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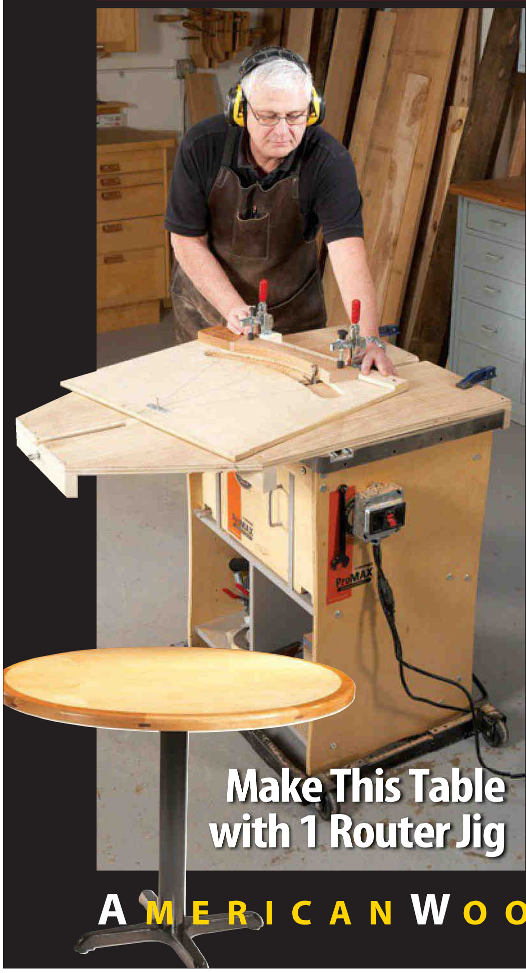
#165, APRIL/MAY 2013

3 Skills, 1 Project

1 Craft Side-Hung Drawers

2 Cut Small Box Joints

3 Saw with Precision



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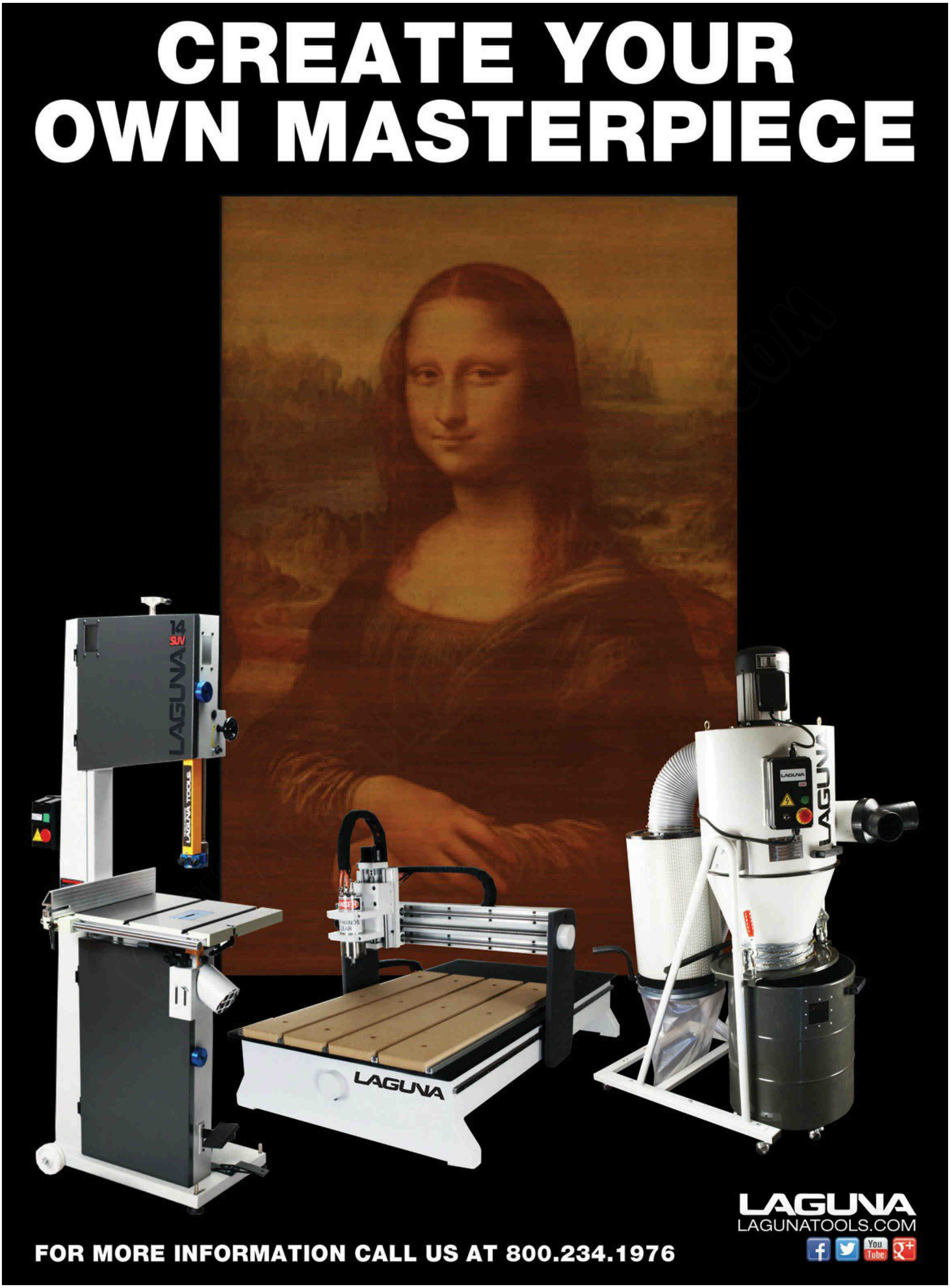
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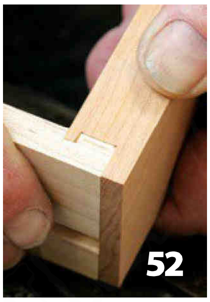
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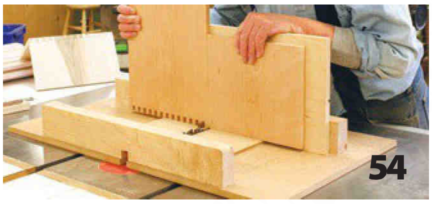
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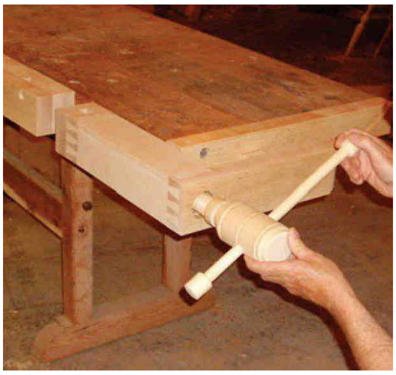
More On the Web at AmericanWoodworker.com

Circle-Cutting Jig

Get plans for one that adjusts from 1-1/2" to 48" dia. at **AmericanWoodworker.com/WebExtras**

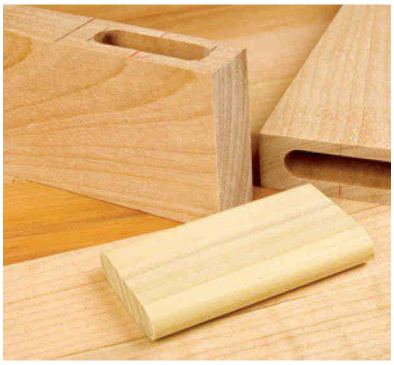
Easy Drawer Boxes

See how a pro bangs them out at **AmericanWoodworker.com/WebExtras**



Wooden Tail Vise

Learn how to build one at **AmericanWoodworker.com/WebExtras**



Loose-Tenon Joinery

We've got plans for an adjustable router jig at **AmericanWoodworker.com/WebExtras**

Tablesaw Drawer Joints

See additional tips for each step (p. 52) at **AmericanWoodworker.com/WebExtras**

Build A Crosscut Sled

Most are complicated. This one is simple! **AmericanWoodworker.com/WebExtras**

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Terrific Tip!

Saddle-Style Push Stick

ANY PUSH STICK adds a measure of safety, but I prefer using one that straddles the saw's fence. It lifts right off when I'm done.

A saddle-style push stick has two clear advantages. First, there's no chance of tipping it into the saw blade. Second, it keeps your fingers far, far away from the blade.

The right-hand side and top of my push stick are made from hardwood. I attached a handle shaped like a hand plane's tote to the top board.

The foot—the part that does the pushing—is 3/4" MDF, which is cheap to replace when I make narrow cuts and slice into it too many times. The foot has a hook on it to engage the board's end and is adjustable, up and down. Set to the thickness of the board, it acts as a hold-down, too.

Serge Duclos

Bench Stop for Thin Stock

COURTESY OF CONTRIBUTOR

I USE A HAND PLANE to remove milling marks, even on pieces that are 1/8" thick or less. To hold the work, I made a stop whose top is only 1/32" thick.

When I'm planing wood that's more than 3/8" thick, I use the normal method of clamping the board between two dogs. This is problematic with a thinner piece, because the wood might bend. I butt it up to this single stop, instead.

My stop is made from a 3/4" dowel and part of a discarded plastic credit card. I used Super Glue and a brass tack to secure the card to the dowel. I also drilled 3/4" holes in a couple more cards. If I want the head of the stop to be thicker, I slide the cards onto the dowel under the attached card.

Charles Mak

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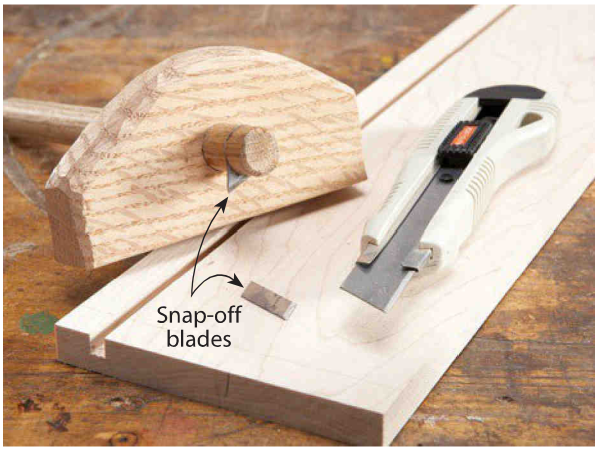
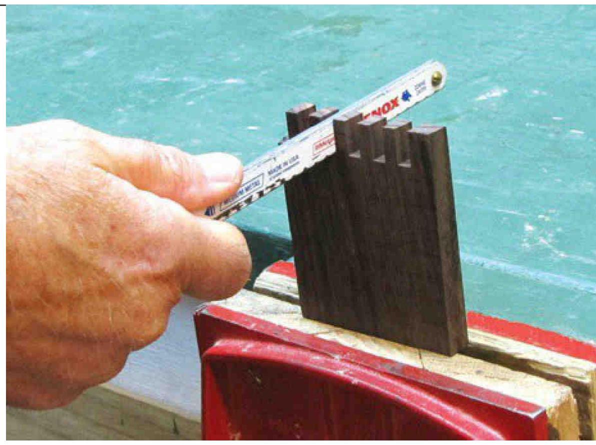


Marking Gauge Refills

THE BLADE of a marking gauge must be as sharp as a scalpel in order to cut a fine line across the grain. Sharpening it can be very difficult, because it's so small. I solved that problem by making a gauge that accepts snap-off utility knife blades.

I use epoxy to glue the blade into a kerf sawed into the gauge's beam, which is just a dowel. When the blade gets dull, I cut off the end of the dowel (blade included), snap off a new blade and glue it into a new kerf.

Alejandro Balbis



COURTESY OF CONTRIBUTOR

Adjustable-Width File

HACKSAW BLADES ganged together make a really useful file, one that can be as wide or narrow as you wish.

The blades may be full-length or half-length. (Use a rotary tool to cut them in half.) To bind the blades together, put a #6 machine screw through their mounting holes and add a nut. This file has the additional advantage of having smooth faces, unlike a regular file, so you don't run the risk of cutting wood alongside the file.

I made my hacksaw-blade file when I got into a jam. I'd cut some box joints and put away the jig, only to find that a few of the notches weren't deep enough. Eight half-length pieces cut from old blades saved my toast, and justified my having kept those things for so long!

Bill Wells

Cam-Style Bench Feet

A MOBILE WORKBENCH is handy in a small shop—until you want it to stand still! After outfitting my bench with casters, I found that their locks didn't prevent the bench from wiggling.

My solution is to add levers to each leg. They work like a cam. With the lever in the horizontal position, the bench rests on the casters. In the vertical position, the casters are raised off the floor about 1/4", so the bench stays put, sitting on wide, flat feet.

Each cam is made from two pieces of 3/4" plywood—the second piece is a spacer behind the lever for hand clearance. Cut the spacer's shape to match the cam's foot, to give the foot a larger area of contact with the floor. Attach each assembly with a bolt and lock nut.

Mark Thiel

COURTESY OF CONTRIBUTOR

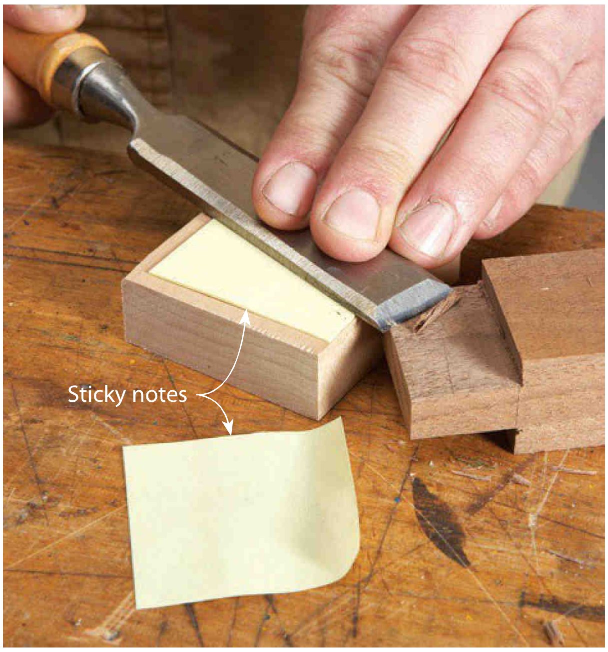
Paring with Sticky Notes

SAWING TENONS BY HAND is tricky business requiring good eyes, a steady hand and lots of practice. Even so, the tenon's cheeks are usually uneven after sawing and need to be trued. I've often used a rabbet plane to do this, but things can go bad in a hurry. You can easily end up with a cheek that's flat, but not in the same plane as the face of the rail.

I've switched to paring the cheek with a chisel, using a guide block. Here's how it works. When you saw a tenon, stay just outside of the layout lines. Clamp the workpiece to your bench.

Make a block that's the same thickness as the distance from your benchtop to the top layout line. Put layers of sticky notes on the block and start paring, making skewed cuts. When the cheek is flat, remove one sticky note and pare again. The purpose of the sticky notes is to control the thickness of the shavings—the thinner the shaving, the more accurate your paring will be.

Once you've peeled off all the sticky notes, you should be down to the layout line. Flip the stock over and pare the other cheek. If the tenon is offset from the stock's center, use a block of a different thickness.



Brad Holden

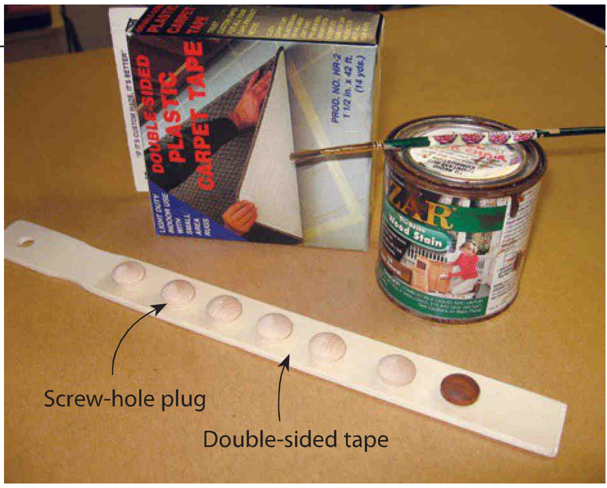
COURTESY OF CONTRIBUTOR

Improvised Offset Driver

ASSEMBLING FURNITURE with dozens of Allen-head fasteners is no fun if all you have is a standard Allen wrench. Faced with one of these jobs, I sped up the process by using a mechanic's socket set. I cut a section off the end of the Allen wrench with a grinding wheel and inserted the piece into a socket of the same size.

For some projects, chucking up that piece in a cordless drill would be even better. But this one had a lot of tight spaces, so a low-profile, ratcheting driver worked best.

Richard Helgeson



COURTESY OF CONTRIBUTOR

Finishing Stick

FINISHING THE PLUGS for covering screw holes is a pain. When you run a brush or rag over them after they're installed, they often cause the finish to run or drip. Finishing them *before* they're installed is the answer, but these little plugs are hard to hold.

Here's my solution. Cover one side of a paint-stirring stick with double-sided tape. Stick the plugs on the tape and use a small brush to apply the stain or finish. When the plugs are dry, pluck them off the stick and glue them in the holes.

John Cusimano

New-Generation Shop Light

A PORTABLE LIGHT sure comes in handy when you're sawing dovetails, brushing a finish or doing any type of close-up work. I'll bet you've used portable incandescent or halogen lights at some time in your shop, but here's something even better: an LED light. The Festool SysLite has six LED bulbs and gives you bright, white light—comparable to daylight—right where you need it. And like all LED lights, it doesn't get hot!

The SysLite is rugged and compact—it fits in the palm of your hand. It disperses light over a 170° arc and has a high and a low setting. The LED bulbs are super-efficient, virtually indestructible and probably won't need to be replaced in your lifetime.

The SysLite is powered by an internal lithium-ion battery. It gives you about 1-1/2 hours of light on the high setting and up to 4 hours on the low setting. For continuous use or to recharge the battery, you plug the SysLite into a wall socket. For longer cordless use, you can attach any Festool battery pack. On the go? Use the included car charger.

The SysLite has several positioning and mounting options. Lay it on one side, and the light shines across your bench; lay it on the other side, and the light is directed at an upward angle. You can also hang the SysLite from its swiveling hook or mount it on a tripod, like a camera.

This has got to be the best worklight I've ever used. It's pricey, all right, but I'll never pay for more bulbs or worry about a light giving me a third-degree burn!

SOURCE

Festool, festoolusa.com, 888-337-8600, SysLite High-Intensity LED Work Lamp, #498568, $175.

Gorilla Glue, Travel Size

A LITTLE BIT of Gorilla Glue will do just fine, thank you, for lots of jobs. It now comes in small Single Use Tubes, four to a pack. Usually, small tubes of anything cost more per ounce, but these can end up saving you a lot of money. Have you ever thrown away an opened bottle of Gorilla Glue because it hardened? That's what I'm talking about.

Each Single Use Tube contains 3 grams (.11 oz.) of glue, which is still more than you may need for a simple repair. So will the remainder harden in the tube? Yes, it will. Once any polyurethane glue is exposed to air, it's doomed. But I checked a half-empty tube 10 days after opening it, and the glue was still good. Good thing I didn't throw it away!

SOURCE

Gorilla Glue, gorillatough.com, 800-966-3458, Single Use Tubes, 4-pack, #50005, $5.

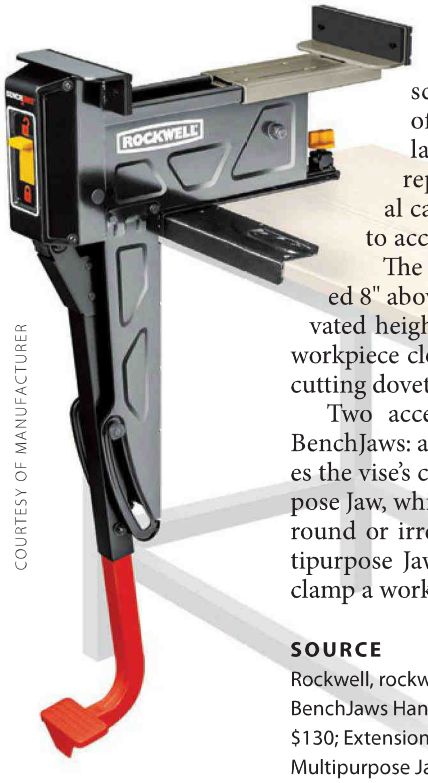
EDITOR: TOM CASPAR | PHOTOGRAPHY: JASON ZENTNER UNLESS NOTED

Foot-Operated Vise

HAVE YOU EVER needed three hands to clamp something in a vise? The new BenchJaws from Rockwell might be the answer: It's a machinist's-style vise with a foot pedal. Lightly stepping on the pedal puts enormous pressure on any object up to 16" wide. Your hands are free to keep a grip on the piece while you tighten the vise.

It took me a few tries to figure out how the vise works, but it made sense once I realized that the mechanism was similar to an old cabinetmaker's face vise I once owned. Basically, you get just one stomp on the foot pedal to tighten the jaws (this moves them by 3/4"), so you must manually position the rear jaw close to your work before tightening the vise. To remove your work, you slide a large yellow switch on the front of the vise to the unlock position and depress the pedal. This releases clamping pressure and allows the rear jaw to freely slide backwards.

The BenchJaws vise has all-steel construction, so it's rigid and sturdy. It mounts to a steel bracket that you can screw to the left or right corner of your bench. Loosening one large thumbscrew allows you to reposition the vise 90°. The pedal can be lengthened or shortened to accommodate your height.



COURTESY OF MANUFACTURER

The jaws are 2-1/2" deep and located 8" above the bench's surface. This elevated height is nice when you want your workpiece closer to eye level, such as when cutting dovetails or carving.

Two accessories are available for the BenchJaws: an Extended Jaw, which stretches the vise's capacity to 24", and a Multipurpose Jaw, which swivels for holding tapered, round or irregular-shaped parts. The Multipurpose Jaw also includes bench dogs to clamp a workpiece on top of the vise.

SOURCE

Rockwell, rockwelltools.com, 866-514-7625, BenchJaws Hands-Free Bench Vise, #RK9006, $130; Extension Jaw, #RW9207, $50; Multipurpose Jaw, #RW9208, $50.

Custom-Fit Dadoes

MAKING A DADO to fit a piece of 3/4" plywood can be an exercise in frustration. The wood is never exactly 3/4" thick, is it? The folks at Rockler have come up with a clever solution to this problem—a jig that cuts the dado in two passes using a standard 1/2" bit.

You don't have to reset anything for the second pass. You just pick up the router, turn it around and rout again. The second pass widens the first pass. This method allows you to cut infinitely-adjustable dadoes to fit any material from 1/8" to 1" thick.

The jig mounts directly to the router, replacing its baseplate. One side of the jig slides in and out, changing the jig's width. This "sliding edge" has a scale that tells you how wide the dado will be. For example, if you use a 1/2" bit and the scale reads 3/16", the dado will be 1/2" plus 3/16" wide (11/16"). If you use a 3/8" bit on this setting, the dado will be 3/8" plus 3/16" wide (9/16").

Once you've set the jig's width (and that usually requires some trial-and-error cuts), you hold the jig along a straightedge and make the first pass. Then you turn the router around so that the jig's other edge is against the straightedge, and finish the dado.

COURTESY OF MANUFACTURER

Both edges of the Rockler Dado Jig are designed to hook into a channel on Rockler's Low-Profile Straight Edge Clamp System, ensuring that the jig doesn't wander from the straightedge, but you can use it with any edge guide.

SOURCE

Rockler Woodworking and Hardware, rockler.com, 800-279-4441, Adjustable Dado Jig (bits and straightedge not included), #43476, $45.

Vac/Dust Extractor Combo

WOULDN'T IT BE SWELL to have a vac that could both clean your shop and suck dust from portable power tools? That's the idea behind the new DWV012 10 gal. wet/dry vac from DeWalt: It can pick up chunks of debris, piles of sawdust and, with the convenience of a tool-actuated switch, hook up to your sander, router or biscuit joiner.

Most vacs are good at one job or the other, but not both. General-purpose vacs are terrific for shop cleanup, but don't have a tool-actuated switch that automatically turns on the machine when you start sanding or routing. Other vacs with tool-actuated switches often lack the power to pick up heavier debris, such as nails, screws and small offcuts.

The DWV012 is outfitted with two HEPA filters. An automatic filter-cleaning system operates every 30 seconds, alternately back-flushing air into one of the filters. This helps maintain suction by keeping the filters clean as the tank fills up. Emptying the vac is much easier if you use DeWalt's plastic liners or paper bags, available as accessories.

Other features on the vac include a variable-suction dial, large rear wheels, lockable casters, a telescoping handle and a 14' hose. To avoid tripping a breaker, the tool-actuated switch shouldn't be hooked up with power tools drawing more than 3 amps.

SOURCE
DeWalt, dewalt.com, 800-433-9258, Heavy Duty Dust Extractor Vacuum, #DWV012, $529.

COURTESY OF MANUFACTURER

Prize Rabbet Plane

SPECIALTY PLANES have a special place in my shop. They're good for the soul. I use them when I want to turn off the power tools and relax, or when setting up a power tool is simply too much bother. I've had my eye on a rare #10 Stanley Carriage Maker's Rabbet Plane for years now, but the new Bevel-Up Jack Rabbet from Veritas is certainly going to prove to be the better choice.

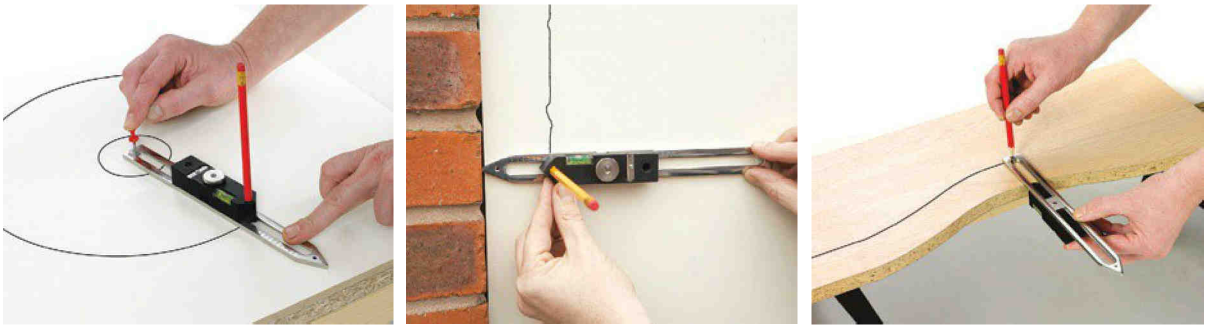
I already own a few standard-size rabbet planes, but with a 15" long sole and a 2-1/4" wide blade, the Jack Rabbet has definite advantages for large-scale work—including making raised panels. Weighing a substantial 6 lbs., it has plenty of mass to carry you through a wide cut.

The Jack Rabbet is far superior to the #10, technically speaking. It has an extra-thick blade, scoring spurs for cross-grain work and a rock-solid frog. A portion of its front sole slides in and out for adjusting the plane's mouth, somewhat like a high-quality block plane. The Jack Rabbet also has a removable fence (the #10 has no fence at all). Its handle tilts left or right for getting into tight spots or for use on a shooting board. As with other Veritas planes, a Norris-style adjuster controls the depth of cut and levels the blade. Three different blade options are available: A2, O1, or Veritas' relatively new addition, PM-V11. All come lapped, ready for final polishing—a huge blessing.

If you want a relatively inexpensive, wide rabbeting plane, I'd recommend looking at an old Stanley 78. But if you want a beautifully engineered tool for serious play, the Jack Rabbet can't be beat.

