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Popular Woodworking Magazine

June 2013 ■ #204

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- Max. cutting height: 6"
- Blade size: 92½"–93½" L (⅛"–¾" W)
- Blade speeds: 1500 & 3200 FPM
- Approx. shipping weight: 196 lbs.

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- Max. cutting height: 12"
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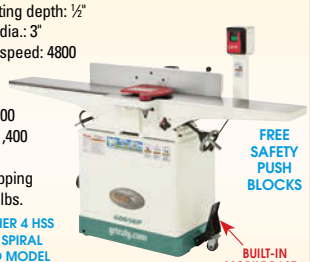
- Cutterhead dia.: 3"
- Cutterhead speed: 4800 RPM
- Cuts per minute: 20,000 (G0656P), 21,400 (G0656PX)
- Approx. shipping weight: 500 lbs.



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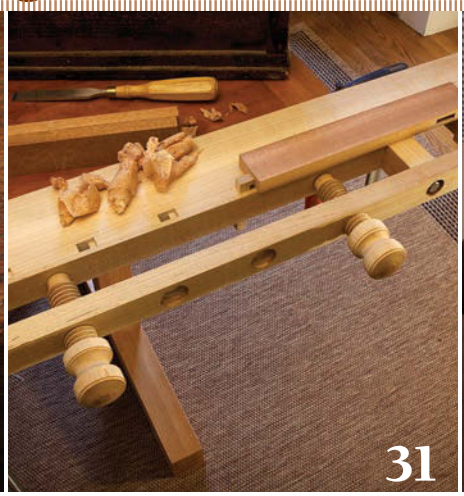
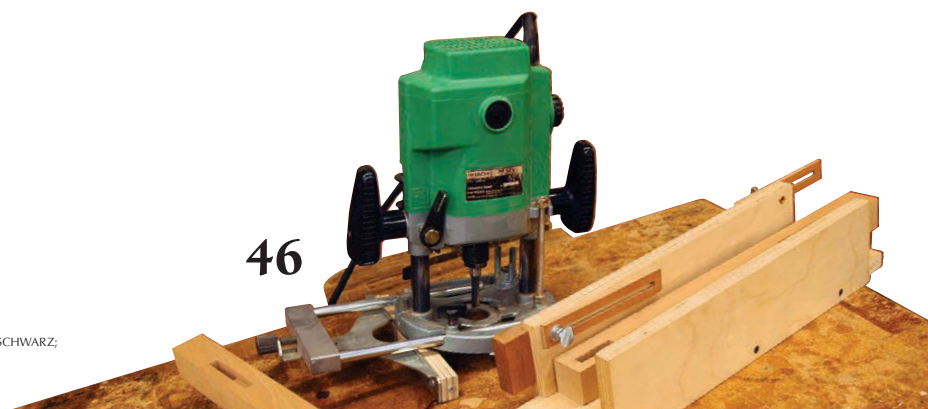


FEATURES



LIBRARY STEPS PHOTO BY CHARLES BENDER; WORKBENCH PHOTO BY CHRISTOPHER SCHWARZ; SERVER PHOTO BY AL PARRISH; ROUTER MORTISE PHOTO BY GARY ROGOWSKI

30 Days for Dad Sweepstakes

It's time to give every Dad his due with a month full of top-flight woodworking prizes. From May 18 through June 16 (Father's Day), *Popular Woodworking Magazine* and its sponsors are giving away a prize a day to celebrate Dads. To earn your chance, you must enter separately for each day's prize. All entrants will qualify for the Grand Prize, a Jet 10" ProShop Table Saw (Model 708494K) with 30" fence, cast iron wings and riving knife.

May 18 — Lee Valley

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www.osbornewood.com

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card# 87
www.knewconcepts.com

May 24 — Blokkz

Universal Clamping Block System

card# 98
www.blokkz.com

May 25 — Woodpeckers®

PRL V2 Precision Router Lift

card# 52
www.woodpeck.com

May 26 — Masterpiece Wood Finish

3-Part Oil/Wax Finishing System

card# 99
www.masterpiecewoodfinish.com

May 27 — Lee Valley

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May 28 — GUHDO

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June 05

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card# 60
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June 06

MIRKA

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www.mirka-usa.com

June 07

CMT ORANGE TOOLS

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June 08

Greener Lumber

River-Reclaimed Mahogany Boards, 4-pack

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June 09

JessEm Tool Company

Mast-R-Lift II Router Lift

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www.jessemdirect.com

June 10

FORREST

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www.forrestblades.com

June 11

DMT

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card# 92
www.dmtsharp.com

June 12

LeeValley

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June 13

BESSEY Simply better

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card# 83
www.besseytools.com

June 14

Oneida Air Systems

Oneida Air Systems Dust Deputy Deluxe

card# 35
www.oneida-air.com

June 15

BOSCH

PR20EVSPK Colt™ Router Plunge Base Kit

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www.boschtools.com

June 16 Father's Day

GRAND PRIZE

JET ProShop Table Saw, 708494K

card# 72
www.jettools.com

Enter every day at popularwoodworking.com/30days

Popular Woodworking Magazine and its sponsors will award one prize each day from May 18 through June 16. The prize pictured on each day in the calendar above is the prize offered for that day. To register for a chance to win each prize, you must enter on the day the prize is offered. You may enter as many of the daily contests as you like, but you are limited to one entry per day. All entries from the first 29 days will be eligible for the Grand Prize: the JET 10" ProShop Table Saw (Model 708494K).

Registration starts at 12:00 a.m. on May 18, 2013 and ends at 11:59 p.m. on June 16, 2013.

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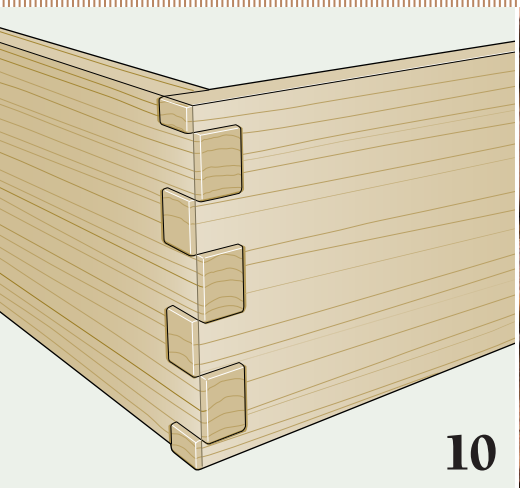

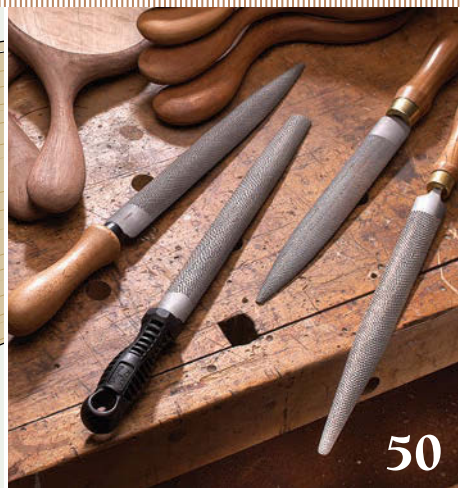

REGULARS

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POPULAR Woodworking MAGAZINE

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No One 'Right' Way

I know I've been lucky as I've learned to work wood during the past eight years. When I started at *Popular Woodworking Magazine* in 2005, I had little woodworking experience (writing, editing and project-management expertise were the job requirements, not shop skills). But I was intrigued by the machinery and awed by the work that Christopher Schwarz, Robert W. Lang and, a few months later, Glen D. Huey were turning out – not to mention the drool-worthy work produced by our many expert contributors. It was made far better than anything I could buy at a store and it looked a lot nicer to boot.

I began to tag along whenever anyone headed to the shop, to watch and ask questions. And I asked lots of questions (still do). I learned everything I could from anyone I could (always will).

Glen was the first to show me how to cut dovetails, using his pins-first approach and a combination of hand and power tools. Then I went to Kelly Mehler's woodworking school in Berea, Ky., for a class on making a hinged-lid candle box, where Kelly taught me how he cuts hand-tool only, tails-first dovetails. Someone taught me to undercut – but I don't recall who. Chris taught me tails first, and added a coping saw to the mix for waste removal.

Then I started cutting dovetails sans tuition, trying each of the approaches I'd learned. They all worked – and I could soon produce picture-worthy joints using any of those methods.

Now, I cut them using a combination of the methods I learned early on, adapting them to suit my own tools and preferred methods of work – and I've picked up more techniques along the way (dividers are your friend).

But the most important lesson I learned was not the joinery (or that dovetails really aren't that difficult); it was that for every woodworking operation, there are multiple valid approaches, whether you use only hand tools, only power tools or a combination of both: dovetails, hinge installation, mortise-and-tenon joints, panel-raising, panel-flattening, rabbets, dados, edge joints, furniture design, mouldings, handplanes, ad infinitum. While there are certainly wrong, dangerous and foolish ways, there is no one single right way.

While you might not have the luxury of walking through an office door to find a handful of great teachers, you can easily find a great many valid approaches to anything woodworking you want to learn – and lots of stuff you didn't even know you wanted to learn – on the Internet, in books, at woodworking schools, at Woodworking in America (woodworkinginamerica.com) and, always, in the pages of this magazine.

I don't need to learn more ways to cut dovetails – but that doesn't mean new ways aren't worth considering. I'll always explore new teachers and new techniques, both for my edification and yours. And in our pages, we'll continue to introduce you to new (and new-to-you) ways of going about things, so you can try them out for yourself before settling on what's "right" for you.

I might not like every technique we print. I might prefer to use a different tool or approach for the same end. But how can I know that until I give it a try – until I know what dovetails best with my experience? **PWM**

PHOTO BY AL PARRISH

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Greene & Greene Drawers: 2 Methods

I am interested in building projects in the Arts & Crafts style, and recently read "Greene & Greene Drawers," by David Mathias (February 2007, issue #160). The drawers shown (adapted from the Gamble house entry table) have proud finger joints in both directions at each of the front corners.

My question is, does the drawer sit forward of or flush to the face frame? If flush, how does one account for spacing around the proud fingers? Or are the proud fingers on the side of the drawer supposed to be flush?

I am not wild about hanging the drawers from runners under the table as shown in David's article, and plan on adapting the construction to my preference of a slide positioned on the bottom of the drawer.

Pat Seminaris,
via e-mail

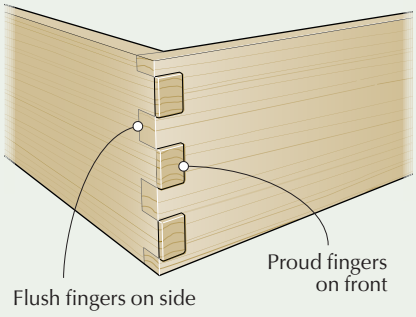
Pat,

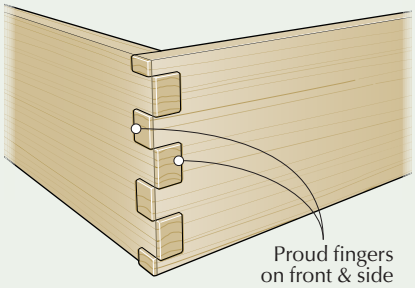
On original Greene & Greene pieces, there were two different approaches to finger-jointed drawers.

In hall tables (such as the one in David's article) the drawers were proud of the apron by a few inches, and the fingers are proud both to the front and to the side.

In case pieces, the drawers close all the way so they are flush with the surrounding frame. The gaps at the sides of the drawers are small, and in these cases the joints on the sides are flush while the fronts remain proud. That is how I made the drawers in the buffet cabinet I built for the October 2010 issue (#185).

Robert W. Lang, executive editor





Can Oilstones be Flattened With Diamond Plates?

I used a DMT plate to flatten an old stone, probably an aluminum oxide stone, and it's now smooth as a baby's butt. Is there a way to bring some grit back to the stone's face? It's an old and not-so-valuable stone. If it can't be repaired, it's no problem, but I'd like to be sure I can actually flatten an oilstone with a diamond plate.

