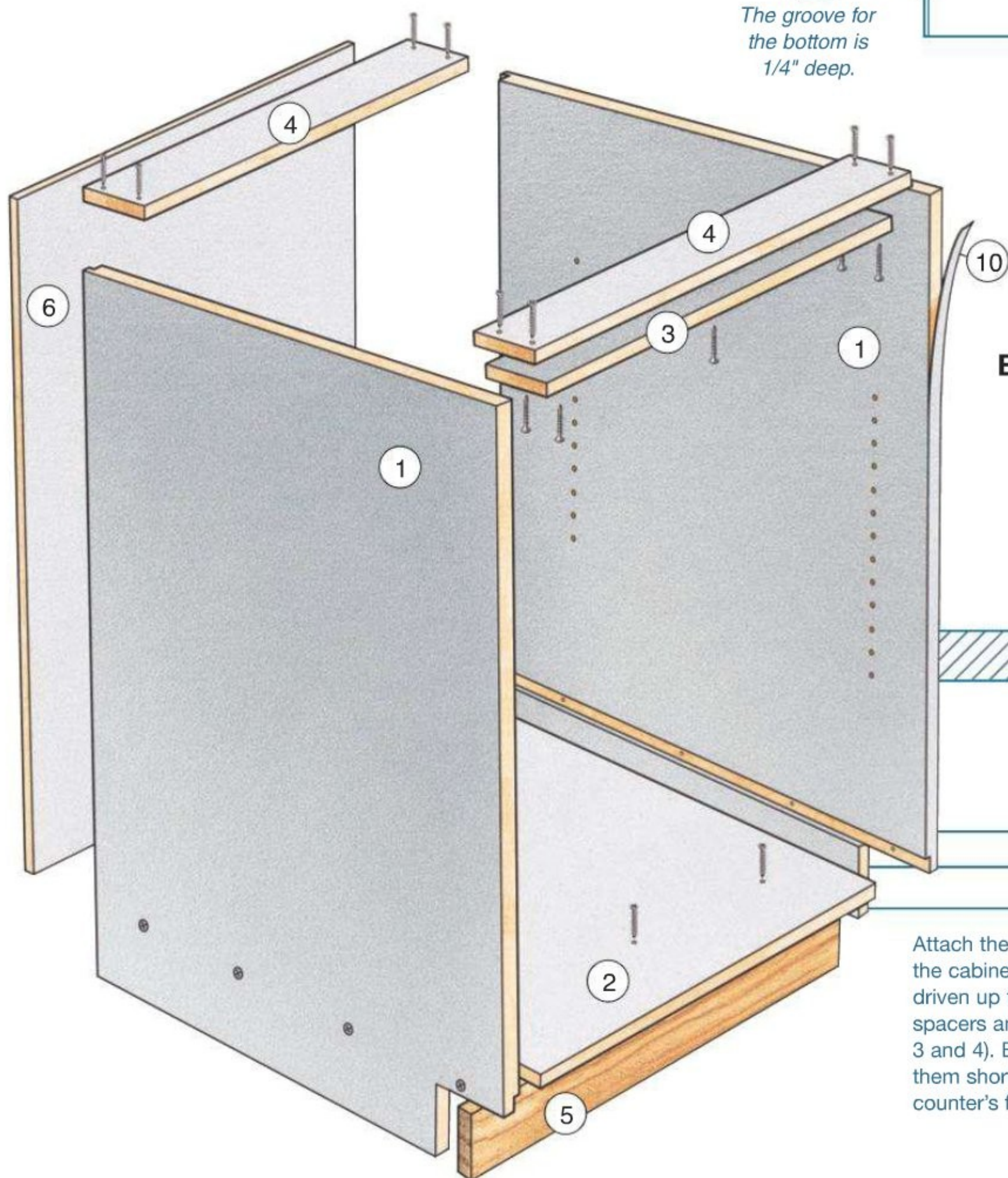


The back rabbet is 1/4" wide by 1/2" deep.

(End View)

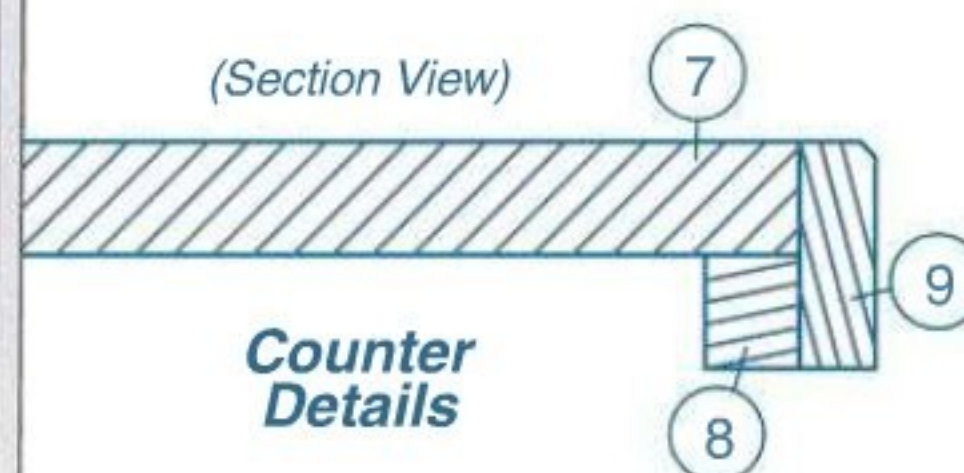


The groove for the bottom is 1/4" deep.



Exploded View

(Section View)



Counter Details

(Bottom View)

Attach the countertop to the cabinets with screws driven up through the spacers and rails (pieces 3 and 4). Be sure to hold them short of the counter's finished top.

your clamped-on straightedge to mill a rabbet (check the *Elevation Drawings* for details) down the inside back edge of each side (to accept the back panel), then return to the table saw to cut the bottom and the spacer (pieces 2 and 3) to size. The spacer is a handy little piece

designed to keep the tops of the cabinet sides parallel. It also provides a solid edge for doors or drawers to close against.

Fasten the sides to the bottom with glue in the dados and screws. As this is a utility cabinet, I used three standard black phosphate-coated screws driven through each dado into countersunk pilot holes. However, there

are screws available with plastic caps that dress up the heads, in case your cabinet ends up in a more "finished" area than the workshop.

Clamp the spacer in place while the glue dries, to help keep everything square. While you're waiting, you can cut the two rails (pieces 4), the hardwood toe-kick (piece 5), and the cabinet back (piece 6) to size. The back can be made from standard 1/4" white paneling or hardboard; it doesn't have to be melamine.

Screw the rails in place next. Drive the screws down from the top through countersunk holes into both the top edges of the cabinet sides and the top face of the spacer.

Attach the toe-kick and the cabinet back, using glue and finishing nails to secure them. A few more countersunk screws



One option with this modular system is to attach doors to the utility cabinets, using Euro-style cup hinges. They require no face frame and are installed in 35mm pockets that can be bored on the drill press.

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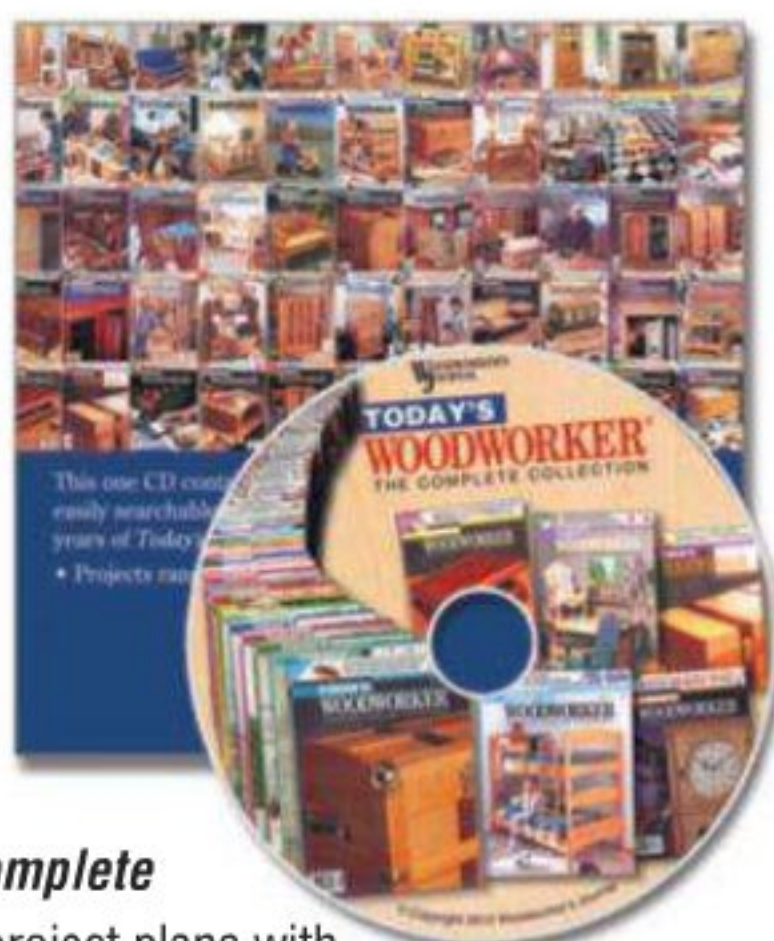
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driven down through the cabinet bottom into the top of the toe-kick will add even more stability and strength.

Making the Countertop

The countertop (piece 7) is essentially just a sheet of melamine cut to size. The actual size of your countertop will depend on how many base cabinets you choose to build and join together. Traditionally, countertops sport a 1½" thick front edge: this can be achieved by screwing a thin cleat called a build-up (piece 8) to the front and side edges of the counter (see the *Detail* on [page 66](#)). Be sure the faces are flush before screwing the build-up in place from below. Add a piece of hardwood (piece 9) to protect and accent the edge. Miter the corners as shown in the photo, above right. You can use glue and finish nails



The author added 1/2"-thick hardwood trim to accent her countertop, in order to hide the melamine edges and increase overall durability. Apply the trim with glue and finish nails.

to secure the hardwood in place. I used a trim router to flush-up the hardwood after the glue had cured. Cover the rest of the exposed edges throughout the cabinet with hot-melt melamine tape (piece 10). I used an old clothes iron to heat and press the down tape. It worked great.

Customizing Your Cabinet

The best aspect of these modular cabinets is that you can customize the interiors by adding

adjustable open shelves, doors, roll-out shelves or drawers to accommodate whatever you need to store.

Doors and adjustable shelves are perhaps the easiest options to build. Simply cut them to size, apply edging (either hardwood or melamine) and install them. Standard Euro-style cup hinges work well for the doors: they're designed for cabinets without face frames, and most models come with detailed installation instructions. Shelves can be installed with adjustable brass pins that fit into rows of holes drilled in the sides of the cabinet. Templates for drilling these holes are widely available.

Both drawers and roll-out shelves will require drawer slides that are screwed into the cabinet sides. Since these are utility cabinets, the drawer bodies can be as basic as two sides butt-jointed and screwed to the front and back, with a bottom either set in a groove or screwed in place. The key is to keep things simple: after all, you don't want to have to find even more storage space for a whole bunch of fresh jigs, now do you?

Linda Haus is a contributing editor to Woodworker's Journal.



Join the cabinets to each other by clamping them together and using a drill/driver to drive screws into countersunk pilot holes every 8" or so down the front and back edges. It's important that the bank of cabinets be dead level and aligned as you screw it together.

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stand like this one for a decade or more. The roller balls are a superior design when compared to a cylindrical roller. The latter has to be aligned square to the line of travel of a workpiece that's in motion, or it'll tend to steer the piece off course.

This stand is a hollow column that houses a solid post. The post slides up and down, and it's locked at any height with a twist knob on a bolt. Four feet give it a solid stance without excessive weight or an oversized footprint.

Make the post and column assembly first (pieces 1, 2 and 3). You have a bit of leeway to alter the girth of the post, but you want it to fit well in the column. I recommend you mill the post but leave it as thick and wide as possible. Make a column to accommodate it. Then, plane the post as necessary to allow it to slide smoothly inside the column.

As shown in the *Elevation Drawings*, the column is built up using dado-and-rabbet joints. I cut

the joints on the router table, using a slot cutter for the dado (technically, it's a groove, since it parallels the grain's direction) and a straight bit for the rabbet. After the column is glued up, rout the slot (see bottom photo) for the adjustment bolt on the router table. Also rout a recess for the tie plate (piece 4) at the top of the column. Then plane the post as necessary to achieve a smooth, bind-free action.

Drill the adjustment bolt hole in the post using the column as a locator. To do this, slide the post inside the column, line up the drill bit at the bottom of the slot in the column, and bore into the post. Slide the post out to finish drilling the through hole. Do this with the post clamped to the drill press table. Then, without moving the post, switch to a Forstner bit and drill a shallow counterbore for the carriage-bolt's head.

Make the base next. Rip the base elements (pieces 5 and 6) to match the width of the column.

With this trusty roll-off stand you can halve a sheet of plywood on your table saw or, if you are ripping, keep the two long halves of a board from tipping off your outfeed table. In addition, because this one is vertically adjustable, you can use the stand with a jointer, drill press, band saw and router table, whatever their differing heights may be.

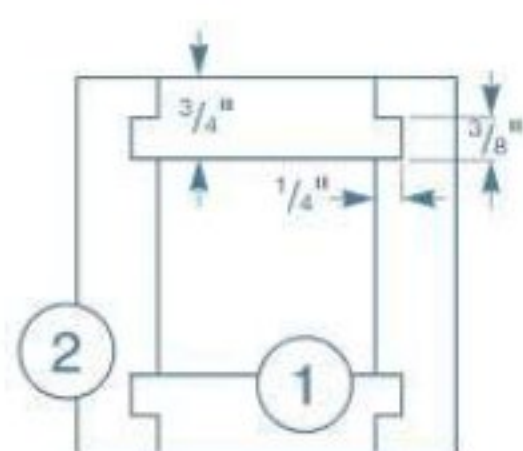
I've been using a telescoping



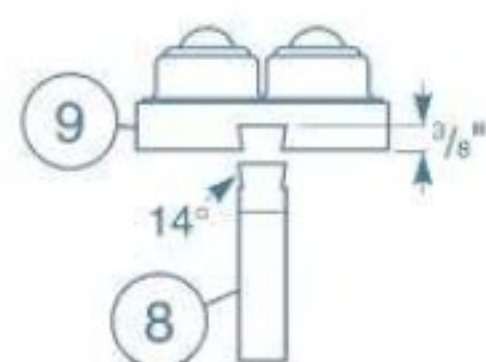
To make the stopped adjustment slot, measure from the bit and clamp a stop to the end of the fence. Cut the slot in two or three passes. Use the bottom end of the slot to locate the adjustment bolt hole in the post (inset).

MATERIAL LIST

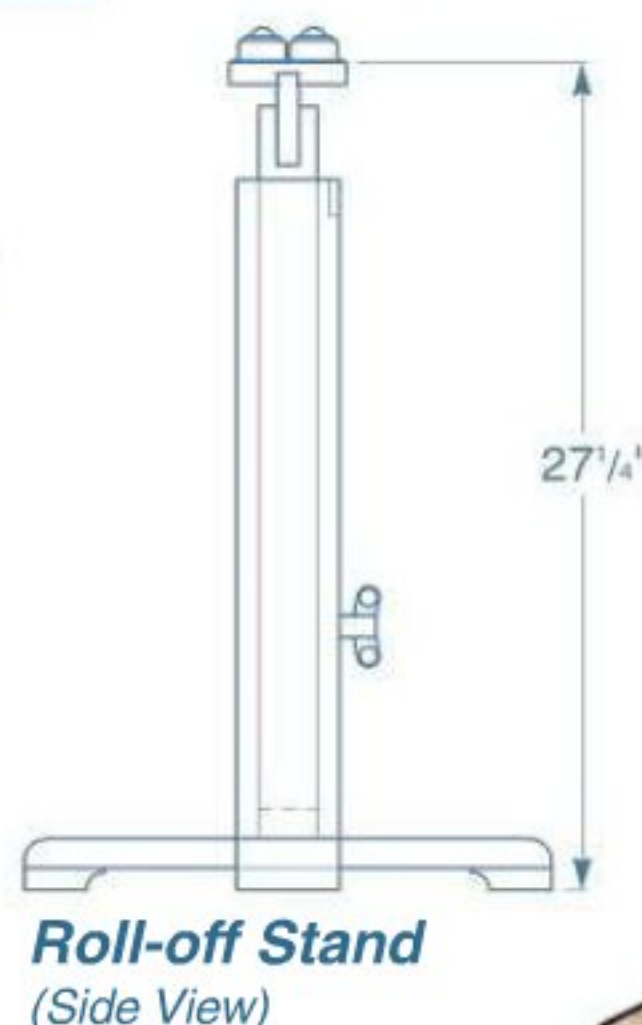
		T x W x L
1	Narrow Column Sides (2)	3/4" x 2 1/2" x 22 1/2"
2	Wide Column Sides (2)	3/4" x 3 1/2" x 22 1/2"
3	Post (1)	2" x 2" x 24"
4	Tie Plate (1)	3/8" x 1 1/4" x 3 1/2"
5	Base Members (2)	1" x 3 1/2" x 18"
6	Foot Blocks (4)	3/4" x 3 1/2" x 2 3/4"
7	Mounting Block (1)	1" x 2" x 2"
8	Mounting Bar (1)	3/4" x 3" x 12"
9	Roller Base (1)	3/4" x 4" x 12"
10	Adjustment Bolt (1)	3/8" x 3 1/2"
11	Fender Washer (1)	3/8" I.D.
12	Ergo-style Wingnut (1)	3/8"-16
13	Ball-bearing Rollers (6)	1" Dia.