SOURCE

Lee Valley & Veritas, leevalley.com, 800-871-8158, Veritas Bevel-Up Jack Rabbet Plane with A2 blade, #05P53.01, $299; with 01 blade, #05P53.01, $299, with PM-V11 blade, #05P53.71, $309.



COURTESY OF MANUFACTURER

Multi-Use Layout Tool

I LIKE TOOLS that can do more than one thing—they keep the clutter down. When I read that Trend's new Multiscribe performs 15 functions, I had to check it out!

Opening the package, I was immediately struck by how solid the tool felt in my hand. It's clearly made to last. Having only two major parts—a slotted bar and a sliding head—the Multiscribe's design is elegantly simple. Both the bar and the head can receive a pencil at either end. Using a knob, the head can be locked parallel or at right angles to the bar. The head also contains a pencil sharpener and a level.

While the Multiscribe can be used for many tasks, I was most interested in how it would perform as a compass, a scribing tool, a combination square and a level.

It shines as a compass. Using a nail or pushpin as a center point, you can adjust the Multiscribe's head to make circles from 1" to 19-3/4" dia.

It's a nice scribe, too. It really works well scribing from an irregular surface, such as a brick wall, using the pointed end of the bar. The tricky part is holding the tool level while you scribe. The spirit level helps, but you still need a steady hand.

The Multiscribe works better than a combination square for marking a line parallel to an edge. First, your pencil won't slip, because its point is trapped by a hole. (I wish my combination square had this feature!) And second, you can mark from a concave edge, something a combination square can't do.

The Multiscribe won't be replacing my combination square for marking accurate 90° and 45° angles, however. There's simply too much play in the locking mechanism. Well, you can't have everything!

SOURCE

Trend Routing Technology, trend-usa.com, 877-918-7363, Multiscribe, #MS/PRO, $48.

A Beast of a Saw

COURTESY OF MANUFACTURER

A 5 HP, 12" TABLESAW has a certain swagger to it, doesn't it? It says, "Bring it on!" Jet's new JTAS-12-DX, like all industrial saws, can handle anything you throw at it.

If you've been looking for extra power, you've probably considered a 3 or 5 hp 10" saw, but here's what this 12" saw offers above and beyond that:

- The Jet 12-DX weighs an eye-popping 630 lbs., enough mass to soak up just about any vibration.
- The entire length of its 80" long table is precision-ground cast iron—not sheet metal or melamine, which may not be truly flat. Set up carefully, the extension tables on the 12-DX will always be perfectly level with the main table, which means greater accuracy when cutting large stock.
- As with any 12" saw, you get up to an additional 1" taller cut.
- Its 31-1/2" table is 3" to 4" deeper than the tables on most 10" saws, giving you more support for big timber.

The 12-DX is a left-tilt saw. Its 40-1/2" long fence can be positioned 50" to the right of the blade and 14" to the left. Like all 12" saws, it has a 1" arbor. The dustport is 4" dia.

SOURCE

JET, jettools.com, 800-274-6848, 12 in. XACTA Saw, # JTAS-12-DX; Stock No. 708546PK, $4089.

Jim Cardon

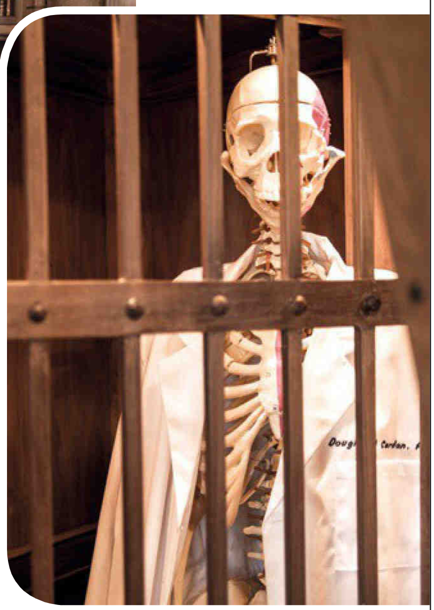
A brain tumor is no match for this woodworker.

by Spike Carlsen

TEN THOUSAND PIECES OF WALNUT, 4500 dowels, gallons of glue and 2700 hours of painstaking labor—those are mind-boggling numbers for a woodworking project. But they aren't nearly as impressive as the woodworker behind them. Just a few months before embarking on this colossal project, he was relearning how to walk and eating meals through a feeding tube. This is the amazing story of Jim Cardon.

One woodworker's path

Now 54, Jim grew up with a hammer in his hand. As both his father and grandfather were carpenters, it was no surprise that Jim and his three brothers spent summers building homes. "We started out cleaning up job sites," Jim explains. "When we got a little older we insulated, then Dad let us install trim in the closets. He never told us whether we were doing a good or



bad job—you could just sort of tell how he felt when he walked by."

After graduating from high school Jim became more involved in the home-building trade. "One December day we were outside pouring a concrete sidewalk," he recalls. "It was so cold, my hands were numb. The next day I was helping to build cabinets inside a workshop. It was way warmer and I loved the smell of wood. I began thinking this was where I'd rather be."

Jim drew inspiration from a number of sources. One woodworker he worked under had a truckload of confidence and an "I can do anything" attitude. (He also had an ego the size of a tablesaw, according to Jim.)

Jim encountered the works of iconic woodworkers such as Sam Maloof, James Krenov and Wendell Castle through books. And *Fine Woodworking* magazine turned him on to the whole notion of, well, fine woodworking. After completing a two-year woodworking course at Utah Technical University, Jim established himself in the field of cabinetmaking, architectural woodworking and finish carpentry. He married his high school sweetheart and had kids. Life was good.

A massive detour

In 1999, Jim began to feel off-balance. He also had trouble hearing. Sensing something was wrong, he visited a hearing doctor, who ordered an MRI to determine the source of the problem. Usually, an object the size of a lemon doesn't present much of an obstacle. But in Jim's case the object was a tumor growing behind his right ear.

Removing the tumor required a team of 16 doctors working 18 hours. The resultant nerve damage took its toll. Jim lost the ability to walk and swallow. "My vocal cords were damaged, so whenever I talked I sounded like Mrs. Doubtfire," he muses. It took physical therapy, a walker and a feeding tube to get Jim through the early stages.

It was during this time that Christopher Reeve—best known for his roles as Superman—was dealing with his own paralysis. "The way Mr. Reeve and his family dealt with things was inspirational," Jim says. "I decided there wasn't going to be any sniveling or 'poor me' going on."

At first Jim couldn't pick up a drill, but after a year he could perform basic tasks. He pressed on, re-learning lost skills. "Today the side of my body still feels like it's asleep, my balance is off and one side of my face feels like I've just had novocaine at the dentist," he explains.

EDITOR: TIM JOHNSON | PHOTOS COURTESY OF DOUG CARDON.

A Great American Woodworker

continued

"My outside feels like it's been in a car wreck—but my inside hasn't changed." Not a snivel in sight.

The mother of all libraries

A few years after the surgery, Jim's brother Doug asked him to build a fireplace mantle. Jim made the 13-hour drive from his home in Littleton, Colorado to Mesa, Arizona and spent two months working on the project. They both liked the results and projects kept getting added—for seven years.

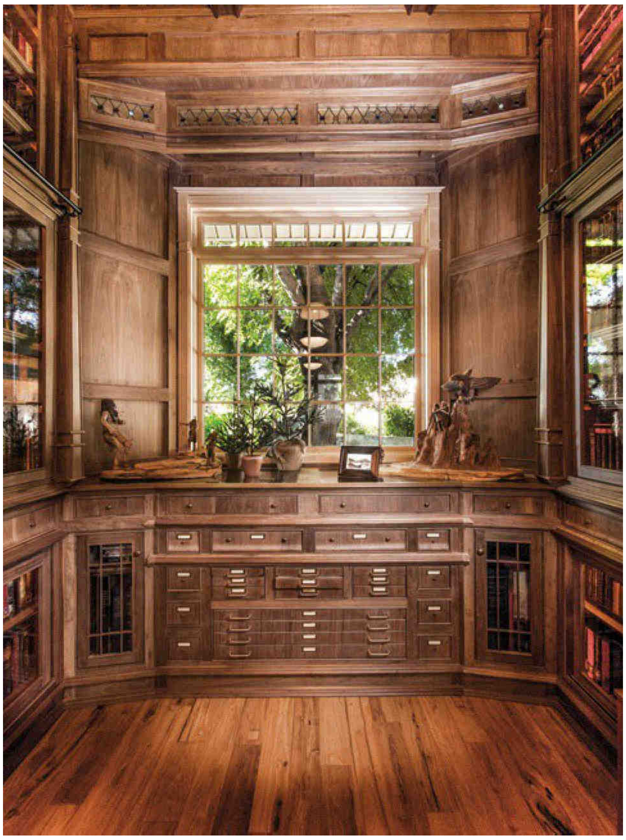
One of those projects involved a library to house Doug's extensive book collection. There were a few givens: Doug loved walnut, he had 4,000 antiquarian books in need of a home and he collected science-related antiques. "Doug wanted a library that would complement his books in the same special way the right setting can highlight a gem," Jim explains. He began working on possible designs, but struggled to find the perfect plan. Then, while watching "The Illusionist" one evening, Jim and Doug were smitten by a library shown in one of the scenes. "We kept rewinding and replaying in slow motion the part that showed the library. It was NICE!"

A 17' x 27' addition was built with a rough game plan in mind, based on the illusionist library. Jim started by designing "The Long Wall," which anchors the room; other parts of the library fell into place from there. Jim began making regular trips and extended visits to Mesa—20 in all—to work on the project. Initially he set up shop in the addition. "I told Doug I was worried about damaging the distressed, reclaimed Chinese elm flooring that had just been laid, but he told me to go ahead—it would make the floor look even better." As the room slowly filled with finished cabinetry, Jim moved his workshop out to the carport (see Photo, page 22, at bottom).

The library's detailing seamlessly blends craftsmanship with function. The 12' high walls are broken into two bands, one at the 8' level to accommodate the rolling library ladder and another waist-high to separate the upper and lower cabinets. All the bookshelves feature wood-framed glass shelves and glass-panel doors, to allow light to filter through. The doors slide, rather than swing, so as not to interfere with the rolling ladder. At the ceiling, the open spaces between the individual pieces of dentil molding provide ventilation for the cabinets and books below.

A dinky workshop

With the exception of the two round columns, the rolling ladder and a handful of moldings, Jim crafted



A Great American Woodworker

continued

every square inch of the library by hand. "Initially I was intimidated and overwhelmed just thinking about the project," he explains. "And then I realized I'd approach it the same way I'd approach eating an elephant: one bite at a time."

His ad hoc shop consisted primarily of bench-top tools: a tablesaw, planer, drill press and router table. "You can do anything you want and get accurate results with bench-top tools," Jim explains. "It just takes a little bit longer."

Jim maintained his minimalist tool approach throughout the project. His sander of choice? A hand-held belt sander. All the cabinets and doors were assembled with dowel joinery. "I know I could have saved time with a doweling machine, but I wound up using a hand-held jig," Jim explains. He based the intertwining moldings that surround the desk's bookcase on a design he found in an 1830s pattern book. "I used a bandsaw, drill press, Dremel tool, carving tools, rasps, rifflers and sandpaper—whatever it took."

Jim created the concave drawer fronts on the tablesaw. After tracing the profile on the end of the board, he shaped it by raising and lowering the blade and adjusting the fence in 1/16" increments while making pass after pass after pass. Then he smoothed the serrated profile left by the blade with his trusty belt sander.

The ceiling alone took 2 months. "I remember staring at it, realizing there were 43 grids and that each grid had 60 pieces—the ceiling contained 2500 pieces of wood!" He cut, sanded and installed each piece of dentil molding by hand.

All the wood was left in its natural state; the finish consists of three coats of hand-rubbed paste wax. "You don't want to leave a sweating glass of lemonade on it," Jim explains. "But it's absolutely gorgeous."

Was the library project worth five years of his life? You bet. "I never got bored. I had free reign over how to build every part and every part was complicated and challenging. Best of all, when you walk into the library, you feel like you're walking into a magical place." Fitting for a magical story.

To see more of Jim's work and read more about his story, visit Jim's blog at **jimcardoncustoms.blogspot.com**.

Spike Carlsen is the author of *Woodworking FAQ*, *A Splintered History of Wood* and *Ridiculously Simple Furniture Projects*. For more information visit **spikecarlsen.com** or **facebook.com/spikecarlsenbook**s.

My American Shop

Chasing the American Dream from Poland to Pennsylvania.

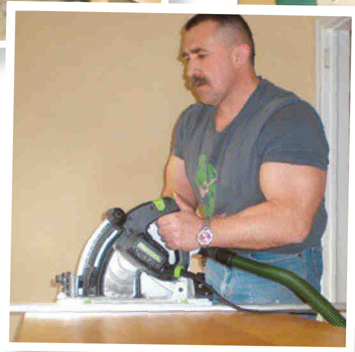
WHEN I CAME TO AMERICA eight years ago, I was able to get a work permit and a job at LA Fitness because I'd earned a license as a personal fitness trainer in my hometown of Ciechanów, Poland. I'd learned woodworking there as well, from a master woodworker who was also a two-time Olympic gold medalist in weight lifting.

Unfortunately, when the economy turned sour in 2008, I lost my job and had to make changes. I moved from Connecticut to Pennsylvania, where it's much cheaper to live, and was lucky to find a job in the woodworking industry. Shortly thereafter, I began to think about having my own shop. My grandpa always told me, "If you can't pay in cash, you can't afford it." So I saved for several months before buying my first stationary tool, a molder/planer, which I had to store in my living room. Slowly, I acquired more tools and eventually I found a 1000 sq. ft. shop space that I could afford.

I started my woodworking business in my spare time by making small pieces free of charge for my new neighbors and friends. I also remodeled my kitchen and built almost all my furniture as well as the equipment for my home gym. (Like my woodworking mentor in Poland, I'm a weightlifter—my friends call me "Big John.") My first serious job was to modify an old TV cabinet to fit a new plasma flat screen TV. Reducing the cabinet's depth was challenging because of its moldings and frame-and-panel structure, but my customer was happy with the results—and I was convinced that starting my woodworking business was the right decision.

Then, as now, I read many woodworking books and magazines, so I was always learning new things at home and on the job. (Currently, I'm studying 3D design.) Every day after work

EDITOR: TIM JOHNSON | PHOTOGRAPHY: COURTESY OF JOHN PUSTELNIK



I made something for my shop, using salvaged materials as often as possible, to save money. I built racks to store my tools and shop supplies, a lumber rack and a large workbench. As money allowed, I upgraded my tools by trading used for new or for better quality. Thanks to the training I received in Poland and here in America, I can build furniture in almost any style. I don't try to compete with pieces that are mass-produced. My customers expect top quality work and I bend over backwards to satisfy them, because I've learned that word-of-mouth is my best advertising.

Starting a business in a bad economy wasn't easy and it's still tough now, but I'm optimistic about the future—I buy goods that are made in the USA whenever I can, because I believe this helps to create jobs and that some of the money will eventually come back to me through customers. I'm not a hero, just a regular Joe who's trying to make this country a little bit better every day as I try to make my American Dream come true. God bless America!

John Pustelnik

Tell Us About Your Shop

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

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

Turning Wood

by Alan Lacer

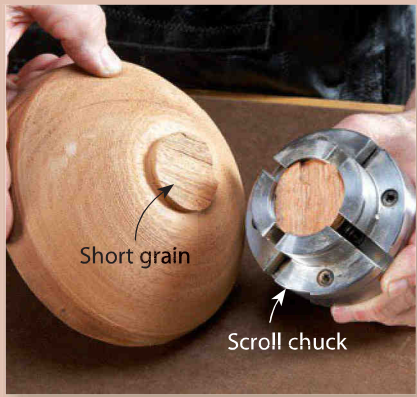
Chucks and Chucking

Learn how to hold and keep work on the lathe.

EDITOR: TIM JOHNSON | PHOTOGRAPHY: JASON ZENTNER

Learn the names and uses of these 31 chucks at **AmericanWoodworker.com/WebExtras**

Three Principles of Chucking



Make sure it's secure

Grain direction matters with many chucks. For example, face-grain mounting on a scroll chuck exposes weak short grain. The failure shown here was caused by sudden shear force due to a catch.

Leave no evidence

What chuck was used to turn these bowls? The correct answer: You can't tell. Finished turnings should show no evidence of chucking. (The real answer: All three were turned on a faceplate.)

Go for pinpoint accuracy

Inaccuracy in centering the work on the chuck can cause big problems. In the reverse-chucking setup shown here, mis-centering has caused uneven cutting, which can be very hard to repair at this stage.

FOR MANY WOODTURNING OPERATIONS, a chuck performs the essential job of holding the work securely and safely. These operations often present unique requirements, so a dizzying array of manufactured and shop-made chucks have evolved to grasp, expand, screw, compress, trap, pull, jam, stick—and even to move the work through an eccentric pattern (see Sources, page 34). Knowing which chuck to use can be confusing, especially because most are designed for specific applications, so they all have strengths and weaknesses. Learning about chucks will expand your capabilities and make your turning safer, to boot.

Critical concerns

Always keep three rules in mind whenever you use a chuck (see "Three Principles of Chucking," above).

Safety: Turning's first principle is to keep the work on the lathe. Using the wrong chuck or improperly mounting a blank can lead to disaster. Countless pieces have been damaged or destroyed and far too many turners seriously injured—some even fatally—by a chucking failure. Above all, remember that no chuck is 100% reliable. Therefore, when using a chuck, it's imperative to wear a full face shield that's ANSI-rated Z87+ (see Sources). Also, pay special attention to the speed of the lathe—excessive speed is the most common factor in lathe accidents.

Craftsmanship: A completed turning should show no trace of being affixed to the lathe. Screw holes and other mounting marks left by a chuck are evidence of mediocre work. Filling them or covering them with felt patches doesn't cut it. And never let the chuck determine key dimensions of your piece. (When I first started, the bases on all my bowls were 3" in diameter, because I always turned the outsides down to the 3" faceplate that I had.) Even a footed bowl on which the dimensions of the foot are based on the chuck that held it is an example of pedestrian design.

Accuracy: Failing to accurately center a piece in or on a chuck can cause problems that may be impossible to correct. Using a chuck that doesn't run true will produce similar frustrating results. Make it a practice to avoid worn or poorly made chucks.

Types of chucks

As your turning skills increase and your projects become more adventurous, you'll keep encountering different chucks and chucking methods, most of which were devised by pioneering turners. Every chuck type has variations. And there's a turner-made version of (or one that pre-dates) virtually every commercial chuck. The chucks that follow are just the tip of the iceberg.

Chucks that grasp

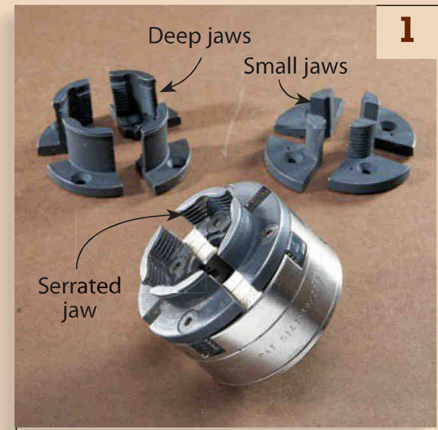
Four-jaw scrolling chucks are probably the biggest advancements in chuck technology (**Photo 1**). The better scroll chucks currently on the market have largely solved problems associated with the early versions, including issues with accuracy, wear of critical metal surfaces and a nasty tendency to loosen while turning. However, modern scroll chucks still have some quirks that are important to know about:

Grain direction matters (see "Make Sure It's Secure," above). Short-grain weakness is a critical factor when a scroll chuck is used for face-grain turning, because a catch at the wrong point can cause the wood to fracture—especially wood that's dry or brittle, or wood that naturally splits easily, such as oak.

Maximize the grip. Always use a suitably sized chuck and suitably sized jaws. (As the size and weight of the blank increases, the contact area between the wood and the chuck must also increase.) Shape the mounting point so the chuck's jaws grip as much surface area (diameter and length) as possible (**Photo 2**). Create a shoulder that rests on top of the jaws as a bearing surface. And use serrated jaws.

House the scroll mechanism. To avoid contacting the scroll mechanism's sharp spinning corners, keep the mechanisms inside the body of the chuck. This also keeps the jaws from being extended too far, so they don't fly out of the chuck.

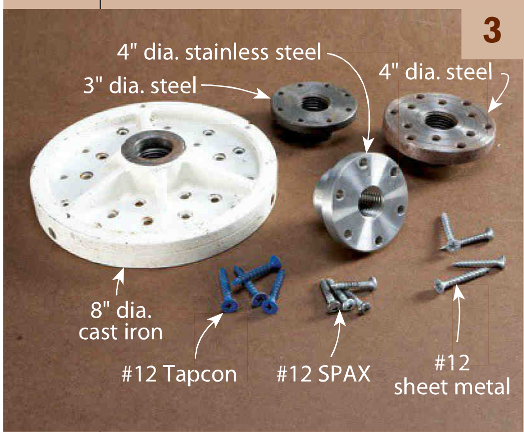
Scroll Chucks



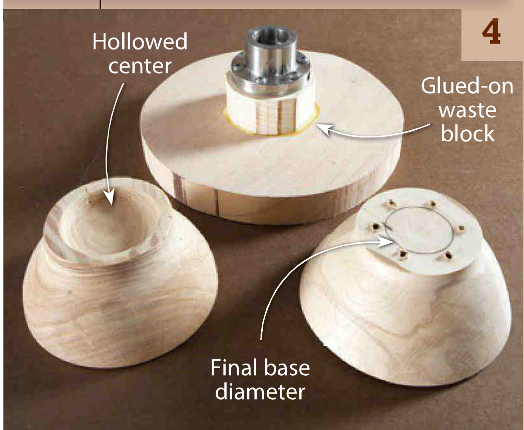
A scroll chuck has jaws that scroll in and out to fit turning blanks of different sizes. Most scroll chucks offer a variety of jaws and other options—including the ability to hold other types of chucks.

To mount a blank on a scroll chuck, turn a tenon for maximum contact—as large and long as the jaws allow, with a slightly concave bearing shoulder. Keep the scroll mechanism within the chuck's body.

Screw Chucks



A faceplate with screws is an excellent choice for face-grain turning. The size of the plate, its composition, the type of screws and length of their threads combine to offer an enormous range of holding capability.



Eliminate screw holes without losing height on the work by hollowing the area that contained the holes, turning away the holes and leaving a smaller diameter base, or gluing a waste block to the back of the blank.

Chucks that expand

Often the same scroll chuck that closes on work is also designed to expand into a recess. This is most helpful when a shallow recess is the only available mount (as when turning a plate or a platter) or when chucking into a drilled or turned opening (as when turning a pepper mill). These chucks work reasonably well, as long as the outward pressure exerted while mounting doesn't split the wood. However, excessive force exerted by a catch or dig-in while turning can split the wood and break the work away from the chuck.

Chucks that screw

No other chuck offers as wide a range of holding power as a faceplate with screws (**Photo 3**). Combined with the plate's bearing surface, screws provide remarkable chucking strength—even a chuck with a single screw in the center can offer surprising holding power. However, these chucks are only suitable for face-grain turning, when the screws mount in the blank's face grain (such as face-grain bowls, platters, stool seats and the like). Faceplates with screws should not be used if the screws will mount in the blank's end grain (including end-grain bowls, boxes and goblets, for example).

Always make sure the faceplate is flat. The mounting point on the wood must also be flat or very slightly concave—never convex or uneven, or with high spots. Here are some other key issues concerning faceplates:

Don't skimp. Buy a high-quality solid steel or hefty cast-iron faceplate. The most practical sizes are 3" and 4" dia.—choose one made of one-piece steel or stainless steel with at least four holes. Faceplates 6" in diameter and larger are usually made of cast iron. Choose one that's at least 3/4" thick. In any faceplate, the more holes the better—my favorite 3" faceplate has 6 holes; sometimes I fill all 30 holes on my 8" faceplate with long #14 screws!

Use the right screws. The best choices I've found are sheet metal screws with square-drive heads, Tapcon screws (hex head, 3/16" dia. and 1/4" dia.) and SPAX (Phillips/square drive) Construction Multiple-Materials screws. Do not use wood screws, drywall screws or deck screws—they're often brittle and have too little holding power due to shallow threads and smaller diameters.

Use #10, #12 or #14 screws for most situations—always start by drilling pilot holes. Hex-head lag screws may be the best choice if the work is large and heavy and the faceplate is 10" or larger. Buy a variety of screw lengths: long for roughing (especially when screwing into what will be the opening of a bowl); shorter for finish-turning or small, light work—but always err on the long side. Even for small work, every screw must penetrate at least 1/2" into the wood (full threads; the lead point doesn't count). Deeper penetration and more screws are always safer paths—especially when working heavy, large diameters or work that's out of balance.

Eliminate the screw holes. Simply filling or covering them looks amateurish. Instead, learn one or more "reverse-chucking" methods. (Reverse chucking involves removing the work after completing most of the turning and mounting it in reverse, in order to finish off the base.)

Once the work has been reverse-chucked, the easiest way to remove the holes is to turn down the base. Consider the height you lose as part of the process (and part of your design). On the other hand, if the blank is just too thin or the wood is so precious that you don't want to lose any, you have several options to choose from (**Photo 4**): Create a recess where the holes resided, plan a finished diameter inside the "screw orbit" (the ring that describes the circle of screws) or glue on a waste block (face grain to face grain) to house the screws and remove it after the turning is completed.

Scraps of hardwoods such as poplar, soft maple, ash, walnut and cherry are suitable waste-block material. Don't use weak woods such as pine, cedar and spruce, or plywood, which can separate. For dry wood, use yellow or white glue to glue on a waste block. Clamp the joint for at least 12 hours and allow at least 24 hours drying time before turning. Do not glue a piece of paper between the waste block and blank. This creates a weak joint that can separate. For wet wood, use a dry-wood waste block and medium-viscosity CA glue. Lightly clamp the joint and allow at least two hours drying time.

Chucks that compress

A block of wood with an anti-slip pad mounted on its face (a 1/8" router mat works well) is the heart of a simple reverse-chucking setup (**Photo 5**). This type of chuck is especially useful for bowls and vessels with natural edges, thin bowls with delicate edges and for reshaping the mounting surface of a "twice-turned" bowl for remounting into a scroll chuck. (A twice-turned bowl is roughed out of a green blank, removed and allowed to dry, and then remounted for final turning.)

Mount the block with the anti-slip material on a faceplate or in a scroll chuck. Center a nearly completed bowl or vessel on the block. Then use the tailstock center to firmly press the base of the work against the block, so that compression—and friction—holds the work while its base is shaped. Make sure to accurately center the work (**Photo 6**). This setup allows working the underside of the base, except near the tailstock center (this area must be worked after the piece comes off the lathe). This setup also allows working the sides, but only about one-quarter of the way up from the bottom.

Chucks that trap

The most common method for mounting turning blanks with through holes—pen blanks, for example—is to trap them on a mandrel (**Photo 7**). Pepper mills, game calls, bracelets and toy wheels are frequently mounted this way.

An unusual trapping chuck for reverse chucking leaves little chance for the work to fly off the lathe (**Photo 8**). An excellent option when full access to the bottom of the work is desired, this system is especially good for full detailing of the base.