Thomas Sawyer,
via e-mail

Tom,

Using a fine or extra-fine DMT plate on your oilstones could remove the grit from the plate rather than simply flatten the stone – but you can flatten oilstones with a coarse diamond plate.

You may have glazed stones (by which I mean the pores between the grit are filled with the slurry from flattening it). Try soaking your oilstones in kerosene overnight then scrub them with a wire brush. That will get rid of any glazing.

Megan Fitzpatrick, editor

Remove Wax From Wood

I'm wondering how the wax on turning blanks is removed. I just bought a piece of black mesquite that's about $1\frac{1}{2}$" thick and about 8" square that I plan to use for drawbore pin handles.

Is there an easy way to get the wax off? I am assuming it melts off when turning, but I'm not using a lathe.

Joshua Hall,
via e-mail

Joshua,

You don't really need to remove the wax – it will likely come off as you start cutting (and it could help lubricate your tools; I wax my sawplates and the bottom of my planes all the time). However, if it's a thick coating that's obscuring your view of the wood or something, you can scrape off the excess. Then, if you really want to remove the rest of it, mineral spirits (or naphtha) will do it. But again, the wax won't hurt your tools – and might even help them perform better.

Megan Fitzpatrick, editor

Distinctions Among Polymerized Finishes

I just finished reading the article on oils and varnishes in the February 2013 issue (#202). It's clear and useful. I wonder, though, if it was a bit unfair to a couple manufacturers in its discussion of marketing polymerized oils (Sutherland Welles and Tried & True).

The article describes these companies as marketing "polymerizing oils" then points out that all drying oils polymerize. The problem is that Sutherland Welles markets its tung oil as "polymerized" (rather than "polymerizing"), meaning that the oil is already partially dried and thus will dry more quickly.

As far as I can tell from the article, that claim is still true – a polymerized oil product (e.g. one that has been heat treated) will dry more quickly.

Adam Wager,
via e-mail

Adam,

You make an excellent point; it's a distinction I missed. Just as you say, both Tried &

CONTINUED ON PAGE 12

ILLUSTRATIONS BY MARY JANE FAVORITE

CONTINUED FROM PAGE 10

True and Sutherland Welles market their products as already partially polymerized. Watco Danish Oil doesn't.

Here's the problem. Tried & True and Sutherland Welles both claim their products are partially polymerized, but their speed of drying is at the opposite ends of the spectrum for oil finishes. How to deal with the similar polymerized claim when the two products are so different? I agree with you. I didn't do a good job.

I did explain the differences in the ways the two products were pre-polymerized; that accounts for the different drying rates. But I should have structured the article differently.

Bob Flexner, contributing editor

Numbering System for Hollows & Rounds

I was pleased to see Matt Bickford's article "The Case for Hollows & Rounds" (*Popular Woodworking Magazine*, issue #201), and it raised a question about the numbering system for the planes.

From Nos. 1 through 12, the number is equal to the number of 16ths in the iron width and curve radius. However, at No. 13, the orderly progression changes.

From an historical perspective, why does this non-uniformity in the numbering system exist?

Bob Simmons,
Litchfield Park, Arizona

Bob,

We asked Matt Bickford and he responded that there was no historical uniformity; he follows the system that was established by Clark & Williams (now Old Street Tool). So we contacted Larry Williams of Old Street Tool. His answer is below.

Megan Fitzpatrick, editor

Historically, the sizing systems weren't standardized like one might expect. When we established our standard, we followed the loose British system (American planemakers were all over the map) – but again, it wasn't standardized.

But in general, the sizes for hollows and rounds smaller than No. 12 were sized by 16ths of an inch – but different makers' sizing varied. Even the larger sizes generally changed in greater increments than what we used.

So we tried to make the sizes follow in some logical pattern and produce the most useful sizes of moulding planes. The increase by 1/8" of radii on the larger sizes simply takes into account the minor visual change of diameters when circles get larger. (You find this same approach in carving gouges.)

Now people are treating what we decided on as an historic standard.

Larry Williams, Old Street Tool

Tool Storage Wisdom

I was wondering if you have any advice for long-term, summer tool protection in hot and humid climates? I need to temporarily store my shop and do not want to return to find everything has been ruined.

I've poked around on the Internet, but I'm not sure I can trust some of what I've read.

Steve Moore,
via e-mail

Steve,

One approach is to wipe everything with jojoba oil (or other non-drying vegetable oil) then store each item in anti-corrosion bags (available from Lee Valley Tools). For good measure, you could drop your bagged tools into a cabinet or chest along with silica moisture absorbers. And of course, if you have electric service available, consider a dehumidifier. **PWM**

Megan Fitzpatrick, editor

ONLINE EXTRAS

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PHOTO BY ROBERT W. LANG

Highly Recommended

The biggest problem with miter joints isn't cutting perfect angles, it's clamping the joints together. Collins Tool miter clamps pinch the ends and apply pressure in the right direction and the right place.

These wire gizmos have been an essential part of my tool kit since I first saw them. They are inexpensive, made by an American company and were developed by a carpenter. They're available through various suppliers, or directly from the manufacturer ($33/dozen, $12.75/four; collinstool.com). — *Robert W. Lang*

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Safety Note

Safety is your responsibility. Manufacturers place safety devices on their equipment for a reason. In many photos you see in *Popular Woodworking Magazine*, these have been removed to provide clarity. In some cases we'll use an awkward body position so you can better see what's being demonstrated. Don't copy us. Think about each procedure you're going to perform beforehand.

THE WINNER:

Line & Berry Geometric Layout

Illustrated below is a line and berry inlay pattern that I wanted to be able to easily scale for a set of graduated drawers on a chest of drawers inspired by Chester County, Pa., period work.

While it could seem a daunting task to scale this pattern, many parts of it are composed of segments of circles. This insight leads to a simple way to scale and lay out the pattern in any size, using a compass or a manufactured scratch tool such as those available through Lee Valley/Veritas and Lie-Nielsen Toolworks.

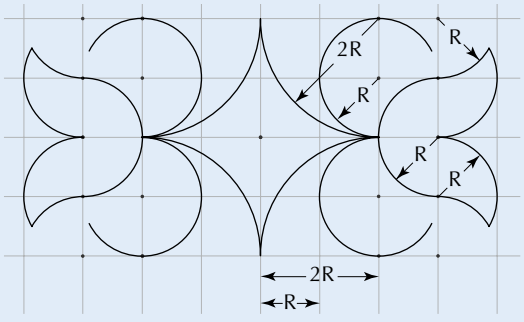
As seen in the illustration, only two compass radii are used to create this pattern.

First, decide on the height of the pattern matched to the drawer height. This distance, divided by four, is the smaller radius, or R. The larger radius is twice this distance, or 2R.

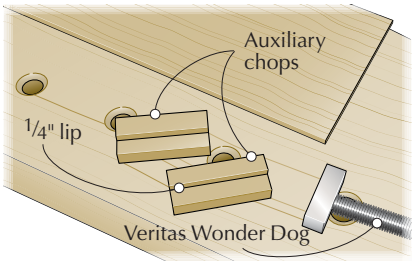
The location of the compass points are simple multiples of distance R, referenced from a vertical centerline of the diamond and the centerline of the drawer. For example, the compass point for one arc of the diamond is located over 2R then up 2R. The tulip is created with three compass points (over 3R, over 3R then up or down 1R and over 3R then up or down 2R).

The illustration makes this easy to understand.

Bill Tindall,
Church Hill, Tennessee



Editor's note: On period pieces with line and berry inlay, the pattern didn't typically graduate. Using a compass to scratch the inlay recesses is, however, period practice, as shown by Lee Ellen Griffith in her University of Pennsylvania dissertation, "Line and Berry and Inlaid Furniture: A regional Craft Tradition in Pennsylvania, 1682-1790." Compass points can clearly be seen on inlaid Chester County work.



Wood Scrap Chop Fix

I use a Wonder Dog as the tail vise on my workbench. One of its limitations is the 5/8"-tall head on the vise, which prevents you from handplaning stock thinner than 3/4" in most cases. I have a simple trick to solve this problem.

I make auxiliary chops for the Wonder Dog by cutting a 1/4"-deep rabbet on a couple of pieces of scrap stock, the width of the stock doesn't matter too much. The chops raise the work above the Wonder Dog and the 1/4" lip acts as the new chop. Used in conjunction with my bench dogs, I've been able to plane stock as thin as 3/8". I usually throw them away after each use, but you can make permanent chops out of any hardwood. Chops with longer tables support the stock even better, and it helps if you slip support pieces somewhere near the center of longer workpieces.

The great thing is that they take only minutes to make. I've used chops made from 3/4"-thick oak scraps, but found that 1"-thick stock works best. While it's not a perfect solution, it is a quick fix when needing to plane a thin board.

Bill Lattanzio
Spring City, Pennsylvania

Use White Cedar Shingles for Burnishing on the Lathe

Many people use a handful of plane shavings to burnish their turnings while the work is still on the lathe. I use a different, and I believe superior, method. I use a small scrap of a white cedar roof shingle, usually the thin end, pushed into the work while it is spinning on the lathe. The action is rather like using a scraper on a piece. This leaves a very burnished and glossy surface while keeping your hands and fingers away from potentially dangerous spinning work. (The use of shavings requires direct contact with your workpiece.)

You can modulate the pressure easily, which allows you to vary the level of gloss. You can also use this method to help melt a wax finish, then buff it to a nice, smooth surface.

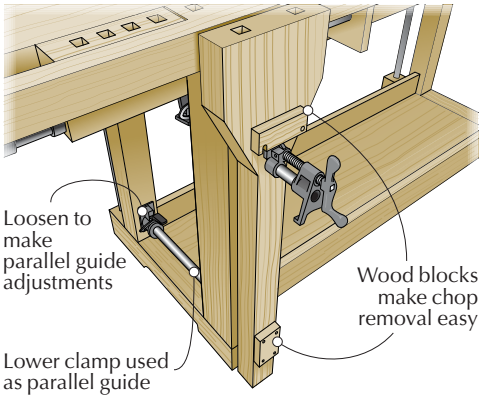
I've tried other woods, but white cedar is the best combination of softness and abrasiveness I've found. The best thing is it will not damage your turnings, but will conform to the shape of the piece. This allows easy burnishing of all areas of a spindle, including the sides of rings and beads. I use this method on all of my turnings.

Zachary Dillinger
Charlotte, Michigan

ILLUSTRATIONS BY MARY JANE FAVORITE

Easy Pipe Clamp Leg Vise

This leg vise design is an easy add-on to many workbenches, and it uses pipe clamps you may already have on hand. In theory, this vise can even be added to benches that don't have legs flush with the front edge of the top. The upper clamp serves as the screw of the typical leg vise design. The lower clamp extends through the back leg, serves as the parallel guide and holds the bottom end of the chop out at any position. The capacity of the vise is limited only by pipe length. A head assembly of a pipe clamp has about 1½" of travel, but the tail stops are easily moved to allow larger adjustments.



As an additional benefit, you can remove the chop from both pipes in about a minute – getting it out of the way when needed. The block of wood on the face of the chop slides down over the pipe clamp face, so retracting the clamp also retracts the chop – it rotates up to release the clamp from the chop.

Drilling perfectly aligned holes in the legs is the most difficult part of this build.

In use, my leg vise works very well and it has plenty of holding power. The drawing shows more details of the setup. PWM

Chris Merrill,
Raleigh, North Carolina

Cheap Saw Blade Cleaner

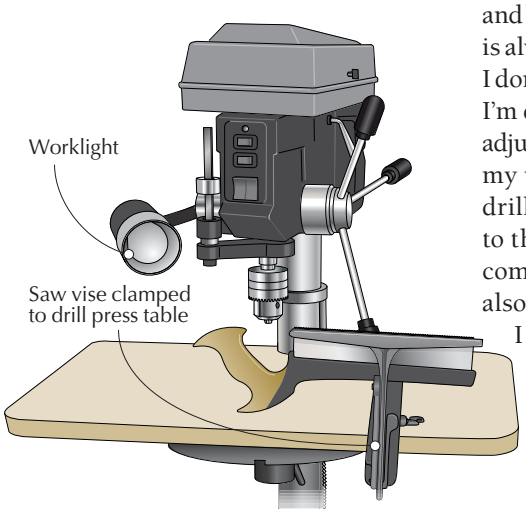
First cut 2" from the bottom of a 5-gallon bucket (a nice fit for a 10" saw blade). Next, mix 1 to 2 tablespoons of washing soda (such as Borax) with enough hot water to cover the blade in the bucket. Pour the soda solution over the blade. After the blade has soaked for several minutes, scrub away stubborn deposits with an old toothbrush. When done, rinse the blade in warm water then dry it. Lastly, apply a rust-prevention lubricant to the blade.