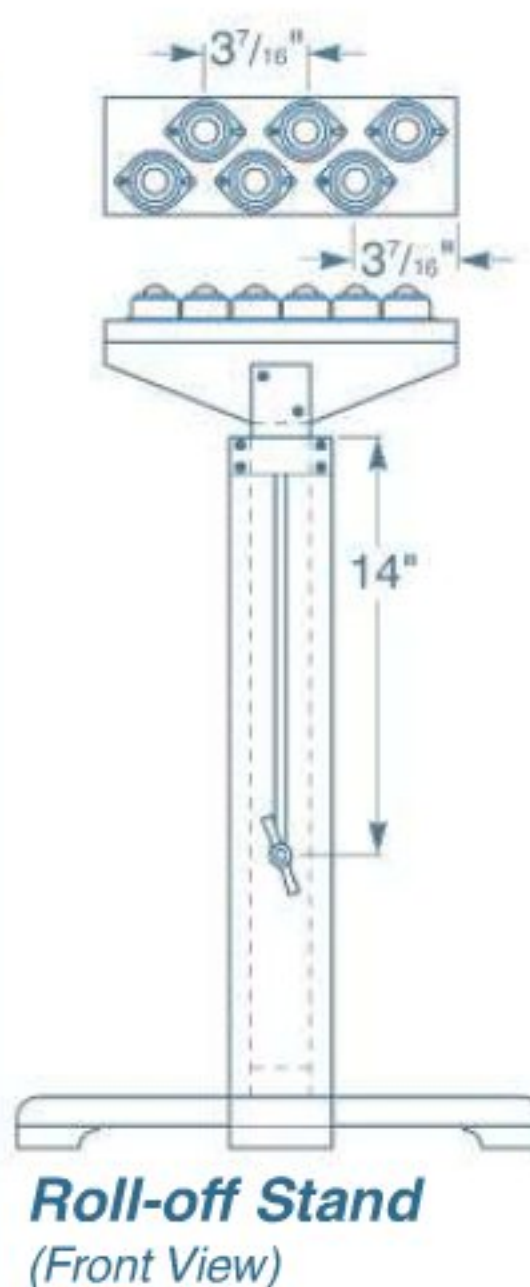
Column
(Section View)



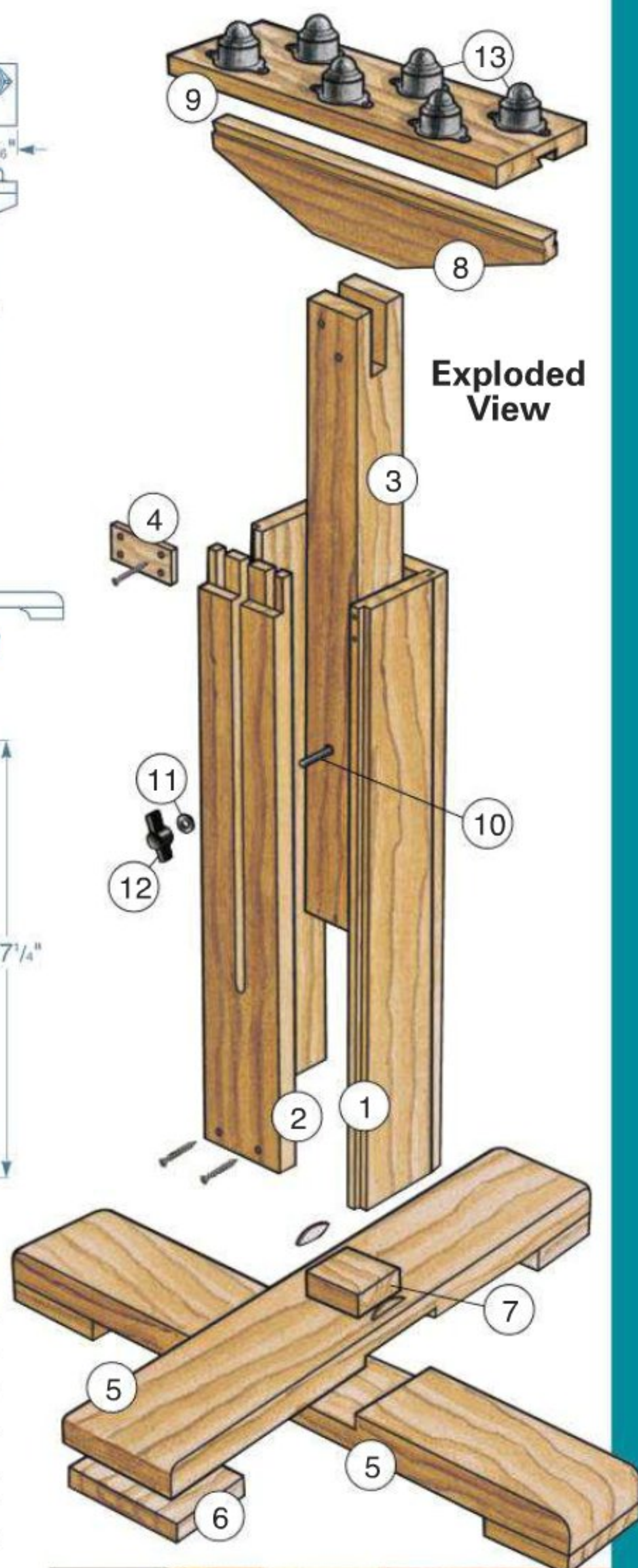
Mounting Block Subassembly
(End View)



Roll-off Stand
(Side View)



Roll-off Stand
(Front View)



Exploded View

Cut the cross-laps in the base members. I routed these joints with a job-specific jig guiding a bit with shank-mounted bearing. Cut and glue the feet to the ends of the base elements. Round over the edges if you like, then glue up the X-shaped subassembly.

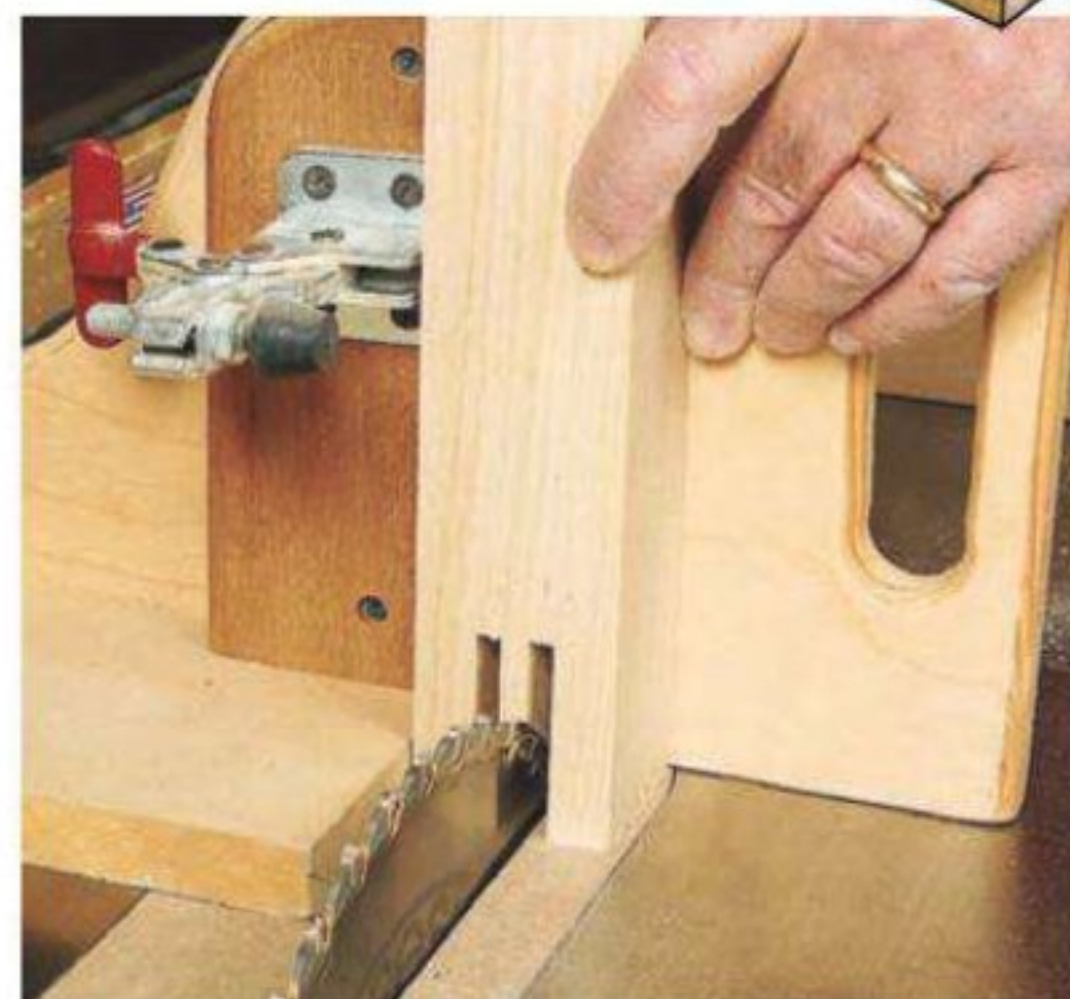
To join the column to the base, I used a mounting block (piece 7) and a pair of biscuits. Rip and crosscut a 1" thick scrap to fit tightly inside the column. Face-glue it to the base (orienting its grain parallel to the piece you are gluing it to). Cut two biscuit slots in the base, using the block as a reference surface and making the slots parallel to the grain. Cut matching slots in the end of the column, using the post as a reference surface. Glue the column and base together.

The base for the roller balls is joined to its mounting bar (pieces 8 and 9) with a sliding dovetail joint. I routed both halves of the joint on the router table. The bar is joined to the post with a bridle

joint. I cut the slot in the top end of the post using my shop-made table saw tenoning jig. The tapers on the bar were sawed on the band saw, then smoothed with a hand plane. The sliding dovetail is glued; the bridle joint is fastened with screws.

After fitting the adjustment bolt (piece 10) through the post and driving the head into its counter-bore, slide the post into the column. Fit a fender washer and an easy-on-the-fingers plastic wingnut (pieces 11 and 12) on the bolt. Install the tie plate with four screws but no glue, so it can be removed easily should the post assembly need servicing. Attach the rollers (pieces 13) to their base with screws, and you are ready to roll ... literally.

Bill Hylton is a contributing editor to Woodworker's Journal.



The bridle-joint slot in the post can easily be sawed with a tenoning jig on the table saw. Cut the margins of the slot first, then remove the waste from the middle.





Workshop Techniques

Expanding your wheelhouse of techniques can enrich your woodworking pastime while also preparing you to take on more ambitious and complex projects. In this section, you'll learn an expert's approach to scraper sharpening, a safe and simple method for bending solid wood and a half dozen ways to improve your routing, plus much more.

Two Quick, Strong Jig-made Joints74-75

Scraper Sharpening Basics76-80

Drilling on the Lathe82

Steam Bending Basics84-85

Six Tips for Avoiding Router Tearout86-88



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

Two Quick, Strong Jig-made Joints

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

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

Pocket Screws

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

Pocket screws are the fastest way I know of to build face

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

It's easy to get started making pocket hole joints, but you'll need to buy a jig. Pocket hole jig

designs vary to some degree, but all of them have steel sleeves to guide the drill bit correctly. Jig kits typically come with the stepped drill bit, a long driver bit and a stop collar.

Hidden Dowel Joints

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

There's a trick to making successful dowel joints: you need a jig that registers parts precisely. If dowel holes are even slightly askew, the joint parts will be thrown out of alignment or worse, the joint won't fit together at all ... big hassles either way. Here's where a simple jig can



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



save time and frustration. A good doweling jig will clamp securely to your workpiece and provide index marks to indicate exactly where the dowel will go. Just draw or knife a thin layout mark across the joint at the index mark, and registering the drill bit will be easy.

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

Once the holes are drilled, carry out a dry assembly first, then apply glue, slip in the dowels and clamp. You're done!

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

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

Chris Marshall is a senior editor of Woodworker's Journal.



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



Scraper Sharpening Basics

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

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

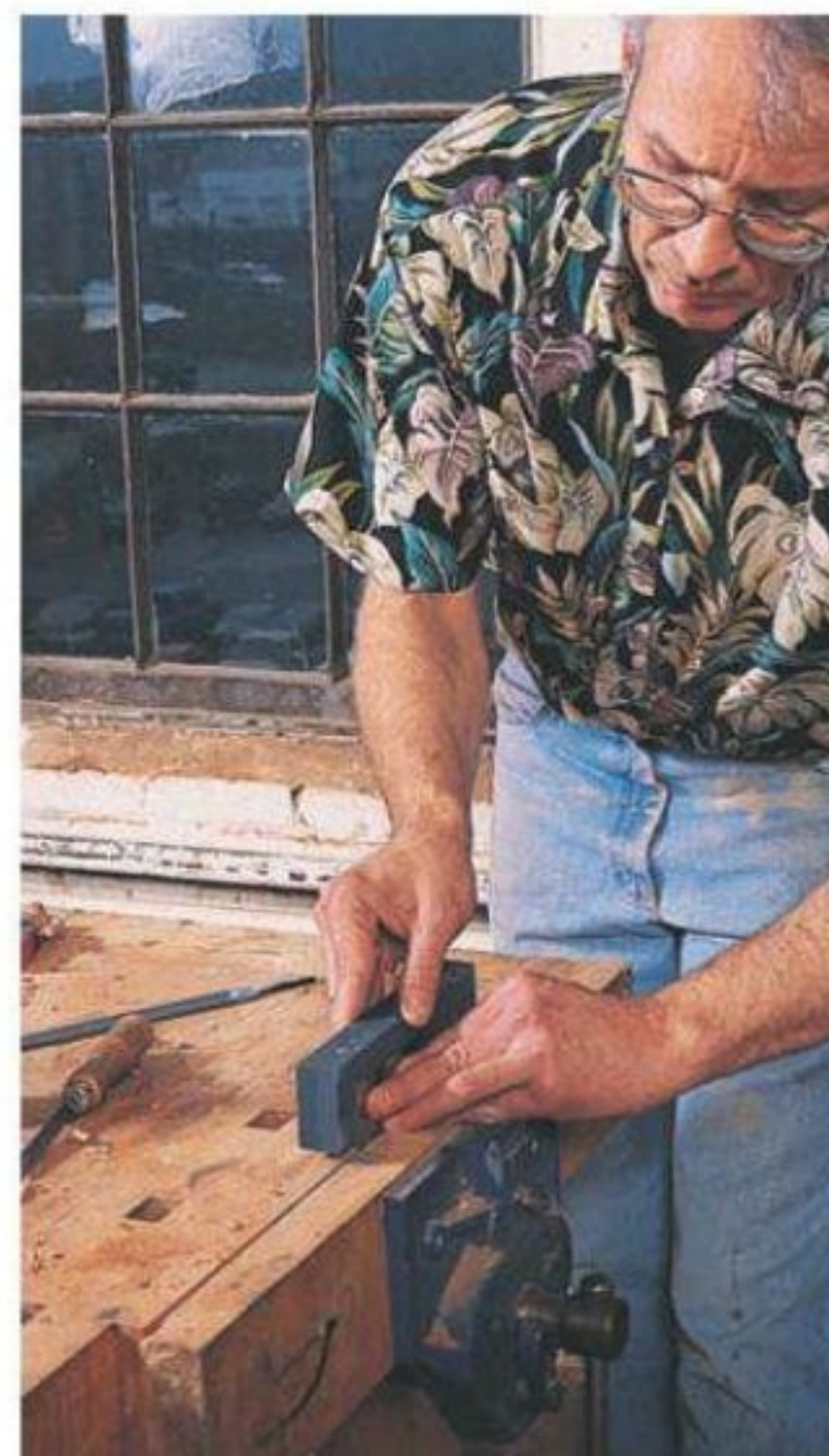
cutting neatly. I returned to the boss and asked how to get the thing sharp again. The accompanying lesson looked like nothing was happening, but again the steel produced those fine shavings. At least until I tried to duplicate the sharpening.

The problem with sharpening a scraper is similar to the problem with sharpening so many woodworking tools. Things happen at the microscopic level, and you just can't see what is going on. You need an understanding

of what is supposed to be happening to the edge of the tool. And a lot of it is the touch that is applied. I made many attempts to get a scraper sharp before I was able to try it and have it work like it did when the boss had done it. But finally, with success comes the revelation, "So, that's how you do it." The scraper has four corners, and these can all be made sharp. Therefore, it makes sense to do all four edges while you've got your files, stones and burnishers



START BY GETTING YOUR SCRAPER SQUARE



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

out on the workbench. The key to getting the scraper sharp is to get the edges filed perpendicular to the face.

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

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

the edge over to create the scraper's cutting edge. After you've done one edge, flip the steel over; give all four edges the same treatment.