Chucks that pull

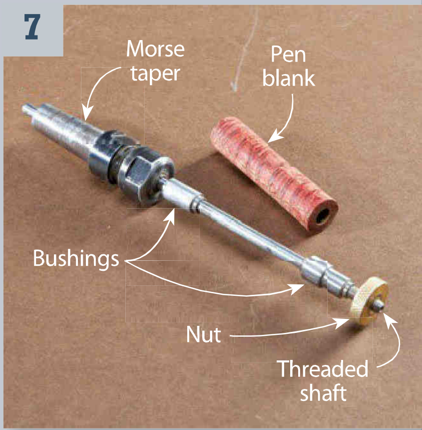
Using vacuum pressure to hold work on the lathe is a relatively new option for reverse chucking (**Photo 9**). This system is great for production work or if full access to the bottom of the piece is desired, but it's not suitable for pieces that are fragile or very deep, pieces that contain voids, and woods with open pores.

Compression Chucks

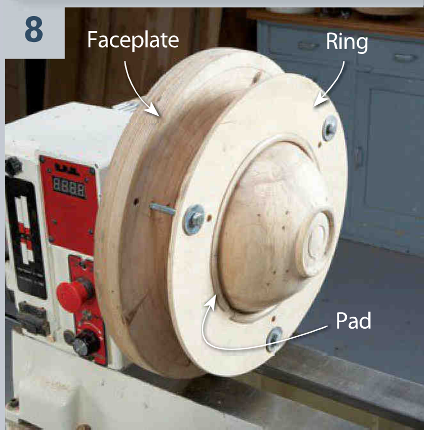
A compression chuck is used in conjunction with the tailstock to remount work to allow finishing its base (called "reverse chucking"). Here, the tailstock will be used to press the work against a block of wood with a padded face.

To center work on a compression chuck, mount it with light pressure and turn the lathe by hand to locate the high spot. Slightly loosen the tailstock, push on the mark, tighten the tailstock and mark again. Repeat until marking creates a full circle.

Trapping Chucks

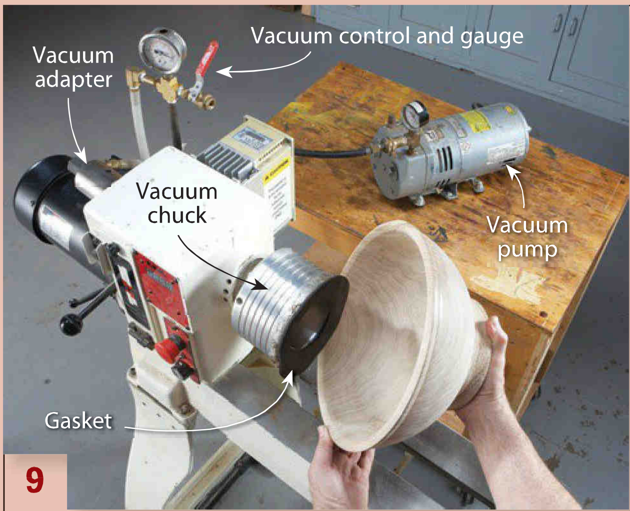


Mandrel chucks trap work with pre-drilled holes on a threaded shaft (between bushings in this case). One end of this pen-turning mandrel mounts in the headstock. The tailstock supports the opposite end.



This trapping chuck for reverse chucking provides full access to the bottom of the work and a high level of safety. The system consists of padded rings in a variety of external and internal diameters that bolt to a dedicated base and faceplate.

Pull Chuck



9

Vacuum chucking is a rapid way to mount a bowl for reverse chucking. This method provides total access to the bottom of the work, but it requires a considerable investment.

Jam Chucks

10

Jam chucking is frequently used in box-making. A tenon is turned on the base of the box to snugly fit the hollowed top. Jamming the top onto the tenon allows final shaping of the box's entire outside profile.

11

Jam chucking into a recess is another option. Here, the tenon on the box's base (now shaped and hollowed to form a rim) snugly fits into a recess turned in the waste block, so the box's bottom can be completed.

See an eccentric chuck in action at **AmericanWoodworker.com/WebExtras**

There are solutions for some of these issues, but choosing other chucking methods is arguably the best one.

Chucks that jam

Jam chucks are often created for one-time use or where metal jaws might cause damage. Basically there are two approaches: Either you jam a hollowed piece over a tenon turned on a waste block (**Photo 10**) or you jam a tenon (or a rim) into a recess turned into a waste block (**Photo 11**).

If you only have a faceplate, you can use a jam chuck in lieu of a scroll chuck for end-grain hollowing (to hollow the box base shown in **Photo 11**, for example). Mount a face-grain block on a faceplate and turn a recess (a round mortise) in it. Then turn a tenon on the end of the base blank to snugly fit this recess (as shown in **Photo 2**, but with a mortised face-grain block mounted on a faceplate instead of a scroll chuck). Jam-fit the tenon into the recess or glue it. The tenon's shoulder provides additional stability by bearing against the block on the faceplate. Here's a tip: A jam fit can be tightened by adding a layer of tissue paper around the tenon or by wetting the tenon to slightly swell the wood.

Chucks that stick

Using high-strength double-face tape (see Sources)—not carpet tape or the stuff from the local hardware store—is a great way to mount thin, face-grain, non-oily, dry-wood blanks for turning into small bowls, plates or platters. Note: This method isn't foolproof, so it's only for experienced turners; a catch may pull the piece off the lathe.

Cover a clean faceplate (lightly sanded and washed with alcohol or lacquer thinner) with the tape—don't allow the seams to overlap. Flatten one face of the blank and then clamp it against the taped faceplate for several hours. (The bond strength increases with clamp time.) For added safety, I bring up the tailstock and keep it in position while I'm turning, until the final cuts at the center. Freeing the completed work from the faceplate takes a slow, continuous pull until the tape starts to release.

Eccentric chucks

Some chucks can move the work through preordained eccentric patterns. Such chucks have been around for centuries, but new versions can easily change the center of the work or move it through elliptical or wobble patterns.

SOURCES

- Oneway Manufacturing, oneway.ca, 800-565-7288, chucks and faceplates.
- Craft Supplies, woodturnerscatalog.com, 800-551-8876, chucks, faceplates and double-face tape.
- Packard Woodworks, packardwoodworks.com, 800 683 8876, chucks, faceplates and double-face tape.
- MSC, mscdirect.com, 800 645 7270, Full Face Shield with ANSI Z87+ rating: Headgear, #09797218, $26.21; Visor/Shield, #09797234, $9.22.

Alan Lacer is a turner, writer and instructor living near River Falls, Wis. To learn more about Alan visit **alanlacer.com**.

Double-Duty Bread Box

by Garrett Glaser

Sliding doors and contoured sides store bakery goods and favorite cookbooks.

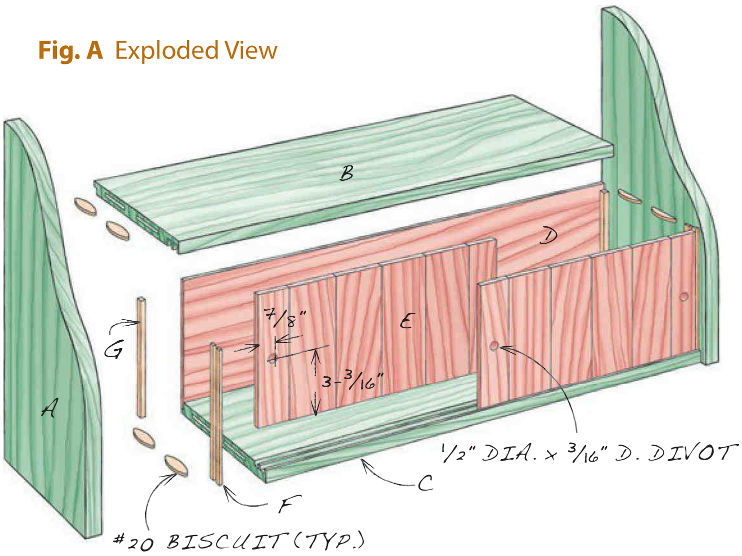
WHETHER SITTING on a countertop or mounted on a wall, this little gem helps to organize your kitchen. In addition to keeping cookbooks handy, it holds two supermarket loaves of bread and a package of hamburger or hotdog buns, with room for a baguette laid across the top of them.

It's easy to change the dimensions or reconfigure the design to suit your needs. I just measured the distance between the outlets the bread box would sit between and how much room my tallest cookbooks required to fit under the upper cabinets. With a wall-mounted box, you might decide to screw hooks into the bottom for coffee mugs or lengthen the sides and add a towel rod underneath.

You can start by heading to the board store, but figuring out how to use the wood you have on hand can also be fun. I used African mahogany offcuts from a paneling project and maple and cherry pieces culled from a garage sale. One thing's for sure: If you build your bread box this weekend, next weekend's dinner guests will want one.

EDITOR: TIM JOHNSON | PHOTOGRAPHY: JASON ZENTNER | ILLUSTRATION: FRANK ROHRBACH

Fig. A Exploded View



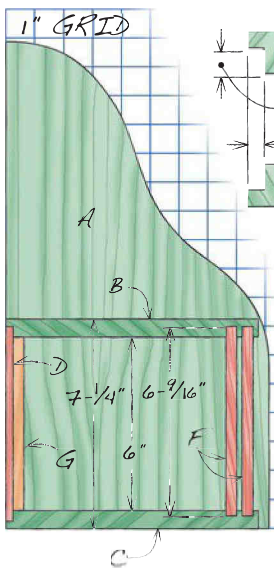


Fig. B Side Profile

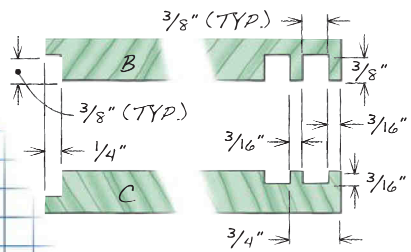
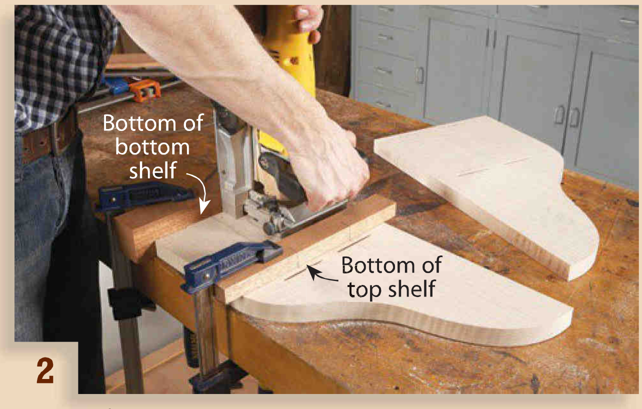


Fig. C Dadoes and Rabbets

1

Lay out the sides of the box using a template. The curved profile comes from a magazine-storage box.

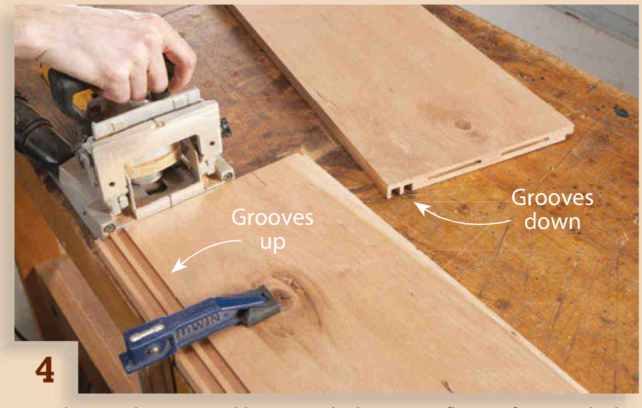


2

Cut slots for the shelves in both side pieces with the biscuit joiner held vertically and pressed against boards clamped to locate the bottom of each shelf.

3

Cut grooves for the sliding doors in the top and bottom shelves. The grooves in the top shelf are deeper (right).



4

Cut slots in the top and bottom shelves on a flat surface, with the biscuit joiner held horizontally. Clamp the bottom shelf grooves up and the top shelf grooves down.

Build the box

Lay out the box sides (A, Fig. A, page 35, Fig. B, Cutting List, page 37; **Photo 1**). Their curved profiles function as bookends. Cut out each side piece using a bandsaw or a jigsaw and smooth the curves using a spindle sander or a sanding drum in a drill press. The curves don't need to be identical.

Draw a line on each side piece to indicate the bottom of the top shelf (B, Fig. B). Clamp a board on this line and use it to locate the biscuit joiner when you cut the biscuit slots (**Photo 2**). Use a second board clamped against the side's bottom to cut the slots for the bottom shelf (C).

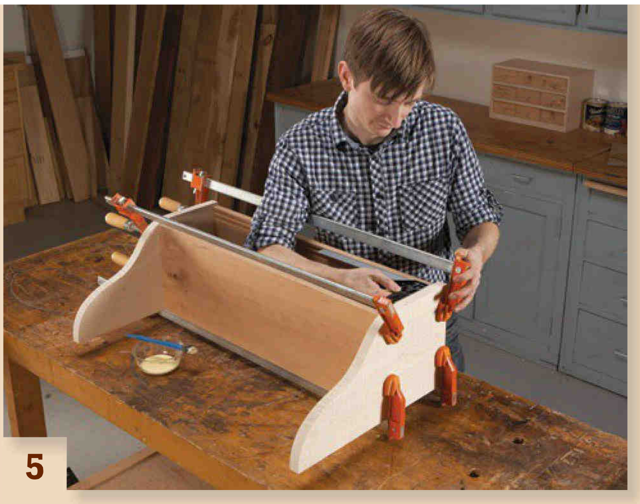
Cut rabbets for the plywood back (D) and grooves for the sliding doors (E) in the top and bottom shelves (**Photo 3**; Fig. C). The grooves in the top shelf are deeper to allow installing the doors. It's a good idea to cut test grooves in a scrap piece to dial in the blade heights and fence locations. Cut both grooves in the bottom shelf first, then raise the blade to cut the deeper grooves in the top shelf. You'll have to reposition the fence to cut the last deep dado: Simply use the appropriate shallow dado that's already been cut in the bottom shelf as a guide.

Clamp the top and bottom shelves to a flat surface to cut the biscuit slots (**Photo 4**). Make sure to correctly orient each piece: Clamp the bottom shelf with its grooves facing up and the top shelf with its grooves facing down. Rest the biscuit joiner on the flat surface to cut the slots.

Finish-sand the box pieces. Then install the biscuits and glue the box together (**Photo 5**). Glue and pin the door stops (F) using the dadoes for alignment. Likewise, glue and pin the retainers (G), aligned with the edges of the rabbets in the top and bottom shelves. Then cut the back to fit and install it with glue and pins.

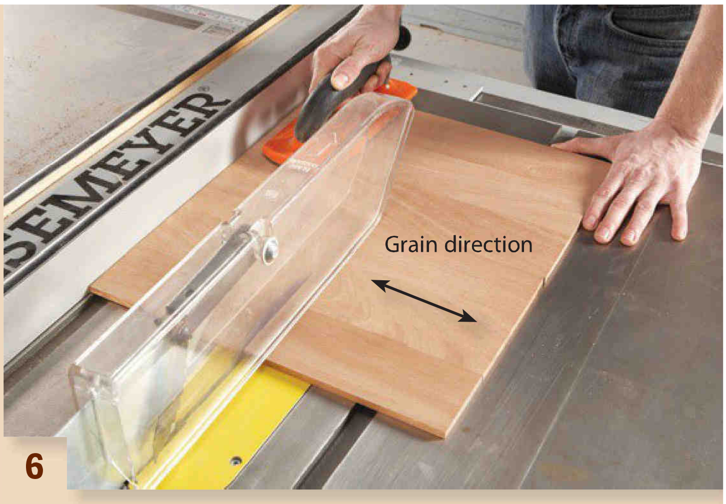
Make the sliding doors

The grain on the doors must be oriented vertically to avoid problems due to seasonal movement. This poses milling problems, because the doors are too wide and too short to run through a typical planer. The solution is to glue up a pair of 7-1/2" wide x 18" long blanks made from narrow rift- or quartersawn pieces. (This helps to prevent cupping.) The doors will look best if these narrow pieces are all the same width. To avoid tearout, make sure to orient all the pieces so the grain runs in the same direction. Joint the two glued-up blanks flat, mill them to thickness and then glue them together to make a single blank that contains both doors. Carefully align the joint so the faces are flush and use cauls to keep the blank flat. Test the glued-up blank in the scrap-



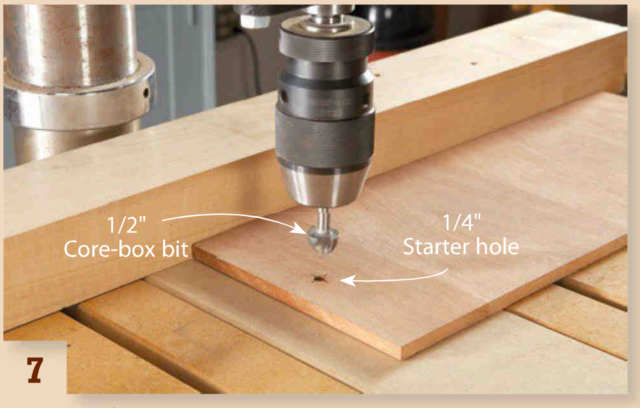
5

Make sure the door opening is square and the back edges of the top and bottom shelves are flush with the sides when you glue the box together.



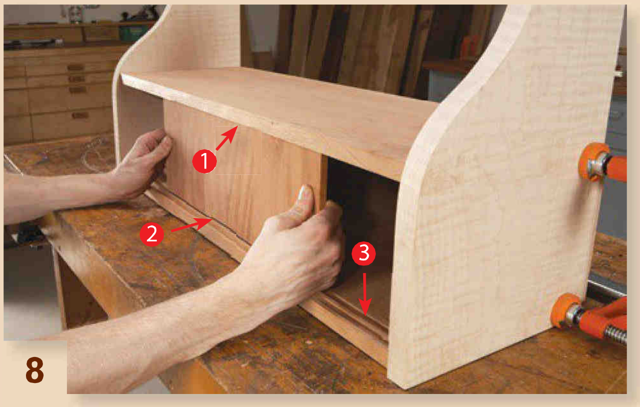
6

Crosscut both doors from a single glued-up blank. Orient the grain vertically so seasonal changes in humidity won't affect the doors' operation.



7

Shape the finger pull "divots" with a core-box bit. Drill a shallow starter hole first to seat the router bit and clamp the door in place before creating each divot.



8

Install each door by sliding it into the top groove and then pushing it in at the bottom until it drops into the bottom groove.

stock groove that you cut earlier to make sure the doors will slide freely.

Joint one edge of the blank, rip it to final width (14-1/4") and square one end—be sure to trim off any snipe left by the planer. Then cut the doors from the blank, using a crosscut blade to minimize tearout. (**Photo 6**). Sand or plane the doors' long-grain edges by hand as necessary to remove tearout or saw marks. Create divots for finger pulls (**Photo 7**). Then slightly chamfer the back of each door at the top and bottom to make them easier to install. Note: These chamfers must be tiny; if they extend beyond the grooves when the doors are installed, the doors will wobble.

Test-fit each door by sliding it all the way into the top groove and then pushing its bottom edge into the bottom groove (**Photo 8**). It probably won't fit on the first try, so cut a tiny amount off the top edge and try again. Keep shortening the top until the door just squeaks into place. The inside door may need a slightly more severe chamfer at the top to fit into the groove.

A food-safe finish

Most finishes are food-safe once they've fully cured, but the smell can linger for a long time in a closed box, and could permeate bread and other perishables stored inside. Mineral oil is a good alternative. It's often sold as a wood finish at woodworking stores and home centers, but you can find the same product at a drug store for less. Mineral oil is a very pretty, natural-looking finish, but unlike other oil finishes, it never cures and tends to fade, so you'll probably need to refresh it every year or so.

Garrett Glaser is a furniture maker who lives and works in St. Paul, Minn. To see more of Garrett's work, visit: **garrettglaser.carbonmade.com**.

Cutting List

Overall Dimensions: 29" L x 9-1/8" W x 16-7/8" H

Part	Name	Qty.	Material	Th x W x L
A	Side	2	Maple	7/8" x 9-1/8" x 16-7/8"
B	Top shelf	1	Cherry	5/8" x 8-3/4" x 27-1/4"
C	Bottom shelf	1	Cherry	5/8" x 8-3/4" x 27-1/4"
D	Back	1	Plywood	1/4" x 6-3/4" x 27-1/4"
E	Door	2	African mahogany	5/16" x 14-1/4" x 6-3/8" (a)
F	Door stop	4	Cherry	3/16" x 3/8" x 6-9/16"
G	Retainer	2	Cherry	3/8" x 3/8" x 6"

Notes:
a) Crosscut both doors from a 5/16" Th x 14-1/2" W x 18" L blank. Orient the doors' grain to run vertically.

Twin-Screw Workbench

by Steven Bunn

A huge vise, an expansive work surface and a stable base—it's a workbench trifecta!

Hefty wooden screws securely hold large work because of their mighty clamping power and the massive clamping surface between them.

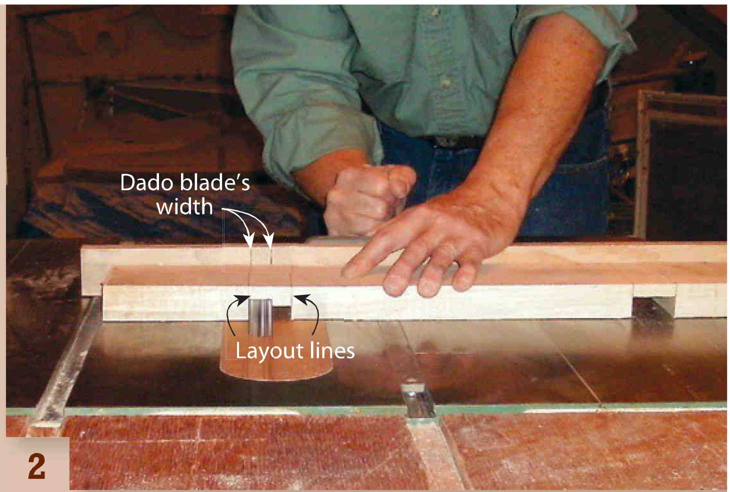
BUILT FOR HARD USE, this traditional-style bench won't vibrate like a kettledrum when you chop a mortise or skitter across the floor when you plane a board. It features a spacious 1-1/2" thick solid-wood top and an extra-large twin-screw face vise that can securely hold work of almost any size. Heavy timbers form the trestle-style base, which provides full-width support for the top and assembles with time-tested knock-down joinery: mortises, tenons and bed bolts (see Sources, page 45). Build your bench of dense hardwood, such as hard maple or beech—or save money by using a combination of hardwoods culled from your lumber pile, as shown here. You'll need a lathe and basic turning skills (or a wood-turning friend), along with a $50 wood-threading kit to create the wooden screws and threaded holes (see Sources).

For additional functionality, consider outfitting this bench with a fully functional wooden tail vise. Doing so will make the bench 4" deeper. It also requires altering the end caps and vise shown here, so it's best to decide up front if you want to take on the challenge. The reward is that you'll have built your own European-style woodworking bench entirely from scratch.

EDITOR: TIM JOHNSON | PHOTOGRAPHY: ANN HARTZLER | ILLUSTRATION: FRANK ROHRBACH

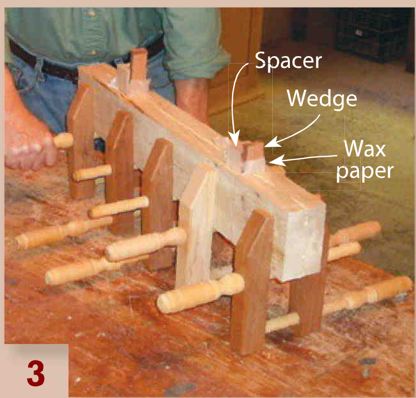
1

Mill 6/4 stock to make blanks for the trestle beams, feet and posts. These thick parts will be made by gluing together two blanks.



2

Cut dadoes in each beam and foot blank. Precisely mark both edges of the dado blade on the miter gauge fence. Then simply align these lines with the layout lines you've drawn on the blank.

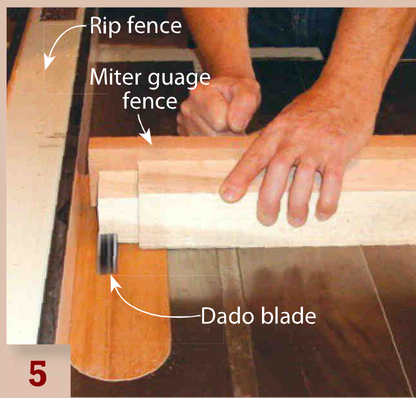


3

Glue a pair of dadoed blanks to make each beam and foot. Spacers and wedges automatically align the dadoes to create through mortises.

4

Use a coffee can to lay out the curves on the top of each foot after cutting a notch to establish its shoulder.



5

Cut tenons on the trestle posts after setting the rip fence to establish the shoulders. Make half-depth passes on all four sides, then raise the blade and go again.

Make the trestle beams and feet

Make the 2-1/2" thick beams and feet (A and B, Fig. A, page 40; Cutting List, page 40) for the trestle-style base from 6/4 stock milled to 1-1/4" thickness (**Photo 1**). Each beam and foot requires two milled blanks. Precisely cut the blanks to final length and width (note that the feet are 1" wider than the beams).

Clamp the blanks together in pairs, flush at both ends. Then lay out the mortises (Fig. B) by using a square to draw lines across the top edge of each pair. Continue these lines across the outside face of each blank; make sure the edge and face lines are perfectly aligned.

Disassemble the blanks and cut 1-1/2" wide x 3/4" deep dadoes on both inside faces (**Photo 2**). Cut all the dadoes halfway deep; then raise the blade and go again to complete them. Assembling each pair of dadoed blanks automatically creates the mortises. To make all the dado shoulders align perfectly, you might have to return to the saw and shave a bit off here and there. When all is said and done, the mortises must align on the beam and foot of each trestle assembly. So pair up and mark all the blanks for each trestle before you glue them together (**Photo 3**).

Lay out the curves on the ends (**Photo 4**). On the feet, cut 1/2" deep notches to establish the decorative shoulders. Then use a compass or a coffee can to draw the 3" radius curves. The beams don't have shoulders, just curves. Lay out the 1/2"notch on the bottom of each foot. Then use a bandsaw to cut the curves and the notches.

Make the trestle posts

As before, mill and glue together 1-1/4" thick blanks made from 6/4 stock to create the posts (C). This time, wait until the posts are glued together before cutting them to final length. Then cut 1-1/2" square x 1-1/2" long tenons on both ends (**Photo 5**). Test-fit the joinery between the posts, beam and foot in each trestle assembly and make any necessary adjustments. Then mark each mortise and tenon so you'll be able to correctly reassemble each trestle. In addition, mark the outside faces of each pair of posts. Then disassemble the trestles.

Lay out holes for the bed bolts and mortises for the stretchers on the posts (Fig. B; Fig. C). Using a square, strike a perpendicular line across the outside face of each post, 12" up from its bottom shoulder. Mark the center of this line to locate the center of the bed bolt hole. Carry the perpendicular line around to the post's inside face and mark its center point. Then lay out a 3/4" wide x 4" long mortise that's centered on this point.