To dispose of residual solution, pour it down the drain. It helps clean the drain and does no environmental harm.

Jerry Dye
Troy, Ohio

Adjustable-height Saw Vise

I use handsaws for a lot of the cuts I make and for all of my joinery cuts. So, I need to sharpen my handsaws on a regular basis to keep them in working order. I have purchased several vintage saw vises for holding saws. A great feature of these vises is the C-clamp mechanism that attaches to a worksurface.



One thing I hate about saw sharpening is it can be a real pain in the neck and back, and hard on the eyes. The job is always easier if I elevate the work so I don't have to sit or crouch to see what I'm doing. As it so happens, I have an adjustable-height worksurface to clamp my vise to right in my shop. It's my drill press table. I clamp the saw vise to the table then raise or lower it to a comfortable height in just seconds. I also have a built-in light close at hand.

I know this tip requires two things: a saw vise and a drill press. But if you have these, this trick is a real back and neck saver.

Adam Petersen
Sioux Falls, South Dakota

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Makita LXT Cordless Sander

This full-featured, 5" tool is powered by an 18v lithium-ion battery.

Makita has liberated the pigtail from a full-sized random-orbit sander with the introduction of the 5" LXT 18-volt lithium-ion cordless sander.

Cordless sanders have challenged manufacturers because of the continuous-duty nature of the tool; only Makita and Ryobi have one on the market.

LXT Cordless RO Sander

Makita ▪ makitausa.com or 800-462-5482

Street price ▪ from $99 bare to $278 with two batteries and charger

▪ VIDEO *Watch a short demo of the LXT cordless sander online.*

Prices correct at time of publication.

The Makita sander weighs in at 3.6 pounds, not bad for a machine toting an 18v battery – and the tool is well balanced, with the battery tucked behind the grip.

Speed controls are conveniently located at the top front of the tool. The sander has three operating speeds: 11,000 orbits per minute (opm) in high speed for most sanding chores; 9,500 opm for finish sanding and 7,000 opm for polishing. Orbit size is 1/8" inch. In our test, the battery ran for 24 minutes at high speed (four minutes longer than the company states). Recharge time is 30 minutes. While I'd prefer longer run times (of course), the LXT sander delivers solid performance.

As with most random-orbit sanders, dust collection is through holes in the pad and is only moderately functional.

If you have already bought into the Makita 18v-system – it now includes 50 products – the LXT is attractively priced.

— Steve Shanesy

Monster Jointer Plane from Scott Meek Woodworks

The longer your jointer plane, the straighter the work that flows beneath it. Because of that maxim of handwork, some Old World planes for making furniture were lengthy – 36" isn't unusual.

Most modern jointers top out at 24" long, so picking up the new 36" jointer from Scott Meek Woodworks is a time-bending experience. On the one hand, it's like using an old Dutch jointer because of its wooden body and extreme length. But it's made like one of the planes James Krenov made famous – its body is laminated to create the bed and sidewalls of the tool. And the tool has flowing shapes like a futuristic sports car.

Meek Jointer Plane

Scott Meek Woodworks
▪ scottmeekwoodworks.com

Street price ▪ from $895

▪ VIDEO *See two ways to grip this plane.*

Prices correct at time of publication.

The plane works quite well once you become acquainted with its grip and the space it occupies. Your first instinct is to place the web between your thumb and index finger on the horn behind the blade. For me, that was a recipe for a sore hand. After pushing with my palm instead, the tool became easier to wield.

But it is huge. I have a small shop and an 8' bench, so I had to make sure the area around the tool was clear before I started work. Once I made a path, the plane made remarkably straight edge joints and flat panels.

There is another downside to long and accurate tools: Because they make flatter surfaces, they require more passes than a shorter tool will to finish an edge or surface. Luckily, if a 36"-long tool is too long, Meek also makes a shorter version of this plane.

The iron is bedded at 50°, which is steeper than Stanley jointers, and uses a nice 2"-wide Hock blade made from high-carbon steel (.19" thick).

The craftsmanship on the tool is top-shelf; it's like a piece of sculpture with its flowing lines. I quite like the tool, though I'd probably buy a shorter one for my smaller shop.

— Christopher Schwarz

CONTINUED ON PAGE 18

PHOTOS BY AL PARRISH

CONTINUED FROM PAGE 16

Veritas Handsaw File Holder

Some woodworkers – myself included – are leery of filing their own saws. But this new saw file holder from Veritas takes away some of the fear by "tricking" you (through both tactile and visual cues) into holding triangular saw files in the correct orientation for your desired tooth geometry.

There are lots of charts available on the Internet to help you choose the proper saw file (for an excellent filing primer see vintagesaws.com by Pete Taran). But the quick and dirty way is to drop a triangular file into a gullet – the right file will be slightly more than twice the height of the saw tooth; that way, when one side of the file is dull (after about five sharpening sessions), rotate it and you still have a full, unused part of the file hitting every tooth.

Once you've determined the correct file to use, insert it into the holder just far enough so the set screw can grab it beyond the file teeth then lock it in place.

Now choose your rake (how far the tooth leans forward or back) – a 15° rake for a crosscut saw, for example – and adjust the vernier scale's rotating collar to 15°. (You can't see the scale in the photograph; it's on the bottom of the jig.) Your natural tendency is to hold the top of the file flat with the top of the saw (which would give you a 30° rake); the vernier scale adjustment shifts the jig's handle so it is perpendicular to the teeth, but holds the file in the correct orientation for a 15° rake.

To set the fleam (bevel angle), adjust the protractor to the desired setting (15° in my crosscut example), then keep the fence parallel to the teeth as you file (were that fence an inch or two longer, the visual cue would be even better).

The vernier scale adjusts from -30° to +30°; the protractor adjusts 45° left and right.

The jig is available on its own for $39.50, or in a kit with seven Grobet saw files for $79.

Am I brave enough to file my progressive pitch dovetail saw yet? Well, no – but an 8 teeth-per-inch panel saw? Bring it on. *— Megan Fitzpatrick*

Handsaw File Holder

Veritas/Lee Valley ▪ leevalley.com or 800-871-8158

Street price ▪ $39.50

▪ ARTICLE *Download our article on building a simple saw vise for your shop.*

Prices correct at time of publication.

Easy Chuck from Easy Wood Tools

Four-jaw scroll chucks used in wood turning largely work the same. They have interchangeable jaws held by screws, and the jaws open or close using a geared key, a hex key or tommy bars. The jaws usually have a dovetail-shaped rim that clamps a similarly shaped tenon turned on the base of the workpiece.

The Easy Chuck is an altogether new chuck now available from Easy Wood Tools. It is simple to operate – and exhibits the same game-changing innovation as the turning tools the company introduced a few years ago.

Two significant innovations are built into the Easy Chuck. First, jaw changeout is reduced to a simple push of a jaw key on a spring-loaded jaw-holding device – one quick push and the jaw slides effortlessly off the chuck. (On most jaws, it's necessary to remove two holding screws for each of the four jaws, or eight screws per chuck.) So with the Easy Chuck, there's a significant time savings, there are no screw heads to bugger up and no screws to lose in ankle-deep piles of shavings.

The second innovation is the Easy Chuck's Zoom Ring, another timesaver and convenience feature. This ring is located at the base of the chuck's body, and quickly moves the jaws to the extremities of their travel with just a few quick twists. When the jaws are set to a desired opening, a conventional hex key is used to securely tighten the work in the jaws.

The chuck is made with 1" x #8 threads per inch (tpi) for mounting on the lathe spindle. An adapter for 1¼" x #8 tpi is available. The 4" Easy Chuck comes with dovetail jaws able to grip up to 1⅜" tenons, or to expand to fill 2⅛" recesses. Other jaw sizes and types are also available. **PWM**

— SS

Easy Chuck

Easy Wood Tools ▪ easywoodtools.com or 866-963-0294

Street price ▪ $499

▪ VIDEO *Watch a short demo of the Easy Chuck online.*

Prices correct at time of publication.

Hannah's Inlaid Chest

BY GLEN D. HUEY

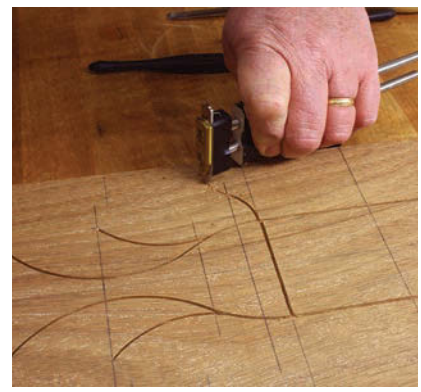
Router and hand tools combine for line and berry inlay on this 18th-century piece.

In 1746, at the age of four, Hannah Pyle stored her prized possessions in a small three-drawer chest with line and berry inlay. Lines of holly stringing on the front of that chest included her date of birth and initials – a common practice in southeastern Pennsylvania in the mid-1700s. The pale white numbers and letters stood out against the dark walnut background, as did the inlay on each of the three arched-top drawers.

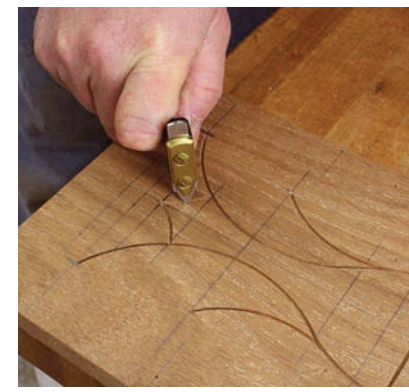
Hannah's father, an accomplished Pennsylvania cabinetmaker named Moses Pyle, built the chest for his daughter. A second chest, also with inlaid initials and drawer fronts, was owned by Hannah Darlington, Pyle's sister-in-law. Her chest, built a year later in 1747, is also attributed to Pyle. That chest is now part of the collection at the Winterthur museum. I left the date off my chest and chose to work with mahogany.

Begin radius work. *Use a back-and-forth action as you scratch the pattern and be mindful to keep the pivot point planted.*

The key. *A successful inlay design is accomplished only with a smooth transition from arc to arc.*



Two arcs, one radius. *The short S-shaped line is a double arc made with the cutter set at a 1" radius.*



Get the point? *The design pattern repeats over the four quadrants of the front. The only connection of the arcs is the arrow near the ends.*

Scratch a Design

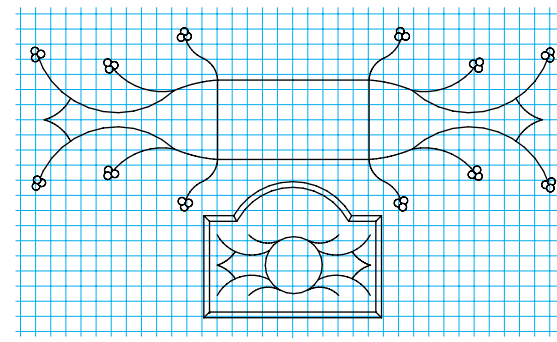
There are two natural starting points for this project. If you're new to dovetails, build your box then do the inlay work – it would be disheartening to complete the inlay work only to trash the piece as you dovetail. If, on the other hand, you are dovetail-savvy, begin with the inlay.

Grooves for stringing can be created using a router setup, scratched by hand or with some combination of the two. For the straight lines of the box front, I suggest a trim router and a 1/16"-diameter bit. For all other grooves, a radius cutter and .062" blade (available from Lie-Nielsen Toolworks) works great.