I use a burnisher with a triangular profile, and I personally like the way it feels. Other woodworkers I know get good results from a round profile. The key is that the tool needs to be made from a very hard steel to successfully push the scraper edge. It's also important for the

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Customize Products



Cabinet Inlays



Custom Birdhouse

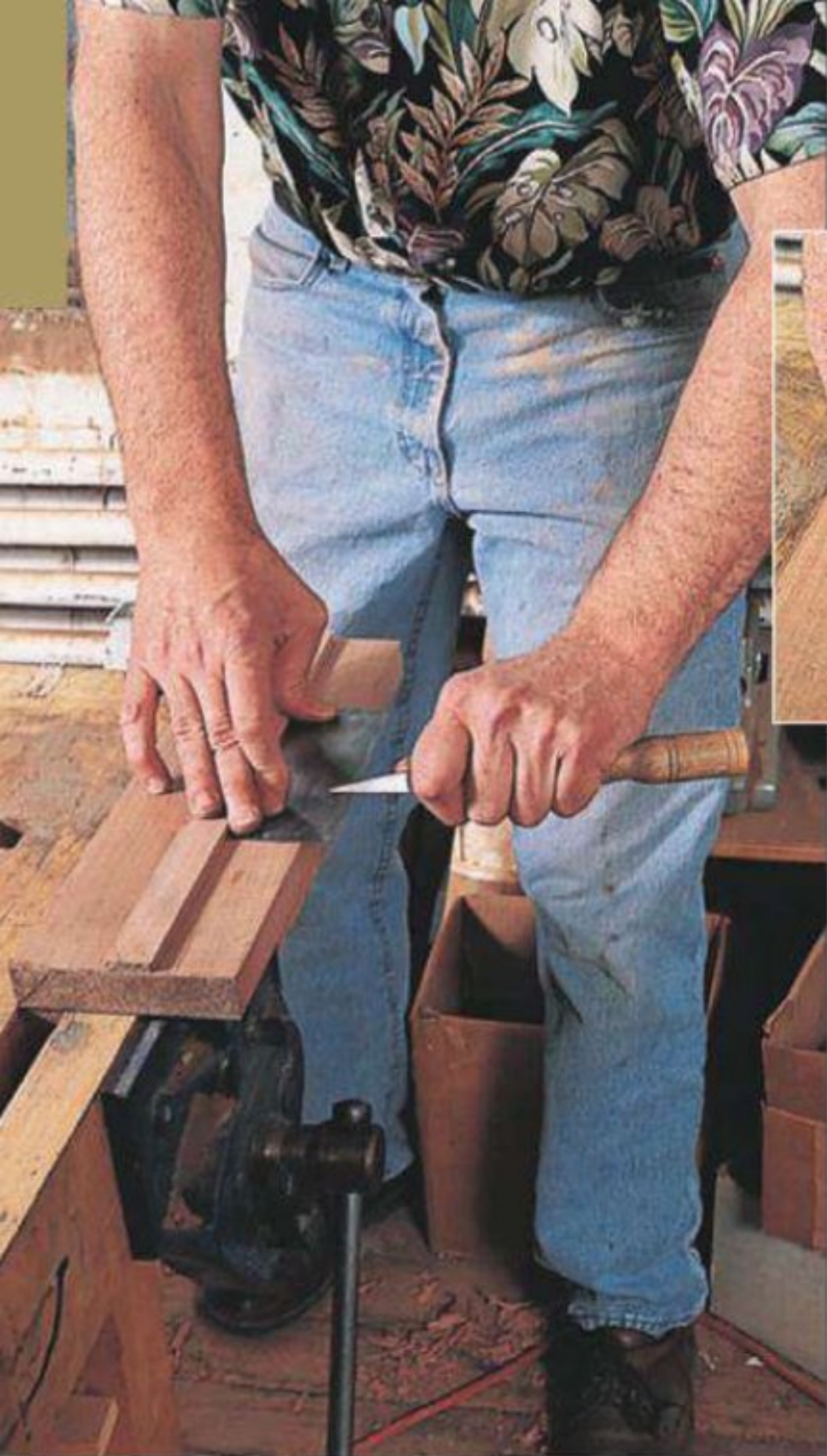
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Lay the scraper on a flat surface and hold your burnisher at a slight angle (about 5°) as you strop across the face of the scraper as shown in the photos above.

burnisher to be smooth without any nicks or dings that would potentially catch on the scraper.

Using a Scraper

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

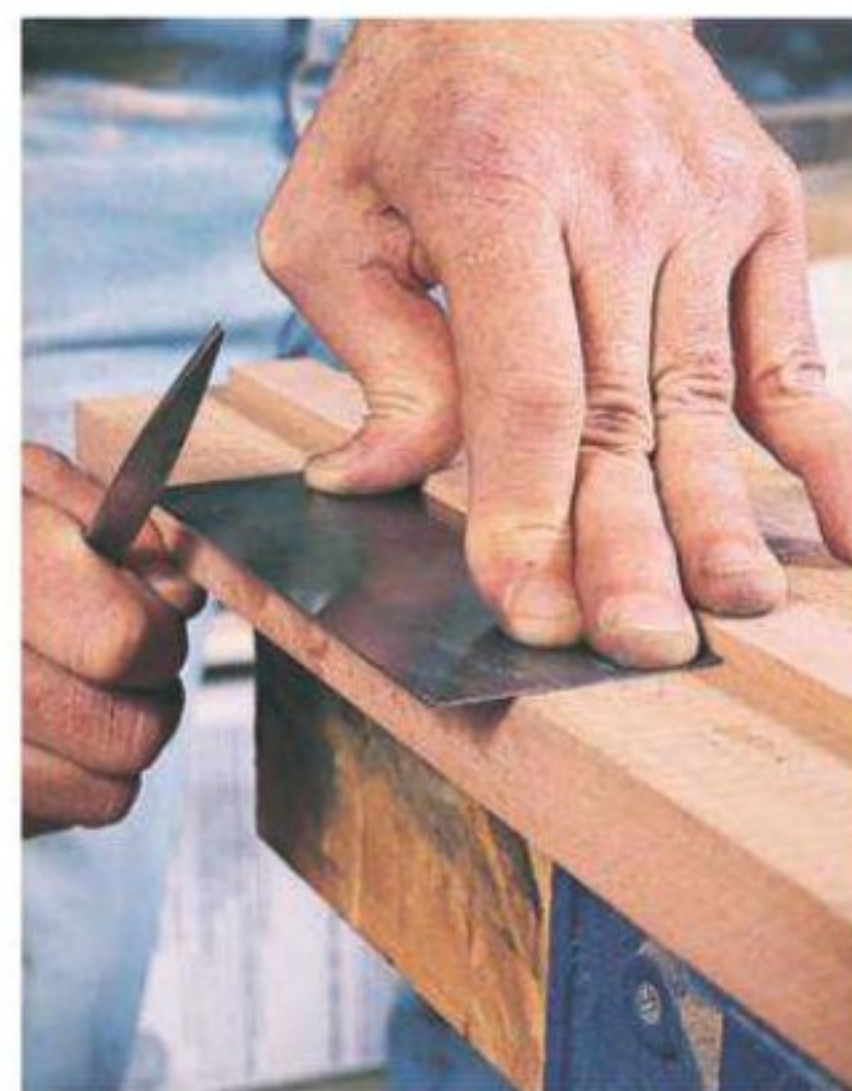
A scraper can also be used on shaped parts. It can be pulled or pushed. It can be used to clean up interior corners. And after you have mastered sharpening the straight scraper, try the same basic technique on a swan's neck scraper. Once you've got that sharpening technique down, a curved scraper will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

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

Silas Kopf is a contributing editor to Woodworker's Journal.



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Next, pull the burnisher along the edge to curl the steel back at an angle to the face of the blade (see photo sequence above). Tilt the burnisher about 85 degrees and hold it at an angle away from you. Start with the end of the burnisher touching the end of the scraper edge farthest from you. With a continuous motion, pull the burnisher toward you, drawing it up to its end as you finish the stroke. What you are attempting to do is curl the edge over. It becomes the cutting edge of the scraper. Repeat for the other three edges. You'll know you've created the tiny edge "hook" if you can catch it all along the length with a fingernail.



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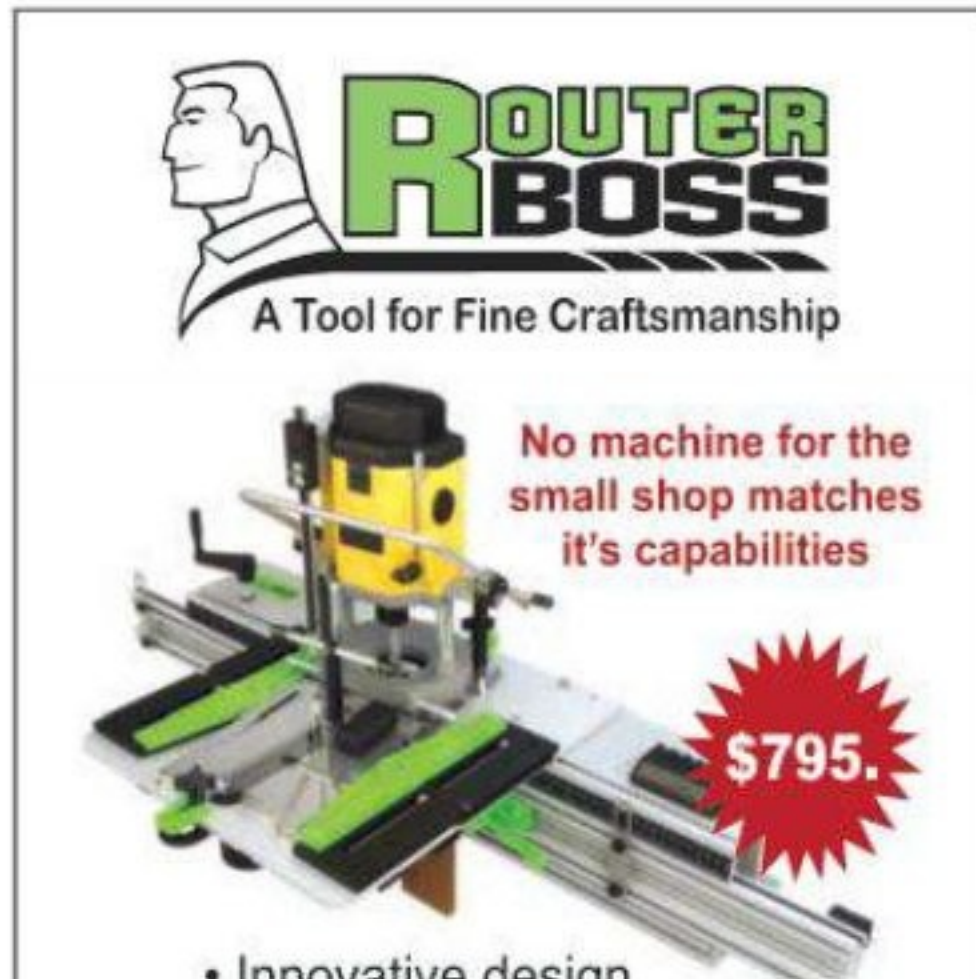
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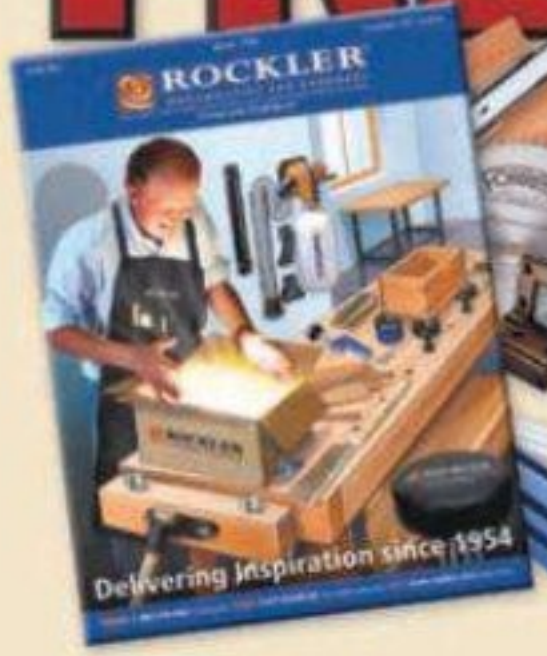
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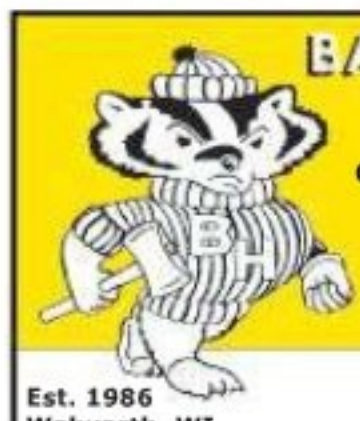


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Drilling on the Lathe

A DRILL CHUCK MAKES A SWEET ADDITION TO YOUR LATHE.

There are some gadgets and gizmos that simply complicate our lives (many of which are sold late at night on the TV). And then there are some that, once you have used them, you cannot imagine getting along without. I will suggest that if you have not yet mounted a drill chuck in the tailstock of your lathe, you are missing a “can’t live without it” accessory.

Will you use it every time you turn on the lathe? Well, if you primarily turn bowls, as I do, the answer is pretty much, “yes.” If you are turning hollow vessels shaped like a vase, the answer is — “yes.” Candlesticks ... “yup.”

It is actually surprising how many times the simple act of drilling a hole dead center in the middle of your turning blank can be a benefit.

The chuck mounts in your tailstock on a Morse taper — either a #1 or #2, depending on your lathe. Your owner’s manual will indicate which taper is right for your tool. Of course, you can mount it or dismount it, as needed.

Using the Chuck

If you are removing a lot of material, a Forstner bit is a great option. The center spur keeps the bit feeding straight into the stock, as do the squared-up



Mounting a drill chuck in your tailstock is easily done. First, you must check your manual to determine what type of taper is right for your lathe.

cylindrical sides of the bit. I also know woodturners who use paddle bits for the same task. One downside to the paddle bits is that their guide spur is very long by comparison to a Forstner bit, and you always need to take the length of the spur into account as you bore. Be sure to advance the bit a short distance and then back it out to assist waste removal.

Sometimes I prefer to use a cutter that does not have the spur protruding past the flat surface of the bored hole. In those circumstances, I use a router bit (a bowl carving bit) chucked into the lathe-mounted drill chuck. It gives me a smooth-bottomed boring that I can shape my bowl bottom to meet. It is a small trick, but one that a moderately skilled turner like myself can take good advantage of.



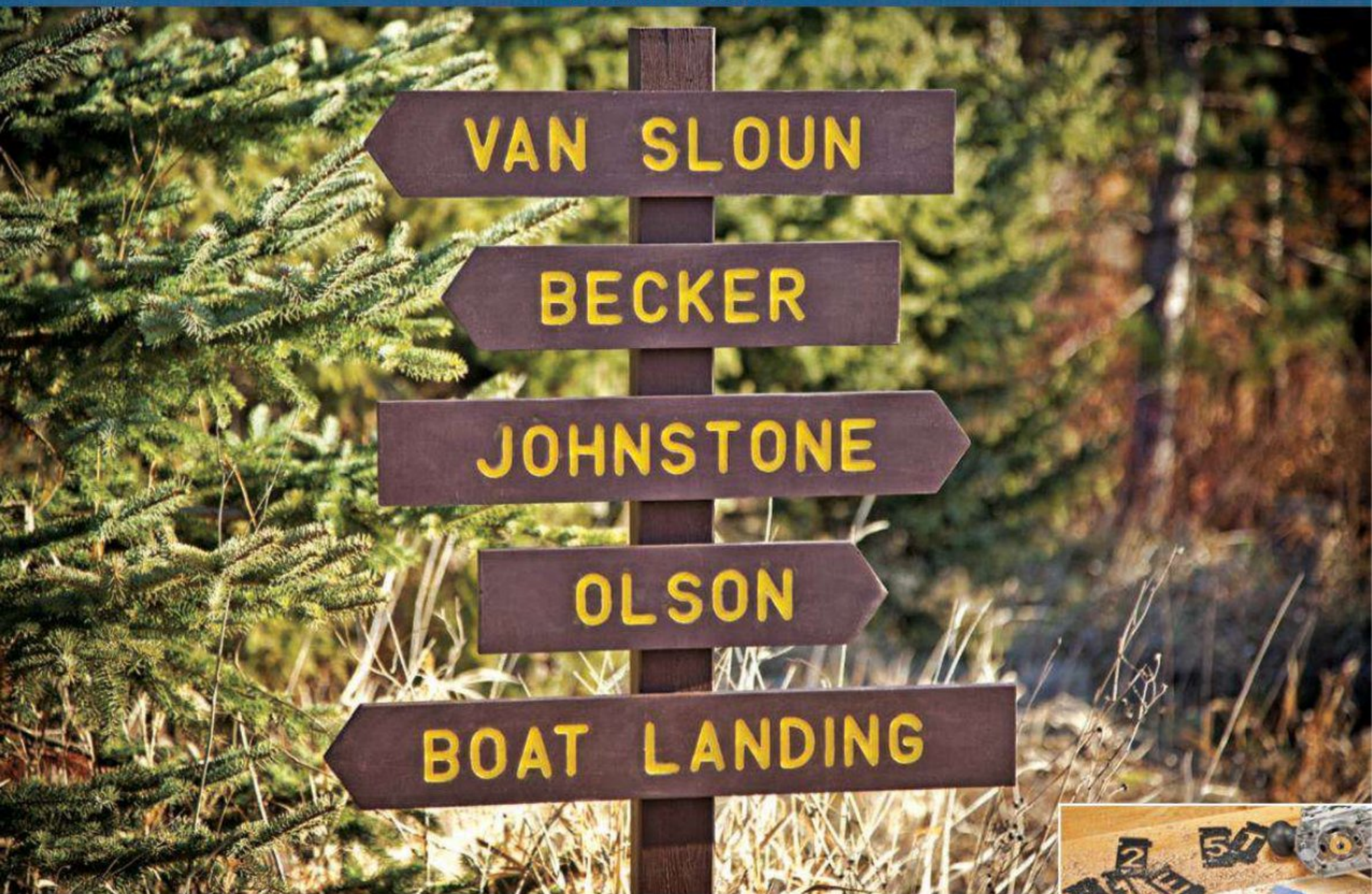
With the bowl blank spinning, the author bores a hole dead center in the wood. He sets the depth of the boring with the graduated scale on his tailstock.