Cut the mortises using a mortiser or a drill press outfitted with a mortising attachment. You can also create the mortises

Fig. A Exploded View

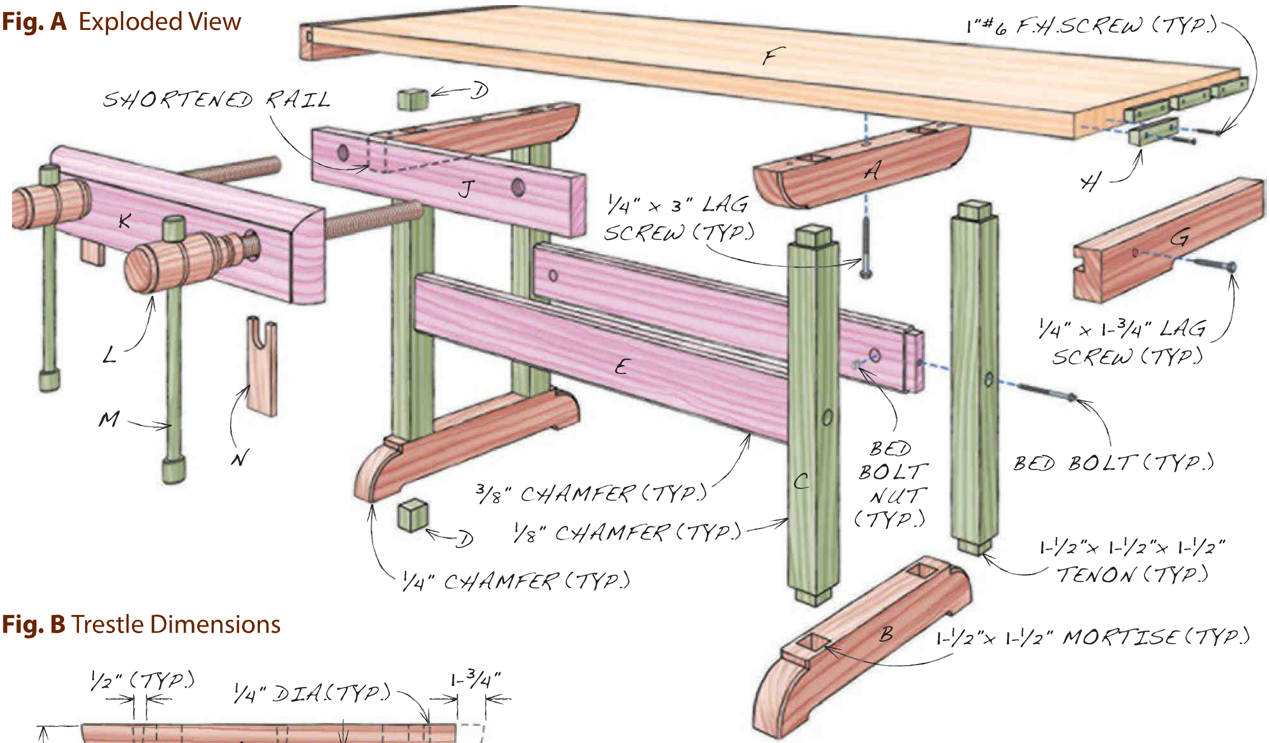


Fig. B Trestle Dimensions

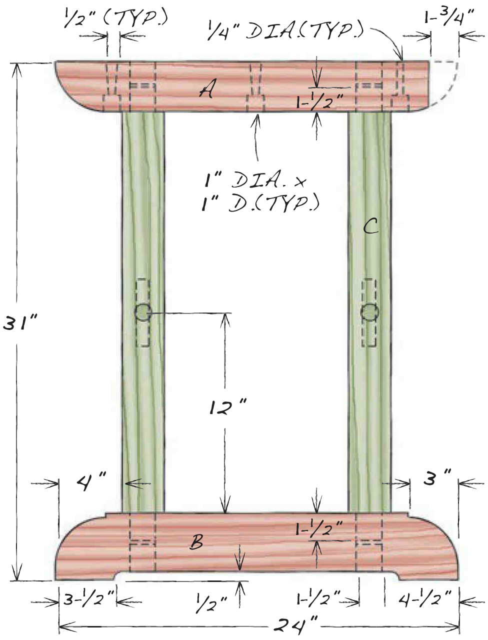
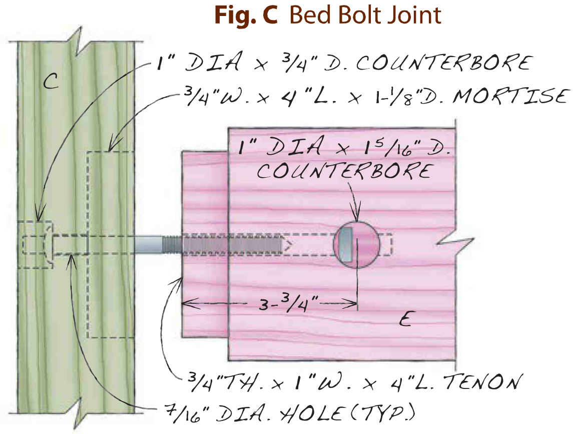


Fig. C Bed Bolt Joint



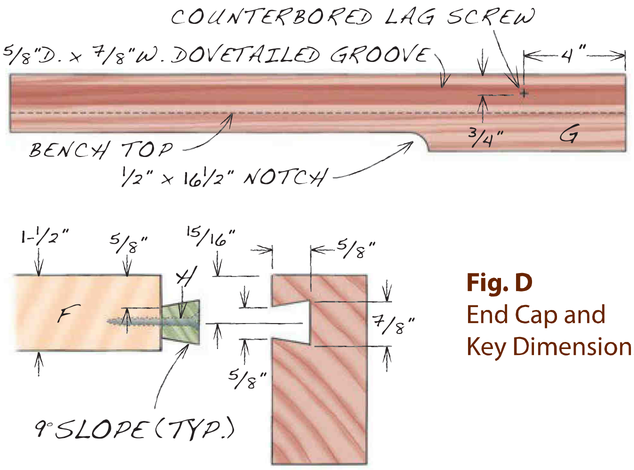


Fig. D
End Cap and Key Dimensions

Cutting List

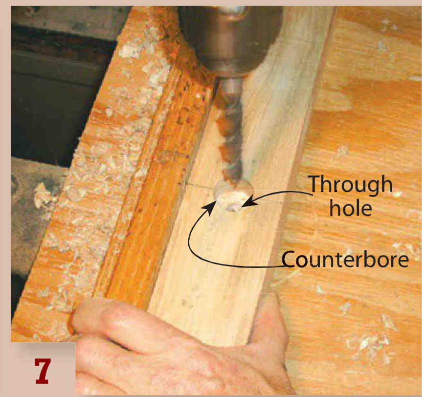
Overall Dimensions: 32-1/2" H x 80" L x 30-1/2" D

Part	Name	Qty.	Material	Th x W x L
A	Beam	2	Hard maple	2-1/2" x 3" x 24" (a)
B	Foot	2	Hard maple	2-1/2" x 4" x 24"
C	Post	4	Hard maple	2-1/2" x 2-1/2" x 27" (b)
D	Fill block	8	Hard maple	1-1/2" x 1-1/2" x 1-3/4" (c)
E	Stretcher	2	Hard maple	1-1/2" x 5" x 45" (d)
F	Top	1	Oak	1-1/2" x 24" x 76-1/2"
G	End cap	2	Oak	1-3/4" x 3" x 24"
H	Key	10	Hard maple	5/8" x 7/8" x 5"
J	Fixed jaw	1	Oak	1-1/2" x 4-1/2" x 33-11/16"
K	Adjustable jaw	1	Oak	1-1/2" x 6" x 35"
L	Screw	2	Hard maple	3" dia. x 21"
M	Handle	2	Hard maple	1-1/4" dia. x 16-3/4"
N	Garter	4	Hard maple	3/8" x 2-3/4" x 6"

Notes:
a) Shorten the front of one beam by 1-3/4" to accommodate the fixed jaw.
b) Length includes 1-1/2" tenons on both ends.
c) Trim the beam fill blocks to 1-1/4" L before installation.
d) Length includes 1" tenons on both ends.

6

Cut a mortise for the stretcher in each post. Drill overlapping holes to rough out the mortise. Then square the shoulders.

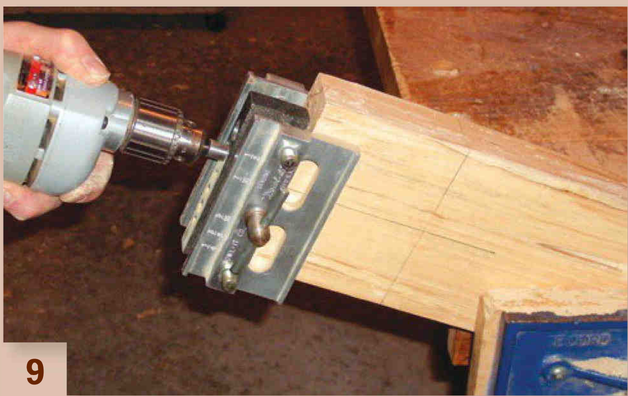


7

Drill a counterbored hole for a bed bolt opposite the stretcher mortise in each post.

8

Glue each trestle after drilling mounting holes for the top and cutting notches to raise the feet. Shorten the left trestle's beam.



9

Drill a centered hole in the end of each stretcher for the bed bolt. Use a self-centering doweling jig to start this deep hole and remove the jig to finish drilling it.

10

Drill a counterbored hole for the bed bolt nut. Center this hole on the bolt's shaft hole and drill just deep enough to make the threaded hole in the nut concentric with the shaft hole.

using a drill press equipped with a 3/4" Forstner bit. Install a fence on the drill press and set it to center the bit on the mortise. Set the drilling depth to 1-1/8" and drill a series of overlapping holes to rough out the mortise. Then square the shoulders by hand (**Photo 6**).

The bed bolt holes are counterbored. (A counterbore is a stopped hole with a flat bottom. Here, counterbores are used to house the heads of the bed bolts.) Start by using a 1" dia. Forstner bit to drill a 3/4" deep hole at the center point marked on the outside face of each post. Here's a tip: When the drill bit is centered on the layout line of the first post, make a tick mark on the fence where the layout line touches it. The tick line allows you to quickly position the remaining posts for drilling.

Install a 7/16" dia. drill bit to drill the through holes. Use the tick mark on the fence to position each post. Each hole must be centered in the mortise on the post's opposite face, so before drilling make sure that the bit engages the center point left by the 1" Forstner bit (**Photo 7**).

Glue the trestle assemblies

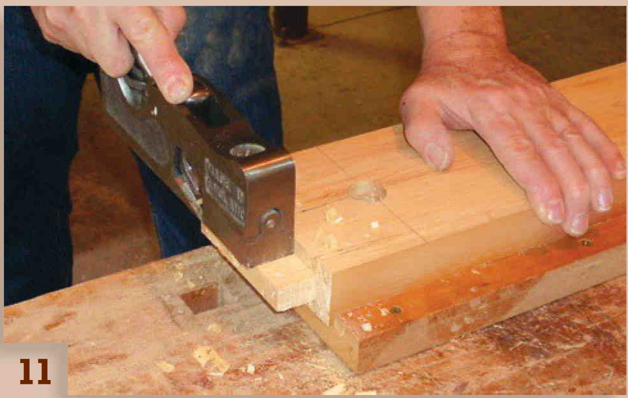
Install fill blocks (D) in all the mortises. Shorten the left trestle assembly's beam by 1-3/4" to accommodate the fixed jaw of the vise, which mounts on the front of the bench. Drill counterbored holes through both beams for the lag screws used to mount the bench top. To allow the top's seasonal movement, elongate the top ends of the center and back holes by working the bit back and forth. Chamfer the rounded ends on the beams and feet and all the posts' long edges. Match up the posts, beams and feet to make sure all the parts are correctly oriented. Then glue together the trestles (**Photo 8**).

Make the stretchers

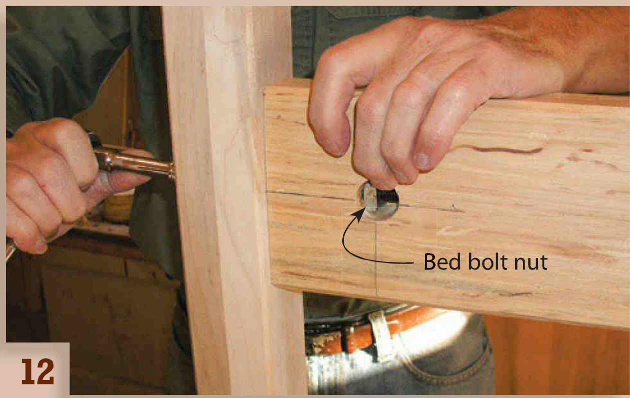
Mill the two stretchers (E) that connect the trestles to final dimensions. Then locate and drill holes for the bed bolt shafts in the ends (**Photo 9**). Using a square, mark a centered line across the end grain on the 5" wide stretcher. (After the stretcher's tenon has been cut, this hole will align with the bed bolt hole in the post.) Continue the centered line about 6" onto the stretcher's inside face.

Align a self-centering dowelling jig on the line marked on the end of the stretcher and drill a 7/16" dia. hole into the end grain as deeply as the drill will go. Note: The jig is great for drilling a hole square to and centered on the board being drilled, but it prevents the bit from drilling deep enough for the bed bolt. So, remove the jig and use the hole you've just drilled as a guide to drill as deeply as the bit allows.

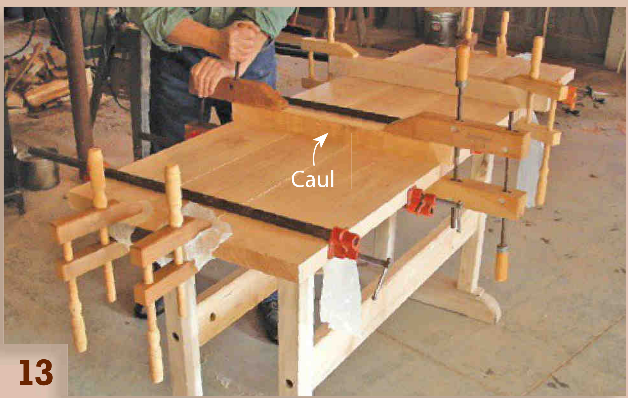
Next, drill counterbored holes to house the bed bolt nuts (**Photo 10**). Located on the inside faces of both stretchers,



Size the stretchers' tenons to slide easily into the mortises. These joints aren't glued. The tenons simply position the stretchers until the bed bolts and nuts lock the parts together.



Install the bed bolts to assemble the base. Slide each bolt through the post and into the stretcher. The square bed bolt nut virtually holds itself in position while you tighten the bolt.



Glue up the top after jointing the boards' edges square and flat. Use cauls to keep the top flat and clamps at both ends to keep the joints aligned. Use the base as an assembly table.

Square each end of the top using a straightedge. Start by cutting with a saw. Then switch to a router equipped with a flush-trim bit and make a shallow pass to clean the edge.

these holes intersect the shaft holes drilled in the ends. Mark a point on the centerline drawn earlier, 3-3/4" from the end of the stretcher. At that point, use a 1" Forstner bit to drill a 1-5/16" deep hole.

Complete the stretchers by chamfering their long edges and cutting 1" tenons on both ends. You can also use the miter gauge setup shown earlier to cut these tenons, but for long pieces like these stretchers, it's best to use a crosscut sled with a long fence for support. (See how to make a simple crosscut sled suitable for long pieces at AmericanWoodworker.com/WebExtras.) Lay each stretcher flat to cut the tenon cheeks. Lower the blade and stand the stretcher on edge to cut the tenon's ends. The tenons are only used for positioning, so it's OK to make them slightly undersize (**Photo 11**). Chamfer the ends of the tenons, to make them even easier to install.

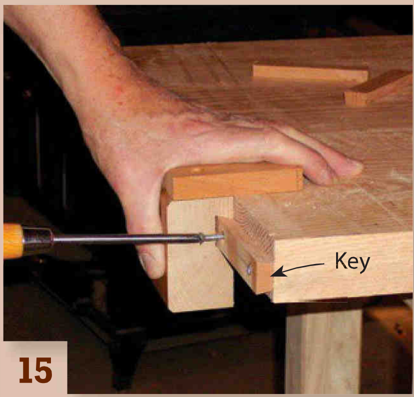
Assemble the base

Stand one of the trestles upright and install one of the stretchers, positioned so the hole for the bed bolt nut faces inside. Push a bed bolt through the holes drilled through the post and stretcher until you can just feel the point entering the hole for the nut. Slip a bed bolt nut in the hole and align it with the point of the bolt. Orient the nut's convex face towards the bolt, so it will seat against the hole's curved wall. Hold the nut steady and use a wrench to tighten the bolt. (Traditionalists will insist on using a bed bolt wrench to properly engage the bolt's square head, but a socket wrench will do.) As the bolt threads, the square-sided nut will bear against the bottom of the stopped hole, so you don't need a wrench to hold it, only finger pressure (**Photo 12**). Continue to tighten the bolt until the stretcher's tenon shoulders draw tight against the post. Repeat these steps to install the other stretcher on the trestle. Then attach the other trestle to complete the base. Reverse the process to disassemble the base.

Make the bench top

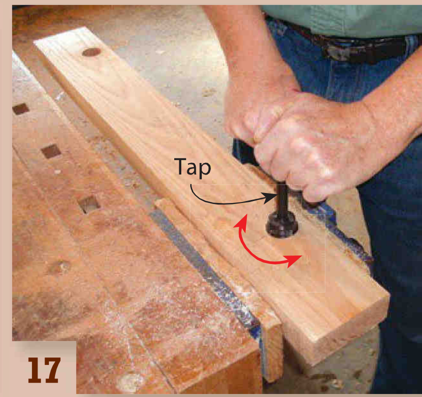
Thickness-plane boards for the top (F) and joint their edges square. Note: If the edges aren't square, the top won't glue up flat. If you don't have a suitable jointer, you can square the edges on the tablesaw, using a glue-line rip blade (see Sources). Glue the boards together (**Photo 13**). Then trim the ends square (**Photo 14**). When you rout to clean the edge, use a straightedge with sufficient overhang to support the router at both ends of the cut and stop short, so you don't blow out the edge at the end of the cut. Flatten the nub left at the very end by sanding with a block or using a hand plane, working from the outside edge toward the center.

Lay the top bottom-side up to install the base. Position the



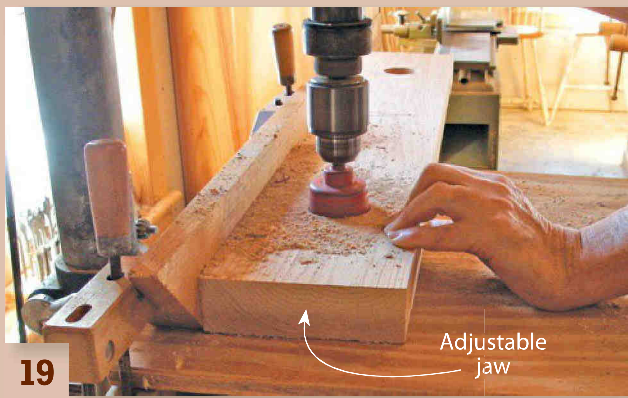
Fasten the dovetailed keys used to mount the end caps. Make a jig using an offcut from one of the end caps to position each key.

Drive each end cap onto the keys until it's flush with the front of the bench top. Then secure it with a countersunk bolt.



Tap the holes for the wooden screws in the vise's fixed jaw. Turn the tap 180° and then back it off to clear the waste. Then go again.

Fasten the fixed jaw flush with the front of the bench. This automatically centers the threaded holes on the overall width of these two parts.



Drill a pair of holes in the vise's adjustable jaw to house the wooden screws. Make sure these holes align with the threaded holes in the fixed jaw.

base so the outside face of its left trestle is 7" away from the end of the top and its shortened beam is 1-3/4" back from the front edge. Then make sure the right trestle's beam is flush with the front edge. Mark the mounting screw locations and drill pilot holes for the 3" lag screws. (Center the pilot holes in the four elongated shaft holes.) Install the lag screws. Then turn the bench right-side up.

Install the end caps

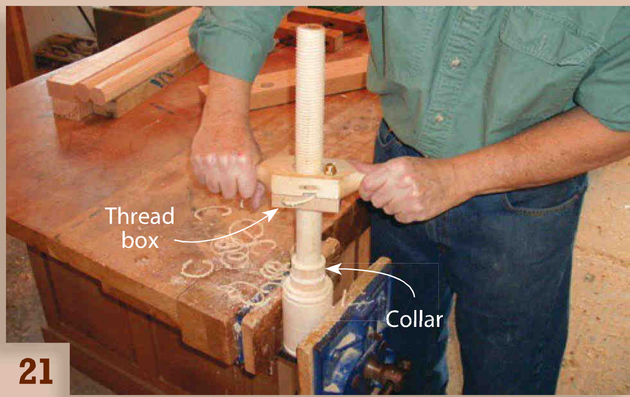
End caps (G) secured by dovetail-shaped keys (H) keep the top flat while allowing its seasonal movement. Mill 8/4 stock to 1-3/4" thickness to create the end caps. Cut a pair of blanks to width and length and drill a single counterbored hole for a 3/8" x 1-3/4" lag screw in each one. Then use the tablesaw to cut a 7/8" wide dovetail-shaped groove on the inside face of each blank, located 5/8" from its top edge (Fig. D). Tilt the blade 9˚ to cut the angled shoulders. Then install a dado blade to remove the waste. You can lighten the end caps' appearance by making them narrower at the back. (This step is optional.) Cut notches on the bandsaw or by making a series of stopped cuts on the jointer. Finish each end cap by lightly chamfering its outside—and *only* its outside—edges.

Make two key blanks on the tablesaw with the blade tilted 9˚ and set at 1" height. Stand a 1" x 4" x 24" blank on its edge to cut the first dovetailed shoulder; turn the blank end-for-end and make a second pass to cut the other shoulder. Reset the fence between passes to determine the key's width. Make a third pass with the blank on its side to cut out each key blank. Each key blank should fit the beam's grooves snugly, but slide without binding. When installed in the groove, each key must also must sit flush with, or slightly below, the beam's face.

Cut the blanks into 4" to 5" long keys and use a jig to screw them to the bench top (**Photo 15**). The jig is simply a 2" wide offcut from one of the end beams with a fence fastened on top. Slide a key into the jig and position the jig on the bench. Drill a countersunk pilot hole through one end of the key and into the end of the bench. Install a screw. Repeat the process on the other end of the key. Then remove the jig. Space the keys about 1" apart, starting at the front of the bench top.

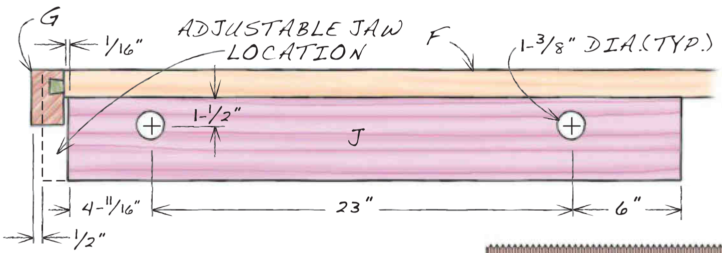
Rub paraffin in the end caps' dovetailed grooves. Then drive each one onto the keys and into position flush with the front of the bench top (**Photo 16**). Drill a pilot hole and install a lag bolt. This bolt locks the end cap flush with the front of the top while leaving the top free to expand and contract across its width. Each end cap can be tapped off with a dead blow mallet once the bolt is removed. Complete the installation by trimming the back end of each end cap flush with the back of the top.

Turn the wooden screws. Finish by cutting a groove for the garter in the collar. The garter locks the screw in the vise's adjustable jaw but allows it to turn freely.



Use a thread box to thread the shaft of each wooden screw all the way to the collar. As before, alternate between threading and backing off to keep the thread box from binding.

Fig. E Fixed Jaw



See how to make a simple crosscut sled at **AmericanWoodworker.com/WebExtras**

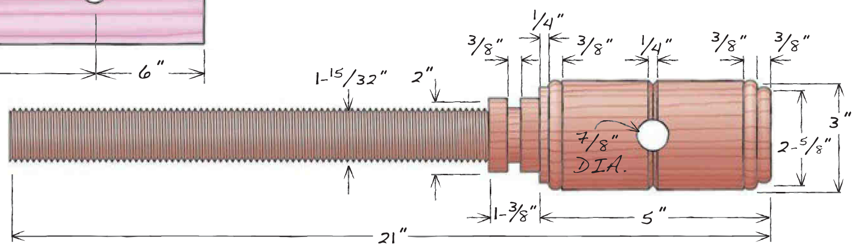


Fig. F Adjustable Jaw

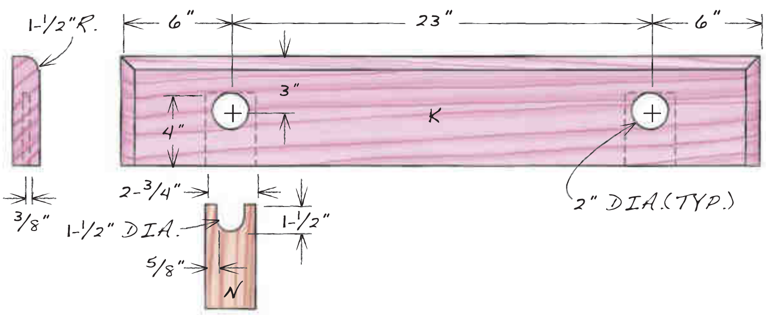
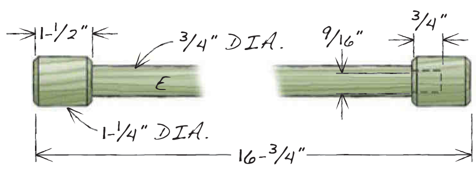


Fig. G Wooden Screw and Handle



Build the vise

The twin-screw vise on this bench (Fig. E; Fig. F) was commonly used in the 18th and 19th centuries by both English and Colonial American cabinetmakers. The wide surface of its thick front jaw, combined with the two widely spaced wooden bench screws makes it easy to clamp up and secure work of almost any size or shape.

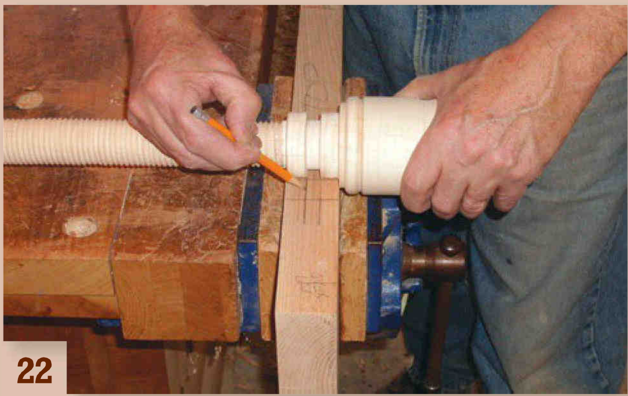
The rear (fixed) jaw of the vise (J) is simply a 4-1/2" wide board with two threaded holes that's glued to the bench top, flush with the front edge. Hard maple is an excellent choice for components that will be threaded. After milling the fixed jaw to final dimensions, lay out the hole locations and drill the 1-3/8" dia. holes. Then use a 1-1/2" tap to thread the holes (**Photo 17**; see Sources). Leave a small gap between the end cap and the fixed jaw when you glue the jaw to the bench top (**Photo 18**).

The vise's 6" wide front (adjustable) jaw (K) matches the overall width of the fixed jaw and bench top. Mark the best edge of the adjustable jaw so that it will face up when the jaw is installed. Then locate and drill a pair of 2" dia. holes that are concentric with the threaded holes in the fixed jaw/bench top (**Photo 19**). Note: When this jaw is installed and closed, it should be flush with the bench top and located 1/2" in from the outside edge of the end cap. Finish the adjustable jaw by routing a large radius on its top and both ends.