To begin, cut your box front to length and width then mark its center. Work off the centerlines to layout the sides of the 2 5/8" x 5" rectangle at the center of the design. Use a router with a guide fence to cut the top and bottom lines then use a router and a shop-made dado jig to complete the shape. (Details of my jig are available online.)

The remaining lines – all arcs scratched into the chest front– rely on layout accuracy. Measure and draw lines at each step to keep your four quadrants identical.

Draw a line 1 7/16" beyond the ends of the rectangle. Set your radius cutter at 2 5/8" (equal to the rectangle's side length), position the pivot point of the radius cutter at a corner then swing your groove out to the line. Repeat the steps at all four corners.



LINE & BERRY PATTERN

Grid = 1/2" squares

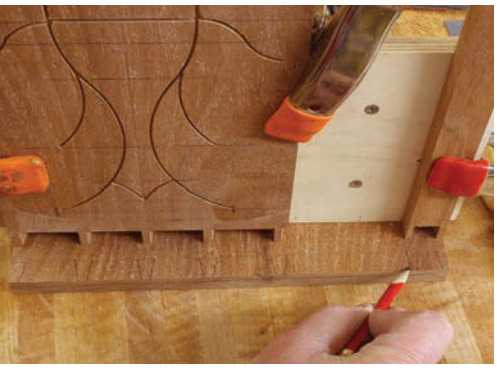
To create the second groove – the longest – slide out another 4 1/2" and draw a vertical line across the front. Mark a line 1 7/8" from the horizontal centerline. Set the radius cutter to cut at 2 3/4", then find a pivot point that allows the tool to reach both the end of the first groove and the point marked on the outermost line.

The third groove begins at the intersection of the first two arcs then moves out 2 1/8". The tool is set at a 2 1/8" radius, which indicates that the pivot point is aligned with the intersection.

The S-shaped line begins at the corner of the rectangle and arcs out toward the end 1/2". The second section of groove transitions from the end of the first and continues out another 1/2" as seen in the photo above left.

The last grooves in the design form an arrow that connects the quadrants. From the outermost vertical line, move

OPENING PHOTOS BY AL PARRISH; STEP PHOTOS BY THE AUTHOR;
ILLUSTRATIONS BY ROBERT W. LANG FROM THE AUTHOR'S MODEL



An easier choice. *Because the base moulding completely covers the lower-front rail dovetails, you could use an easier joinery method for the case in that location, such as a nailed or pegged butt joint.*

Smaller than usual. *With the front's thickness at 9/16", a standard 1/4" mortise would leave mortise walls too weak. Cut a 3/16"-thick mortise here instead.*

> "I am not ashamed to say that no man I ever met was my father's equal, and I never loved any other man as much."
>
> *—Hedy Lamarr (1913-2000), actress & mathematician*

back toward the center 3/8" then draw a vertical line. Draw a second line in another 3/4" then, with your tool set at a 1 3/4" radius, work between the two points (see page 21).

Case Construction

The four corners of this chest are dovetailed together. As with most chests of this design, the pins are in the front and back panels with tails in the ends or side panels. The size and number of pins and tails is left to your discretion. There are a couple tricky spots to bear in mind as you layout your joinery.

When working on the front panel, it's best to begin the layout with a small half-tail at the bottom edge – this keeps you from making one 90° cut in your tail board when cutting your dovetails.

A second tricky area is the lower front rail. The rail has a single tail socket with half-pins on each side. Aesthetically, I would prefer this piece also begin with small half-tails, but its narrow width makes this impractical.

Before any case assembly, cut the mortises for the two vertical dividers into the bottom edge of the front panel and the top edge of the lower front rail.

Because the rail thickness is 9/16", keep your mortise at 3/16" in width for stronger mortise walls. I went with an "old school" power and hand approach to make the mortises; use a drill press to remove most of the waste then chisels to complete the 1/2"-deep mortise.

Two dividers are cut to width and length, including the 1/2"-long tenons. Rough-cut the tenons at a table saw, but leave them oversized. Use a shoulder plane to trim them to a snug fit.

Holly-lujah

Before you assemble the case, cut and fit stringing into the grooves. An easy way to thickness stringing is to rip a couple pieces at a table saw with the fence set at a strong 1/16", then sand the pieces between a shop-made fence and a spindle sander drum. Dial in a perfect fit by adjusting the fence's position.

For string material, I use what's in my shop, which is generally maple. For this piece, however, I chose holly. I found it easier to use. Grooves in this chest do not have a tight radius, but if maple is your string material, you may need to heat-bend a few pieces. Holly, at least in my experience with this project, does not require any heat-assisted bends; moist holly easily bends to fit these grooves.

Cut your pieces to length, but don't worry about hitting the groove ends exactly. Berry placement covers a multitude of sins.

Berries are made using a 1/4" plug cutter at a drill press, and need to be 1/8" thick. There are 36 berries on the front panel, but always cut a few extra plugs. My piece of holly had a bad end that provided an otherwise unusable area from which to make berries. Cut your plugs, then use a screwdriver to pop them free.

To plant your berries, drill 1/4"-diameter holes about 3/32" deep at the ends of your string. For a realistic look, I find it best to drill and install the berries one at a time so they can overlap. After the

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#WM11

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#CP-11, semi-bright

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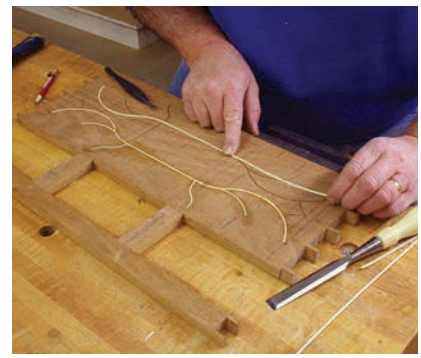
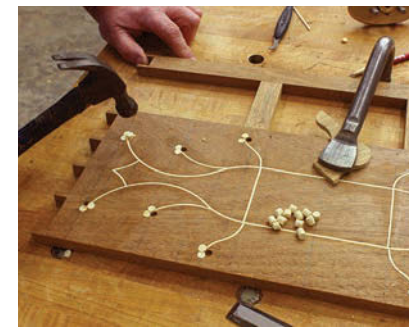
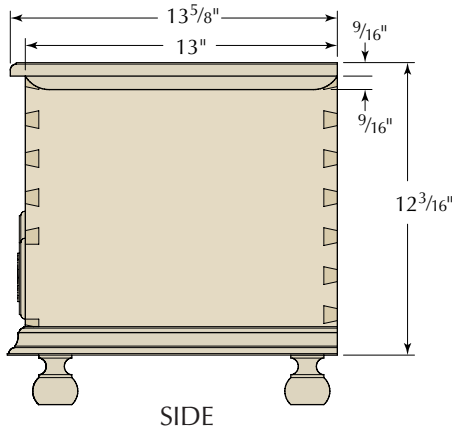


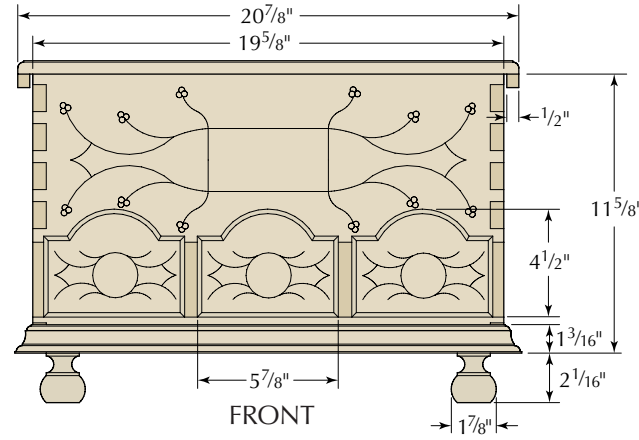
Long is better. *When stringing a design, begin with the longest piece of inlay; you can then work to the shortest.*



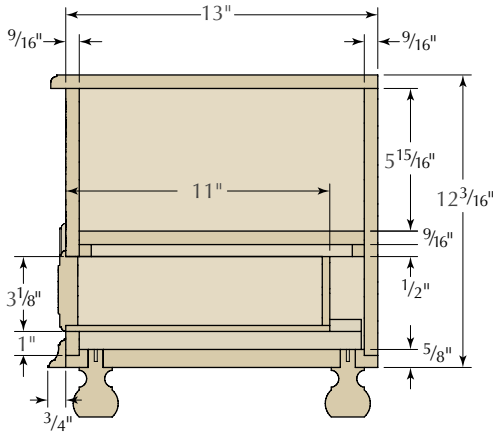
Grown by the bunch. *As you install your berries, it's better to arrange the plugs to replicate how berries grow in the wild. Nature forms bunches, not straight lines.*



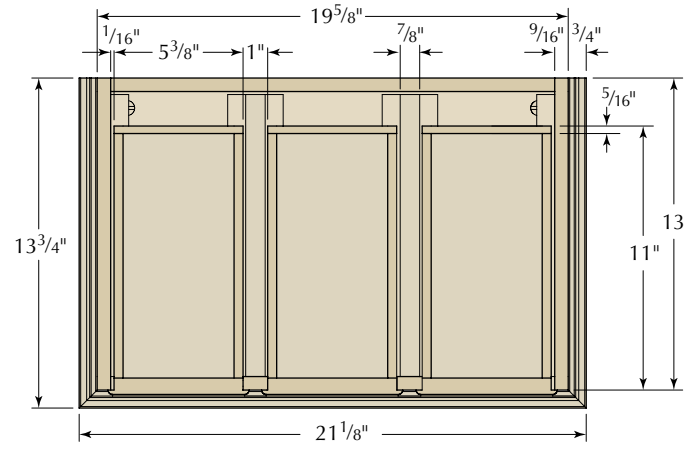
SIDE



FRONT



SIDE SECTION



PLAN

glue dries on the first one, add a second berry to start to form a bunch. When the second installation is dry, drill and install the third and last berry. This process is time-consuming, but results in the best appearance.

After the glue for the berries is dry, apply glue to the pins and tails then assemble the case. Add clamps if necessary and make sure the case is square.

A Firm Foundation

Before you fit the interior parts, you'll need to turn the bun feet. As turning goes, this is a simple task. Turn a design to your liking, or download the full-size drawing for my foot (see Online Extras). It's best to make an extra foot if you're not a talented turner so you can select the four feet that most closely match – but don't sweat it if they are not identical. It's impossible to see all four feet at the same time.

The chest bottom is milled to match the case and has a 1/8" x 9/16" rabbet cut along the outer edge. This allows the bottom to fit an 1/8" up into the case

Hannah's Inlaid Chest

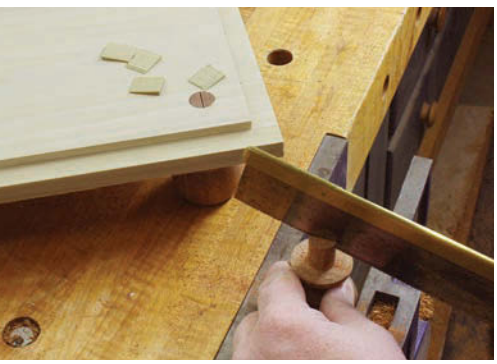
NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
CHEST						
❑ 1	Front panel	9/16	7	19 5/8	Mahogany	
❑ 1	Front rail	9/16	1	19 5/8	Mahogany	
❑ 1	Side	9/16	11 1/8	13	Mahogany	
❑ 1	Back	9/16	11 1/8	19 5/8	Mahogany	
❑ 1	Lid	9/16	13 5/8	20 7/8	Mahogany	
❑ 2	Lid cleats	9/16	9/16	13	Mahogany	
❑ 2	Vertical dividers	9/16	1	4 1/8	Mahogany	1/2" TBE*
❑ 2	Cleats - long	1/2	1/2	17 1/2	Poplar	
❑ 2	Cleats - short	1/2	1/2	11 7/8	Poplar	
❑ 1	Chest - bottom	5/8	13	19 5/8	Poplar	
❑ 1	Foot blank	1 7/8	1 7/8	16	Mahogany	Material for 4 feet
❑ 2	Base moulding	3/4	1 1/4	28	Mahogany	
❑ 1	False bottom	9/16	18 1/2	11 7/8	Poplar	
DRAWERS						
❑ 3	Fronts	3/4	4 1/2	5 7/8	Mahogany	
❑ 2	Runners - outside	3/4	3/4	11 3/4	Poplar	
❑ 2	Runners - middle	3/4	1 3/4	11 3/4	Poplar	
❑ 2	Guides	5/8	7/8	11 3/4	Poplar	

*TBE = Tenon both ends

making 3/4"-thick material ideal for drawer runners. The thinner edge also minimizes the overall height of the base moulding.