Rob Johnstone is the editor in chief of Woodworker's Journal.

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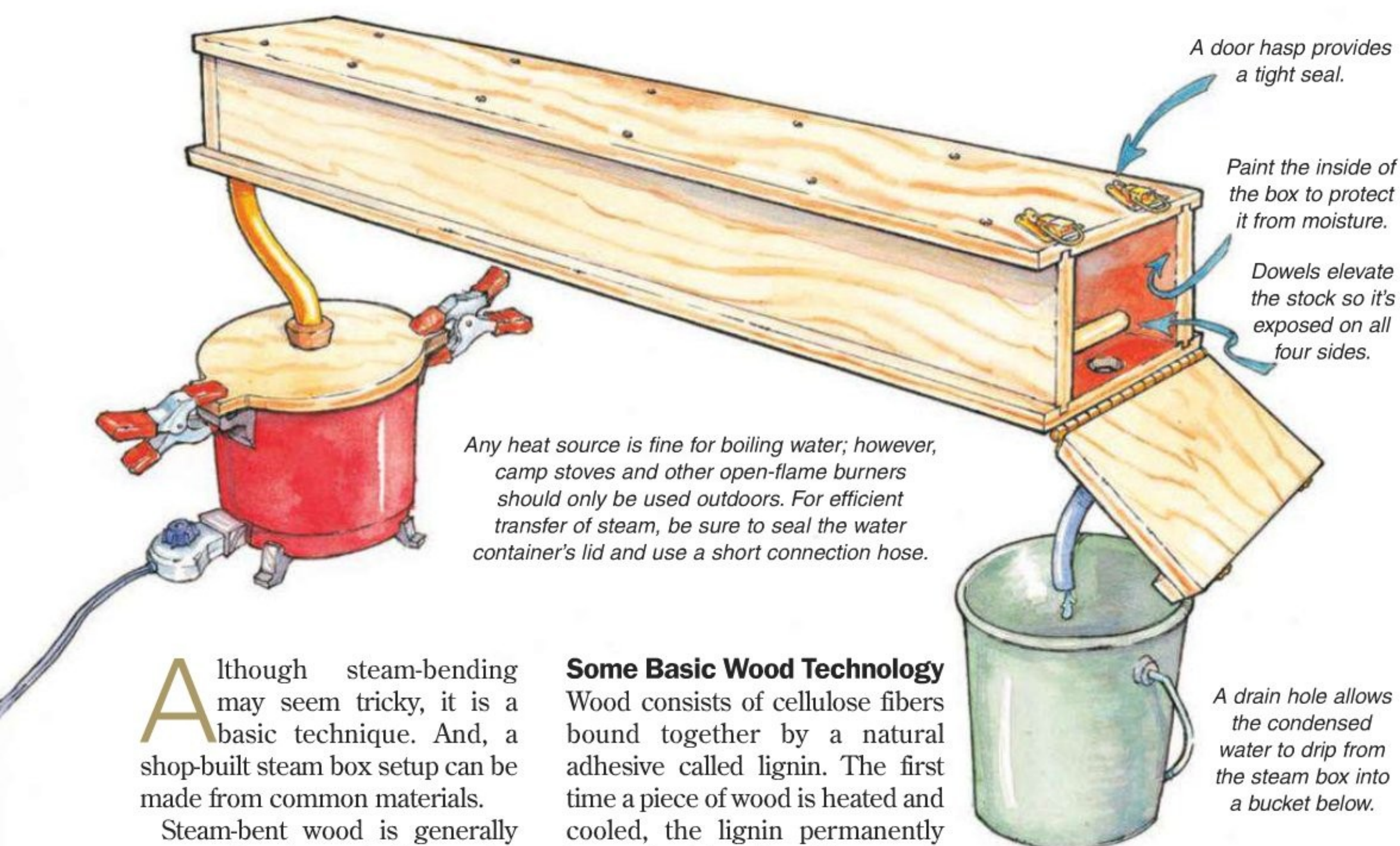


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Steam Bending Basics

WITH A STEAM BOX, A BENDING FORM AND THE RIGHT TECHNIQUE, YOU'LL BE ON YOUR WAY TO CREATING CURVED SHAPES. HERE'S HOW.



Although steam-bending may seem tricky, it is a basic technique. And, a shop-built steam box setup can be made from common materials.

Steam-bent wood is generally strong since its grain follows the length of the curve. By comparison, curved components cut from solid planks tend to contain weak sections of short grain (see the difference in Figure 1, below).

Some Basic Wood Technology

Wood consists of cellulose fibers bound together by a natural adhesive called lignin. The first time a piece of wood is heated and cooled, the lignin permanently loses elasticity. For this reason, kiln-dried wood, which has already lost much of its pliability in the kiln, is not your best choice for steam bending. Air-dried wood is the ticket: when it's steamed and bent, the lignin helps lock the new curve in place.

Wood subjected to steam in an enclosed container heats up and absorbs moisture, dramatically increasing the flexibility of its fibers. When it reaches sufficient pliability, the wood should be rapidly bent over a sturdy form. After cooling and drying the wood will retain its new shape, although varying degrees of springback can occur, depending on the

character of the wood, the amount of steaming and the rapidity with which the hot wood is bent.

Some woods bend better than others. For example, white oak, red oak and ash are particularly good, while mahogany and hard maple are unsuitable. Select straight-grained pieces to reduce the likelihood of fracturing.

Building a Steam Box

Making your own steam box is easy, as shown in the illustration above. For most bending needs, an exterior dimension of about 7" x 7" x 60" will do nicely. Follow these additional guidelines:

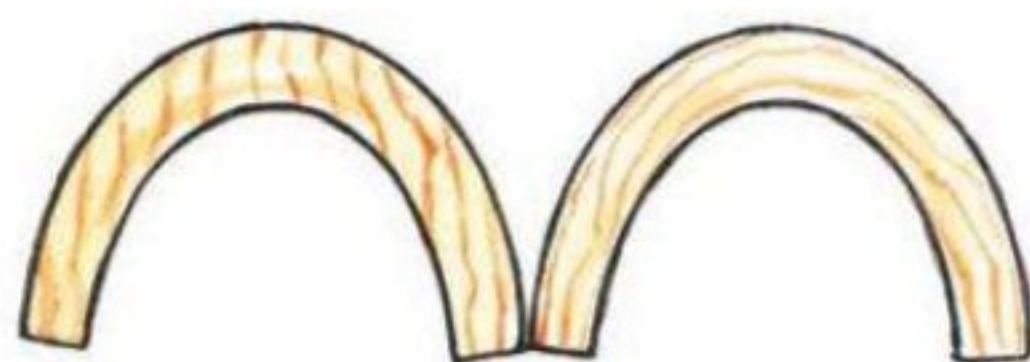


Figure 1: A curve bandsawn from solid wood (left) usually has significant grain runout, which weakens the piece. The grain lines on a steam-bent piece (right), on the other hand, are continuous, making it the stronger alternative.

- Use exterior-grade plywood for the box since its waterproof glue won't degrade from the steam.
- Paint the box's interior to protect it.
- Space a line of dowels across the box's width to elevate the wood above the condensation runoff and to promote the flow of steam.
- Seal one end of the box, and hinge the other end for easy access.
- Drill a small hole through the bottom at one end to drain condensed steam.
- Drill a second hole, at the other end, for the steam hose entrance.

The heat source for your steamer can be an electric burner, a wood fire, a camp stove or whatever you have that will boil water. For safety's sake, remember to use your equipment outside if it generates a flame or has exposed hot coils.

The water container should hold several gallons and have an access hole small enough to be plugged with a large cork or rubber stopper. If the container is made of iron, make sure it's galvanized or enameled, otherwise the steam will probably stain your wood. By drilling a hole through the stopper you can hold the connecting hose in place. The hose should be made of rubber, plastic or copper of at least 1/2" in interior diameter. Thin-walled plastic tubing is not recommended as it collapses when the steam runs through. In use, be sure to set the steam box at a slight incline so condensation flows out the drip hole.

Steaming Your Wood

The first step in steaming your wood is to fire up the burner and boil the water. Once steam begins

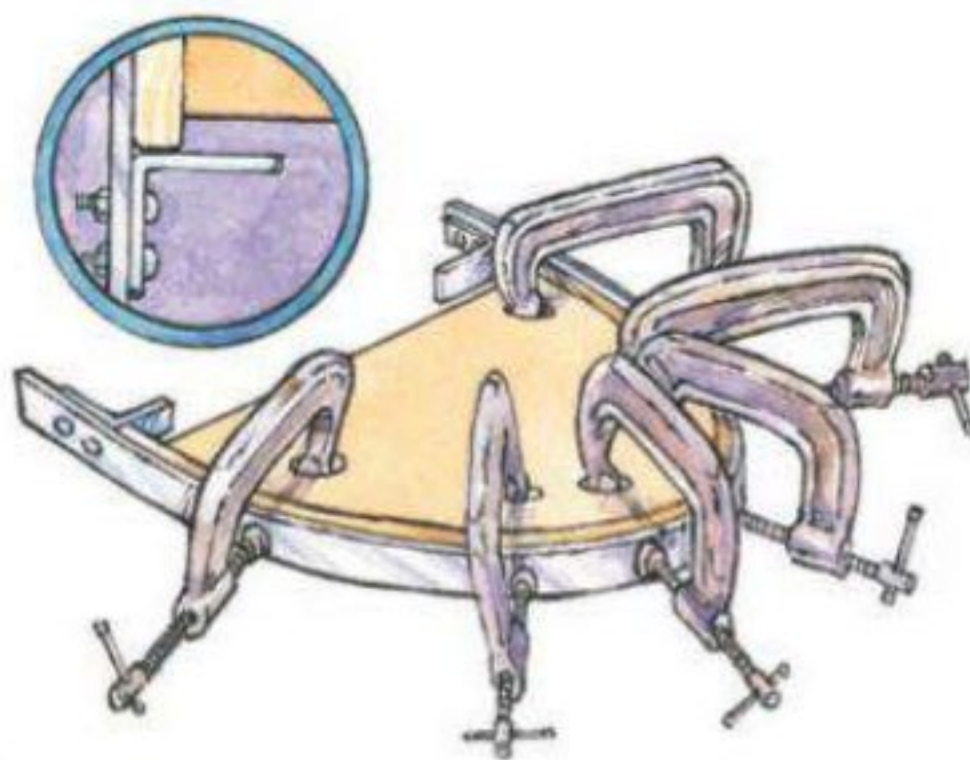


Figure 2: Make a banding strap using metal between 1/16" and 3/32" thick, and bolt angle irons to its ends so the steamed wood fits tightly between them.

filling the chamber, put the wood in the box and close the lid. Steam the wood until it's pliable, then, wearing gloves for protection, remove the hot wood and rapidly bend it to the form.

How long should wood be steamed? There is no precise answer, so it's a good idea to include a couple of test pieces in the box for experimentation. Species, moisture content, and the intensity of the steam environment are all factors. Here are three rules of thumb for steaming air-dried lumber:

- Keep wood with a moisture content below 20% in the steam box for about an hour and a quarter per inch of thickness.
- Steam wood with 20 to 30% moisture content for 45 minutes per inch of thickness.
- Wood with a moisture content in excess of 30% needs only about 1/2 hour of steaming per inch of thickness.

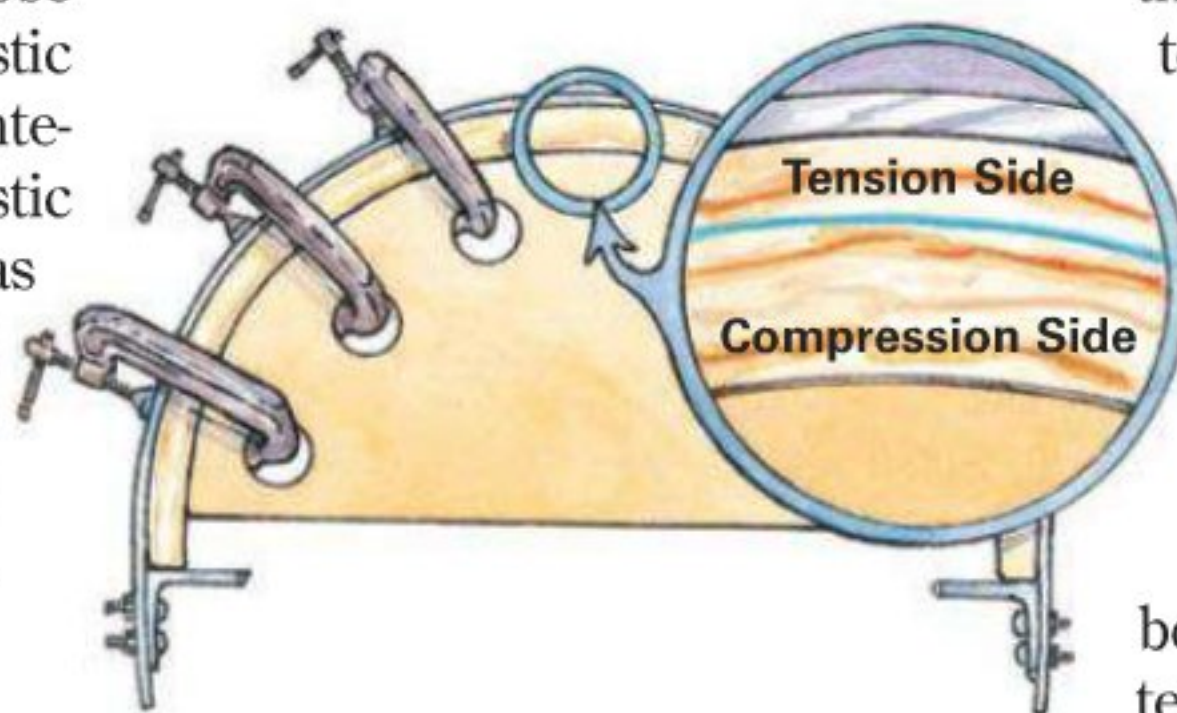


Figure 3: A banding strap is often used to force the entire piece of wood into compression, decreasing the possibility of a split on the tension side of the bend.

When pulling hot wood from the box, work rapidly to place it in the bending form. The wood begins to cool instantly, and it's amazing how quickly flexibility diminishes. If possible, leave the wood clamped in the form for several days.

There are a variety of designs for bending forms. The most common is a one piece form, usually built with layers of plywood, to which the steamed wood is clamped (see Figure 2). Another type of form consists of two mating parts between which the work is sandwiched. Since steamed wood almost always has some springback, cut the form to a slightly more severe bend than you want to end up with. However, spring-back is unpredictable, so until actual test bends are made, the exact amount of over-bend required is anyone's guess.

When you bend a piece of wood, an imaginary line up the center stays constant in length (see Figure 3), while the outside of the curve gets longer (tension) and the inside becomes shorter (compression). Wood is fairly good at compressing, but splits apart readily under tension. It's the tension factor that limits the degree of curvature in a simple bend. Many woodworkers reduce the chance of splitting on the tension side of the wood by using a banding strap — a flexible steel strap about 1/16" thick and as wide as the bending stock, with end stops spaced to enclose the exact length of the workpiece. As soon as the wood is pulled from the steam box, the strap is fitted to the tension side of the stock. With the outside curve unable to expand, the entire piece of wood is forced into compression, minimizing the chance of splitting.



Tearout is one of those avoidable problems with routing, and there are lots of ways to prevent it from happening. Our author offers six tips to help you keep those workpiece corners and edges crisp.

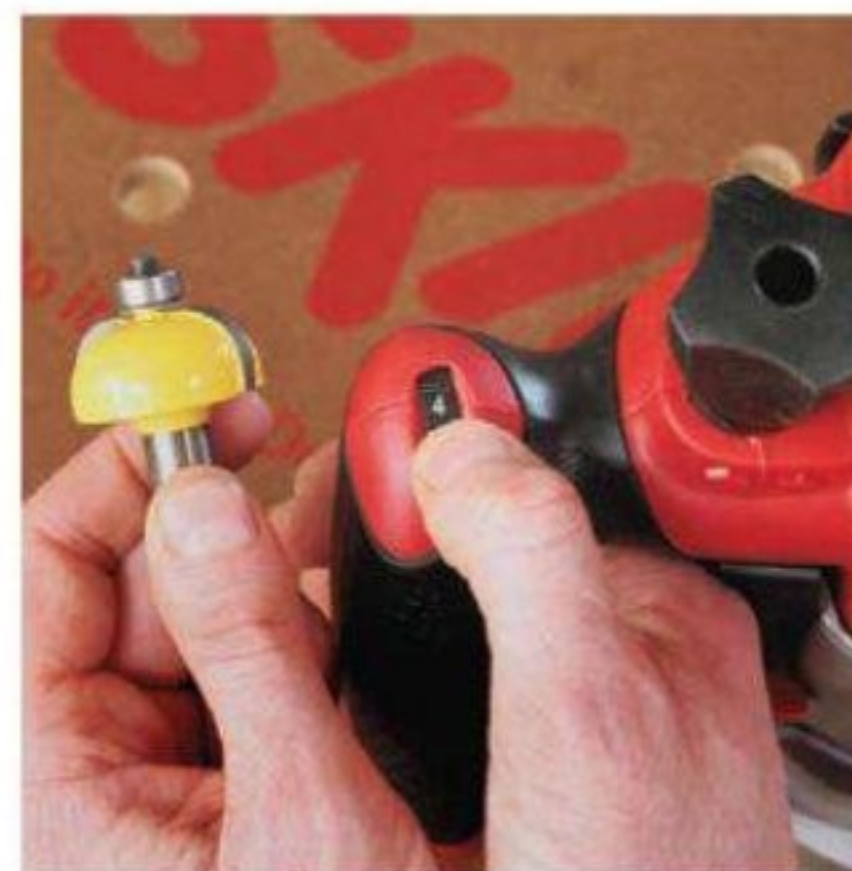
Six Tips for Avoiding Router Tearout

PUT AN END TO SPLINTERY CORNERS, BLOWN-OUT EDGES AND RAGGED PROFILES WITH A FEW SIMPLE ROUTING TIPS. HERE ARE SIX WORTH TRYING.