Turn wooden screws

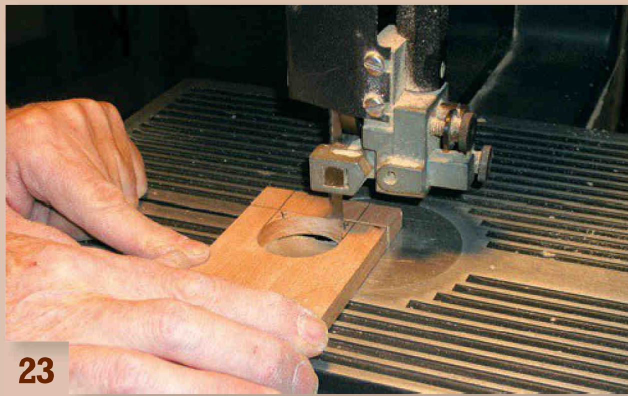
Make the screws (L) from 21" long maple blanks turned to 3" dia. cylinders (**Photo 20**; Fig. G). Lay out and turn the head, its decorative details and the 2" dia. x 1-3/8" long collar. Next, turn the shaft down to 1-15/32" dia. Then finish by cutting a centered 1/4" deep groove in the collar for the garter that will capture the screw in the vise's adjustable jaw.

Clamp the turned screw in a vise (the one on your other



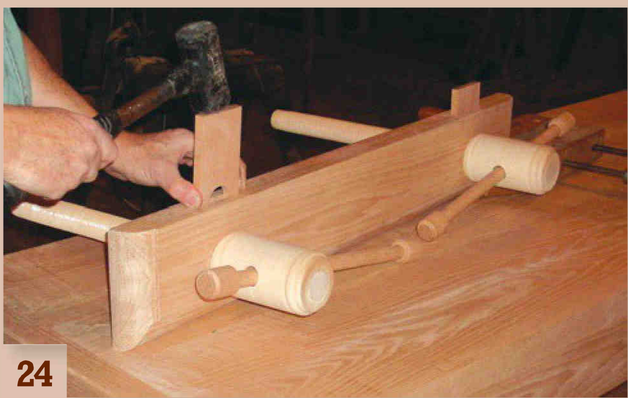
22

Mark the garter mortises on the bottom of the adjustable jaw. Butt a screw against the jaw above each hole drilled through it. Then transfer the location of both garter groove shoulders.



23

Cut a garter to lock each wooden screw in the vise's adjustable jaw. First drill a hole. Then shorten the end and trim the waste to create a U-shaped cutout.



24

Tap a garter into each mortise to capture each screw. Turn the screw to work in the garter and the garter groove. Keep turning until the screw operates smoothly.

25

Install the adjustable jaw by threading the screws into the fixed jaw. Turn each screw separately until they're both engaged. Then turn them together to close the jaw.

workbench) and use a 1-1/2" thread box to cut threads into the shaft (**Photo 21**).

Use a V-block and a drill press with a fence to drill a centered 7/8" dia. hole in the head of each screw for the handle (M). Turn the handles from 1-1/2" x 1-1/2" x 18" long maple blanks. Turn the shaft of each handle to 3/4" dia., with a 1-1/4" dia. knob on each end. On one end, next to the knob, turn the shaft down to create a 9/16" dia. tenon. Then remove the handle from the lathe and cut off the knob. Clamp the loose knob in a hand screw and drill a 9/16" dia. stopped hole for the tenon. Slide the shaft of the handle through the hole in the head of the screw and then glue the loose knob onto the tenon.

Install the screws and mount the vise

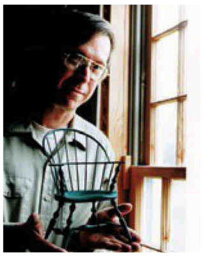
Turn the adjustable jaw upside-down to locate the mortises for the garters that lock the screws in the jaw (**Photo 22**). These 3/8" x 2-3/4" mortises are centered across the jaw's width and also on the axis of each of the holes drilled to house the wooden screws. Dedicate one screw to each hole, as there may be slight variations in the garter groove locations on the two screws. Draw the marks; then chop the mortises.

Make the garters (N). Drill a 1-1/2" dia. hole through a 3/8" x 2-3/4" x 6-1/2" blank, about 2" from one end. Then cut off the end to create a U shape (**Photo 23**). Dry fit the wooden screws and garters to make sure the garters allow the screws to turn smoothly.

To assemble the vise, set the front jaw upside-down on the bench. Slide each screw into its collar hole until its head seats against the face of the jaw. Then use a dead blow mallet to drive the garter into its mortise (**Photo 24**). Align the screw threads with the threads cut into the rear jaw and turn the screw handles until the vise closes (**Photo 25**).

SOURCES

- Rockler Woodworking and Hardware, rockler.com, 800-279-4441, Bed Bolt with Nut, 3/8" dia. x 6", #99277, $8.79 each; 4 req.
- Woodcraft, woodcraft.com, 800-225-1153, Woodthreading Kit, 1-1/2" x 6 TPI, #12T17, $50.39.
- Infinity Cutting Tools, infinitytools.com, 877-872-2487, 10" Ripping Saw Blade, 24T, .125 Kerf, #010-024, $51.90.

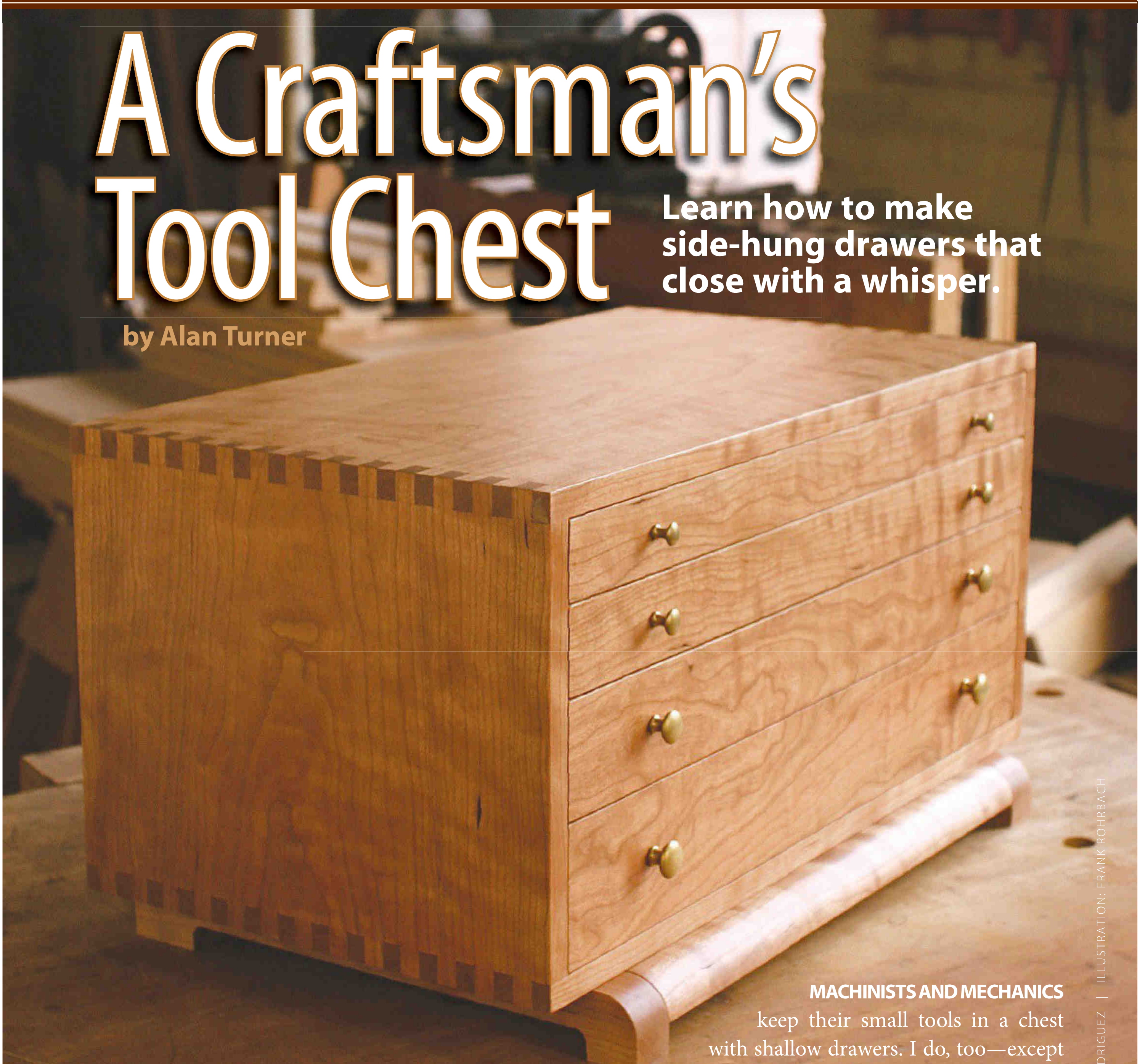


Steven Bunn owns and operates a cabinet shop in Bowdoinham, Maine, where he specializes in crafting Windsor chairs. Steve was juried into *Early American Life* magazine's 2012 Directory of Traditional Craftsmen. See more of Steven's work at **stevenbunn.com**.

A Craftsman's Tool Chest

Learn how to make side-hung drawers that close with a whisper.

by Alan Turner



A secret drawer hides behind the chest's front rail.

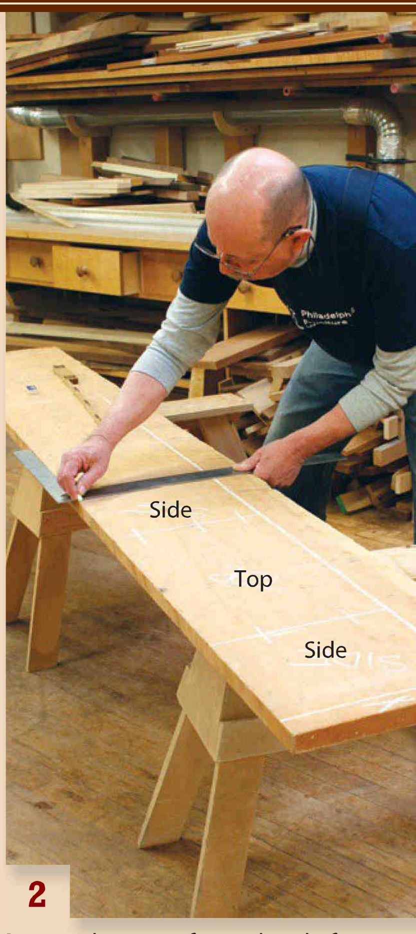
MACHINISTS AND MECHANICS keep their small tools in a chest with shallow drawers. I do, too—except mine is custom-built, sized to exactly fit what I want to keep close at hand. And it's more than a merely functional metal box: Made from figured cherry and matched all around, my tool chest is a daily reminder that grain matters.

The drawers in this chest are side-hung, which maximizes the amount of storage space inside the chest. The whole unit is as compact as could be, and even contains an additional drawer hidden behind its lower rail. I fitted out some of the drawers with interior dividers, but didn't make them permanent. You never know when a new small tool might come along to join the crew!

EDITOR: TOM CASPAR | PHOTOGRAPHY: MARIO RODRIGUEZ | ILLUSTRATION: FRANK ROHRBACH

1

Take stock of what you'd like to store in your chest before you begin building it. Arrange your tools and supplies, then estimate the width, depth and height of the drawers you'll need.

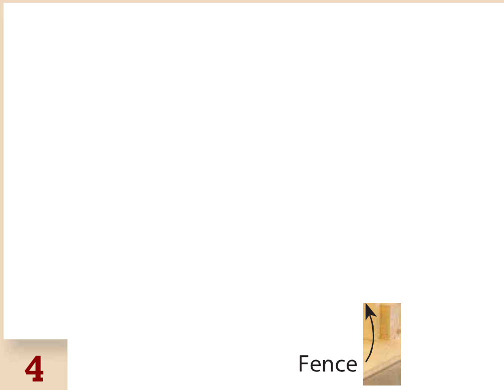


2

Lay out the parts of your chest before you begin cutting. Ideally, you can arrange the sides and top of the chest, as well as the drawer fronts, in sequence.

3

Use a marking gauge to score box-joint baselines on the top, bottom and sides of the chest. These lines help prevent tearout.



4

Cut the box joints with a dado set. I use a special sled with a tall fence (see "Box-Joint Sled," page 54).

Size the case

To get started, take stock of what tools and supplies you would like to store in your chest. Lay them out as they might sit in the drawers and take some measurements to determine the number, length, width and height of the drawers you'll need (**Photo 1**). Make a full-scale drawing of one side of your chest—similar to Fig. F, page 49, but including the drawers—to confirm your measurements and nail down the position of each drawer.

Here's how I arranged the tools in my chest: The top drawer holds various important small items that would get lost in a larger drawer; the second drawer holds marking and measuring tools; the third drawer holds my favorite files and rasps; the bottom drawer contains boxes of screws and other fastening supplies.

Once I figured out how deep the drawers would be, I looked for a board wide enough and long enough to build the chest from a single plank, so all the grain would match (**Photo 2**). I wanted all the drawer fronts to come from one wide piece, so the front of the chest would look like a single board. And I wanted the wood's figure to wrap around the sides and top, as if the board had just been folded at the corners.

The top and bottom (A) and sides (B) of the case are only 1/2" thick. If you're starting with 4/4 (1") lumber, don't take the wood down to this thickness right away. In order to make accurate box joints, your pieces must be absolutely flat, and I've learned the hard way that wood may not stay flat if you reduce its thickness too rapidly. It's best to be conservative and remove only 1/8" or so in one session, let the wood rest for a few days, joint it once more, then plane again. Be sure to plane some additional wood to the same thickness for making test cuts with your box joint jig.

Determine the exact width of your side, top and bottom pieces by the number of fingers your box joints will have. I think box joints look best if the fingers are longer than they are wide; on this box, the fingers are 1/2" long (the thickness of the material), but only 3/8" wide. When I make box joints, I've found that it's easier to keep track of the cutting process if I make an odd number of fingers—this means that the box joints on the top and bottom pieces begin and end with full fingers. Multiplying an odd number (in this case, 27) by the width of the fingers (3/8") gave me an overall width of 10-1/8" as a target.

Don't rip your boards to a theo-

Fig. A Exploded View

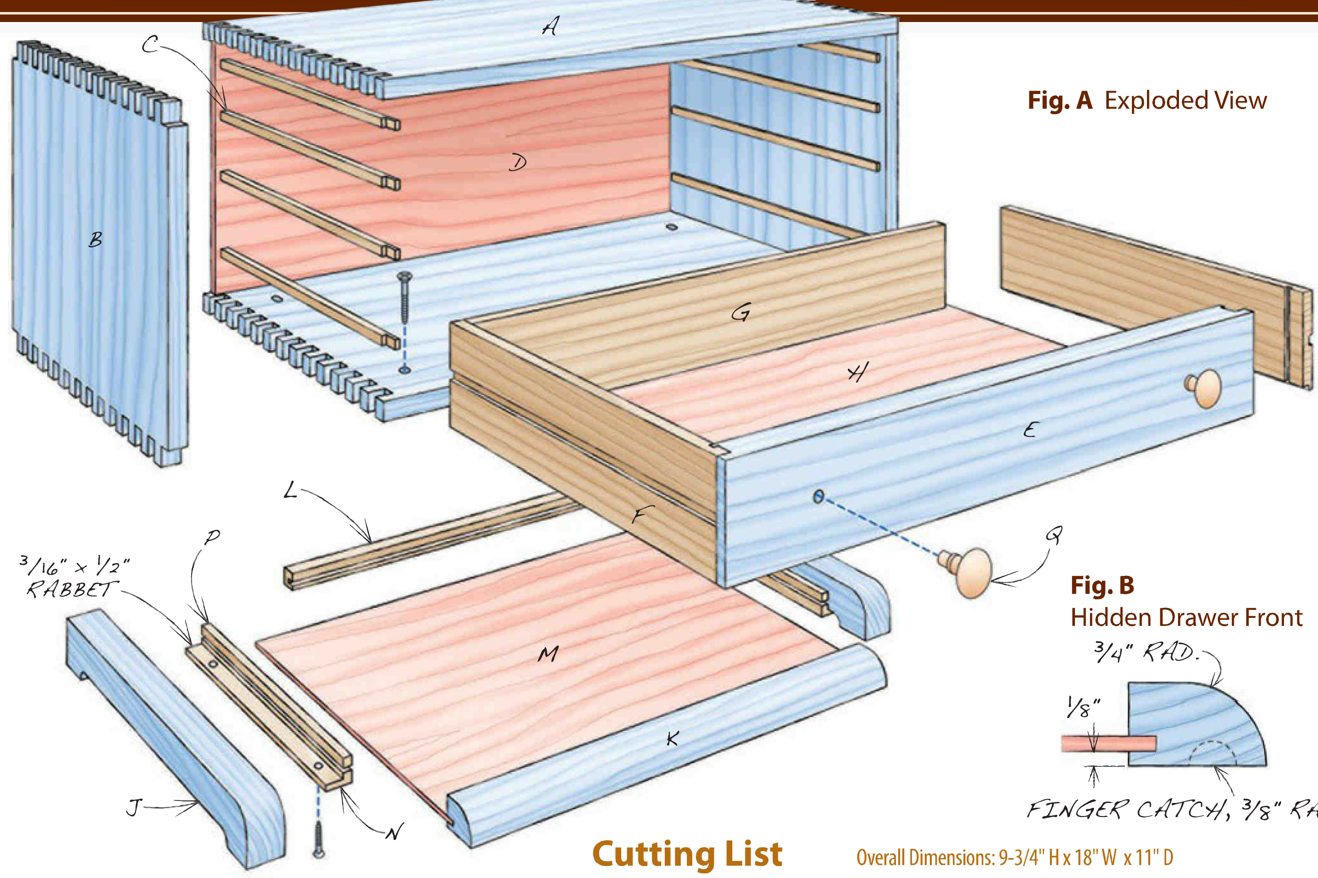


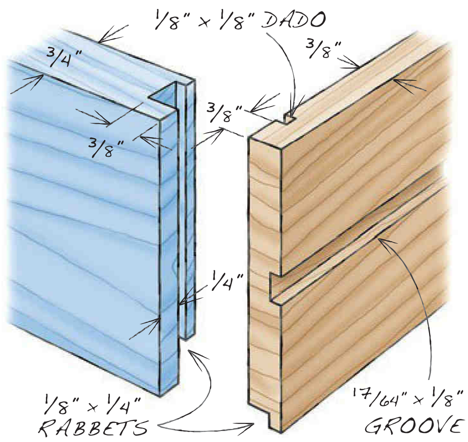
Fig. B Hidden Drawer Front

Cutting List

Overall Dimensions: 9-3/4" H x 18" W x 11" D

Section	Part	Name	Qty.	Material	Th x W x L
Cabinet	A	Top and bottom	2	Cherry	1/2" x 10-1/8" x 18"
	B	Side	2	Cherry	1/2" x 10-1/8" x 8-1/2"
	C	Drawer hanger	8	Soft maple	1/4" x 1/4" x 8-1/2"
	D	Back	1	1/4" Baltic birch ply	1/4" x 7-1/2" x 17-1/2"
Drawer fronts	E1, E2	Fronts 1 & 2	1	Cherry	3/4" x 1-7/16" x 17"
	E3	Front 3	1	Cherry	3/4" x 2" x 17"
	E4	Front 4	1	Cherry	3/4" x 2-15/32" x 17"
Drawer sides	F1, F2	Sides 1 & 2	2	Soft maple	3/8" x 1-7/16" x 9-1/2"
	F3	Side 3	2	Soft maple	3/8" x 2" x 9-1/2"
	F4	Side 4	2	Soft maple	3/8" x 2-15/32" x 9-1/2"
Drawer backs	G1, G2	Backs 1 & 2	1	Soft maple	3/8" x 1-5/16" x 16-1/4"
	G3	Back 3	1	Soft maple	3/8" x 1-7/8" x 16-1/4"
	G4	Back 4	1	Soft maple	3/8" x 2-11/32" x 16-1/4"
Drawer bottoms	H	Drawer bottom	4	1/8" Baltic birch ply	1/8" x 9-1/2" x 16-3/4"
Feet	J	Foot	2	Cherry	1" x 1-1/4" x 11"
Hidden drawer	K	Front	1	Cherry	3/4" x 1" x 13-1/2"
	L	Back	1	Cherry	1/2" x 1/2" x 12-5/8"
	M	Bottom	1	1/8" Baltic birch ply	1/8" x 10" x 13-1/2"
	N	Lower guide	2	Cherry	5/16" x 3/4" x 8"
	P	Upper guide	2	Cherry	1/4" x 1/4" x 8"
Drawer pulls	Q1	Pull 1	2	Brass	3/8" dia.
	Q2	Pull 2	2	Brass	7/16" dia.
	Q3	Pull 3	2	Brass	9/16" dia.
	Q4	Pull 4	2	Brass	5/8" dia.

Fig. C Drawer Details



See more how-to photos for this project at **AmericanWoodworker.com/WebExtras**

Fig. D Feet Setback

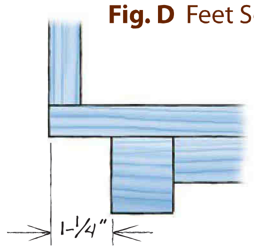


Fig. E Sled Foot Pattern

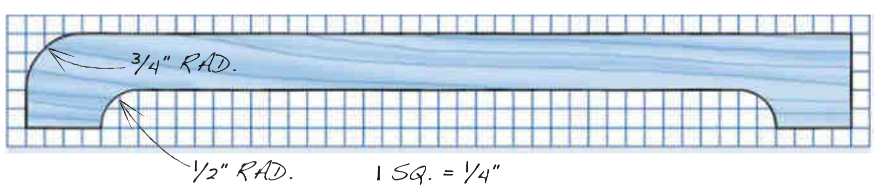
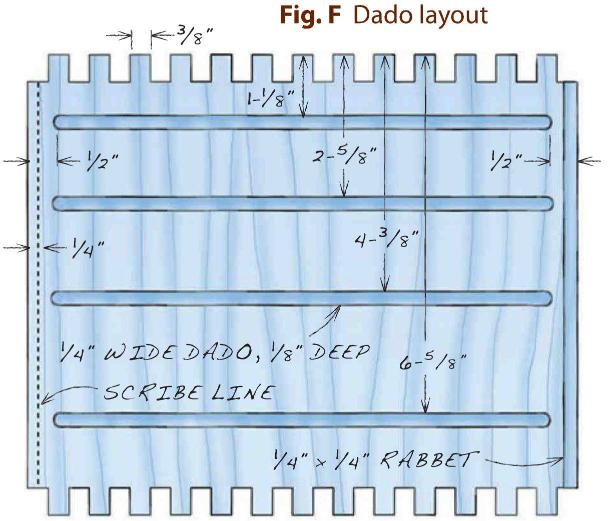
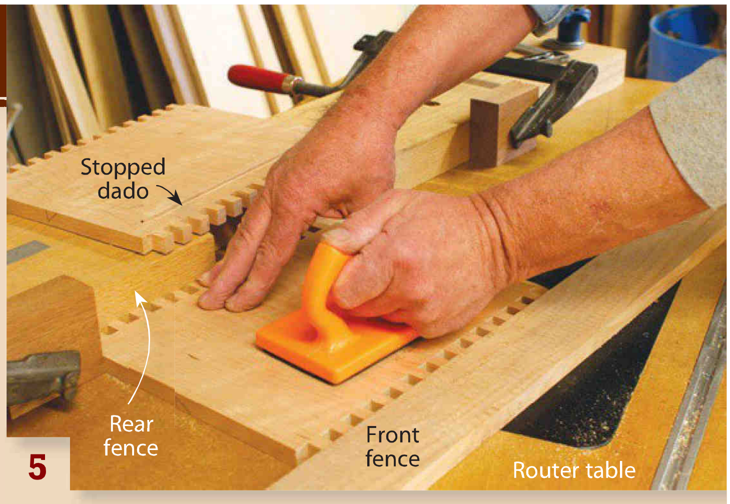


Fig. F Dado layout





5 **On** a router table, cut stopped dadoes in the sides of the case to receive drawer runners. To make straight, accurate cuts, trap the sides between two fences.

retical width such as this, however: Do a real-world test. Set up your box-joint jig, fine-tune its setting until the joints fit right, then cut 27 fingers (or whatever number you want) on a slightly wider test piece. Measure the width that they add up to—it may be a little more or a little less than your math indicated.

Build the case

Cut the sides, top and bottom to final width and length. To prevent tearout when making the box joints, use a wheel- or knife-style marking gauge to score baselines for the joints (**Photo 3**). I want my box joints to be about 1/64" proud when they're glued up, so this line is 1/2" plus 1/64" in from the end of the board. (I leave the scribed lines on the finished piece as a mark of craftsmanship.) Score both sides of each piece, then cut all of the joints (**Photo 4**). I use a shop-made tablesaw sled that I've designed (see "Box-Joint Sled," page 54).

Next, cut stopped dadoes in the sides to receive the drawer hangers (C)—the small strips that the drawers will hang from. Set up your router table with a 1/4" up-cut spiral bit and raise the bit 1/8" high. These dadoes must be absolutely straight; I've found that the best way to ensure this is to trap each side between two fences (**Photo 5**). In addition, clamp two blocks, front and rear, to one of the fences to determine the beginning and end of each cut. Rout both of the case's sides at the same setting, then move the fences for each subsequent pair of dadoes. Don't sweat the precise location of the start and stop blocks each time you move the fences. It's OK if the ends of the dadoes don't exactly line up; you'll be able to correct for that later, when you install the drawer hangers.

Cut a rabbet in the sides to receive the case's back (D). Don't cut a similar through rabbet in the top and bottom pieces; this would create a visible hole in the box joints. The back doesn't really need to be let into all four sides of the case, but if you prefer this arrangement, use a plunge router to stop the rabbets in the top and bottom pieces. Alternatively, you could cut all four rabbets after the case is glued together, using a rabbeting bit with a guide bearing mounted in a router table.

The case is ready to glue together. Gluing dozens of box joints requires speed, so I use Elmer's Glue-All, a white glue that has a longer open time than most yellow glues. I use a syringe to quickly apply the glue on the side pieces (**Photo 6** and Source, page 51), then use a plastic card to spread it. (To save time, apply glue only to the tops of the fingers. You don't have to put any glue on the top and bottom pieces.)

Tap the pieces together with a mallet and a block. Drive the joints home as far as you can, then use clamps to bring the joints up tight. Don't use too much pressure—this could bend one or more pieces and throw the case out of square. Measure the diagonals to ensure that the case is square, then remove the clamps and clean up the glue squeeze-out. After the glue dries, plane, scrape or sand the joints even (**Photo 7**).

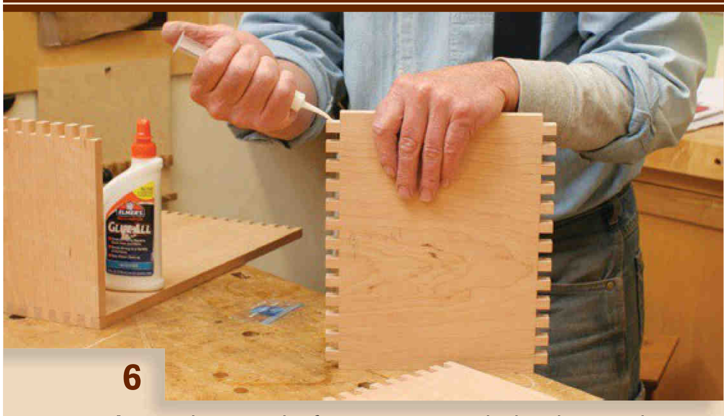
Make the drawers

The fronts (E1-E4) and sides (F1-F4) of the drawers are exactly the same width. Plane these pieces to thickness well ahead of time, but leave them about 1/16" extra-wide and 1/4" extra-long. Make sure that one edge of each piece is dead straight before you rip the piece to final width.