The feet, after turning, are installed into holes drilled in the case bottom. Adjust the foot's grain to run perpendicular to the bottom's grain. Make a saw kerf across the foot tenon, add glue to a small wedge then tap it into the cuts to secure the feet.

Simple lathe work. *Lay out the major transitions for the feet, including the top and bottom of the ball and the top edge just below the tenon that fits into the chest bottom. Use a parting tool to set the proper diameters then shape the ball and cut the cove.*



A strong hold. *Foot tenons slip into holes drilled into the bottom after each tenon is sawn with the grain to accept glued wedges.*

Primarily for looks. *Because these nails will be seen throughout time, the bottom is the perfect place to use period-correct reproduction nails. But don't forget to drill pilot holes.*

As the glued wedges dry, mill and install the 1/2"-square chest cleats that support the false bottom. The chest cleats are flush and level with the front panel's bottom edge. Glue and brads hold them in place.

With the case inverted, add a bead of glue along the front edge and halfway back the sides. Position the bottom assembly to the case then nail along all four sides.

Mill the drawer runners and guides to size. The two outside runners fit tight to the sides and butt to the front rail. Middle runners split the vertical dividers and are squared to the front rail. Add a thin bead of glue to the front half of the runners, position them to the case then secure with brads. Drawer guides fit on top of the middle runners and are attached with glue and brads.

The false bottom above the drawers floats as it rests on the cleats. Mill the panel so the grain runs front to back in the chest to increase rigidity.

Mouldings & Top

The moulding on the case is a bit of a troublemaker in that it is 1 1/4" tall, but only 3/4" thick. This dictates that you stretch the profile more than most router bits allow, so be creative. Also, because the router bit cut is so high, it's important that you make your moulding on a wide board.

Begin with a cove-and-bead router bit set up in your router table. Set your fence flush with your router bearing. To get the extended flat portion of the moulding as shown in the photo at right above, make a number of passes, raising the bit height with each pass.

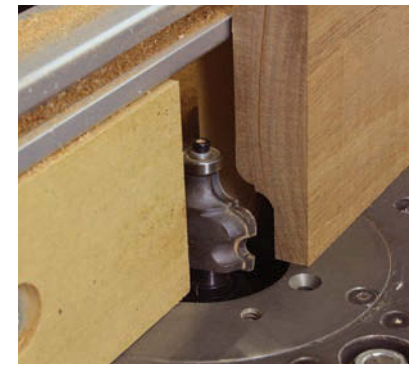
Complete the two-step moulding profile by adding the roundover detail at the top edge. Use a 1/4"-roundover bit, and leave a small fillet for an additional shadow line. After completing this profile, trim your moulding from the edge of the wider stock.

Fit the moulding around the front and ends of your chest, then miter the corners. Apply glue to the entire front piece, but only along the front half of the side pieces. Brads finish the work and hold the moulding in place as the glue sets.

Mill the lid and lid cleats according to the cutlist. Profile the front and ends of the lid using a 1/2"-roundover router bit set to leave a small fillet. Cleats at the ends help hold the lid flat. Glue the front half of each cleat then screw them to the lid. Place the screws toward the inside edge of the cleats to keep them from poking through the top's moulded edge.

Arched-top Drawers

The chest drawers are built with through dovetails at the back and half-blind dovetails at the front. The 1/4"-thick bottoms fit into rabbets cut in the drawer fronts and are nailed to the drawer box. Most of the work, including the string inlay, focuses on the fronts.



Incremental increases. *I used a French Provincial Classical bit to begin my moulding profile. As planned, small increases in the bit height trimmed away the full-bead leaving only the cove-and-bead portion used.*

Lying flat. *With your workpiece flat to your router table, extend a 1/4"-roundover bit to the cut area. Set your fence flush with the router bit bearing.*

Bring to a point. *Rounded corners need to be squared. Continue the reveal to a sharp corner, then use a sharp chisel to trim both shoulders to transition the thumbnail.*

Plane is better. *Material behind the arch is nibbled away at the table saw, but final clean-up is best done using a shoulder plane.*

The arch of the three drawers is a centered 2 1/8" radius with the compass point set at that distance from the top edge. Draw the arch then mark a line 3 3/8" up from the bottom edge to locate the shoulders. After the shape is cut, form the thumbnail edges with a roundover bit. The inside corner at both ends of the arch needs to be squared as shown in the photo above.

Each drawer front is rabbeted as if it were a rectangle. The ends and bottom have a 1/4"-wide x 1/2"-deep rabbet. The entire arch, including a 1/4" at the shoulders, is also rabbeted. Make the cut at your table saw, then nibble away the area behind the arch.

The stringing pattern on the drawer fronts is offset toward the top of the drawer front. Position your pattern 1 5/8" from the thumbnail edge. Also, take the time to lay out the pattern to ensure you have adequate space for the pivot point of the radius tool.

Begin with the 7/8"-radius center circle. Remaining arcs transition from the circle and extend to the layout lines. This exercise is like that used on the case front. The one difference is that there are no berries used on the drawer fronts to mask the string ends.

Fit & Finish

The finish on my chest begins with a coat of boiled linseed oil to highlight the grain. After a coat of shellac, apply a layer of Van Dyke brown glaze to darken the project without discoloring the inlay. Follow that with multiple coats of shellac until a sufficient build is reached. Buff with #0000 steel wool to reduce the shine of the shellac.

Pattern tweak. *String patterns are pushed above the center of the drawer front. Make sure you have ample room for the radius tool's pivot point. It is tight.*

With the finish complete, install an escutcheon with the area behind the keyhole drilled out and painted black – unless you choose to install a lock. The drop-pendant pulls are mounted using a snipe, and the lid is attached with small butt hinges.

I think this is a perfect project. Material costs are low and construction techniques are not over the top. As an introduction to string inlay, this design is easy and the work can be by hand or power. Just have fun with it. **PWM**

Glen has returned to gainful employment as the managing editor of Popular Woodworking Magazine. *He can be reached at glen.huey@fwmedia.com*

Square ends. *The grooves on the drawer front need to stop at your layout lines and the cut has to be at full depth to the very end. A nice trick is to use a screwdriver, sized to fit your lines, to crush fibers at the end of the lines.*

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/jun13**

VIDEO: *Watch an excerpt from the author's "Line & Berry" inlay DVD.*

PLAN: *Download a full-size drawing of the chest's foot plan.*

IN OUR STORE: *Glen D. Huey's "Line & Berry String Inlay by Router" DVD.*

TO BUY: *"American Classics," a downloadable book by Glen D. Huey.*

WEB SITE: *Explore the collection of period furniture online at the Winterthur Museum.*

Our products are available online at:

- **ShopWoodworking.com**

Wharton Esherick

BY CHARLES BENDER

Discover the 'Dean of American Craftsmen.'

After a long, slow, winding drive up Valley Forge Mountain in Pennsylvania, the treeline parts. Through the underbrush several buildings seem to emerge from the hillside. These are not the tightly tended gardens of Winterthur or Longwood, where most of my period reproduction work would feel at home. Nature is the architect and builder here.

My journey to this place began 30 years ago when, as a teenager, I first traveled to Wharton Esherick's property, where buildings of log, board, stone and stucco make up the studio, visitor's center and a residence of what is now the Wharton Esherick Museum. Much of the architecture seems to have grown naturally from the earth. Ever the artist, Esherick (1887-1970) added

splashes of color to the stucco additions, doors and windows. Earthen greens, reds and browns, with accents of bold navy, pink and mauve, compose the palette with which Esherick decorated his environment. Make no mistake – that is precisely what he was creating: an environment.

While my own woodworking combines 17th- to early 19th-century aesthetics with 21st-century building techniques, even at a young age, I felt an affinity for this man whose work and life were so closely intertwined.

At first glance the buildings don't appear to be anything special. But the more you look, the more you realize that they are the expression of a life trying to strike a balance with nature. As an artist influenced by impressionism and cubism, Esherick tried to mimic the asymmetry found in nature.

The studio, built right into the bank of the mountain, has a curved roofline as does the garage/visitor's center. Unlike the garage, where the ridge twists from one corner of the building to the other, the studio ridge curves slightly downward. With the addition of the "tower" and the "silo" to the studio, the entire building takes on a deliberate cubist appearance.

The buildings and grounds are part and parcel with the landmark furniture Esherick made during his career. But just like you cannot understand the builder without his surroundings, you cannot understand his furniture unless you understand his personal history, from painter to sculptor to craftsman.

Birth of a style. *Decades before artists such as Sam Maloof began making furniture with sculpted mortise-and-tenon joints, Wharton Esherick built such pieces as this stool made in 1929.*

Beyond Arts & Crafts

Wharton Esherick grew up in the latter half of the British Arts & Crafts movement and came of age just as the American Craftsman period was getting underway. Born in 1877, he was influenced throughout his formative years by the impressionist, cubist, expressionist and Arts & Crafts movements. From the time he was a child, Esherick wanted to be an artist and specifically, a painter.

The son of a prosperous businessman, Esherick was encouraged to pursue an education in business. In fact, his father tried very hard to discourage his son's interest in art, but Esherick would not be swayed. He attended the Manual Training High School of Philadelphia where he learned woodworking and metalworking. From 1906 to 1908, he studied drawing and printmaking at the Pennsylvania Museum School of Industrial Art. In 1908, Esherick was accepted at the Pennsylvania Academy of the Fine Arts where he studied painting under some of the great painters of the day.

Esherick dropped out of the acade-

Rooms with a view. *The cubist-inspired studio and home of artist Wharton Esherick are surrounded by nature on Valley Forge Mountain in Pennsylvania (left).*

Flowing ridgeline. *The visitor's center at the museum is housed in what was Esherick's garage. His desire to create a complete environment for himself led him to shift the axis of the ridgeline of this roof to create an asymmetrical appearance (right).*

my 18 months after enrolling, saying he had learned everything he could from the teachers, and he was determined to explore art on his own. It was the height of American impressionism but Esherick found steadier work illustrating for the Victor Talking Machine company and the local newspapers than he did with his impressionist paintings. By all accounts, he was a good impressionist painter – but there were lots of "good" painters around. He needed a way to set his work apart.

In 1912, Esherick married Letty Nofer and in 1913, they followed many other artists who fled the city for a simpler life. They purchased a small farm and house on the hillside of Valley Forge Mountain in Paoli, Penn., and began raising their three children. Here, Esherick could paint and the family could raise its own food.

In 1919, the Eshericks spent the winter in Fairhope, Ala. Fairhope, like Arden, Del., and other Georgist single-tax communities, was a gathering place for the artistic and intellectual crowd. Here Esherick painted and taught art. He also met people such as writer Sherwood Anderson and curator Carl Zigrosser. It was at this time he began carving frames for his paintings. He discovered he loved carving wood and began making woodblock prints for illustrated children's books.

As the couple became involved with rhythmic dance, Esherick tried to capture the movements of the dancers in sketches and paintings, and his style became less rigid. It was this attempt to capture movement that would shape his later works. He and Letty also became involved with the Hedgerow Theater in Media, Pa. There, he expanded his artistic endeavors to creating set designs and carving blocks for printed programs and posters.

Through his association with the theater, he became friends with author Theodore Dreiser, through whom, along with other artists, writers and intellectuals of the time, Esherick developed connections that would serve him well for future furniture commissions.