No tool is better at decorating an edge than a router, and it's ideal for cutting dados, rabbets and other joinery. But tearout is a router bugaboo you'll want to avoid at all costs. Generally, tearout happens when routing across the grain, turning corners or removing too much material in one pass. Don't let tearout spoil a perfectly good piece of wood ... or your peace of mind. A few simple router tips are all you need.

Tip 1: Dial Back and Slow Down

Most routers nowadays have variable speed control, and it's there for a reason. The larger your bit diameter, the faster it spins at the outer cutting edges. When you are routing splinter-prone woods like cedar or oak with a large bit, turn your router's speed dial down a few notches. You'll cut cleaner edges with fewer burn marks. Remember to slow your feed rate when approaching the cor-



Dial down your router's speed when using larger bits. You'll get cleaner, safer cuts this way.



The correct feed direction is to move the router against the bit's rotation. When routing an inside cutout, feed the router clockwise around the opening (left). Switch to a counterclockwise direction for outside edges (right).

ners of a workpiece or if you hear the router start to tear the wood instead of cut it. Don't make routing a race to the finish. A steady and smooth operation is always the best goal.

Tip 2: Rout Like Clockwork

For most applications, the correct way to feed a router is against the bit's rotation. This tip has more to do with safety than avoiding tearout, but it will improve your router's cutting performance, too. When routing around the inside of a workpiece, such as a picture frame, feed the router clockwise (see top left photo). Switch directions when you're following an outside edge,

and move the router counterclockwise (see top right photo). You'll know you are feeding correctly if the router gently resists your efforts. If it jerks forward and pulls through the cut, it's a telltale sign that you're heading the wrong way and making a climb cut. Climb cuts are unsafe for ordinary passes when you are removing a lot of wood.

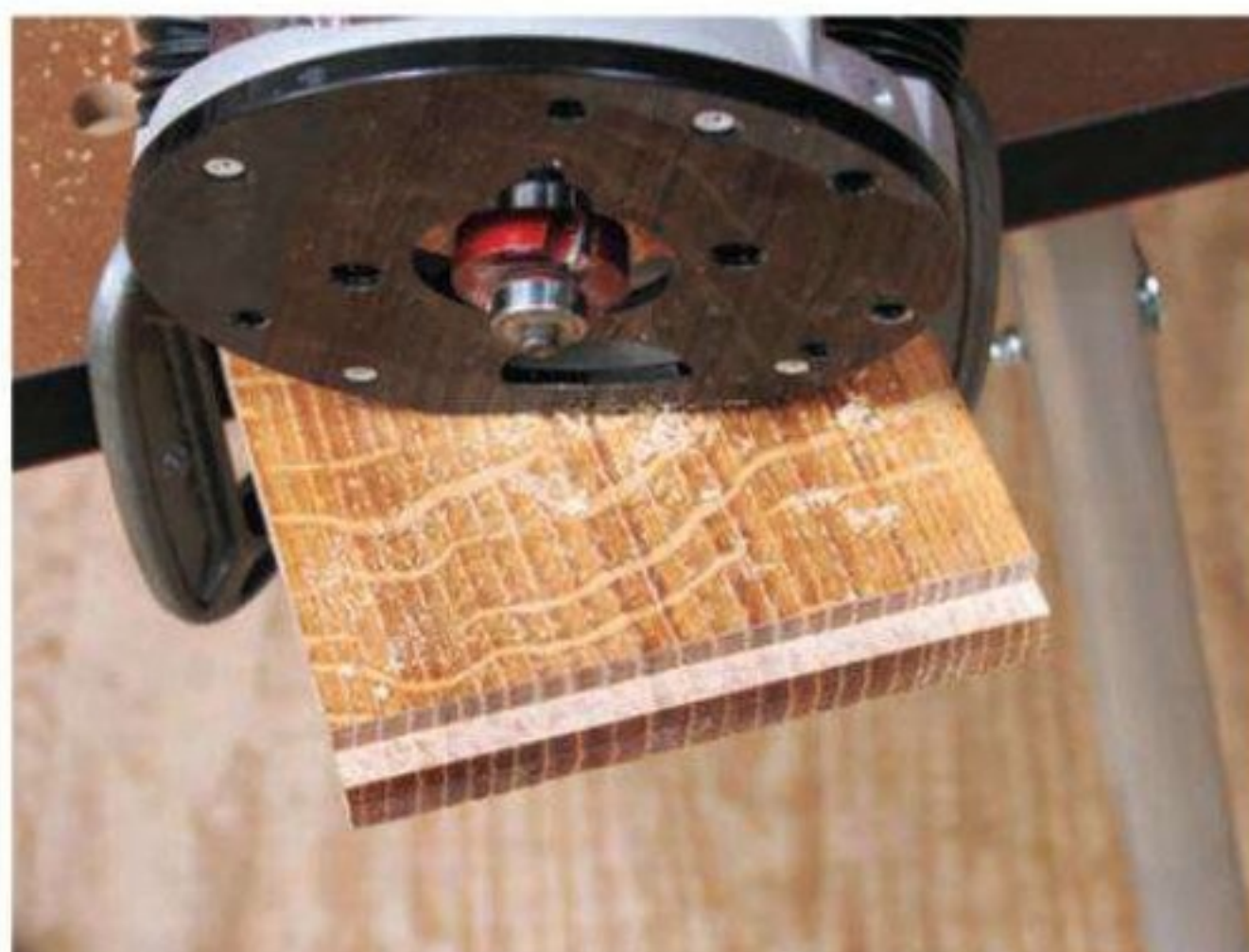
Tip 3: Sometimes a Climb Cut Can Work Wonders

If you are routing across just the end grain of a board, be careful of the exit corner. When the bit breaks through those weak fibers, it's a prime chance for tearout. One way to avoid the

problem is to start your routing pass at the exit corner and make a short climb cut to remove the corner material first (see bottom left photo). Ease the router gently into the wood and pull it slowly back toward you a half inch or so. *Always use extreme caution when attempting a climb cut.* Then, stop the tool and start the cut on the left end, routing across the end grain to meet your climb cut (see bottom right photo). Presto ... no tearout!

Tip 4: Crossgrain Calls for a Scrap Backup

Routing dadoses can result in a nasty blow-out where the bit exits the wood, especially if you



A short climb cut (left) removes the corner that will be prone to tearout when cutting across end grain. Follow it up with a normal left-to-right pass to complete the cut (right).



are hogging out a lot of material. Before you plow the dado, clamp a piece of scrap to the outboard edge first. Then, rout across your workpiece and slightly into the scrap — it will support the fragile edge grain resulting in a crisp, clean cut (see top photo).

Tip 5: Invest in Shear-cutting Bits

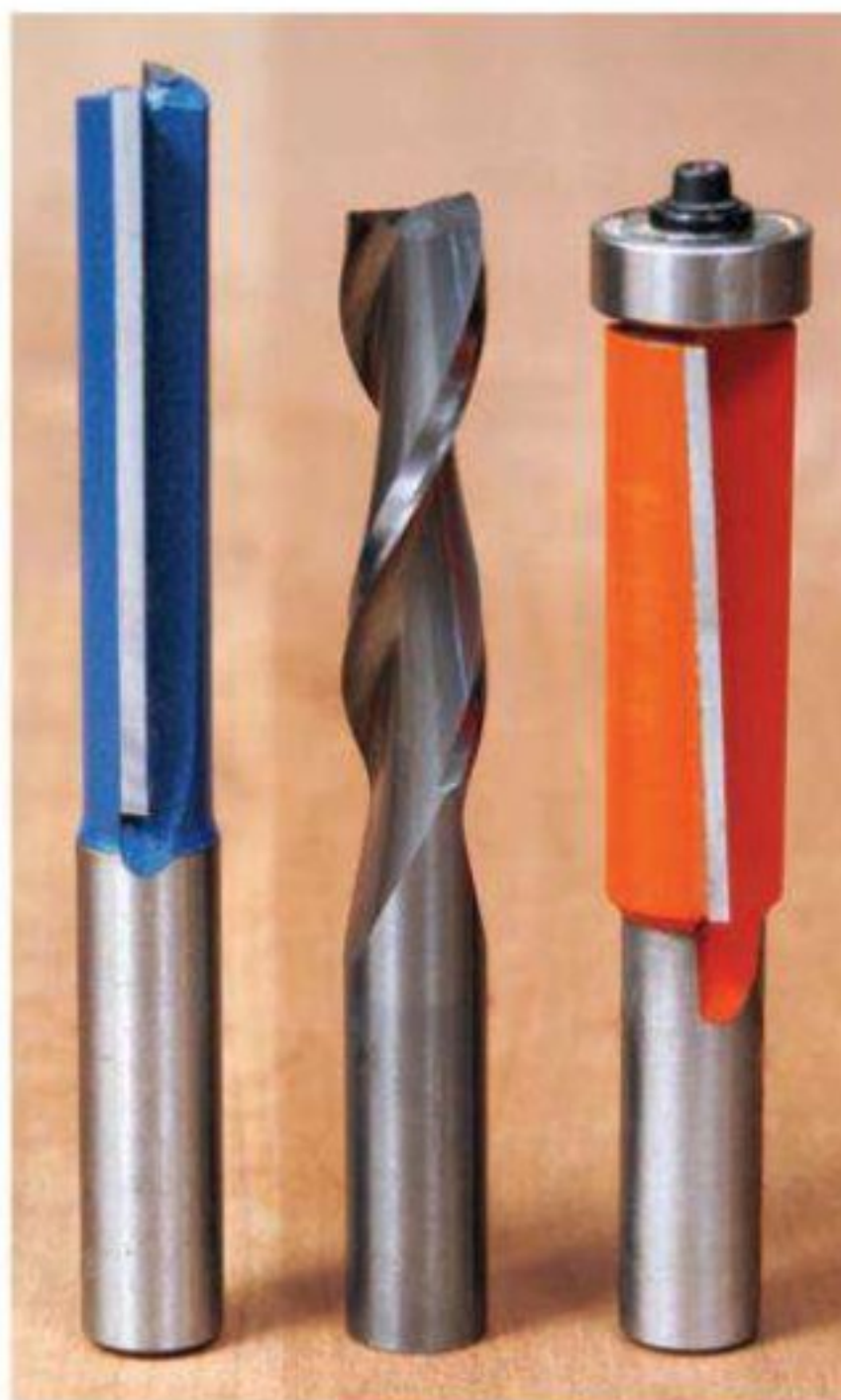
Ordinary straight bits (left in bottom photo) have cutters

aligned with the axis of the bit, and they chop wood like a chisel. That chopping action is fine for softer long-grain fibers, but it can tear out or crush bits of hard end grain and leave a ragged cut. A better option is to use spiral bits or straight bits with cutters set at an angle to the bit's axis. Either of these styles will produce a shearing cut, similar to a hand plane, to help you tame that difficult end grain more easily.

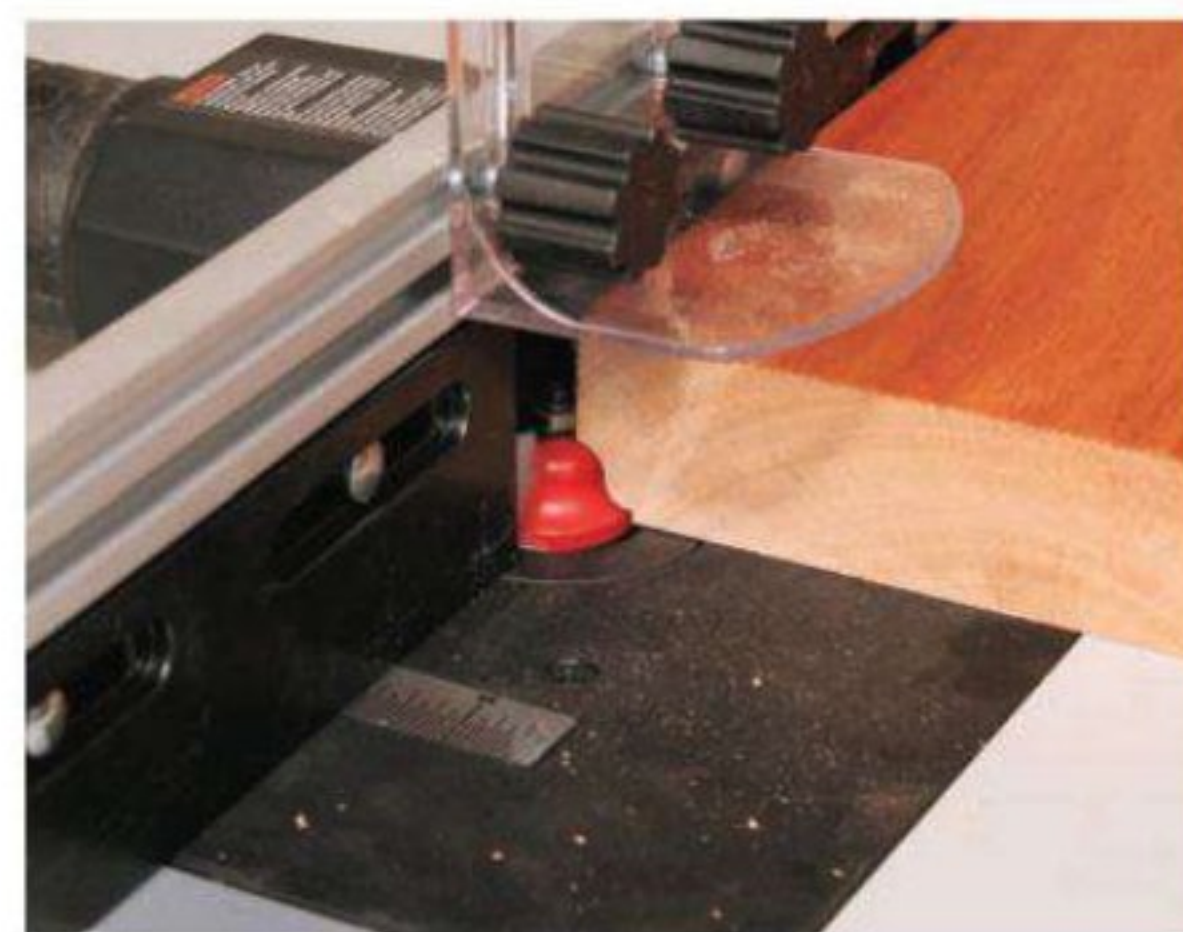
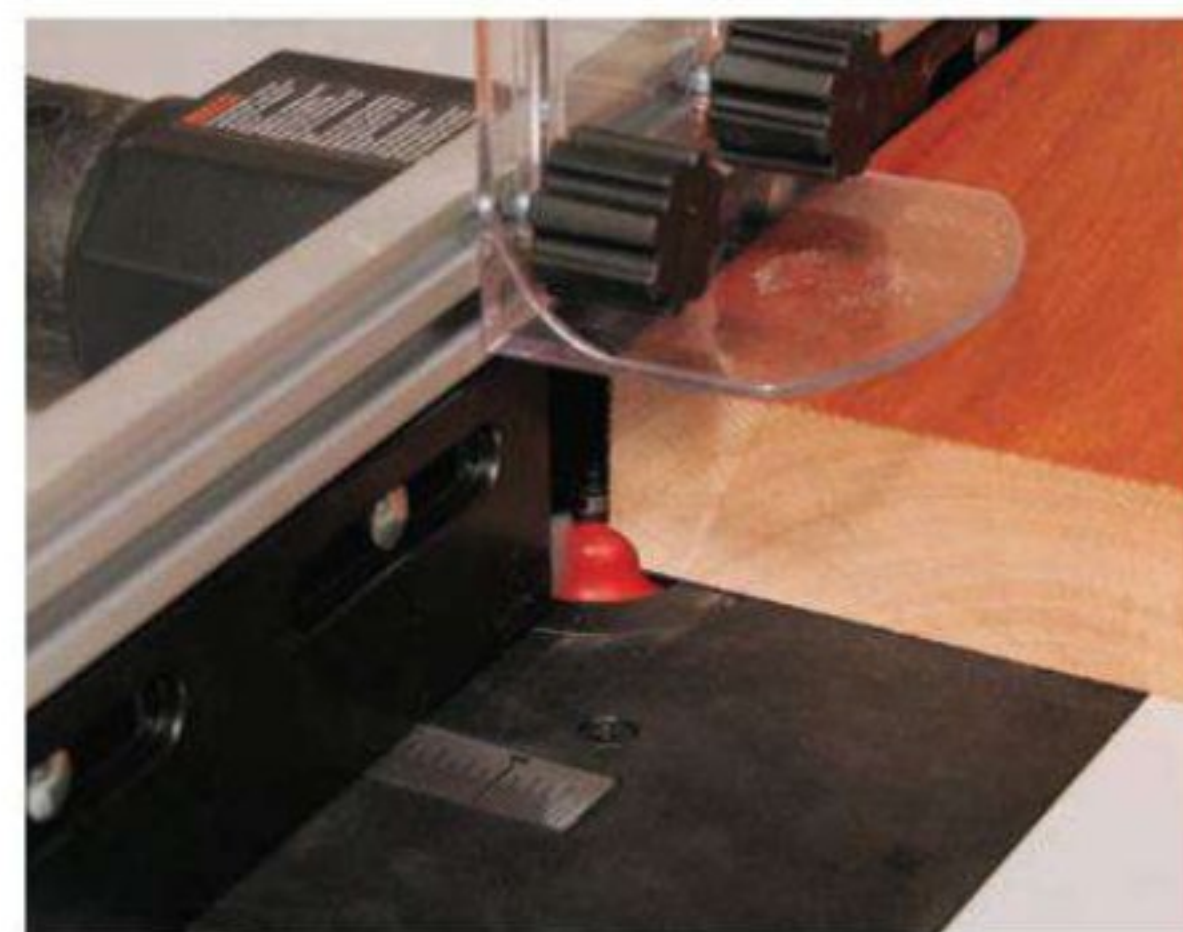
Tip 6: Take Smaller Bites on Big Profiles

Trying to remove too much stock in one pass is a recipe for torn grain and sloppy profile cuts. The best remedy is to rout big cuts in several passes of increasing depth. Set the bit low for the first pass (see right photo, top), then expose more of the cutters in the next pass or two until you reach the amount of profile you want (see right photo, bottom). Make the final pass whisker thin to shave away any minor burn marks or torn grain. Shallow passes also help your router's motor work a little easier, too.