Rip the fronts and sides at the same time, starting with the lowest drawer. As you cut the fronts, stack them inside the case (**Photo 8**). Place shims on the bottom of the case and on top of each front to create 1/32" gaps between each drawer. (Make the shims from three pieces of manila file folder taped together.) When you get to the top drawer, measure the opening to obtain an exact fit. Subtract 1/32" from the distance to allow for a gap above the drawer. Cut the fronts to exact length, so they fit snugly into the case. Trim the sides to final length as well.

Now you can move on to hanging the drawers. First, make the stock for the drawer hangers—it should fit snugly into the stopped dadoes. Cut the stock into pieces that are about 1/2" extra-long. Place four of these pieces into the stopped dadoes on one side of the case.

In the next step, you'll cut grooves in the drawer sides to receive the hangers. These grooves should be about

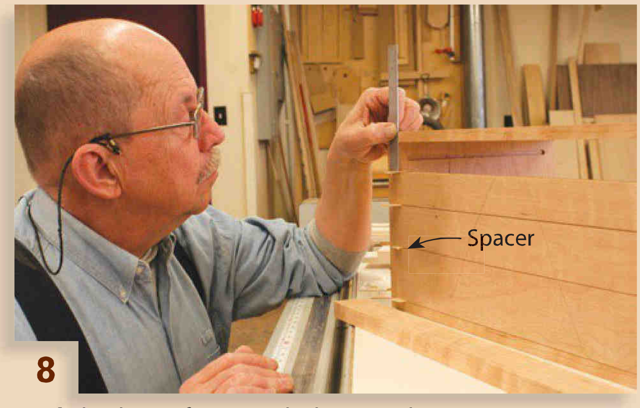


6

Glue up the case. The fastest way to apply the glue is with a syringe. To speed up the process, I put glue only on the side pieces, and only on top of the fingers.

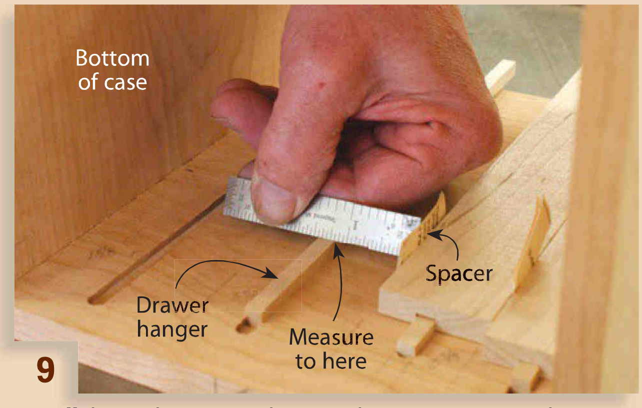
7

Even up the joints with a plane. A random-orbit sander would work as well, but if there's a lot of waste to remove, using a plane is much faster. A skew cut along the joint works best.



8

Stack the drawer fronts inside the case, placing spacers in between. Measure the top opening so the front fits just right. Rip the drawer sides the same width as each drawer front.



9

Install drawer hangers in the case, then cut grooves in the drawer sides to match. Use the drawer-front spacers between the drawer sides when you take a measurement for each groove.

1/64" wider than the hangers so the drawer will slide freely. Make the grooves with a dado set, using shims to get their width just right.

Cutting these grooves in the correct position on the drawer sides requires careful marking and accurate measuring. First, mark the top edge of each drawer side—this edge will go against the saw's fence. Place a shim against the inside top of the case and measure the distance from the shim to the top of the first drawer hanger. Set the tablesaw's fence to this measurement and cut the grooves in the two appropriate drawer sides. Place one of these sides in the case, engaged with the hanger, top edge up (**Photo 9**). Place a shim next to this drawer side, measure the distance to the next hanger and repeat the process.

The next steps depend upon how you intend to join the drawers. The simplest method is to cut rabbets on the ends of the drawer fronts, then glue and pin-nail the sides to the fronts using 5/8" long 23-ga. micro-nails. Although rabbeted and nailed joints aren't all that strong, gluing the plywood bottoms (H) to the front and sides of a drawer will minimize the amount of stress on its corners, so this joint is strong enough.

A nailed rabbet doesn't have much curb appeal, however. Your eye certainly won't linger on it each time you open a drawer. For better looks—and a stronger drawer—I recommend using a half-blind tongue and rabbet joint (see "An Ideal Joint for Small Drawers," page 52, and Fig. C). These joints require some careful tablesaw work, but you can use the same setups for each drawer, regardless of its size.

After making the joints, cut rabbets along the bottom edges of the drawer fronts and sides to receive the drawer bottoms. Temporarily assemble the drawer fronts and sides and cut the bottoms to fit. Temporarily install the bottom and cut the drawer backs (G1-G4) to length—they just butt between the drawer sides.

Glue the drawers (**Photo 10**). The best method is to join the front, sides and bottom all in one shot on top of a flat bench or board. This ensures that the drawer will be flat and square. Use micro-nails or weights to hold the bottom in place while the glue dries. Glue the backs last.

Next, you'll install the drawer hangers. Notice that their front ends are lipped (Fig. A). Make these lips a good 1/4" longer than necessary, to accommodate any differences in the lengths of the stopped dadoes. The front ends of the hangers will butt up to the drawer fronts, stopping the drawer's travel. You'll want the drawer fronts to be even with the case's sides, so the exact setback of the hangers is quite

10

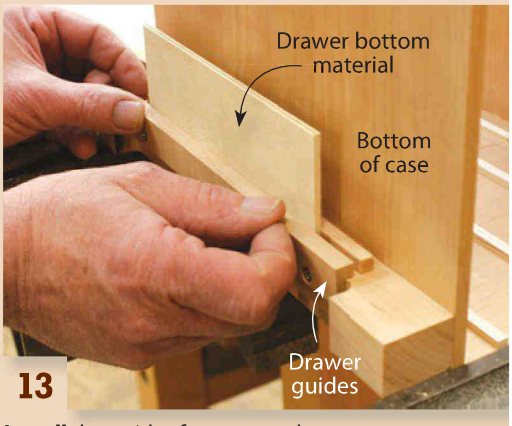
Glue the front and sides of the drawers together. Add the drawer bottoms at the same time to keep the drawer square. Add the drawer backs later.

11

Trim the drawer hangers so their ends all line up. The ends serve as stops for the drawers.

12

Sand the drawers level with the sides of the case.



13

Install the guides for a secret drawer under the case. Set the distance between the guides using a scrap piece of the drawer-bottom plywood.

important. I've found that the best method of creating this setback is to set a marking gauge to the thickness of a drawer's lip, then scribe lines with the gauge on both sides of the case. Glue in the hangers so they extend about 1/16" over the line, then gradually pare the hangers to exact length with a chisel (**Photo 11**).

Sand or plane the sides of the drawers until they slide well, with a minimum of racking. Install all of the drawers and use a random-orbit sander to level the drawer fronts even with the case (**Photo 12**). Use 80 grit sandpaper for this job, then move on to finer grits to make the wood smooth enough for finishing.

Feet and hidden drawer

The feet (J) and front (K) of the hidden drawer have the same rounded profile (Figs. D and E). The easiest way to make this profile on all three pieces is to use a 3/4" radius bit in a router table. Once you've made the feet, fasten them to the case with screws in countersunk holes (Fig. D). (Note: The rear holes should be elongated, so the case isn't restrained from shrinking or swelling with changes in humidity.)

Make the guides for the hidden drawer (N and P). Fasten the lower guide to the feet first, then slip in a scrap piece of drawer-bottom material (M) above the guide to determine where the upper guide should go (**Photo 13**). Glue the upper guide in place.

When you make the front of the hidden drawer, rout or carve a small recess underneath it for a fingerpull. In addition, rout a rabbet in the piece to receive the drawer bottom. Glue the bottom to this piece and add a back (L) to the drawer, so things don't slip out.

I drilled the holes for the knobs on a drill press using a fence, with the drawers in the cabinet. This ensured that the knobs would all line up. Finish the piece inside and out, drawers included. They'll slide much easier on finished surfaces.

SOURCE

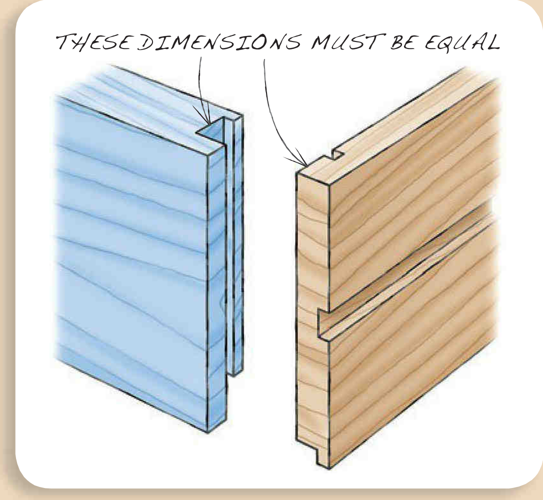
Lee Valley, leevalley.com, 800-871-8158,
Curved-tip glue syringe, #25K07.05, $2.95;
3/8" x 3/8" Brass knob, #05H2202, $2.20 ea.;
7/16" x 7/16" Brass knob, #05H2203, $2.40 ea.;
9/16" x 7/16" Brass knob, #05H2205, $3.00 ea.;
5/8" x 7/16" Brass knob, #05H2206, $3.20 ea.

Alan Turner is the founder of Philadelphia Furniture Workshop (www.philadelphia-furnitureworkshop.com), a woodworking school dedicated to traditional furniture built with hand and power tools.

An Ideal Joint for Small Drawers

All the cuts are made on the tablesaw.

by Alan Turner



WHEN YOU SLIDE OPEN a small drawer that fits nice and tight, it's a pleasure to see well-crafted joints. Small, handcut dovetails answer well, but sawing and chopping them requires a lot of skill and practice. Here's a joint that's far easier to make: a half-blind tongue and rabbet. It's all done on the tablesaw.

This joint is perfect if you're making a set of drawers of different widths, because width doesn't matter. You can cut all the sides and all the fronts at the same time.

This joint can easily be adapted for material of any thickness. I'll show you how to make it for drawers with 3/8" sides and 3/4" fronts, the dimensions I used in a small tool chest (see "A Craftsman's Tool Chest," page 46).

Start by cutting a dado across the drawer sides (**Photo 1**). The dado is only 1/8" wide, so the easiest way to make it is to use a standard-kerf crosscut blade. Set the distance from the blade to the fence at precisely 3/8", or just a hair larger. Make a test cut and use a dial caliper to verify the measurement.

The cut made by this blade won't leave a flat bottom, of course, so if you want a joint without any tiny gaps in it you'll want to shave the bottom of the dado with a small router (**Photo 2**, see Source).

Next, cut a dado in the ends of the drawer fronts using a dado set (**Photo 3**). This cut begins to form the joint's tongue and rabbet. Three settings are critical. Make them in this order:

1) The width of the dado set. This must exactly equal the distance from the end of the drawer side to the dado. Verify the dado set's width before you cut any drawer fronts and add a shim if necessary. Make a test cut in a scrap of wood first and place the scrap directly on a drawer side to see if the width is correct.

2) The height of the dado set. This must equal the thickness of the drawer side material; here, it's 3/8". Again, make a test cut before proceeding.

3) The distance of the dado set to the face of the tenoning jig. This must equal the width of the dado in the drawer side: 1/8". When you cut the drawer-front dadoes, be sure to place the *inside* of the workpiece against the face of the tenoning jig.

Finally, shorten the tongue on the drawer front to fit the drawer side (**Photo 4**). This completes the tongue and rabbet. It's best to cut the tongue a bit long at first, then adjust the fence until it fits perfectly. The drawer front and side should lock together, without any gaps.

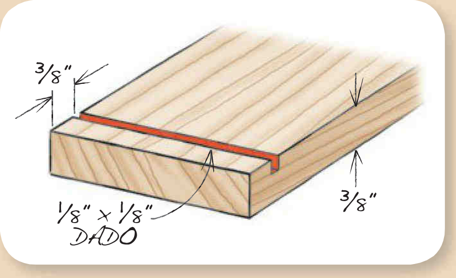
SOURCE

Lee Valley, leevalley.com, 800-871-8158, Veritas Miniature Router Plane, #05P82.01, $39.50.

Watch a video on how to make these joints at **AmericanWoodworker.com/WebExtras**

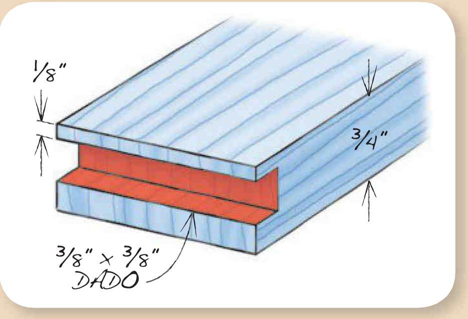
EDITOR: TOM CASPAR | PHOTOGRAPHY: MARIO RODRIGUEZ | ILLUSTRATION: FRANK ROHRBACH

1 **Saw** a 1/8" wide dado across the drawer side, using a standard-kerf crosscut blade.

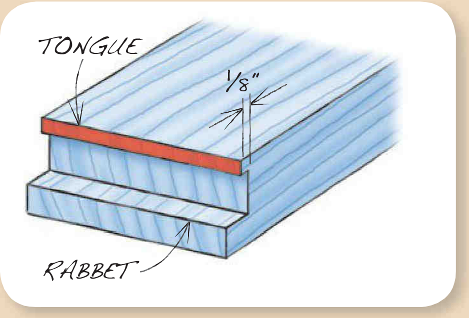


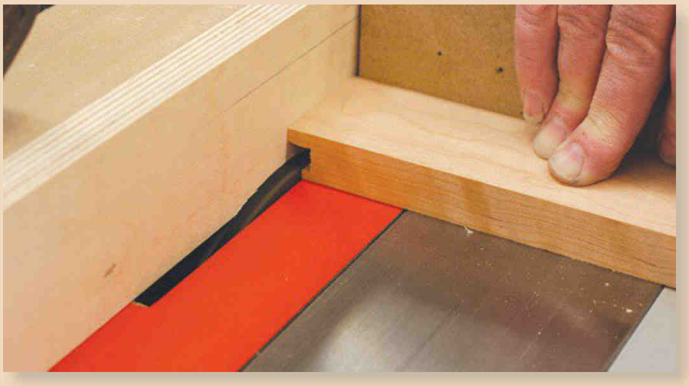
2 **Use** a small router plane to give the dado a flat bottom. This is an optional step.

3 **Cut** a 3/8" x 3/8" dado into the end of the drawer front using a dado set. Support the piece with a tenoning jig. Use a fresh backup board to prevent tearout.



4 **Trim** the tongue on the drawer front to exact length, again using the dado set.





Box-Joint Sled

by Alan Turner

A rock-solid jig delivers precise results.

WHEN I WAS A KID, my mother had a small, wooden recipe box that was made with box joints. I remember marveling at how exquisite those joints were, and so easy to understand, too—there's nothing hidden or mysterious about them. They're a perfect example of form following function.

As a woodworker, however, I've learned that there *is* a magic to box joints, and that's achieving the precision necessary to fit them together. Of course, it's really just sound engineering that does the trick, but when you first assemble a project with lots of box joints, like the tool chest at right, I'm sure you'll be amazed that a shop-made box-joint jig can work so well. It's a very simple device.

I use this jig quite often when I teach classes at the Philadelphia Furniture Workshop. It's safe, reliable and durable. The cuts are always square, tearout is minimal, and the jig can easily be adjusted to make box joints of any width and depth.

Let me first show you how the jig works. Then I'll show you how to build it and how to adjust it. For more details about how to lay out, cut and glue box joints, see "A Craftsman's Tool Chest," page 46.

Box joints are ideal for joining thin boards at right angles, such as the 1/2" thick sides of this case.

EDITOR: TOM CASPAR | PHOTOGRAPHY: MARIO RODRIGUEZ | ILLUSTRATION: FRANK ROHRBACH

How the sled works

WHAT DOES a box-joint jig do? Basically, it makes notches of any width, using a dado set in your tablesaw.

The jig automatically spaces the notches the same distance apart. After cutting the first notch, you lift up the workpiece, shift it to the right and lower the notch down onto an **indexing pin**. Then you cut another notch, and another, making a series of notches separated by **fingers**.

The precise width of each finger is critical. Ideally, *each finger should be the same width as each notch*—within a thousandth of an inch or so.

What determines the width of a finger? It's the distance between the blade and the indexing pin. On this jig, that distance is easy to tweak. On the drawing below, you'll see that the **indexing pin (H)** fits into a **sliding fence (F)**. The sliding fence rides on a **fixed fence (D)** that's fastened to the jig's base. Once the indexing pin and sliding fence are positioned to make a finger of the correct width, a pair of robust **handles (J)** locks the sliding fence in position.

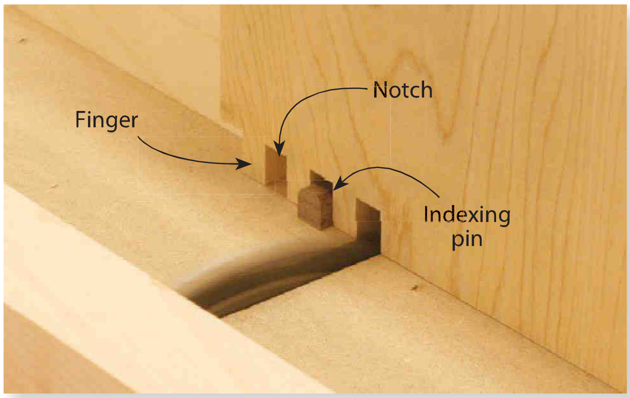


Fig. A
Exploded View

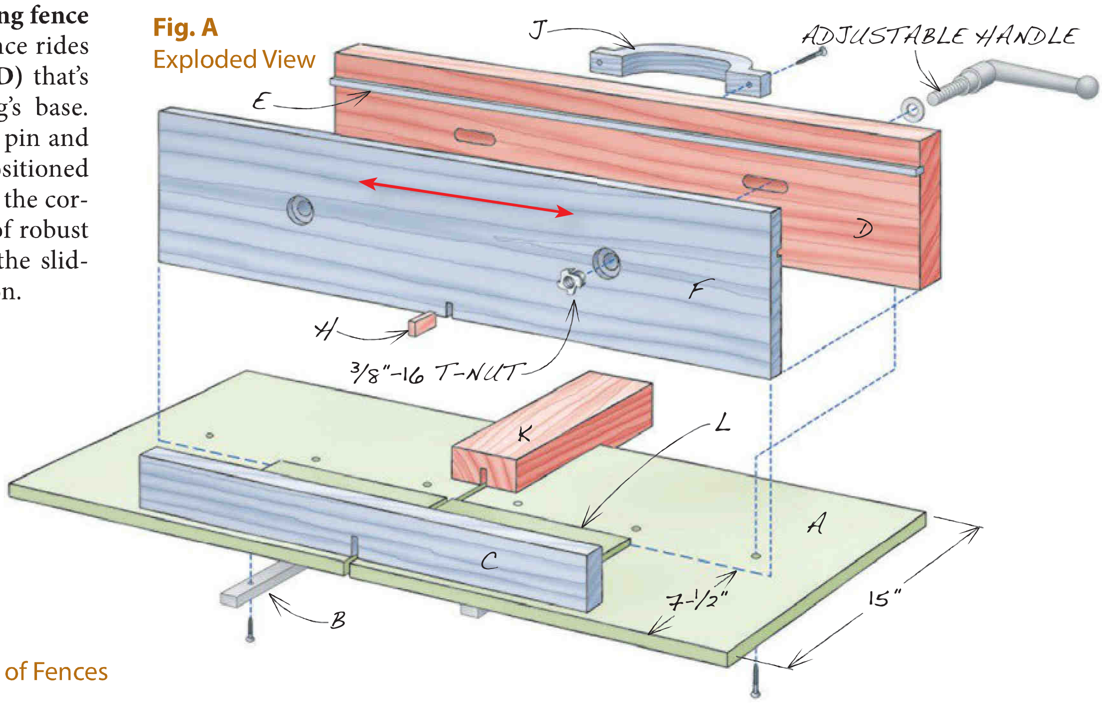
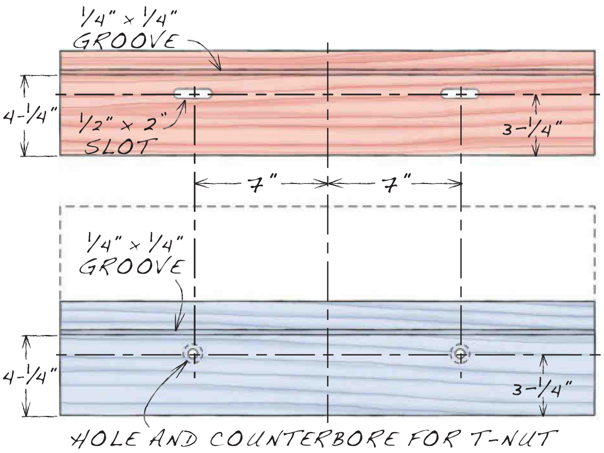


Fig. B Plan View of Fences



Cutting List

Overall Dimensions: 11-1/2" H x 31-1/2" W x 15" L

Part	Name	Qty.	Material	Th x W x L
A	Base	2	MDF	1/2" x 16" x 15"
B	Bar	2	see note	3/8" x 3/4" x 15" (a)
C	Bridge	1	Hard maple	1" x 2-1/2" x 20"
D	Fixed fence	1	Hard maple	1-5/8" x 5-1/2" x 28"
E	Fence spline	1	Baltic birch	1/4" x 1/2" x 28"
F	Short sliding fence	1	Baltic birch	3/4" x 6" x 28"
G	Tall sliding fence	1	Baltic birch	3/4" x 11" x 28"
H	Indexing pin	1	Hardwood	1-1/2" long (b)
J	Handle	1	Hardwood	1-1/4" x 2-3/4" x 8"
K	Blade guard	1	Hardwood	1-3/4" x 3" x 10"
L	Throat plate		MDF	1/4" x 6" x 16"

Notes:
a) May be made from wood, but an aluminum bar with setscrew adjustments for a tight fit is better. See Sources.
b) Make indexing pins as needed for each fence.

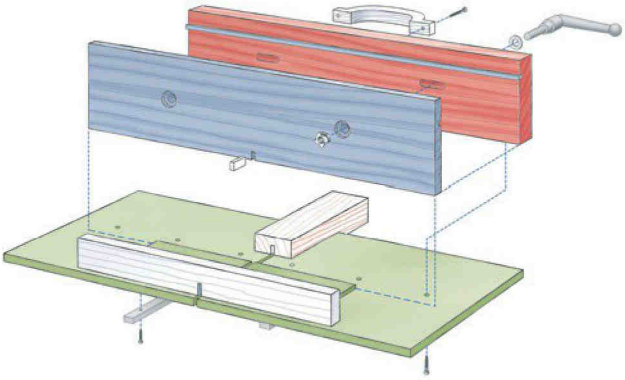
SOURCES

- McMaster-Carr, mcmaster.com, 330-342-6100, Adjustable Handle with Threaded Stud, #6271K35, $10.72 ea.
- Kreg, kregtool.com, 800-447-8638, Jig and Fixture Bar, 30" L, #KMS7303, $23.99.

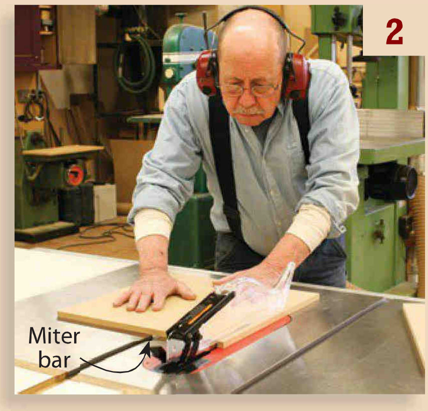
Build the base and fences

BOX JOINTS must be cut with the utmost precision, so you don't want your jig to wiggle. A sled using a single runner may have some play, but a sled that uses two runners, like this one, will track much better.

The challenge is to make runners that fit nice and tight in your saw's miter slots. While you can make your own runners from solid wood, plywood or hardboard, I prefer to use commercial miter bars that are adjustable in width. The miter bars shown here have small setscrews in their sides; adjusting the screws allows you to fine-tune each miter bar's width until it fits just right.

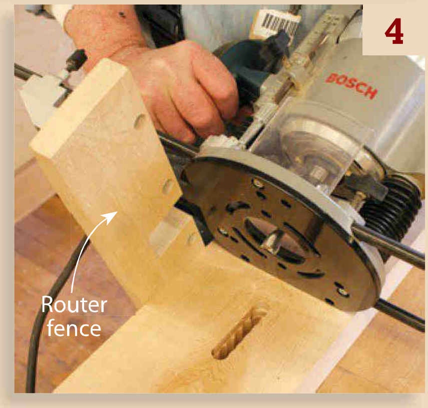


Build the sled's base from two pieces of 1/2" MDF. Attach a shop-made or commercial miter bar to each piece.



Place each piece in the saw's miter slot and cut off what will be its inside edge. Next, using the saw's fence, rip the outside edge parallel to the inside edge.

Make the sled's fences. Cut mating grooves in them to receive a spline. The spline will keep the fences aligned with each other.



Rout two large slots in the fixed fence. Remove most of the waste on a drill press first, to make routing easier.

Begin by cutting the two base pieces (A) to final size. Cut the miter bar stock (B), which comes 30" long, into two pieces. Measure the distance from the blade of your saw to each miter slot, then attach the miter bars to each base piece so that the base pieces will extend beyond the blade by about 1/4". I use CA glue to lock the bars in place first, then run in some screws (**Photo 1**).

When the miter bars are secure, adjust their fit in the saw's miter slots. Cut off the inside edge of each base piece (**Photo 2**). Then flip over both pieces and cut off about 1/8" from their outside edges. Both sides of the base pieces are now parallel and square to the blade.

Mill the wood for the sled's fixed fence (D). In addition, make two sliding fences (F and G). They're identical, except that one is short and one is tall. Use the tall fence for cutting box joints into boards that are more than 24" or so long.

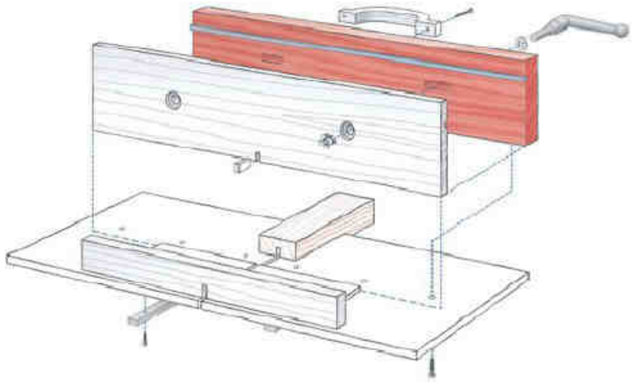
Cut mating grooves in the fixed and sliding fences (**Photo 3** and Fig. B, page 55). Cut slots in the fixed fence for the adjustable handles (J). Rout from both sides to get all the way through this thick piece (**Photo 4**). Make a piece of spline (E) to fit the grooves in the fences, then place the spline in the fixed fence. (I don't glue the spline, so the sliding fences are easier to remove.)