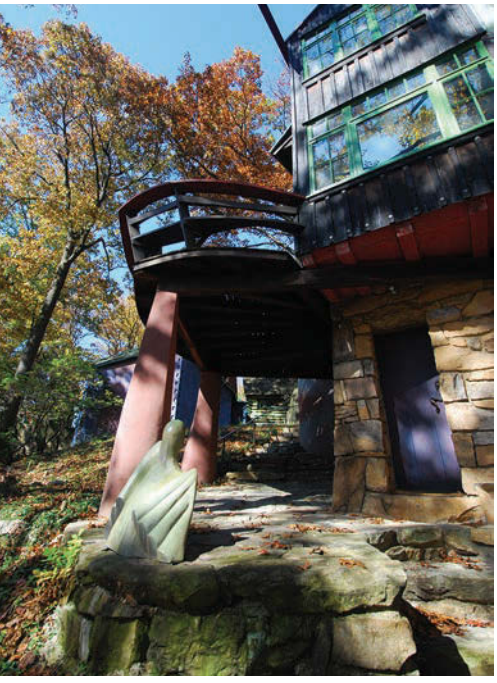
So what does all this social and art history have to do with woodworking? To understand Esherick's genius, you need to understand the influences on his life and art to appreciate the cutting-edge nature of his woodworking. As woodworkers, we tend to identify with the Arts & Crafts movement through its furniture and decorative arts, and perhaps forget that for some, it was a philosophy of life. It was counter-industrial. It was about people coming together and getting in touch with a simpler lifestyle.

For the intellectuals of the time Marxism and Communism were not yet political ideologies but the basis for a more Utopian society – a society where people would live, work and create in greater harmony with one another and nature. This idea of a simpler, self-reliant, holistic kind of life drove Esherick's creativity.

> "If it isn't fun, it isn't worth doing."
>
> —attributed to Wharton Esherick (1887-1970), American artist

Stepping off the Edge

It was in the early 1920s when Esherick began sculpting wood. By the mid-20s, he began work on his studio farther up the mountain from his farmhouse.



Colorful environment. *Bright accent colors blend with the natural materials Esherick used to build his studio, and his love of asymmetry is exhibited in the deck that allowed Esherick an open space to enjoy his environment. The spiraling deck supports are his take on the pillars of iconic Chester County bank barns. Every detail, from the placement of the sculpture to the handmade door handle and latch, were carefully considered.*

Early influences. *Early in Esherick's career his work was typically in the Arts & Crafts style. In this piece you can see his penchant for things organic. The carvings on the lower panels represent the undergrowth of the woods. The middle panels are carved as if one is looking up through the trees, and the top panels have circling turkey buzzards.*

Museum quality. *Esherick made this piece to replace his Arts & Crafts-style desk when it was destined for loan to the Museum of Arts & Design in New York in 1958. But when the museum staff arrived, they opted to display the new desk instead. (Unlike many artists, Esherick's unique talents were recognized during his lifetime.)*

Maker's mark. *Esherick carved these stylized initials into most of his work.*

The location looked out over the valley and his home and, surrounded by trees and lush vegetation, was perfect for an art studio.

There, in a structure built to mimic the stone barns of Chester County that surrounded him, Esherick began creating sculpture that by 1926 was on exhibit in the Whitney Museum in New York.

During the same period, Esherick also began making furniture. At first his pieces were squarish, Arts & Crafts-style pieces to which he added carvings on the flat surfaces. Although he was already creating sculptures, he was still looking at furniture through the eyes of a painter: two dimensionally. It wasn't until 1928 that Esherick realized carving needn't be "applied" to the surface of a piece; it could be the piece of furniture itself.

When Esherick began to think in terms of form rather than adornment, his furniture changed dramatically. He began incorporating prismatic shapes that were reminiscent of his cubist and expressionist painting influences. And as his sense of motion and organicism grew, his furniture took on ever-more fluid asymmetrical shapes.

Inventing a New Style

Over the trajectory of his career, we can see a clear progression in Esherick's furniture work from the straighter, box-like shapes of the Arts & Crafts furniture of his youth to the wholly fluid pieces he created in the 1950s and '60s. And because he was developing his joinery skills and techniques as he developed his designs, it is easy to see how he moved from the rectangular joinery of the Arts & Crafts period, to sculpting away the material surrounding the joined pieces of wood, to eventually creating gracefully curved pieces where the joinery flows as part of the design.

Pragmatic maker. *Esherick's sculptural pieces filled his work and living space. Ever the pragmatic capitalist, he sold then remade his dining room table many times until, in his old age, Esherick decided to finally attach it to the wall, thus eliminating the temptation to sell his dining table yet again.*

Seeing examples of Esherick's work, and knowing the time in which he made the pieces, it's easy to see why he was such a big influence on the woodworking world – even though you may not know his name.

Esherick spent his life creating original, organic works of art, most of which happened to be functional. His sculpture brought him celebrity and the connections to obtain commissions for interiors and furniture. The unique nature of his work earned him the moniker "Dean of American Craftsmen," a title coined by one craftsman to whom Esherick was a huge inspiration, Sam Maloof.

During Esherick's life, his furniture and interiors were exhibited in many major museums and expositions, in-

A natural approach. *Many of the aritst's wooden sculptures demonstrate a sense of the twisting, flowing asymmetry of nature.*

One of the three pieces for which Esherick is best known, his music stand has inspired countless music-stand makers for decades.

The classic three-legged stool Esherick produced in great numbers shows his sense of balance in design. He was more concerned with the sculptural elements of furniture than the joinery. His "apprentices" would make the bases for these stools and Esherick would shape the seats.

Possibly his most successful furniture design, Esherick's library ladder includes all the elements he held dear in his art. The natural flowing twist of the main handle and asymmetric treads combined with the practical usefulness of the piece show Esherick's total thought process for furniture design. — CB

cluding three world's fairs. He built one-of-a-kind pieces of furniture for his clients in the isolation of his studio on the hill at a time when the term "studio furniture" didn't exist.

And while you might not know his name, you are likely familiar with some of his best-known work. His designs are "contemporary" by today's standards.

Pieces such his music stand, his three-legged stools and his spiral library ladder inspire and influence studio furniture makers to this day.

So you may wonder why a period furniture maker, who started woodworking in 1976, is writing about and extolling the groundbreaking vision of a contemporary artist who died in 1970? When I first stepped onto the grounds of the Wharton Esherick Museum, I immediately felt a connection. Although our design sense differed, the tactile nature of everything Esherick ever created struck a chord with me. To see his work exhibited in the place where he made it and eventually lived, made me realize there was more to woodworking than mere process.

Although I never met Wharton Esherick, a visit to his museum felt to me as if I was meeting the artist. To wander through the studio and home, and see his hand in everything from the floors and ceiling to the hand-carved latches on the doors to the iconic spiral stair that leads from the studio to his living area, brings to life the completeness with which Esherick lived his artist's journey. It's not like visiting a museum at all. It's like coming home. **PWM**

Chuck is the lead instructor at Acanthus Workshop, host of the online show No BS Woodworking and star of many woodworking videos.

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/jun13**

WEB: *Visit the web site for the Wharton Esherick Museum.*

BLOG: *Read the author's blog.*

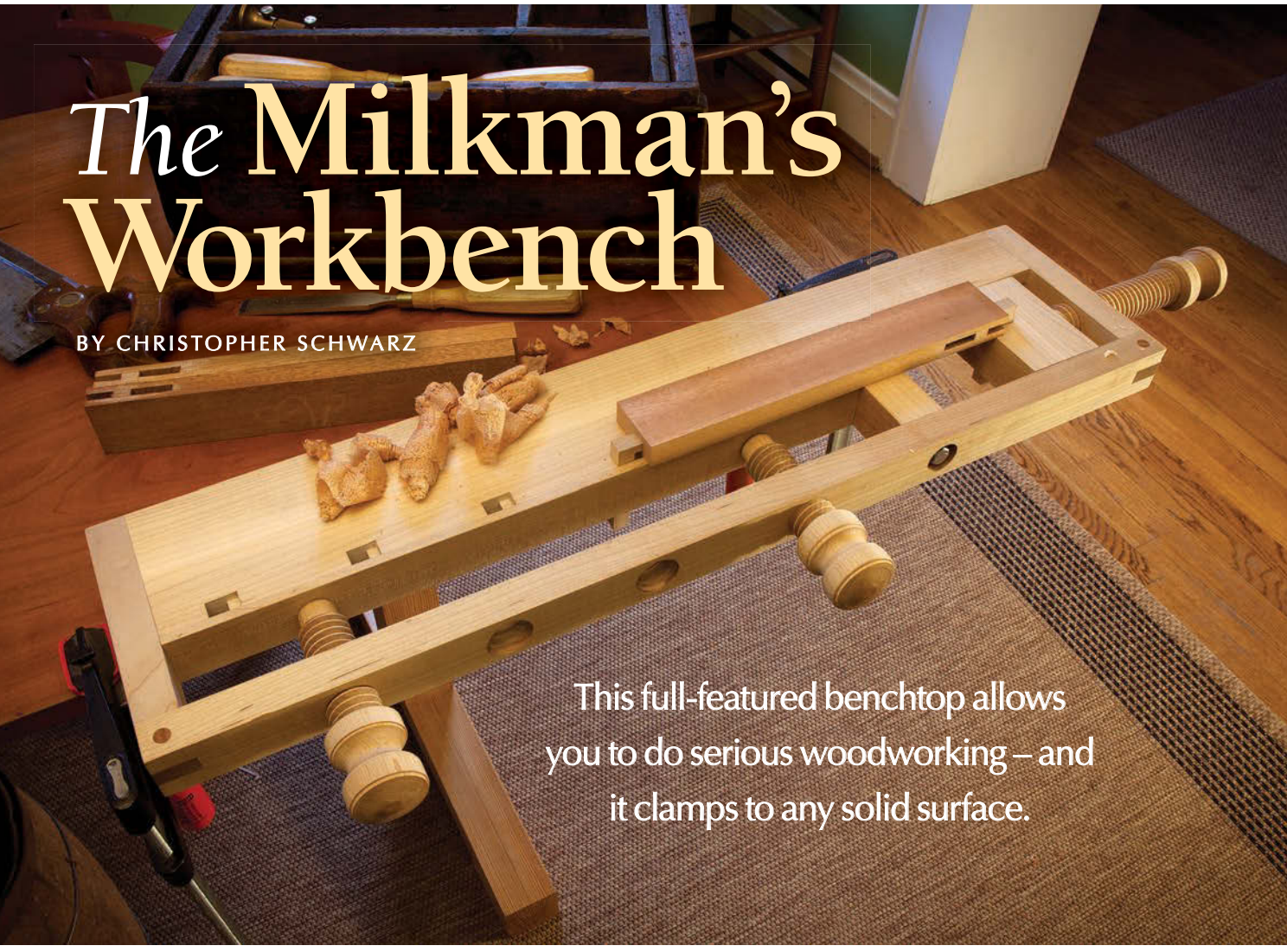
TO BUY: *"Cabriole Legs Simplified," a DVD by Charles Bender.*

Our products are available online at:

- **ShopWoodworking.com**

The Milkman's Workbench

BY CHRISTOPHER SCHWARZ



This full-featured benchtop allows you to do serious woodworking – and it clamps to any solid surface.

One of the best things about working with hand tools is you don't need much shop space – often a corner of a bedroom provides enough space. And a complete tool kit fits in a box the size of blanket chest.

As a result, many apartment-dwellers work with hand tools because they are compact, relatively quiet and fairly easy to clean up after. But there is one huge thing missing from the above – a good workbench.

Woodworking is much easier with a solid workbench that is equipped with vises and bench dogs. Good workbenches are usually massive and enormous, and they might not fit in tight quarters. A big bench can also be intimidating to build for a beginning woodworker. And small commercial benches are generally too spindly for real woodwork.

Enter the "Milkman's Workbench" – a small, full-featured benchtop that clamps to any solid surface – a dining table, dresser or kitchen island. And it's not just for the apartment-dweller. This is a great bench for traveling, demonstrating at woodworking clubs or even for working in the living space of your home if you have a shop without HVAC.