Back up cross-grain dado cuts with a piece of scrap (light-colored wood in photo). Then rout the dado, feeding the router slightly into the scrap to finish the pass.



Spiral or shear-cutting bits (center and right) are better choices for end-grain jobs than conventional straight bits (left).



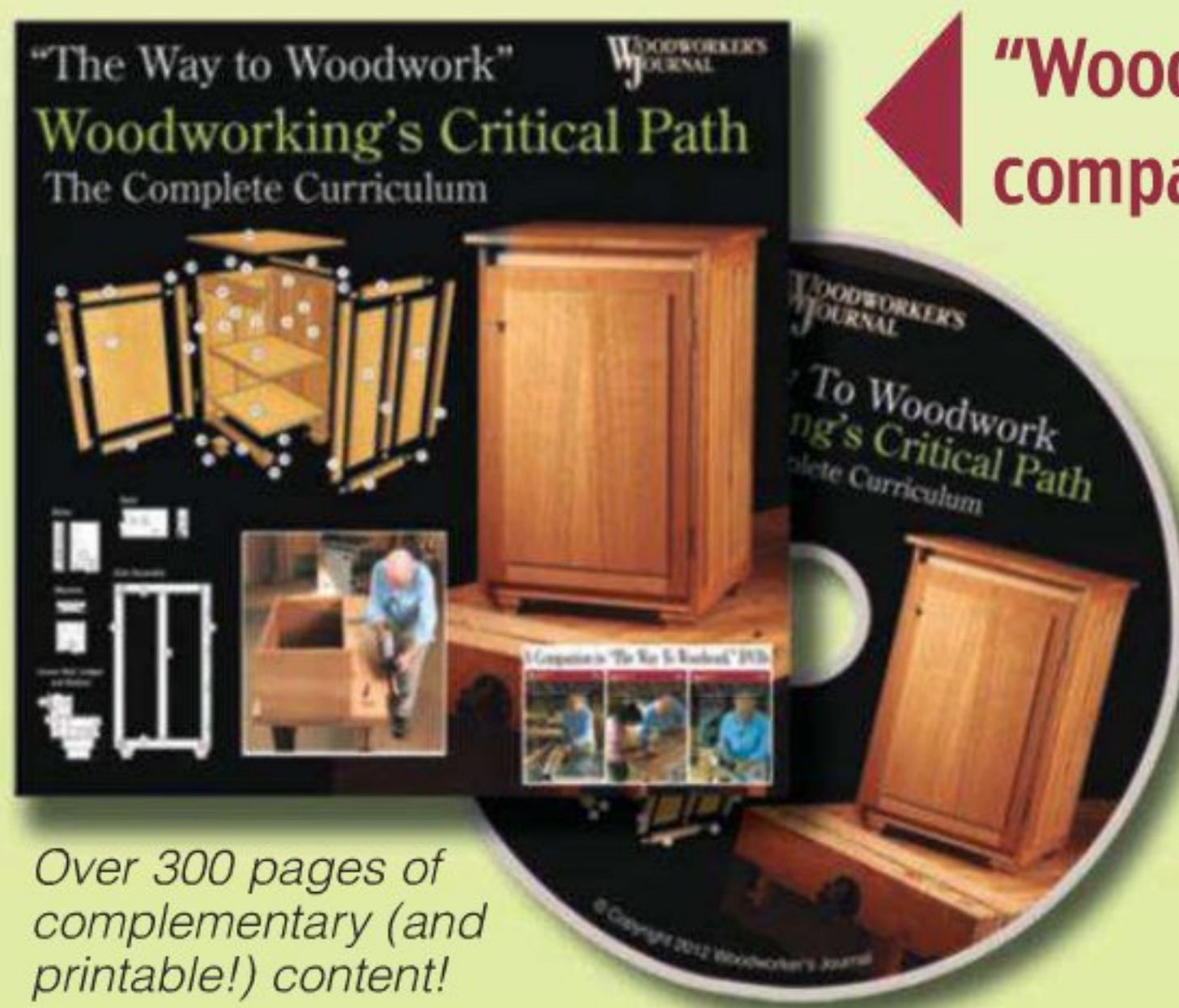
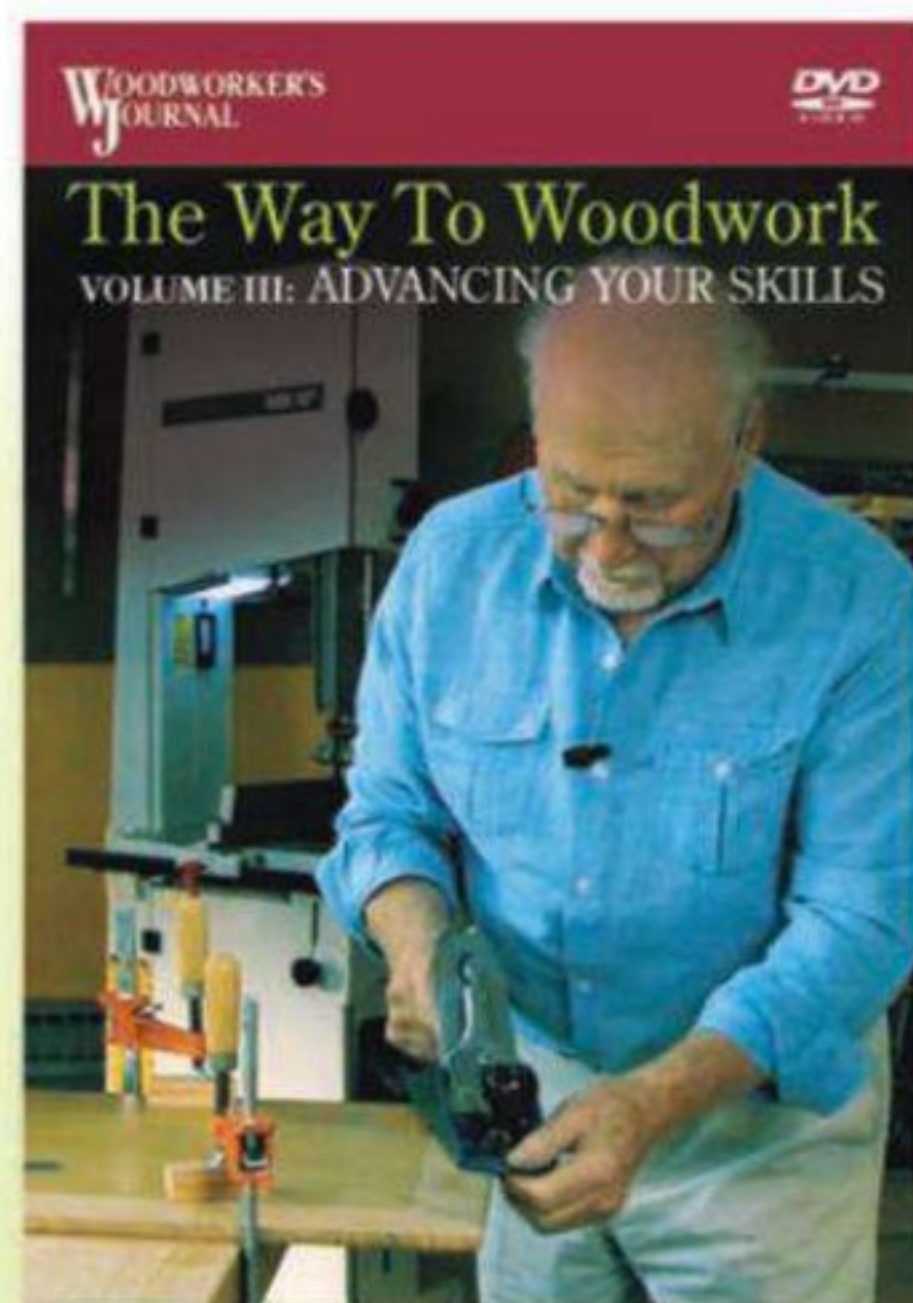
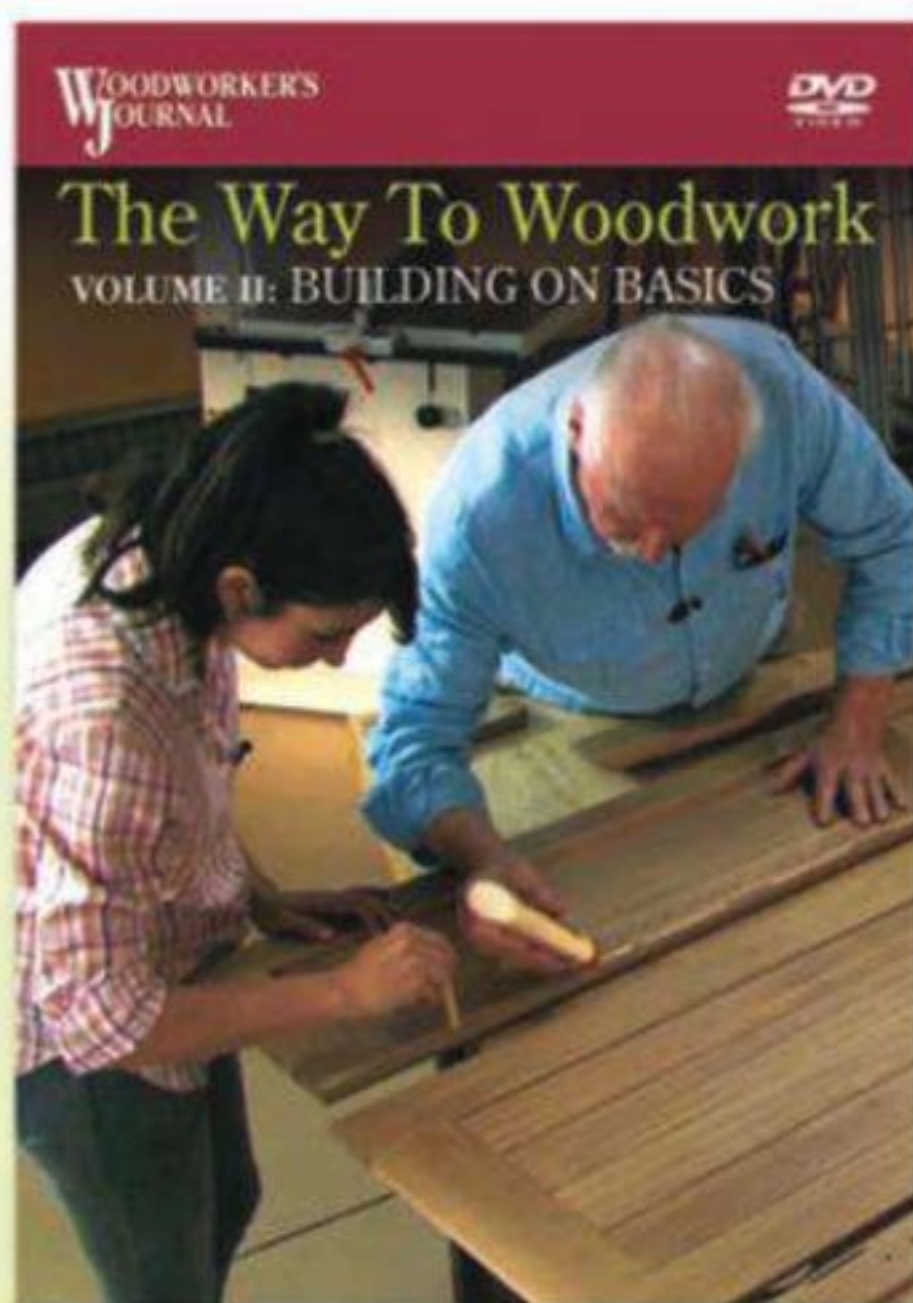
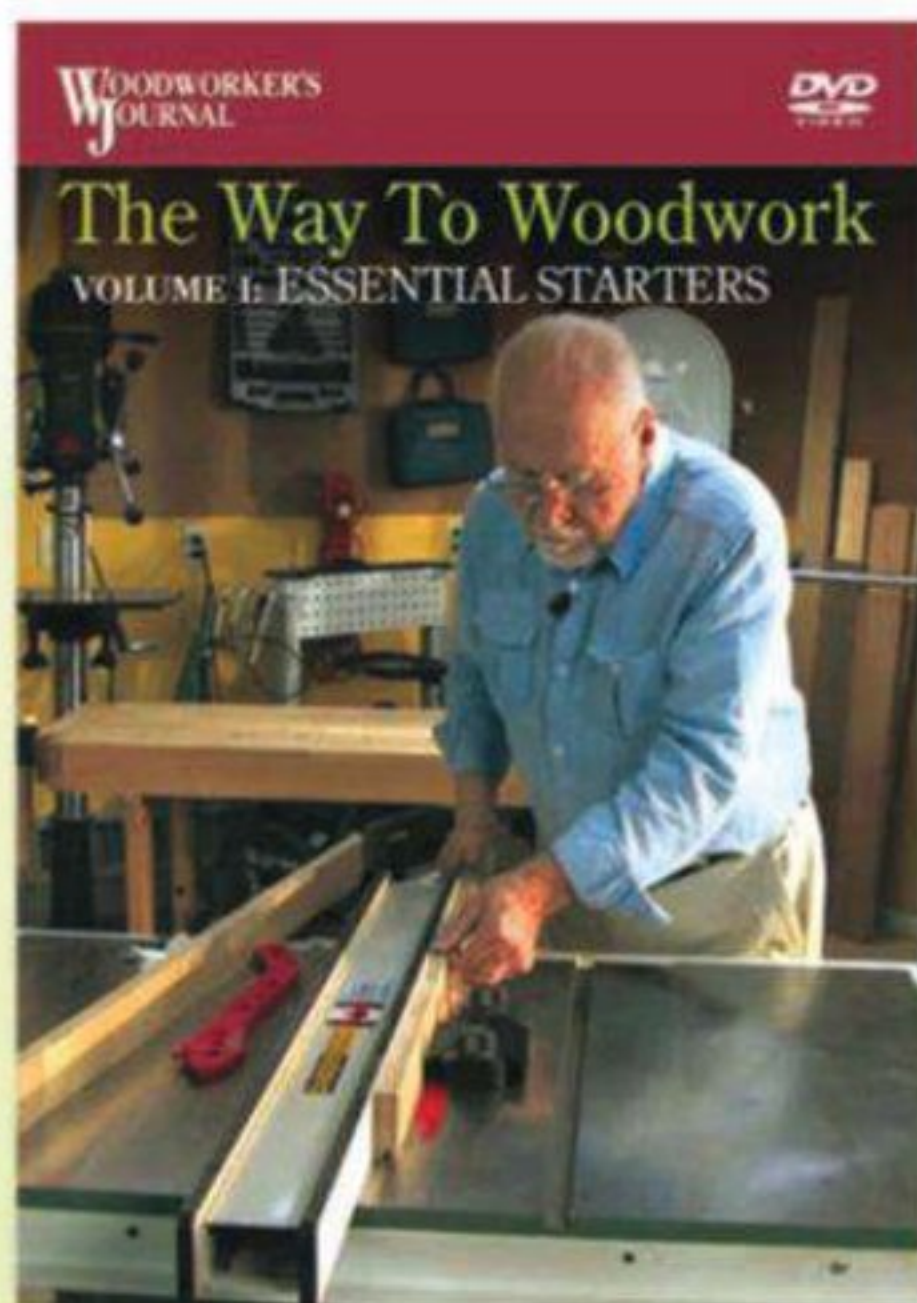
You'll eliminate burning and ragged surfaces on large profile cuts if you rout them in several lighter passes. Raise the bit more with each pass until you reach the profile you desire.

Chris Marshall is a senior editor of Woodworker's Journal.