Drill holes for the T-nuts that go in the sliding fences. Drill the large diameter, shallow holes first. Install the T-nuts.

Square the fixed fence

THE FIXED FENCE is permanently fastened to the jig's base. The fence must be absolutely square to the saw's blade, so the box joints come out square, too.

To square the fence, I work very fast using a method that requires an 18 ga. brad nailer. If you don't have a nailer, or if you prefer to work more slowly, you can proceed in a different way. I'll explain below.



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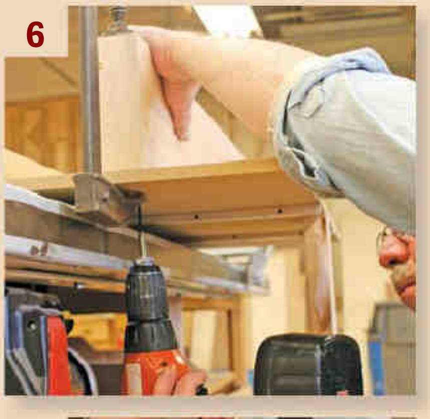
Connect the two halves of the base by gluing on a bridging piece. Then position the fixed fence square to the base.

6



Clamp and glue the fence to the base. While the glue is wet, run a single screw into the left hand end of the fence. Shoot one short brad into the right end of the fence.

7

Quickly make a test cut on a scrap piece. Check it for square.

8

If the piece isn't quite square, act fast before the glue grabs. Adjust the fence's position by tapping its right end. Make another test cut. If it's OK, clamp the fence to the base.

Make the bridge (C). Place both base pieces on the saw, spread glue on the bridge and place it in position—close is good enough. Rub the bridge back and forth until the glue squeezes out, then let the glue dry. Flip the assembly over and reinforce this glue joint with screws.

Place the fixed fence in position on the base using a framing square (**Photo 5**). Remove the square and trace around the fence. Remove the fence and drill one hole for a screw to fasten the fence to the base (Fig. A).

Put the fence back on the base, slide the base partly off the saw and clamp the fence in position (**Photo 6**). Drill a pilot hole into the fence. Unclamp and remove the fence.

Here's where you must move fast—you only have about three minutes. Spread glue on the fence and clamp it in position. Run in the screw and shoot one short brad into the fence's opposite end. Remove the clamp and make a test cut (**Photo 7**). If the cut is square, shoot in some more nails, clamp and let the glue dry. Add screws later.

If the cut isn't square, tap the fence's right end to nudge it into the correct position (**Photo 8**). Make another test cut, and so on.

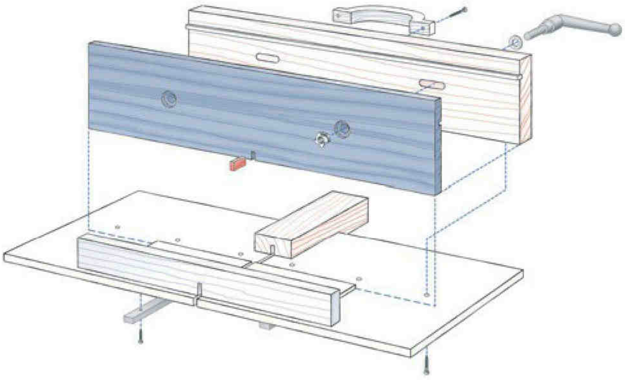
For a slower process, don't glue the fence while you're squaring it. Instead, screw an additional block to the top of the base about 1/8" behind the fence. Place a number of thin shims between the block and the fence, then clamp the fence to the block. Use a single screw, as above, to fasten the fence to the base. Make the same test cuts, and add or subtract shims to readjust the fence's position as needed. Once the fence is square, run in additional screws to permanently lock the fence in position.

After the fence is installed, add a handle (J) and the blade guard (K).

Install the indexing pin

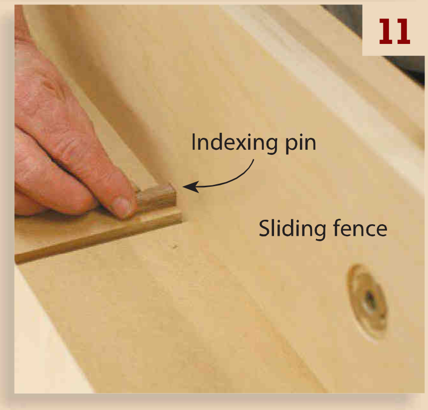
THE SLIDING FENCE carries the all-important indexing pin. Of course, the size of this pin will vary for each size box joint. I make a new indexing pin each time I make a new set of box joints (it only takes a few minutes).

Doesn't a new pin require a new sliding fence, too? No, I just re-use the old one. I knock the old indexing pin out of its slot, glue in a patch piece and make a fresh slot for the indexing pin in a new location.



Cut a groove in a piece of scrap wood. Make the groove the same width as the box joints you'll cut. Make an indexing pin that fits tight in the groove.

Nail a sacrificial board to the base of the sled. When you cut through it, this piece becomes a zero-clearance throat plate.



Cut a slot through the throat plate and a notch in the sliding fence. Slide the fence to the right and glue the indexing pin into the notch.

Slide the fence and pin into the correct position, using a spacer that's the same width as the indexing pin. Tighten the handles on the sliding fence.

Making an indexing pin is fussy work, but it pays off. The width of the pin must exactly match the width of a notch made by your dado set, so the process starts by installing the dado set. Take a scrap piece of plywood, about 12" square, and use the dado set to cut two 1/4" deep grooves in it.

You can make the indexing pin from any scrap of hardwood. For safe cutting, the scrap should be at least 12" long. Remove the dado set from the saw and install a standard blade. In these photos, I'm making a 3/8" indexing pin, so I raise the blade about 1/2" high and set the fence 3/8" from the blade, plus another 1/64". I rip the piece of wood once, using a push stick, then flip the piece around and rip it a second time, producing a piece that's a fat 3/8" x 3/8" x 12".

Test the fit of this piece into both of the grooves in the plywood (**Photo 9**). If it's too tight, plane or sand the piece until it slides into the groove, or reset the fence and cut another piece. Cut a section from the piece that's about 1-1/2" long—this will be the indexing pin. Cut a second piece about 4" long—you'll use this as a spacer for adjusting the sliding fence later on.

Put the dado set back on the saw. To minimize any chance of tearout when cutting box joints, nail a sacrificial throat plate (L) to the jig (**Photo 10**). Raise the blade to the correct height for your joints, then tighten the sliding fence to the fixed fence. Saw through the throat plate and the sliding fence.

Loosen the sliding fence and shift it to the right. Glue the indexing pin into the notch (**Photo 11**). Place the spacer between the blade and the indexing pin (**Photo 12**). Adjust the sliding fence until the spacer fits tight, then tighten the fence.

Test the width of the fingers

EACH TIME you make a set of box joints, you must readjust the position of the sliding fence to fine-tune the width of the joint's fingers.

This width must be very precise. If the fingers are too wide, the pieces won't go together. If the fingers are too narrow, there will be gaps between the notches and fingers. A few thousandths of an inch one way or another makes a big difference. You're aiming for a finger that's .001" or .002" narrower than a notch.

Start making test cuts. For the first cut, butt the stock right up to the pin.

13

Continue making cuts, moving the test board over one notch each time.

14

Cut the same notches in a second test piece. This time, the first notch starts at the edge of the board.

15

Continue making notches across the board. When you're done, fit the two test pieces together. If the fingers aren't exaclty the right width, which is typical, slightly loosen the handles of the adjustable fence.

16

Tap the adjustable fence closer to the blade if the joints are too tight. (This decreases the distance between the pin and blade, which reduces the width of the fingers.) Tap the opposite way if the joints are too loose.

17

Adjusting the width of the fingers requires trial and error cuts in scrap pieces. Use pieces wide enough to make at least 6 notches. Start by butting up the first piece to the indexing pin (**Photo 13**). Cut one notch. Retract the jig, lift up the piece and shift it to the right, then slide the notch down onto the indexing pin. Cut another notch (**Photo 14**). Repeat the process until you've cut notches all the way across the board. To make this easier, round over the top of the indexing pin with a file or sandpaper.

You could cut the mating board in the exact same way, starting with the piece butted up against the indexing pin, but here I'd like to show you how you would do it on the actual project (**Photos 15 and 16**). Chances are that your two test pieces won't fit perfectly. To adjust the width of the fingers, loosen the sliding fence and lightly tap it one way or another (**Photo 17**). Gripping the two fences with your fingers will allow you to tell when it has moved as little as .001"—the precision necessary for tight joints.

How to Build a Segmented-Rim Tabletop

One router jig does everything.

by Richard Tendick

THERE'S SOMETHING SPECIAL about a small table with a round top—it invites intimacy. When I sit at one, I stop and savor warm memories of lingering with my wife in a quiet café or bistro years ago.

The task of making a round top can break that spell, however: It ain't easy. Well, it could be easy if you just made the whole thing from solid wood sawed into a circle, but I don't think a top like that has a pleasing look. Its linear grain pattern usually fights with its round shape.

You could also make a round top by ironing on thin banding around a piece of plywood, but sooner or later that banding will chip or delaminate, spoiling everything.

I prefer a round top with a plywood center and a wide, segmented rim of solid wood encircling it. Rounded over, a solid-wood rim is elbow-friendly and durable enough to take years of use and abuse.

Making that rim fit tight is a perfect job for a router jig. I've designed one that makes both the plywood center and the rim with a high degree of precision. Before getting into the details of how to build the jig and how to use it, let's take a quick look at what it does.

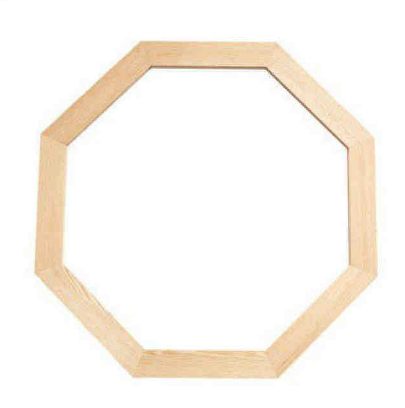
In this article, you'll learn how to build a top like this of any size. The center of the top is maple plywood, while the rim is solid cherry. You'll make both parts using just one router table jig.

EDITOR: TOM CASPAR | PHOTOGRAPHY: JASON ZENTNER | ILLUSTRATION: FRANK ROHRBACH

Quick-Start Guide

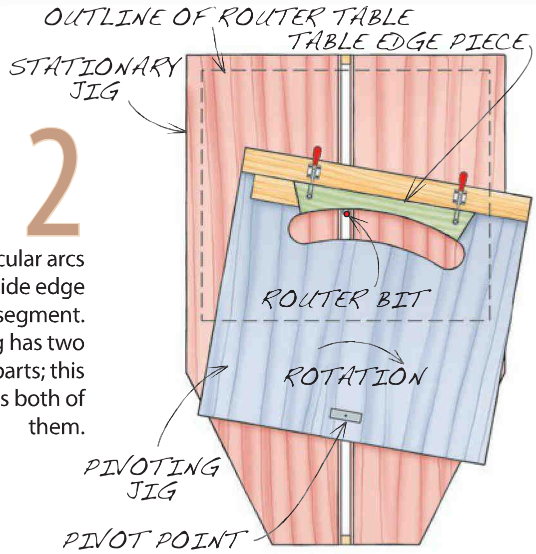
1

Cut the wood for the rim segments so the pieces make a perfect octagon. (I'll show you how to do that on page 64.)



2

Rout circular arcs on the inside edge of each segment. The jig has two major parts; this step uses both of them.

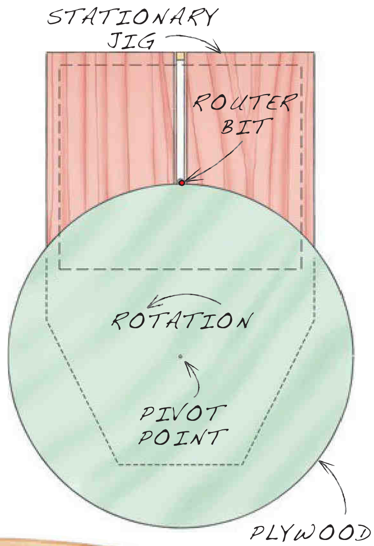


3

Clamp all of the pieces end to end, forming a straight-sided doughnut with a big hole in the center.

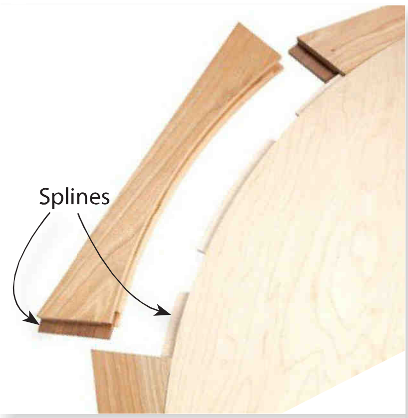
4

Make a plywood center that fits perfectly inside the doughnut. Here, you only use the lower section of the jig.



5

Glue the rim segments around the plywood, using splines to keep them aligned.



6

Cut the outside edge of the top into a circle, level the rim segments with a plane and round them with a router.

Fig. A Exploded View

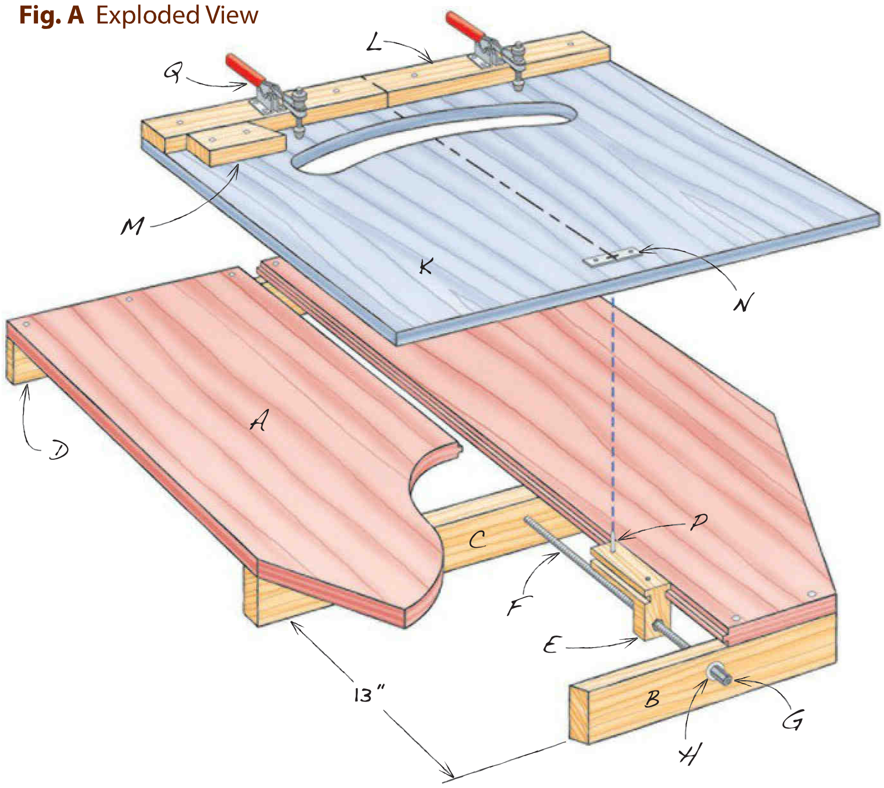


Fig. B Plan View of Pivoting Jig

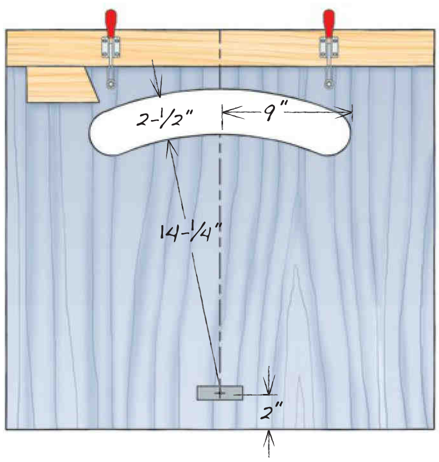
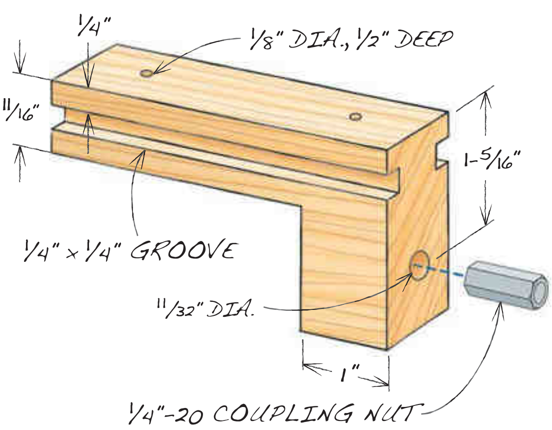


Fig. C Pivot Block

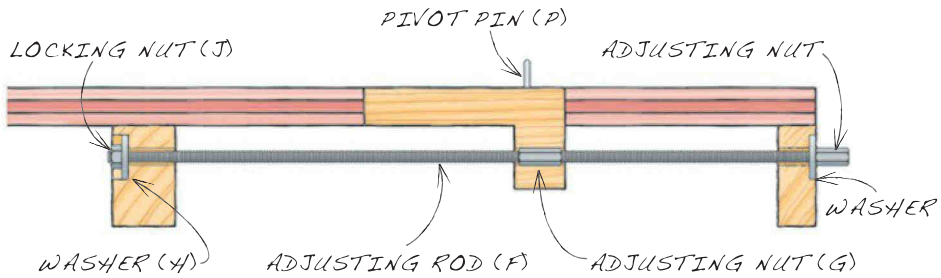


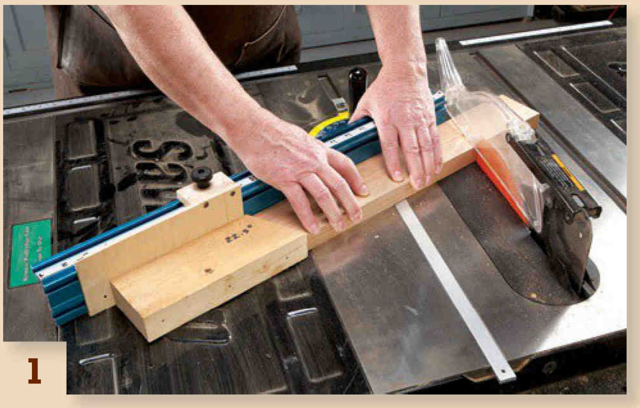
Cutting List

Overall Dimensions: 25-3/4" W x 39-3/4" L x 4" H

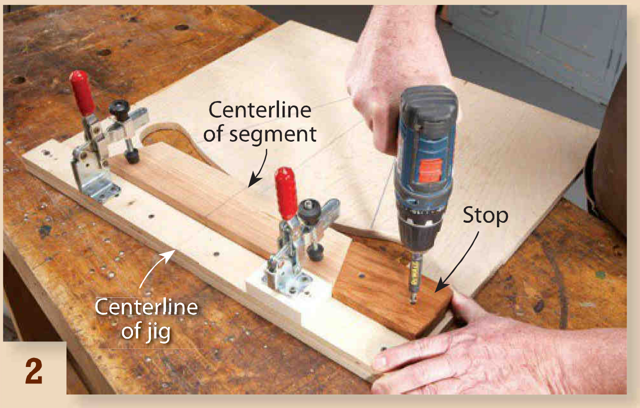
Section	Part	Name	Qty.	Material	Th x W x L
Stationary jig	A	Platform	2	Plywood	3/4" x 12-1/2" x 39-3/4"
	B	Cleat 1	2	Hardwood	3/4" x 2" x 12-1/2"
	C	Cleat 2	1	Hardwood	1-1/4" x 2" x 26"
	D	Cleat 3	1	Hardwood	3/4" x 2" x 26"
	E	Pivot block	1	Hard maple	1-1/4" x 2" x 4"
	F	Adjusting rod	1	All-thread rod	1/4-20 x 16"
	G	Adjusting nut	2	Coupling nut	1/4-20 x 7/8" L
	H	Washer	2	Fender washer	1/4" x 1" dia.
	J	Locking nut	1	Locknut	1/4-20
Pivoting jig	K	Base	1	Plywood	1/2" x 23-1/2" x 22"
	L	Fence	1	Plywood	1/2" x 2" x 23-1/2"
	M	Stop	1	Hardwood	3/4" x 2" x 4"
	N	Pivot plate	1	Aluminum	1/16" x 3/4" x 2-1/2"
	P	Pivot pin	1	Steel	1/8" dia. x 7/8"
	Q	Hold-down clamp	2		

Fig. D Cross Section of Stationary Jig

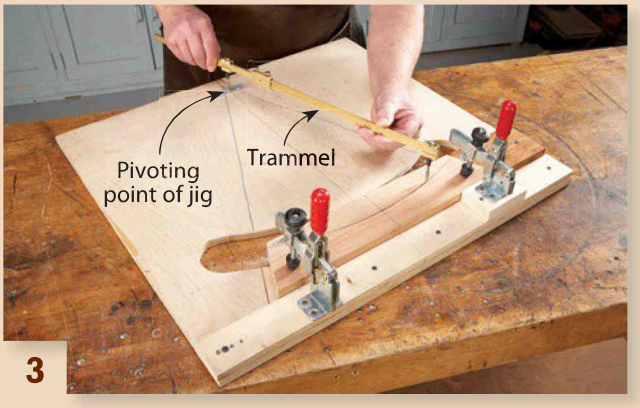




Make the rim segments first. This table will have eight, forming an octagon, so their ends must be cut at precisely 67-1/2°.



Line up the center of one segment with the centerline of the jig. Butt a stop against the segment and attach the stop to the jig.



Use a trammel to draw an arc on the segment. The arc represents the inner curved edge of the rim. Place the center of the trammel in a hole drilled through a metal plate attached to the jig.

Saw the inner edges of all the segments. This is a rough cut, so stay at least 1/8" inside the pencil line.

Build a two-part jig

I designed this jig to make tabletops from 28" to 48" dia., but it's easy to modify for making smaller or larger tops. The lower half of the jig—the "stationary jig"—fits any router table with a top less than 24" deep. The upper half of the jig—the "pivoting jig"—is sized to fit the stationary jig.

Build the stationary jig first, starting by shaping tongues on both inside edges of the platforms (A). Make the three cleats (B, C and D), but don't drill holes in them yet for the adjusting rod (F). Make the pivot block (E, Fig. C, p. 62) from a piece that's at least 12" long, for safety. Cut grooves the full length of this piece, then cut one end into the shape of an L. Lastly, cut the pivot block to final length. Drill a hole in it for the adjusting nut (G). Next, drill holes in the cleats for the washers (H) and adjusting rod—make sure that the centers of these holes align with the center of the hole in the pivot block (Fig. D).

Fasten the cleats to the platforms so the pivot block slides without wiggling. Permanently mount an adjusting nut onto the front end of the adjusting rod using epoxy or Loctite. When you install the adjusting rod, tighten the locking nut (J) so the pivot block doesn't have any front-to-back play.

Let's move on to the pivoting jig. The arc-shaped window in its base (K, Fig. B) need not be precise—you can cut it with a jigsaw and leave the edges rough. Fasten the pivoting jig's fence (L) so it's even with the base. You'll add the stop (M) later; its location will depend on the exact size of the rim pieces you make. Position the pivot plate (N) so that the distance from its hole to the fence equals the radius of the top you're making (including the rim pieces). Using a framing square, draw a centerline from the fence to the hole in the pivot plate, then extend the centerline up and over the fence.

Begin with the rim

Let me show you how I used the jig to make a top with an eight-sided rim with a 36" dia. First I drew the top full-scale on a piece of plywood and figured out that if the rim was to be 1-3/8" wide, I'd need to start with blanks that were 2-11/16" wide and a little under 15" long, from outside point to outside point. Although the center of the top will be 3/4" plywood, I'll be milling the rim pieces 1-1/8" thick to make the top appear thicker. So here's where you'll start: with a target diameter, a drawing and a precise size for the rim blanks.

Next, you must cut the blanks accurately enough to form an octagon with tight miters (**Photo 1** and "How to Make a Perfect Octagon," page 64). Make a few extra blanks in order to test your setups later on. Make a stop block (M) with one end cut at the same angle as the blanks. Draw a precise centerline across one of the blanks, then clamp the piece onto the

How to Make a Perfect Octagon

CABINETMAKERS are known for being fussy, and for good reason. A little sloppiness building an outdoor project or remodeling the house is usually OK, but when it comes to making a piece of furniture, tolerances have to be tight.

Using a tablesaw to make an octagon without any gaps is fussy work. The angles must be so precise that you really can't measure them. The practical way to test for accuracy is to actually cut eight pieces and see how they fit together.

You'll need a miter gauge that doesn't wiggle in your saw's miter slot. Some have adjustable bars—these are ideal, but if yours doesn't, modify or shim its bar to take out the slop.

Start by setting your miter gauge as close as you can to the correct angle (22-1/2° or 67-1/2°, depending on the model). While I often use a square or a drafting triangle to set my miter gauge, I don't rely on a commercially made tool for this particular job—I make a template. To make one like mine, you'll need a 12" x 12" piece of stiff paper with a square corner (I use poster board), a compass, a straightedge and a utility knife.

Start by drawing a right angle about 1/2" in from the edge of the paper. Set your compass to 6" (or as large as it will go), stab its point into the paper at point A and draw an arc from B to B (**Photo 1, step 1**). Draw two arcs from both points B (**step 2**). Draw a line from A to C, then draw arcs from B and D (**step 3**). Draw a line through E. Cut along the line from A to E, using the straightedge to guide your knife.

While not perfectly accurate, use this template to set your miter gauge for a trial run (**Photo 2**). Using square and angled stop blocks, cut 8 pieces exactly the same length. (Of course, these pieces must be flat and have parallel sides. You can either use scrapwood or the pieces you'll use for your final octagon, providing you're willing to cut them a bit shorter as you refine the miter gauge's angle.)

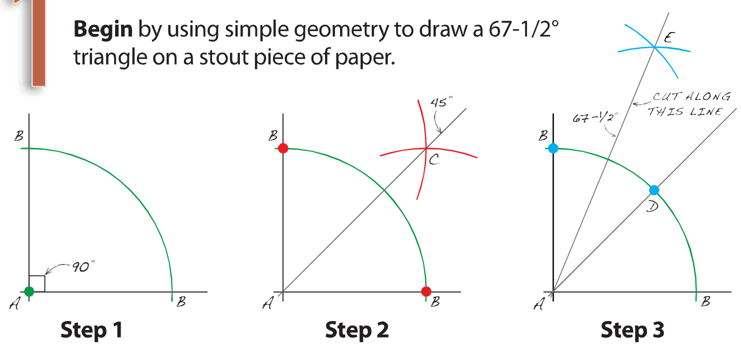
Assemble the pieces into an octagon. (I use a band clamp to keep the corners aligned.) Check to see how tight the miters are. Typically, one or more will be open, which indicates that the miter gauge angle isn't quite right (**Photo 3**).