It offers a lot of features for such a small thing. You can dovetail boards more than 19" wide in its twin-screw vise area. You can pinch boards almost 24" long between dogs, and you have a decent worksurface for chopping. Best of all, you can attach it to something sturdy using only two F-style clamps, do your business then put the bench away in a closet or under a bed.

I first saw a commercial version of this bench on an Australian auction site. Then I had a student, Jonas Jensen, whose father owned one. He had bought it from the town's milkman. I purchased the original from Jonas' father, studied its construction and worked with it for months. I concluded it was nearly perfect.

The version in this article is almost identical to the original with only slight changes to make it easier to clamp to your work surface.

Construction Overview

There's little joinery in this bench. The corners of the frame are joined by bridle joints that are pinned with 3/8" dowels. The frame is screwed to the benchtop it surrounds. The benchtop is just glued together with edge joints.

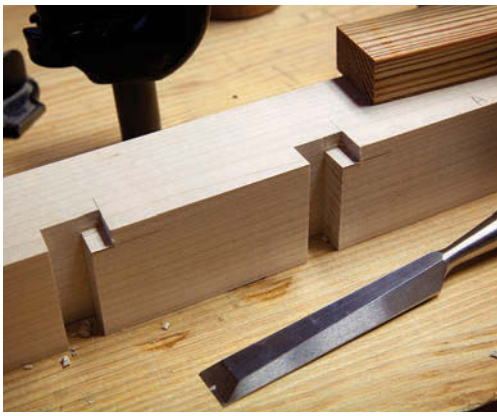
The only tricky part of the bench is the wagon vise. It's a block of wood that slides in two grooves plowed into the internal surfaces of the bench.

All the vises are powered by 1 1/4"-diameter threaded wood screws, which

PHOTOS BY THE AUTHOR; ILLUSTRATIONS BY ROBERT W. LANG FROM THE AUTHOR'S MODEL

Essential grooves. *Before you do any assembly, cut the grooves for the wagon vise.*

Digging for dogs. *Cutting the dog holes using a dado stack makes for crisp work.*



Snouts for dogs. *These notches allow the dogs to rest below the benchtop when not in use.*

I made with a lathe and a threading kit from Beall Tool Co. (see "Make Threaded Wooden Screws" on page 34 for details on the system). You don't have to invest in a threading system to make this bench. You can purchase three veneer-press screws for less than $20 each and use those instead of the wooden screws. You can also simplify construction by installing round dogs instead of square ones.

The place to begin your bench is at the lumberyard.

Stable, Dry & Straight

The original bench looks to be made of beech. Because beech is hard to come by in the Midwest, I opted for red maple, though almost any wood will do. What is more important than the species is that the grain is straight, the stock is dry and there isn't a lot of internal stress in the wood.

I purchased about 8 board feet of 8/4 maple for the bench.

Using my cutting list, I milled all the stock close to size – 1" over-long and 1/4" over-wide. As I progressed through the project I brought the pieces I needed to final size.

Assemble the Middle

The benchtop inside the frame has three significant pieces: the rear benchtop, the middle benchtop and a thin strip that covers the dog holes. Before you can glue the rear and middle benchtop together, you need to plow a stopped groove in the rear benchtop for the wagon vise. This groove is 1/2" wide x 3/8" deep x 7" long. It's centered in the thickness of the rear benchtop.

After you cut this groove, cut a similar groove – but 8" long – in the front frame. That's the other groove for the wagon vise.

Glue the rear and middle benchtop pieces together. When the glue is dry, level the seams then lay out the location of the 1/2" x 1/2" dog holes on the front edge of this assembly. You can cut these by hand with a backsaw and router plane. Or you can use a dado stack installed in your table saw.

Whichever way you go, it's best to cut the dog holes so they are angled about 3°. They need to lean toward the wagon vise – this helps the dog pinch your work against the benchtop.

With the dog holes cut, you need to make a notch at the top of each hole for the snout of the dog. The notch is 1/4" x 1/2" x 1/4" deep. Chop out the notch with a chisel and finish the floor with a router plane.

Then glue the 1/4"-thick strip over the front edge of your benchtop. When the glue is dry, level the seams and square up the ends of the benchtop. You are ready to make the frame.

The Frame: Bridles & Screws

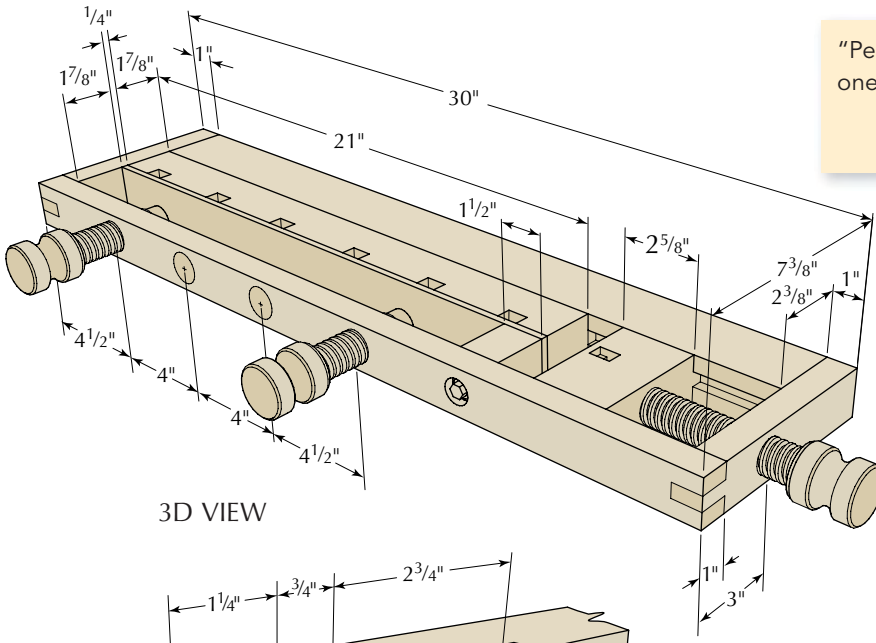
Cut your frame pieces to their final lengths by using the assembled benchtop as a guide. Then cut the bridle joints at the corners. Note that the "slot" half of the bridle joint has to be cut on the front piece of the frame. Otherwise the groove you already milled for the wagon vise shows.

After the bridle joints are cut and the frame wraps around the three sides of

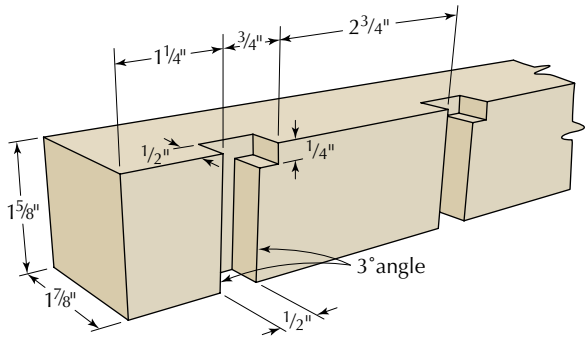
The Milkman's Workbench

NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑ 1	Rear benchtop	1 5/8	2 3/8	28	Maple*
❑ 1	Middle benchtop	1 5/8	1 7/8	21	Maple
❑ 1	Dog cover strip	1/4	1 5/8	21	Maple
❑ 1	Front frame	1 5/8	1	30	Maple
❑ 2	Frame ends	1 5/8	1	7 3/8	Maple
❑ 1	Spacer block	1 5/8	1 1/2	1 7/8	Maple
❑ 1	Vise block	1 5/8	2 5/8	4 3/4	Maple
❑ 1	Garter	1/4	1 5/8	2	Maple
❑ 3	Vise hubs	1 3/4-dia.		2 3/8	Maple
❑ 2	Face vise rods	1 1/4-dia.		5**	Maple
❑ 1	Wagon vise rod	1 1/4-dia.		7 3/4	Maple

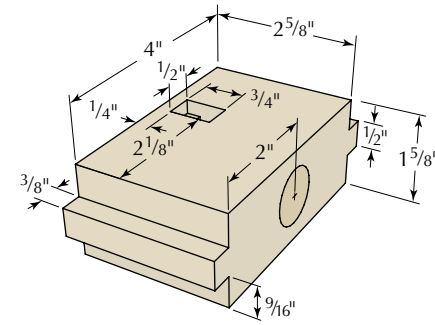
*Any seasoned, straight-grained wood will do; **Trim to fit vise block



3D VIEW



DOG HOLE DETAIL



VISE BLOCK DETAIL

> "People love chopping wood. In this activity one immediately sees results."
>
> —*Albert Einstein (1879-1955), theoretical physicist*

the benchtop, you should bore the four holes for the movable vise screws in the front piece of the frame and the end piece where your wagon vise is located. If you are using the Beall 1¼" threading kit, you'll need to bore 1⅛"-diameter holes. Use the drawings to lay out their location. Bore all the holes then tap them for the threads.

Next you need to cut the spacer block that holds the frame away from the benchtop, making room for your face vise and your wagon vise. Cut two identical spacer blocks. One will be bolted in place permanently in your bench. The other will help you keep parts aligned as you assemble.

The best way to assemble the frame is to first attach the front piece and the end piece that does not house the wagon vise. Leave the other end piece unattached for now so you can fit the wagon vise.

The front part of the frame is bolted to the benchtop spacer block with a ⅜" x 4" lag screw (don't forget the washer). The end piece is glued and screwed to the benchtop with three #10 x 1¾" wood screws. Drill the clearance holes and counterbores for all the hardware. Glue the corner of the frame then clamp together the two frame pieces, spacer blocks and the front of the frame.

When everything is where it should be, drill your pilot holes for your hardware. Drive in the three #10 screws. Use a socket wrench to install the lag screw. Let the glue dry, then level the joints and turn your attention to the wagon vise.

Tap the holes. *A simple pair of locking pliers can help you turn the tap into the holes in the frame.*

The Wagon Vise

If you have never built a vise like this, some of the parts – a garter? – can be baffling. But the photos and drawings will help the words do their job.

Here's how it works: The vise block is pushed forward by the threaded screw. The end of the threaded screw sits in a blind hole in the vise block. So far, so good. Now, here's where people get confused.

If you want the threaded screw to also retract the vise block, you need to do two things. You need to cut a ¼"-wide x ⅛"-deep groove around the circumference of the end of the threaded screw. You also need to make a "garter" – it's a block of wood that fits in a mortise in the vise block and intersects the blind hole. The garter locks together the threaded screw and the vise block. The photos do a better job than words can.

But before you make the gar-

MAKE THREADED WOODEN SCREWS

Make clean threads. *The Beall system makes crisp threads, once you dial in the right settings and have some good stock to work with.*

Turn with care. *Turning the dowels slightly undersized pays off when cutting the threads.*

Turn with more care. *Keep the dowel moving forward into the jig with steady hand motions. Eventually, you will need to turn the dowel with one hand on the infeed side and one hand on the outfeed.*

Tenons on both ends. *Here's the threaded dowel for the wagon vise. One end goes into the vise block, and the other into a hole in a hub.*

Groove for a garter. *Now I'm turning a 1/4"-wide x 1/8"-deep groove for the garter in the wagon vise.*

Hubs & screws. *Here you can see how the hubs and threaded screws are assembled. The longer turned portion fits into the hub.*

Wooden vise screws are quite durable (as long as you don't abuse them). Once you have a rig to make them you'll be eager to make your own handscrews, panel clamps and other useful shop gizmos.

Sadly, the modern manual wood-threading kits are fragile and fussy – I've burned through four sets. So when it comes to making precise, clean threads, the best method is the Beall Tool Co. wood-threading system (bealltool.com, 800-331-4718).

This American-made and patented system uses a router-powered threader to create the threads. The tap is hand-powered. But it uses an ingenious pilot bearing to ensure you tap holes dead straight.

The instructions and enclosed DVD are quite good, but here are some tips that aren't covered.