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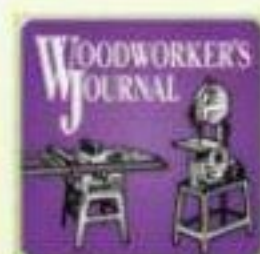
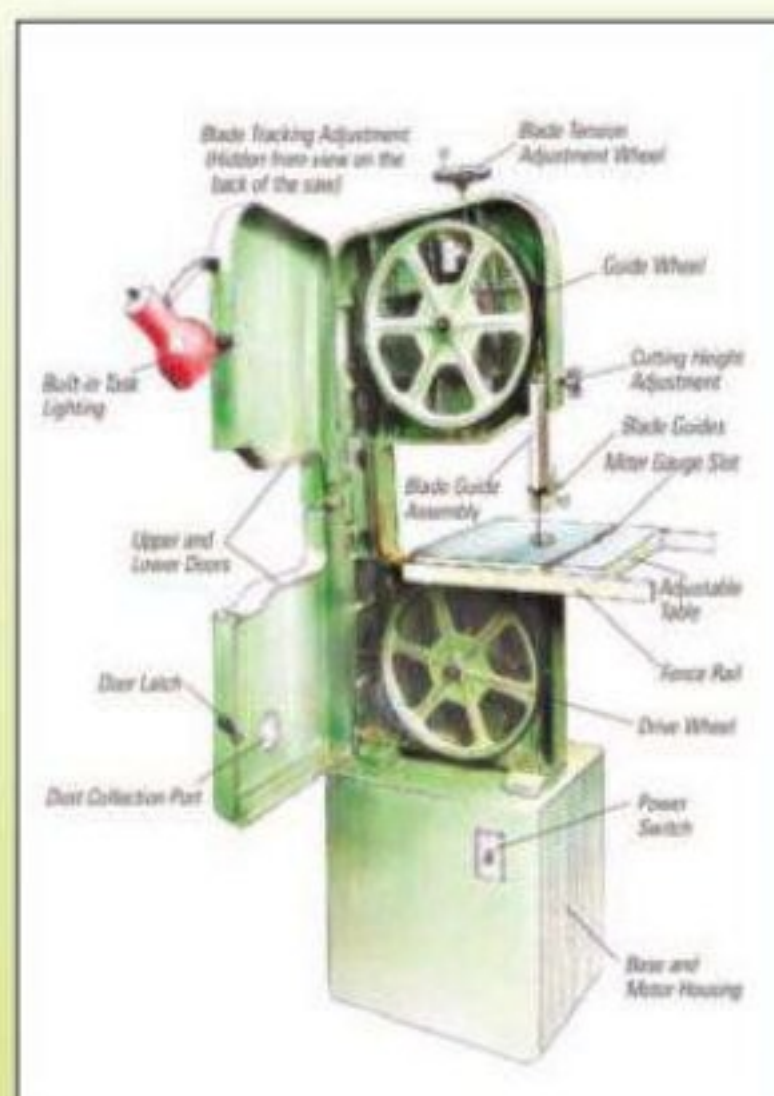
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Q&A and Readers' Tricks

Readers often write in with workshop questions, and our team of experts provide the answers. Here's a selection of shop-related questions from past issues. Home workshop tricks are never in short supply either! For a sampling, see [page 98](#).

[Questions & Answers](#)94-97

[Tricks of the Trade](#)98



Questions & Answers



Q The question I have concerns the issue of having my favorite expensive saw blade resharpened. What do I look for in a sharpening service so that I can be assured my blade will be sharpened to its original performance? Or, am I at the mercy of the skill of the sharpening service?

Martin Casey
North Wales, Pennsylvania

A According to John Ferrie, whose company, Ridge Carbide Tool Corp. of Lyndhurst, New Jersey, both manufactures saw

blades and resharpens them, you are at the mercy of the know-how and equipment of the sharpening service. He offers these tips for any woodworker with an expensive blade that needs to be resharpened.

- Look first for an industrial carbide grinding service. Don't entrust it to some grimy coot working in his basement or garage. And don't drop off the blade at the local hardware store, because it'll end up in the hands of that grimy coot.
- Ask what grit grinding wheel is used. The absolute minimum,

says Ferrie, is 600 grit, and anything higher (800 or 1,200) is even better.

- Ask if automatic grinding machinery is used. An up-to-date service will use a CNC grinder. The operator mounts the blade, programs the machine for the tooth geometry, and the \$90,000 machine grinds each tooth precisely and uniformly.

Depending upon where you live, you may need to ship your blade away to get a good sharpening job. But, most services make that pretty affordable.

— **Bill Hylton**



Q What respirator should the average woodworker wear in a small shop where there is no filtering of air?

Ralph Kallweit
Lansing, Michigan

A There are literally dozens of different dust-filtering respirators and masks specifically designed for protecting woodworkers from the fine dust created by most wood sanding and machining operations. Fortunately, the majority of masks are more than adequate for providing good respiratory protection for small-shop woodworkers. Inexpensive disposable dust masks made from cloth-like paper are soft and light in weight, which makes them comfortable to wear for long periods of time.

Make sure the mask you buy has two elastic straps; the single-strap “comfort” masks don’t have adequate filtering ability for woodshop work.

If eyeglass fogging is a problem, try a disposable mask with a built-in exhalation valve. Respirators with rubber masks and single or double replaceable filter cartridges are another possible choice. They’re heavier, more expensive, and the mask part should be cleaned after every use, but they feature an

exhaust valve that discourages eyeglass fogging and you can fit them with different types of filters: for wood dust, organic vapors and more. Note that neither disposables nor respirators do a particularly good job when worn by bearded users — they don’t form an adequate dust seal around the face. Instead, bearded woodworkers should use powered air-purifying respirators (commonly called “air helmets”), which cover the entire face and efficiently filter out wood dust.

— Sandor Nagyszalanczy

Q We recently retired to central Texas where it’s either hot and humid or cold and humid. A 12’ x 16’ shed could make a small workshop. I make small items, but need space for tool storage. I also need to store a walk-behind lawn mower, wheelbarrow and garden tools.

Aside from the space problem, I’m concerned about dust clogging an air conditioner filter or exploding from a gas or electric heater. Flammable fumes, too, are a concern. Maybe I want more than I can have, but if you can suggest ways to solve these problems, you’ll have my vote for president.

R. R. Ihrig
Whitney, Texas

A If nominated, I will not run; if elected, I will not serve ... but thanks for your vote of support! It sounds like you are willing to put some time and money into creating an efficient and functional shop space. And you are doing it in the right way by planning to avoid problems before you begin. My favorite book on this subject remains Scott Landis’s *The Workshop Book*, from Taunton Press.

To your questions about dust and flammable fumes, common sense is the key in dealing with both. Sufficient dust collection (both point source dust extraction and ambient air filtration) is a great investment. New options for both enter the market every day. In a small space, finishing with hazardous fumes can best be dealt with by avoiding them altogether. With the large selection of shellac and water-based finishes on the market, not to mention products like wipe-on polyurethane, I would be surprised if you would need to resort to spraying lacquer or its like. I would avoid a heating system that uses an open flame, but I am aware of hundreds of shops that use woodburning stoves to heat them. I wouldn’t ... and, in fact, when I run for office, that will be part of my policy statement: I’m strongly against open flames in the workshop.

— Rob Johnstone

Questions & Answers *(continued...)*

Q My shop is located in the basement of our home, so you can imagine the noise level in the upper areas when the machinery is running. What suggestions can you recommend that will help with the noise?

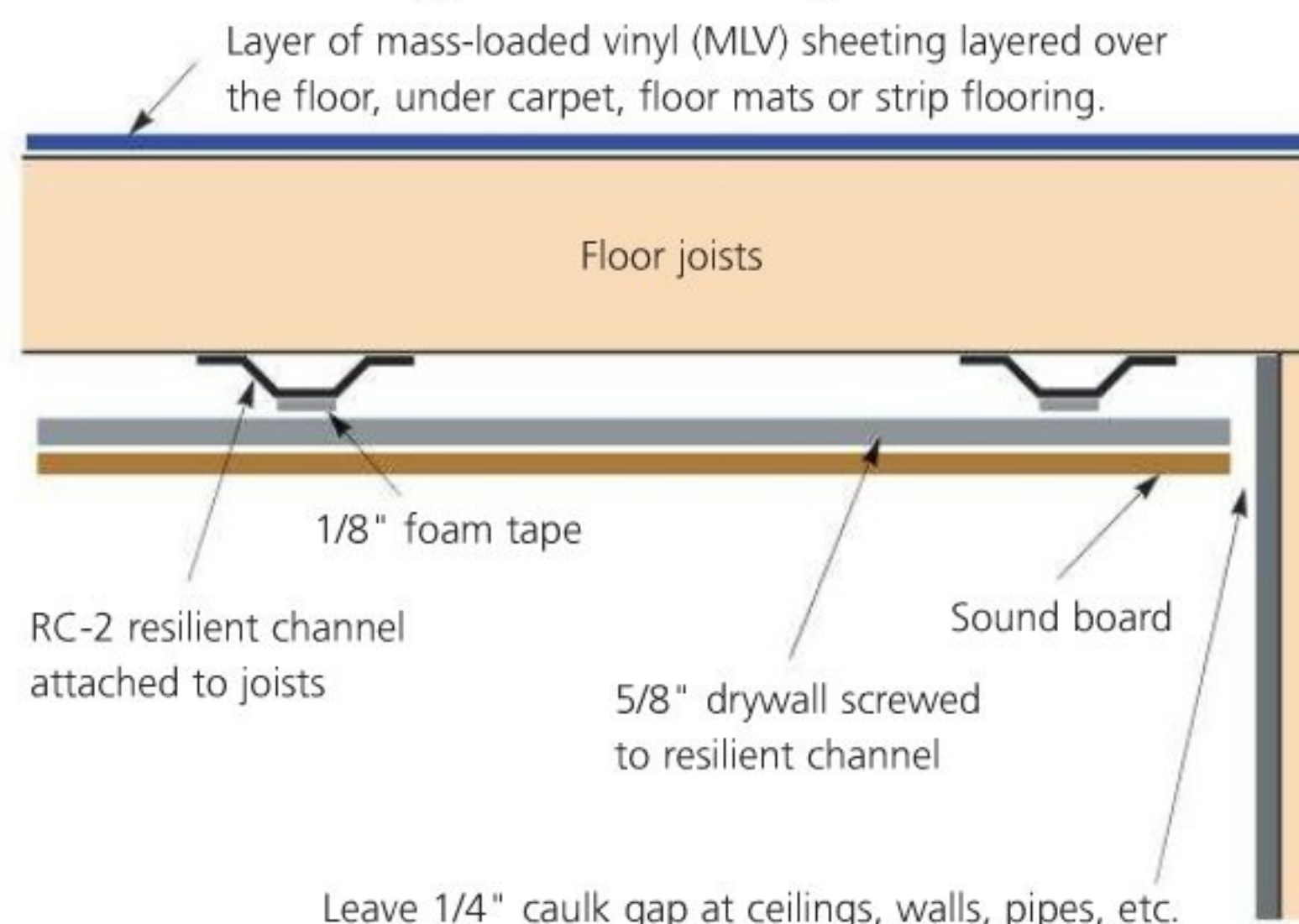
Robert Davis

Somerville, New Jersey

A The best way to decrease your basement shop's din is to reduce the vibration coming up through the floor by isolating the shop ceiling from the floor joists. Start by stapling bats of fiberglass (or cotton fiber) insulation between the joists. Now nail or screw strips of RC-2 resilient channel (available from your local acoustical supply, or from www.soundproofing.org) at 2' intervals, at a right angle to the joists. Stick a layer of 1/8" foam tape to the face of each channel strip and attach a layer of 5/8" drywall to the channels, using screws to hold it in place. Avoid driving screws directly over where the channel is attached to the joists. Use flexible caulk and tape to seal the seams between drywall sheets. Leave a 1/4" gap between the drywall ceiling and the walls, and fill that gap with flexible caulk. Screw a layer of sound board (e.g. Celotex, Homasote) atop the drywall (avoid screwing directly into channels), staggering the seams and taping and caulking them between adjacent sheets. For even greater sound attenuation, install a layer of MLV (mass-loaded vinyl; available at the URL above) sheeting on the floor above the basement.

— Sandor Nagyszalanczy

Reducing Basement Shop Noise



Q How long can you keep woodworking glue (the white and yellow varieties) around your shop before they go bad? I have not found any "best if used by" dates as I would if the glue was a food product. Are there any tests or guidelines I can follow?

Liam Moriarty

Harrisburg, Pennsylvania

A Most companies put an "official" shelf life on their products to limit liability in case poor storage conditions cause product failure. The official shelf life of wood glue typically is between one and two years. However, if kept in good storage conditions, such as a basement offers, white and yellow glues can last up to 10 or more years. Increased chemical reactions between glue particles can decrease the expected shelf life of water-resistant or fast-grab adhesives.

The worst storage conditions allow freezing, then thawing and heat. Most wood glues are designed to withstand a minimum of five freeze/thaw cycles. With each cycle, the glue forms gels. Mixing easily breaks up these gels, but each

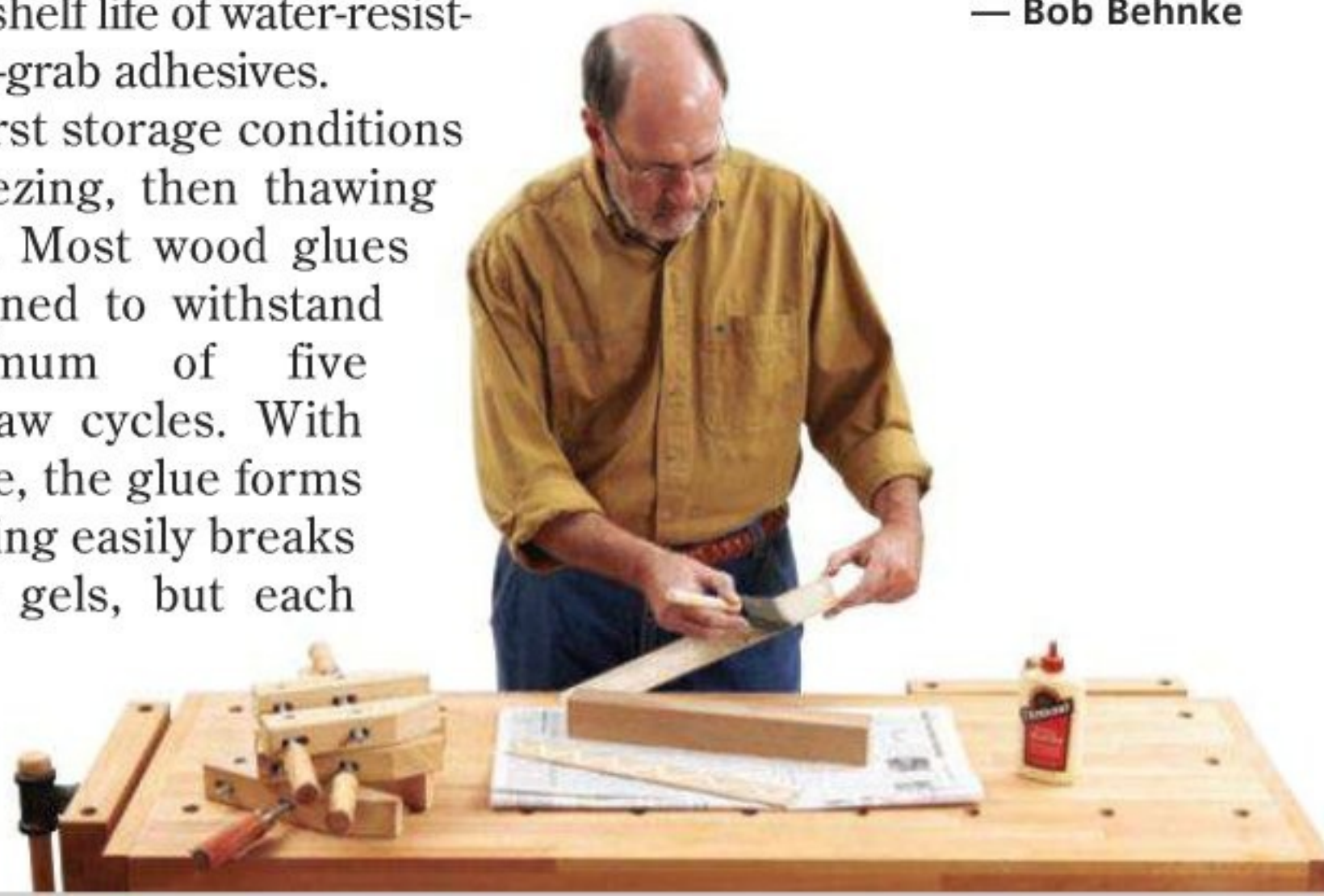
subsequent freeze/thaw incident will make the gels more difficult to disperse. Eventually, the gels won't break up, and the glue will remain solid. Heat also can cause the polymer to clump and gel.

Here is a rule of thumb for testing wood glue to see if it is still good. It's a good sign when the glue comes out of the bottle. Then, the glue must wet out the joint smoothly. It shouldn't look pasty, stringy or want to stick to itself better than to the wood substrate. If it does, it is time for a new bottle of glue. Otherwise, the glue should bond as well as the day it was produced.

If the adhesive passes the test but is a bit thick, add about five percent water.

In short, there isn't a "best if used by" date; it's just best to store the glue correctly.

— Bob Behnke



Q How do you clean your dust collector bag? I have tried blowing it with high pressure air, have turned it inside out and used the shop vac, and beat it with a long screwdriver handle. The shop vac seems to do the best job. I do this outside since my dust collector is in a covered area outside.

Ken E. Smith
Chico, California

A When a dust collector filter bag is brand-new, its efficiency actually increases as it traps some amount of fine dust in the filter media. In the industry, we call this a “healthy cake.” Washing or vacuuming out a filter bag removes the healthy cake and retrogrades it back to a stage of cleanliness before it was the best filter it could be. In my shop, here’s how I clean my filter bags: I leave them on the machine, shake them vigorously (while wearing a particulate mask) and then empty the bottom collection bag as usual. I don’t feel that there’s a positive benefit, from a filtration standpoint, of cleaning the bag any more thoroughly than that.