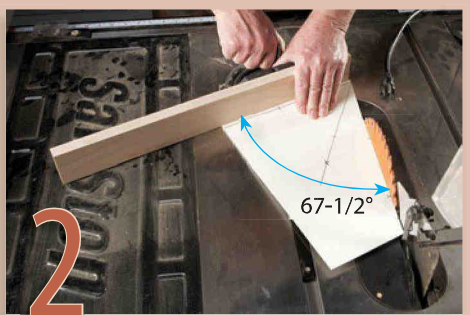
You could alter the angles of one or two pieces to bring the joints tight, but I want the angles of all eight pieces to be identical, so the pieces can be interchangeable. The best way to adjust the miter gauge is by using shims (**Photo 4**). You can use brass shim stock or just pieces of paper or tape. The shims need only be a few thousandths of an inch thick.

Recut all of the pieces on both ends, so they're slightly shorter. Reassemble them into an octagon and check the miters once again. You may have to add or subtract more shims, but it won't be long until the miter gauge will be right on the money.

1

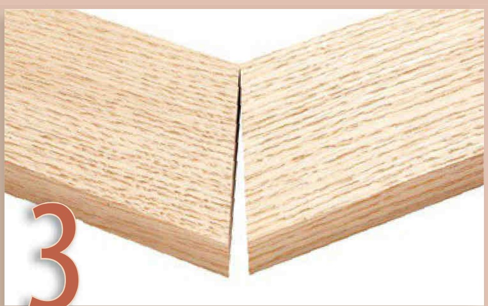
Begin by using simple geometry to draw a 67-1/2° triangle on a stout piece of paper.





2

Set your saw's miter gauge using the triangle. Saw a test set of eight pieces.

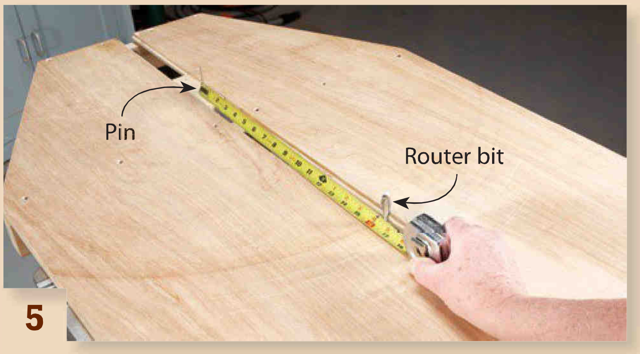


3

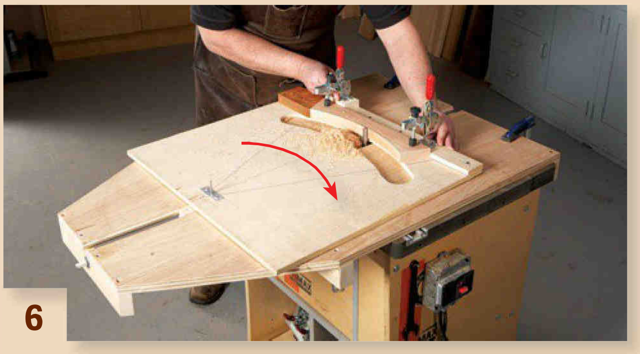
Arrange the eight pieces in an octagon. Chances are that one or more miters won't fit tight, which means that the miter gauge must be readjusted.

Shim the miter gauge's fence on one side or the other to slightly alter the cutting angle. Recut all eight pieces and form them into an octagon again. Repeat until the miter angle is perfect.

4



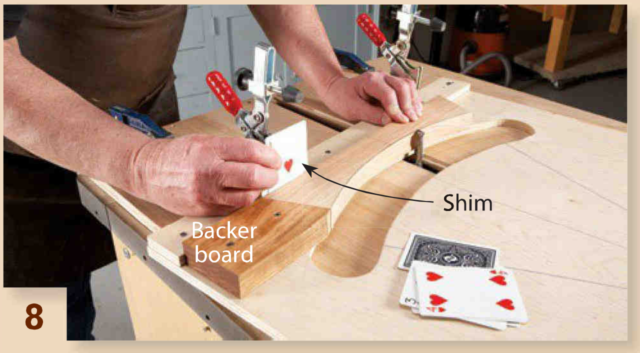
Clamp the lower half of the jig to your router table. Set the distance between a pin in the jig's pivot block and the inside edge of the router bit equal to the trammel setting.



Place the upper half of the jig on the router table and rout the inner edges of the rim segments.

Caution: Push the jig only in the direction shown, against the rotation of the bit.

Measure both ends of each segment; they must be precisely the same width.



If one end is wider than the other, add a shim or two behind the wider end of the segment and rout each piece that's off.

Rout grooves for splines in both ends of all the segments. To steady the pieces, back them up with a block cut at 67-1/2°.

Clamp all of the segments into a circle, with splines installed, using a band clamp. Measure the diameter of the circle.

pivoting jig (**Photo 2**). Fasten the stop to the jig.

Draw the rim's inside radius on one of the blanks (**Photo 3**), then saw away the waste (**Photo 4**). Use this piece as a pattern to mark and saw the remaining blanks.

Install a 1/2" dia. bit in your router table (an up-cut spiral bit works best), then clamp the stationary jig to the back of the machine (**Photo 5**). Adjust the position of the jig's pivot block so that the distance from its pin to the *outside* edge of the router bit equals the inside radius of the rim. Mount a test piece in the pivoting jig and rout its inside edge (**Photo 6**). Take two passes to make a smooth cut. Turn off the router between passes and when clamping a new piece in the jig.

See if both ends of the test piece are the same width (**Photo 7**). If they're not, add a shim or two to the jig (**Photo 8**) and try again. This system ensures that all the inside arcs on the rim pieces form a perfect circle.

I've found that it's essential to use splines in order to align the rim pieces with each other and with the plywood center. I made this particular top with shop-made splines that were 1/4" thick and 1" wide; in retrospect, 1/2" wide splines would have worked fine and been easier to rout grooves for. Install a slot-cutting bit in your router table and cut spline grooves in the end of each rim piece (**Photo 9**). The splines' grain should run in the short direction.

Make the center

You started with a theoretical diameter for the plywood center of the table—now it's time to calculate its actual diameter.

11

Draw a circle approximately 1/8" larger than your measurement on a piece of plywood. Cut the plywood to rough shape on the bandsaw. I use a circle-cutting jig for this job.


12

Rout the plywood into a perfect circle using the lower half of the jig. Remove the plywood from the jig and see if it fits inside the rim segments.

13

Turn the adjusting nut on the jig to gradually reduce the jig's cutting radius. Rotating the nut by one "hour "(like moving the hour hand on a clock face) reduces the radius by about .004".

14

Rout a spline groove all the way around the plywood.

15

Rout a similar groove around the inside of each segment. The two grooves must be offset by about 1/32", so the top surface of the rim will stand proud of the plywood.

16

Draw short pieces of curved spline, using one of the segments as a guide. Cut the splines on the bandsaw.

Clamp the rim pieces and measure the distance across the circle they form (**Photo 10**). Draw a circle about 1/4" larger in diameter on your plywood and cut it out (**Photo 11**).

Drill a shallow 1/8" dia. hole in the center of the plywood, on the underside, to engage the pin in the pivot block. Adjust the position of the pivot block so that the distance from the pin to the *inside* edge of the router bit equals the radius of your oversize circle. Rout the roughsawn circle into a true circle (**Photo 12**), then use the adjusting nut in the stationary jig to gradually reduce the diameter of the circle until it fits perfectly inside the rim pieces. Remove the plywood from the jig between passes—it's easy to do—and try dropping it into the rim. Creep up on the final diameter by turning the jig's adjusting nut in very small increments (**Photo 13**).

Rout a groove for splines all the way around the plywood (**Photo 14**). Rout a similar groove along the inside edges of the rim pieces (**Photo 15**). Be sure to adjust the bit's height so the rim pieces will be about 1/32" proud of the plywood. Make sections of curved splines (**Photo 16**) and glue them around the plywood (**Photo 17**).

Get the plans for making an extra-large circle-cutting jig for your bandsaw at **AmericanWoodworker.com/WebExtras**

The glue-up

Gluing up the entire rim in one shot would be ideal, but it's just about impossible to do without enlisting the help of two

17

Glue the splines into the top.

18

Glue just one segment onto the top. Let the glue dry before proceeding.

19

Glue two more segments, butting them up to the first piece. Add the remaining segments—without glue—to force the new pieces into position. Let the glue dry, then add two more, and so on.

20

Saw the outer edge of the table. I use a circle-cutting jig for this operation, too. It leaves a smooth and even edge that's easy to clean up by sanding.

21

Plane the rim almost flush to the plywood, then scrape or sand the rim even with the plywood.

22

Rout a roundover or other profile around the tabletop. Be sure that the routing doesn't cut into the splines—after all this hard work, that just wouldn't look right!

or three people. If you just tackle a few pieces at a time, you can glue the rim without any help. I use a relatively slippery glue, such as Elmer's Glue-All, to make it easier for pieces to slide into position. A glue with a fast tack would make the glue-up more difficult.

Start with just one rim piece—let's call it #1 (**Photo 18**). Glue splines into both of its ends, then place another rim piece, without glue, on the opposite side of the tabletop. Apply glue to the #1 piece and clamp it to the plywood. Check with a straightedge to make sure that #1 isn't cocked up or down. Clean off the squeeze-out and let the glue dry.

From here, glue pieces #2 and #3 on either side of #1. To pull them tight to #1, clamp the rest of the rim pieces around the table—without glue, of course (**Photo 19**). Continue adding pairs of pieces in this fashion, gradually building up the glued portion of the rim, all the way around.

Complete the top

When all of the rim pieces are glued, draw the outside diameter of the top and cut off the waste (**Photo 20**). Clamp the top to a sturdy bench and plane the rim pieces until they're a paper-thickness proud of the plywood (**Photo 21**). Scrape or sand them flush.

Rout a profile around the top (**Photo 22**). (I used a 1/2" roundover bit.) Smooth what's left of the outside edge of the rim with sandpaper, then rout the profile a second time to remove the bumps. Finally, rout a 1/8" roundover on the underside of the rim to soften its edge. Dreamy people will feel it!

Budget-Friendly HVLP Spray Systems

Modestly priced sprayers produce results you can brag about.

by Kevin Southwick

WHETHER YOU PLAN to finish a kitchen full of cabinets or create a beautiful and durable coating on a single coffee table, spraying is a great way to apply finish faster than brushing—without the usual brush-mark problems. Today's new generation of affordable HVLP (High Volume Low Pressure) spray equipment means it's no longer necessary to make a major investment in an expensive large compressor or full-blown professional HVLP system to spray beautiful wood finishes. These new spray systems make spray finishing accessible to woodworkers of all means.

Turbine power

HVLP spray systems ranging in price from around $80 to $340 can be found in just about any home center or specialty woodworking store.

A turbine supplies the air power that makes these machines work effectively. It's basically the same as a portable vacuum cleaner motor, except that for spraying, the output of air is used instead of the intake. Unlike a compressor, a turbine motor can easily run continuously to supply lots of air movement without overheating and it doesn't require a tank to store compressed air. The first HVLP sprayer I ever saw was a small spray gun that came with a Kirby vacuum from the 1960s (an accessory that's still available today).

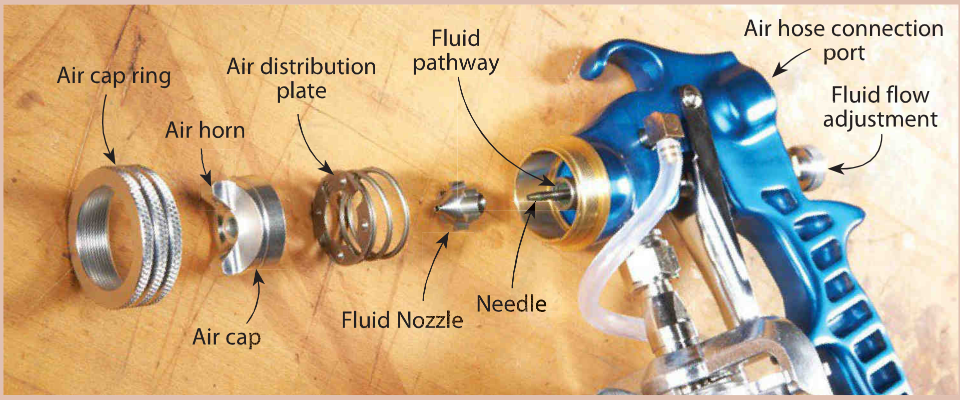
In the systems shown here, the power is rated by the wattage the turbine motor draws. The more powerful turbines can spray more finish faster, and can handle thicker materials with less thinning. However, for all of these systems, heavy paints that are supplied ready for brush application will definitely need to be thinned. A viscosity cup is included with instructions and recommendations for each system to help gauge appropriate thickness.

Clean air

The air filter is an important part of all these systems to keep airborne dust from getting in your finish. Perhaps more importantly, like a respirator protects your lungs, the air filter protects the system's turbine from problems caused by sucking in dirt and overspray. (Overspray is the mist of atomized droplets of finish floating in the air.) Every owner's manual stresses the importance of making sure the air filter is installed and working properly to avoid damage to the machine.

EDITOR: TIM JOHNSON | PHOTOGRAPHY: JASON ZENTNER

Spray Gun Basics



A spray gun combines a stream of liquid finish with moving air to create a spray of fine droplets. The fluid nozzle screws into the fluid pathway, a tube coming from the cup. When the trigger is at rest, this pathway is cut off, because the needle is tightly seated in the nozzle. Squeezing the trigger pulls back the needle and opens the pathway. Pulling the trigger further back enlarges the opening and increases the flow of fluid. Too little fluid creates a dry mist; too much results in puddles and runs. On these guns the amount of fluid is controlled by a screw adjustment that limits how far the trigger—and thus the needle—can be pulled back.

The air cap has a round hole in the center that channels air flow around the fluid nozzle. It also has two opposing air "horns" with air paths that can blow the round air pattern into a fan pattern. These horns can be turned 90° to change a horizontal fan to vertical, or shut off to create the round pattern by turning the air cap to a 45° angle. In this position, the distribution plate blocks the horns' air paths so air flows only out of the round hole in the center. The threaded air cap ring holds everything together.

Three spray pattern choices are standard on all of these guns: vertical fan, horizontal fan and round. In most situations it's best to use the fan pattern settings for spraying furniture, as they make it easier to lay down a consistent, even coating. The round pattern can help reach into corners. When the gun is set up properly, it should spray a consistent pattern of finely atomized droplets. The fan, whether vertical or horizontal, should be a symmetrical narrow oval, usually between 6" and 8" long when the gun is held about 6" to 8" from the surface. Blockage in either the fluid or air pathways will change the shape of the pattern and result in uneven coverage.

With no filter, the turbine's lifespan will be shortened. On the other hand, a plugged filter reduces airflow, which will not only affect spray quality but can also cause the turbine to overheat—and wear out faster.

The filters on these systems vary in size and location. The two tiny filters in the Wagner Control Spray Double Duty are very hard to keep clean because they're in the turbine on the gun, so they're exposed to lots of filter-plugging overspray. The filters on the Wagner Control Spray Plus, the Rockler HVLP, and the Earlex Spray Station are located on the turbine unit. This desirable feature helps to keep the filter clean, because it allows keeping the turbine and its filter as far away from the spray area as the hose will allow—always good practice. The Earlex system's filter is located on the bottom of the turbine, so setting it on a dusty floor or bench should be avoided.

Even though the filters on all these systems seem rather small and limited when compared to my professional-grade system's large expensive pleated two-stage filters, I found them to be adequate. They'll work as long as they're kept clean or regularly replaced as needed. Just remember that like furnace filters, if these filters look the slightest bit dirty, they are dirty.

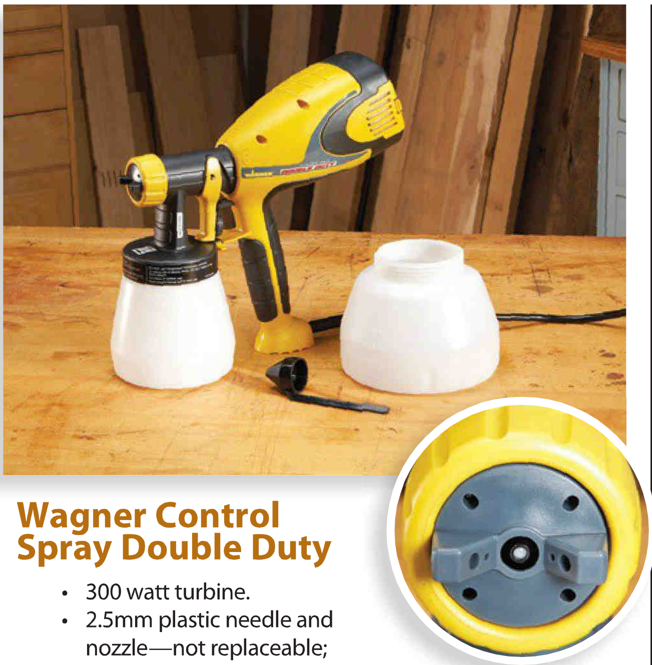
The biggest problem concerning the filters is that while the manufacturers stress how important they are, replacement filters aren't readily available in stores or online. You have to call customer service. Rockler was very helpful and willing to send me a new filter, but they don't currently sell the filter as a separate part. Earlex offered a pack of three filters for $6.38 plus shipping. Wagner referred me to gleempaint.com to order new filters.

No-frills guns

The spray guns included with these HVLP systems are very simple and work well. On the Wagner Control Spray Double Duty, the turbine is directly connected to the gun. Although this setup frees you from dragging around a separate turbine unit, it adds considerable weight to the gun. (This unit weighs about 6 lb, including the empty cup.) The other three guns connect to the turbine with a lightweight hose that's about the same diameter as a garden hose.

All four of these guns use air flow from the turbine to pressurize the cup and help push fluid to the tip. None of them allows adjusting the air flow, but that's OK—this feature isn't needed for these sprayers to work well.

The needle and nozzle set at the tip of each gun is where the stream of liquid finish mixes into the air flow from the turbine (see "Spray Gun Basics," above). The sizing of these parts is important. A large needle and nozzle set allows thicker liquids to be sprayed with less turbine power, but results in larger droplets that leave a noticably textured pattern on the surface called "orange peel." A smaller needle and nozzle set "atomizes" thin liquids into



Wagner Control Spray Double Duty

- 300 watt turbine.
- 2.5mm plastic needle and nozzle—not replaceable; smaller sizes not available.
- 800cc and 1400cc plastic screw-on cups.
- No hose required.

SOURCE: Wagner Spray Tech Corp., wagnerspraytech.com, 800-328-8251, Control Spray Double Duty, #0518050, $79.99.

Wagner Control Spray Plus

- 350 watt turbine.
- 2.5mm plastic needle and nozzle—not replaceable; smaller sizes not available.
- 800cc metal screw-on cup; 1400cc plastic screw-on cup.
- 20' hose.

SOURCE: Wagner Spray Tech Corp., wagnerspraytech.com, 800-328-8251, Control Spray Plus, #0518070, $99.99. Note: This sprayer will be phased out this summer in favor of the Control Spray Max, which has air flow adjustment and a more powerful turbine, #518080, $129.99.

smaller droplets better, resulting in a smoother fine finish.

All of these guns have an adjustment to control the amount of liquid being dispensed when the trigger is squeezed. Too little fluid flow creates a dry mist, too much will result in excess finish creating puddles and runs.

Having the option of removable needle and nozzle sets available in different sizes is useful because being able to switch to a larger or smaller set allows spraying both thin and thick materials with the same gun. Both the plastic-body Rockler gun and the aluminum Earlex gun come with two different-sized sets that are made of metal. Metal parts are easier to clean and will last longer. Earlex offers a total of four sets, with two additional sizes sold separately as accessories.

Both Wagner guns are all plastic and equipped with a single large-diameter plastic needle and nozzle set that's not removable or replaceable with other sizes. This large needle makes it possible to spray thick finishes and paints with a less powerful turbine, but it also limits atomization.

Set up and cleaning

Sprayers are sometimes viewed as tools to eliminate all finishing problems. Of course that isn't true, especially if you don't take the time to learn how to set up, use and maintain your system. And as with any new tool, mastering a spray gun takes practice. Do not forget the importance of wearing a respirator and providing good ventilation when spraying. Inhaling overspray mist is probably worse than solvent fumes.

Always test the spray pattern and gun function before filling the gun with finish. It's easy: Pour a small amount of the appropriate solvent for the finish in the cup. Then aim the gun at a piece of dry cardboard and pull the trigger just long enough to wet the cardboard. Check the shape of the pattern to be sure it's the shape you expected and the gun is operating properly. Then fill the cup with finish and retest.

If the gun is set down—even for a few minutes—be sure to retest its function before aiming it at your project. Spray tips can quickly get dried drips on them that will affect the spray pattern and apply the finish unevenly. Never aim the gun at your work when you are not sure what will happen when you pull the trigger.

Always follow the instructions for thorough cleaning after each use. When in doubt, keep on cleaning. Cleaning a spray gun and cup is just as important as cleaning your good finishing brush—do a half-dashed job and you'll be buying a replacement. The Earlex system has a Teflon-lined cup with a quick-release clamp that makes this tedious process a little more pleasant. The other three guns have screw-on cups—they're harder to attach and remove, and harder to clean out. Whenever you clean the gun, it's good practice to check and clean or replace the air filters.

The bottom line

All of these sprayers worked amazingly well in my tests. Even the smallest turbine supplied plenty of air to spray any thin- to medium-viscosity wood-finishing material. However, the higher-priced spray systems shown here have better guns and produce a smoother fine finish.

Rockler HVLP Spray System

- 1000 watt turbine.
- 1.8 mm metal needle and nozzle set installed; 0.9mm set included.
- 24 oz. plastic screw-on cup.
- 15' hose.

SOURCE: Rockler Woodworking and Hardware, rockler.com, 800-279-4441, #61577, $146.99.

Earlex Spray Station HV5500US2

- 650 watt turbine.
- 2mm metal needle and nozzle set installed; 1.5mm set included.
- Teflon coated quick release metal cup.
- 13' hose.

SOURCE: Earlex, Inc., earlex.com, 888-783-2612, Spray Station HV5500US2, $339.99

The "Conversion" Option

Vaper HVLP Touch-Up Spray Gun

This small HVLP gun is big enough to finish most furniture projects. Called a "conversion" gun because it's powered with air from a compressor, rather than having its own turbine to provide the air power, this gun is a cost-effective option to the turbine systems shown here because many woodworkers already own a suitably sized compressor to power it.

Conversion guns use high-pressure compressed air moving rapidly at the inlet, and then slow down the airflow to reduce the pressure without reducing the volume at the outlet. Full-size conversion guns require powerful compressors with very large tank capacities to keep up with the volume of air, so they aren't practical for most small shops. However, this small gun works well with my 1-1/2 HP Porter-Cable pancake compressor, spraying with good atomization and control with the compressor's onboard regulator set at about 20 PSI.

- Requires compressor with minimum CFM of 3.5 @ 40 PSI.
- 1mm metal needle and nozzle set.
- 100cc stainless steel gravity-feed cup.
- Uses any standard compressed air hose; an inline filter is recommended.

SOURCE: "Where to buy" information is available from Titan Professional Tools, titan-us.com, 800-386-0191, Vaper HVLP Touch Up Spray Gun—1.0mm, #19110, $49.95.

Kevin Southwick is a wood-finishing specialist and furniture restorer/conservator in Minneapolis. Visit **southwickfurnitureconservation.com** to learn more.

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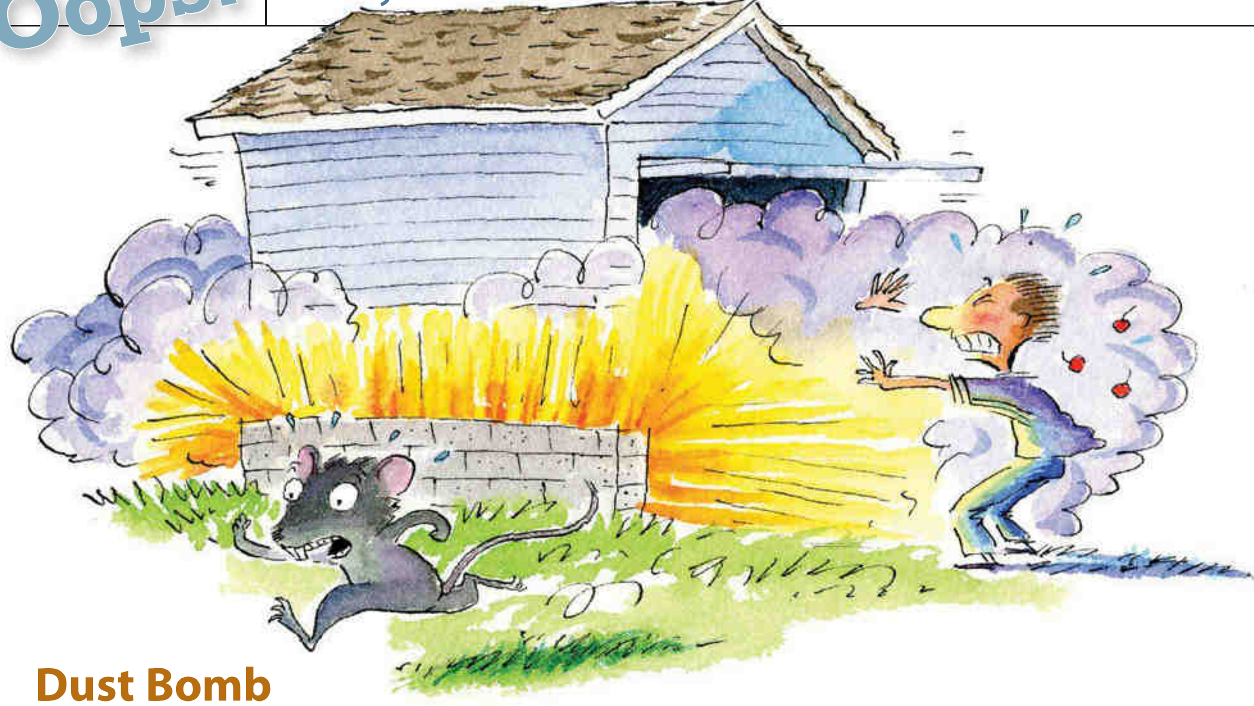

Dust Bomb

MY NEIGHBOR has had a woodworking shop in his garage since I was a kid. Recently, when he discovered that mice and other furry critters were living in its cinder block foundation, he decided to drop cherry bombs down the holes in the blocks to encourage them to leave.

Unfortunately, the results were more spectacular than he expected, because the cherry bombs ignited all the sawdust that had collected in the cinder blocks over the years. The huge explosions that resulted cracked his shop floor.

Dawn Nelson

Powerlift Woodworking

YEARS AGO, I was hired to build and install a floor-to-ceiling bookcase in a nook in a customer's living room—provided that I guaranteed not to mar the freshly painted walls and varnished floor.

I built a 12' x 30" tall base unit to run the full length of the nook and three 4' x 5' tall units to nest together on top. These units featured beadboard backs and fixed shelves graduated Shaker-style, with the spaces decreasing from bottom to top. A face frame and crown molding would tie these units together.

The completed units were heavy, so I enlisted help to install them. We positioned them in the nook without incident, so with grateful thanks, I let my helper go. But upon returning to install the face frame and molding, I suddenly realized I was in big trouble: All three top units were upside down!

My only option was to carefully remove each top unit—each incredibly heavy, hard to handle unit—turn it right-side up and reinstall it without touching the walls, ceiling, base unit and floor. By myself. For several days thereafter, every muscle in my body reminded me to never make that mistake again.

Steven Bunn

Correction

To make the "Snazzy Frames" featured in the February/March 2013 issue of *American Woodworker* (#164), you must start with 13/16" thick stock, rather than 3/4" thick stock, as the story states.

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