— **Barry Schwaiger**

Q I am in the process of remodeling my garage to make it more woodworking friendly. Someone suggested that I should have a first-aid kit in the shop.



Left: Vigorously shaking out a dust collector bag might, our expert warns, eliminate its “healthy cake.” It’s best to gently empty and shake the bag into a trash bag (right) and call it a day.



My question is: Rather than just put in a regular first-aid kit, which is normally packed tight with a bit of everything, what do you recommend I keep in it, other than Band-Aids® and tweezers? I want to have the really important items on hand if I need them.

Jeff Price
Lexington, Kentucky

A A well-stocked woodshop first-aid kit should have all the things you’d have in a regular household kit, including an assortment of Band-Aids; some antiseptic wipes and a tube of disinfectant ointment such as Mycitracin, for everyday small cuts, scrapes and light burns; a roll of sterile gauze; scissors and a few large

triangular bandages or 4" x 4" gauze pads for larger wounds; a good pair of fine tweezers for removing splinters; and an up-to-date emergency first-aid guide. Additionally, woodshop kits should contain: An eye cup, a small mirror and some boric acid solution, to help flush sawdust particles from the eyes; butterfly bandages, to close large lacerations; a clean plastic bag, to keep (God forbid) amputated fingers clean on the way to the ER; and an instant cold compress, to reduce swelling due to injuries (and to chill amputated parts). Also, don’t forget to include medications you might need in a hurry (nitroglycerine tablets, asthma inhaler, etc.), stored in well-labeled containers. Finally, make sure to post your doctor’s phone number as well as the number of your local hospital or ER next to your phone, just in case.

— **Sandor Nagyszalanczy**

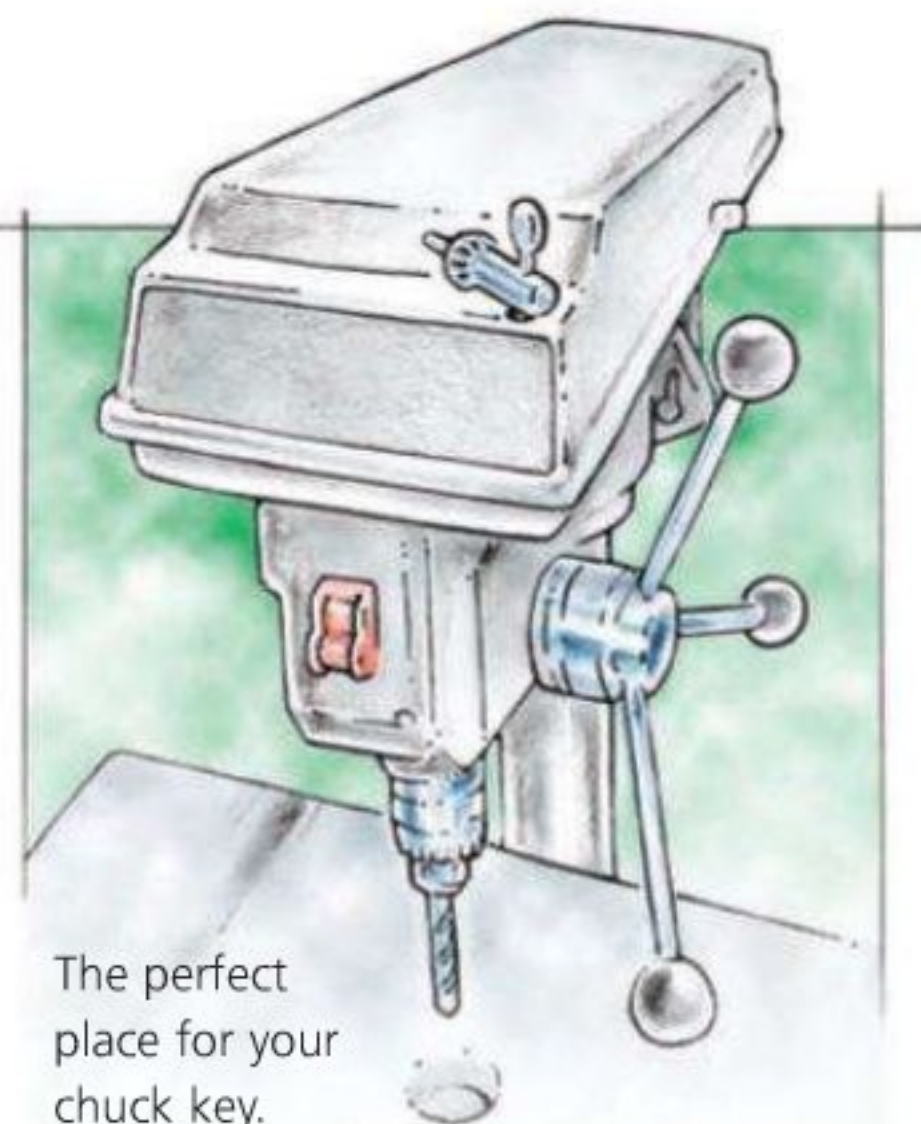


Tricks of the Trade

THERE'S NEVER A SHORTAGE OF CLEVER SHOP TRICKS SHARED BY JOURNAL READERS. GIVE THESE A TRY IN YOUR SHOP.

Simple Chuck Key Storage

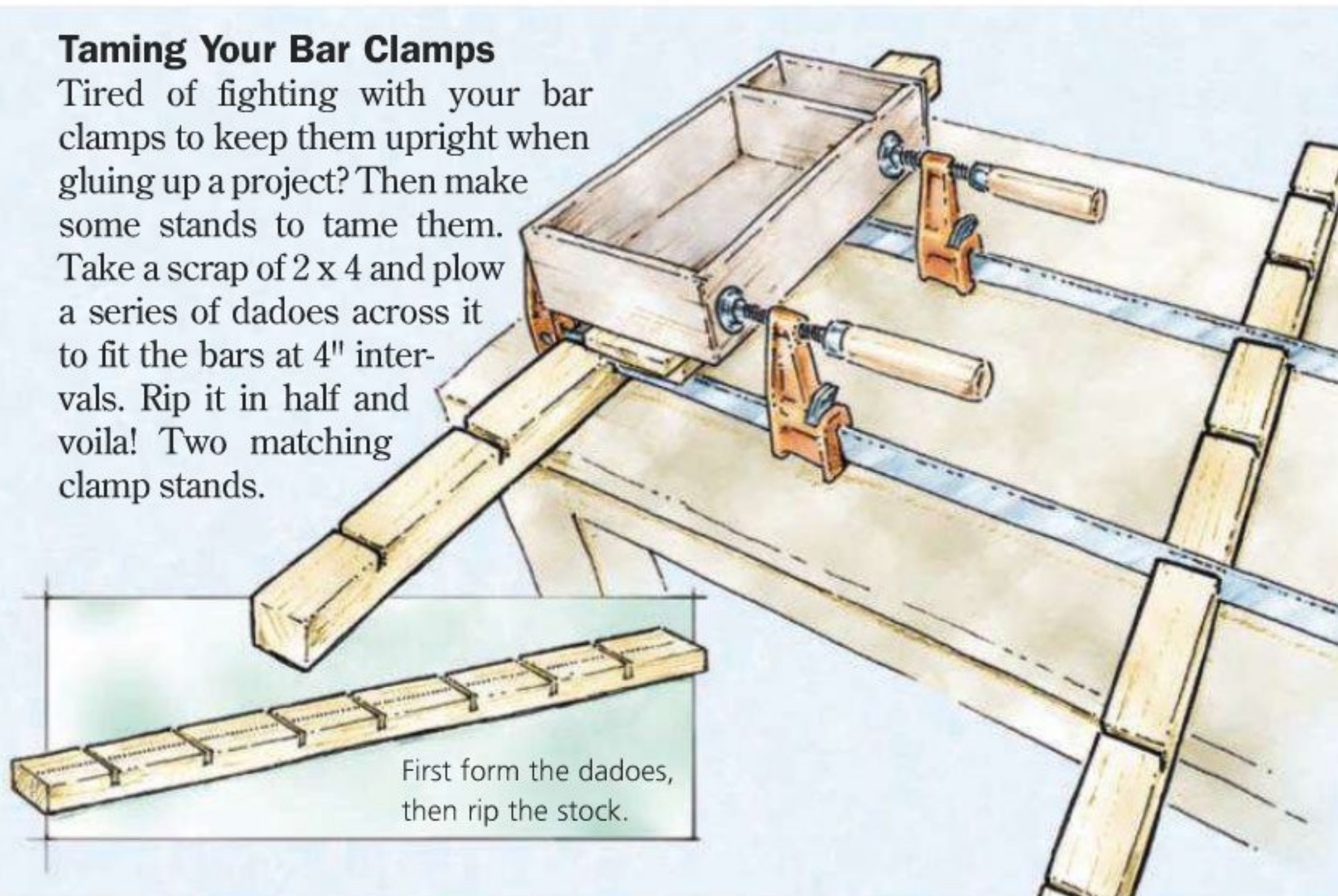
The most convenient place to store your drill press chuck key may be right in front of your nose. Just drill a hole through the top of your drill press pulley case cover near the front for storing the key. Make the hole the same size as the key's crossbar so it fits securely. Be sure to locate the hole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



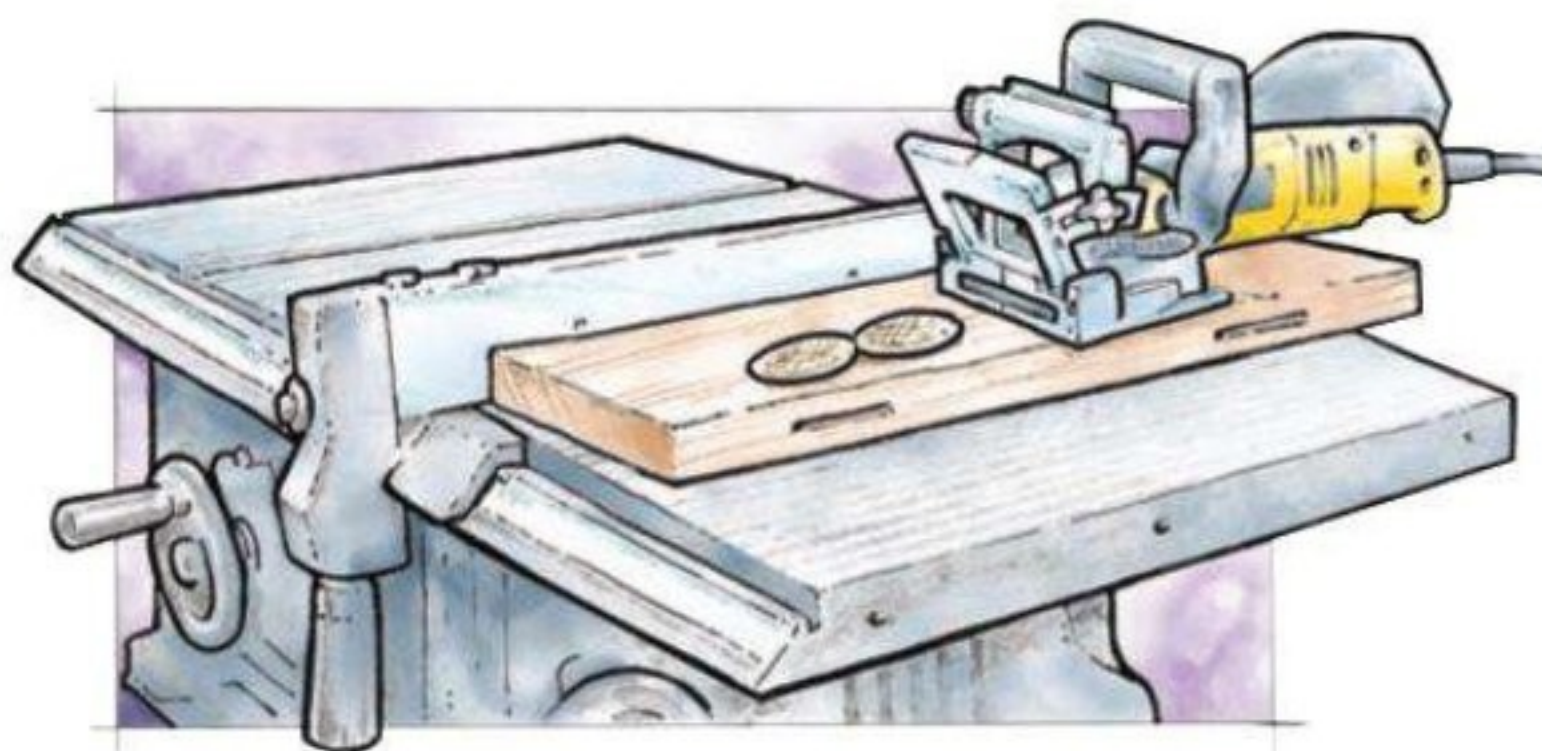
The perfect place for your chuck key.

Taming Your Bar Clamps

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



First form the dadoes, then rip the stock.

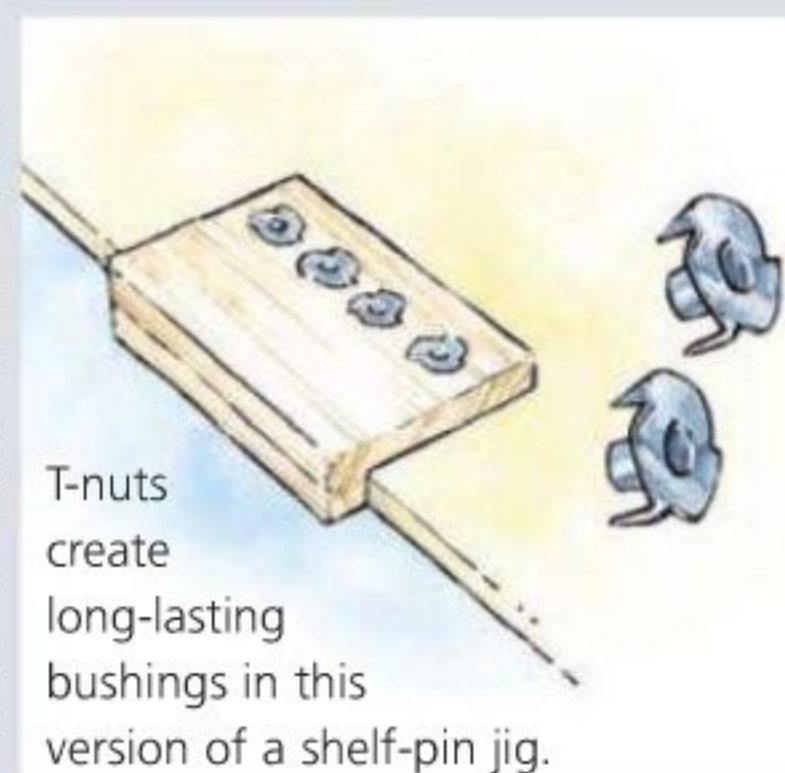


More Biscuits with that Rip Fence?

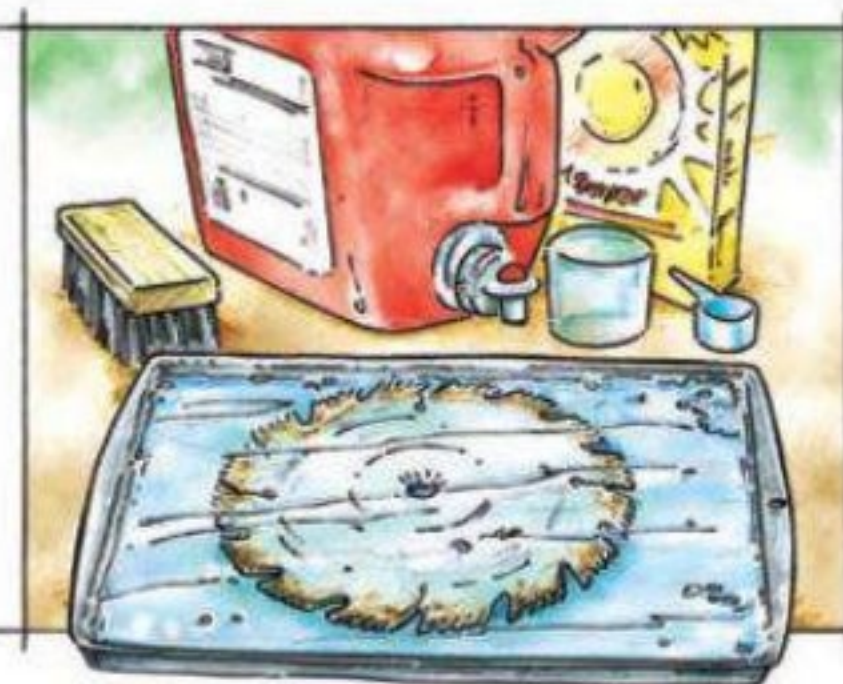
If your workbench doesn't have bench dogs, a table saw makes a great workstation for supporting workpieces when biscuit joining. The top provides a flat surface for the joiner base. Use the locked rip fence as a backboard behind the workpiece. It's sturdy and always at the ready!

T-nut Shelf-Pin Jig

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



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



Laundry Room Blade Cleaner

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

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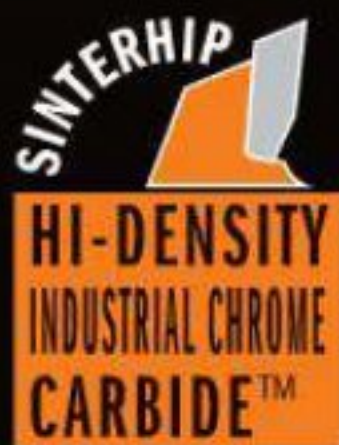
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