1. Precise and sturdy stock is imperative. Home-center dowels don't work, but hardwoods with tight, straight grains work best. Turn your own (I did) or buy some tight-tolerance dowels from Beall.
2. Soaking the dowels in alcohol or linseed oil overnight makes for cleaner threads.
3. Despite what the DVD shows, don't back out your threaded rods from the jig while the router is running.
4. Longer lengths of dowel are better than short lengths. Threading 12" lengths (at minimum) is best.
5. The depth of the cut on the router is critical. A few thousandths of an inch makes an enormous difference in the shape of your threads.
6. Test every screw in a tapped sample hole before you commit to using it.

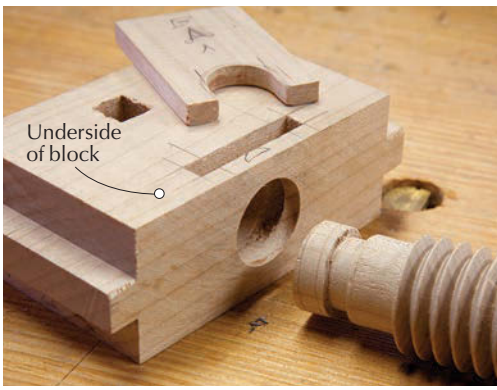
Here's how I made the vise screws for this bench. I sawed some straight stock into 1 3/8" octagons. I turned down the octagons into 1 1/4"-diameter cylinders. I turned them just a few thou shy of 1 1/4". Then I cut the threads on these dowels with the Beall system.

I then chucked the dowels back in my lathe and turned 1"-diameter tenons on the ends of the dowels. I crosscut the threaded rods to the desired length.

Then I turned the hubs on my lathe from 1 3/4" stock. When the hubs were complete, I bored 1"-diameter holes to receive the tenons. I glued the threaded rods to the hubs using epoxy. — CS

A close fit. *The vise block needs to move smoothly. The less it wobbles in its grooves, the better.*

Poke the block. *Mark the centerpoint of the hole for the threaded screw using a Forstner bit. Layout is then almost foolproof.*



Vise block. *Here you can see the garter, the underside of the vise block and the completed threaded screw.*

ter, you need to shape the vise block so it slides smoothly in the grooves in the bench. So cut stub tenons on the ends of the vise block. The block should fit without wobbling like a loose tooth, but it should slide back and forth with fingertip pressure.

With the vise block fit and in place, clamp the still-loose end of the frame to the benchtop. Place a 1 1/8" Forstner bit in the hole in the end and prick its center point on the vise block. Remove the vise block and drill a 1"-diameter x 7/8"-deep hole in the vise block, using the center point to guide you.

There are two more steps to complete the vise block. First add a 1/2" x 1/2" dog hole. You can make this hole in a variety of ways – chop it out by hand, use a hollow-chisel mortiser or bore a round hole then square it up. Next, add the snout like you did for the other dog holes. Last, you need to chop the mortise for the garter. That mortise is 1/4" wide x 1 5/8" long x 1 1/4" deep. It is centered on the hole for the vise screw. And it's 1/4" from the end of the vise block. Whew.

To complete the work on the vise block, you need to fit the garter into the mortise you just cut and fit it to the groove in the end of the threaded screw. Again, words are not the ideal medium for comprehending this 3-dimensional construction.

When everything in the wagon vise moves smoothly, glue and screw the end to the benchtop. Peg the bridle joints with 3/8"-diameter dowels. Now turn your attention to making the threaded screws and hubs (handles).

Clamping Hardware & Finish

The original bench had wooden clamps below the top that would allow you to attach the benchtop to a table or other stout surface. These clamps, however, were easily worn out and pulled out of their mountings.

After many experiments, I settled on attaching 2"-long sections of angle iron to the rear edge of the benchtop and at the end of the bench opposite the wagon vise. These little bits of metal allow you to clamp the benchtop to any surface with F-style clamps.

With the benchtop complete and functioning, take apart everything you can and prepare the surfaces for finishing. I use a finish that is equal parts varnish, boiled linseed oil and low-odor mineral spirits. Wipe the finish on with a rag. Remove the excess with a dry rag. Two coats should be enough for a bench.

Make some wooden dogs to suit your dog holes (there's a free online tutorial available on how I made mine). They are pieces of maple that are friction-fit into the holes. And get to work – in the kitchen, in the bedroom or anywhere else you can find a stout surface. **PWM**

Hold-downs. *These 2"-long sections of angle iron are easily screwed to the benchtop and then clamped to any surface with F-style clamps.*

Christopher is the editor at Lost Art Press and the author of "Workbenches: From Design & Theory to Construction & Use" (Popular Woodworking Books).

ONLINE EXTRAS

For links to all online extras, go to:
- **popularwoodworking.com/jun13**

VIDEO: *See "The Milkman's Workbench" in action when clamped to the author's dining room table.*

BLOG: *Read about how the author made the dogs for his portable bench.*

VIDEO: *See the Beall threading system in action in our free video.*

TO BUY: *Make your own bench screws using the Beall Tool Company 1 1/4" - 5 Big Threader Kit recommended by the author.*

IN OUR STORE: *"Workbenches: From Design & Theory to Construction & Use" and "The Workbench Design Book," both by Christopher Schwarz.*

Our products are available online at:
- **ShopWoodworking.com**

Chimney Cupboard

BY BOB ROZAIESKI

This classic furniture piece offers lots of storage in a small footprint – and it's a simple hand-tool build.

Small footprint, big stature. *The small footprint of a traditional chimney cupboard takes up very little of floor space, but it provides tons of storage thanks to its tall stance.*

I need some additional storage space in my 7' x 13' shop, however, space in my shop is at a premium. At the moment, every inch of floor and wall space is occupied, except for a 14"-deep area behind the door. Options for this spot are limited, but a traditional chimney cupboard should be the perfect fit.

It's not clear if chimney cupboards are so called because of their tall, narrow, chimney-like appearance, or because they were frequently placed in the narrow space next to a fireplace. In fact, it's highly likely that the term is a modern description for something that was simply called a cupboard.

Whatever you call them, these attractive cupboards are great for adding storage in narrow areas such as hallways and behind doors where a larger, deeper piece won't fit. Their simple, sturdy construction also makes chimney cupboards great projects on which to practice traditional joinery methods that go together fast, but last for generations.

Quick & Easy Case

While many period cupboards were assembled with complex, time-consuming dovetails, this is not one of them. In simple terms, it's assembled with dados and nails. This type of construction is sturdy and economical, and was quite common in utilitarian pieces of the 18th and 19th centuries.

Start by planing the front edges of the sides straight and square to their inside faces. The front edges and inside faces will be the reference surfaces for marking and gauging because that is where the joinery will be. With the reference surfaces true, cut the side boards to their final length and ensure the top and bottom ends are square to the front edges.

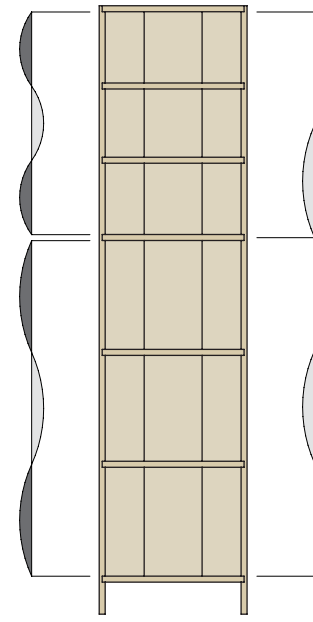
Place the two side boards on the workbench, front edges together, inside faces up and bottoms to the right. To keep the sides aligned, nail battens across the top and bottom. Place the bottom nails in the area that is cut away for the feet and the top nails where the top rabbet is cut.

Measure 4" from the bottom of each case and nail on a straight, square fence to guide a dado plane for cutting the bottom dado. Be sure the bottom of the case is to your right so the nail holes are under the dado where they will be less visible. (If you are opposed to the nail holes being visible in the finished piece, you can clamp the fence down instead of nailing it.)

To cut the dados for the shelves, the most efficient hand tool is a well-tuned dado plane. At the front of this plane is a scoring iron that scribes the sides of the dado to the appropriate width (3/4" in this case). The rear iron is skewed specifically for cross-grain work and peels up the material between

PHOTOS BY THE AUTHOR;
ILLUSTRATIONS BY ROBERT W. LANG FROM THE AUTHOR'S MODEL

Riding the fence. *Plane the dado across both case sides at the same time to guarantee that the dados line up in the assembled case. Leave the nails in the fence and battens proud for easy removal.*



Divide & conquer. *A pair of dividers makes partitioning the inside of the cupboard much faster, and leaves less room for error versus measuring and using math to divide the space.*

Two rabbets at once. *Like planing the dados, planing the rabbets in both sides together ensures good alignment. It also prevents the rabbet on the near side board from spelching at the far edge.*

the scribe marks, leaving a smooth, flat bottom. The plane also has a built-in depth stop so it stops cutting once the desired depth is reached (3/8" in this case). To use the plane, hold it vertically against the nailed-on fence.

Once the bottom dado is cut, the interior of the case is divided into upper and lower sections. Divide the open space between the case top and bottom shelf into five equal parts using a pair of dividers. The bottom section is equal to three of these parts and the top section is equal to two of these parts. This locates the center of the dado for the shelf that separates the top section from the bottom section. Offset this mark 3/8" toward the bottom of the case to locate the bottom of the dado. Nail your fence at this location then plane the dado across both cupboard sides.

Repeat the process by dividing the space in both the top and bottom sections into three parts to locate the centers of the remaining dados. Offset the marks toward the bottom of the case by 3/8" to locate the bottoms of the dados then plane away.

After planing the uppermost dado, leave the fence in place. Remove the upper batten used to keep the sides aligned then plane the top rabbet. I use a moving fillister plane for the top rabbet. This is a fenced rabbet plane with a depth stop, a skewed iron and a scoring iron for clean cross-grain cutting. A regular fenced or unfenced rabbet plane can be used as well. If your rabbet plane doesn't have a scoring iron, scribe the shoulder of the rabbet with a knife prior to planing and deepen the scribe as necessary to maintain a crisp, clean shoulder.

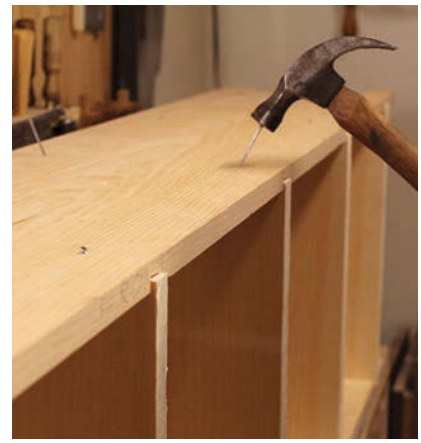
After the cross-grain dados and rabbets have been planed, the fences and battens can be removed. The final joinery that needs to be cut into the case sides are the long-grain rabbets for the backboards. This is done after the cross-grain work so that any spelching that occurred is removed when planing the rabbets for the backboards. These rabbets are 3/4" wide and as deep as the dados (3/8").

With the joinery done, clamp the sides face to face with their front edges aligned. Lay out and draw the feet then cut them out using a turning saw or coping saw. Clean your cuts with a spokeshave, rasps and files, gouges or scrapers.

The hard part is now done; move on to making the shelves. Cut all seven shelves to final length, but don't rip them yet. Instead, dry-fit the case with the shelves aligned with the back of the dados, and mark each shelf on both ends where it meets the front of the case. Connect these marks with a straightedge and pencil, then rip the shelves about 1/8" wider than the pencil line so they sit proud of the case when assembled. The shelves are planed flush after assembly.

To assemble the case, place one side on the benchtop with the dados facing up. Place the shelves in the dados without any glue. (The side is just being used for support and alignment at the moment.) Put glue in the dados of the other side then place it on the shelves, aligning them with the back of the dados. The fronts of the shelves should be proud of the fronts of the case sides. Secure each shelf with two fine finish nails driven through pilot holes in the sides and into the end grain of

Feet are offset. *In order to account for the face frame, the cutout for the feet is not centered on the side boards. Adding the face frame centers the cutout in the sides of the assembled case. Saw and smooth both side boards simultaneously so the feet match.*



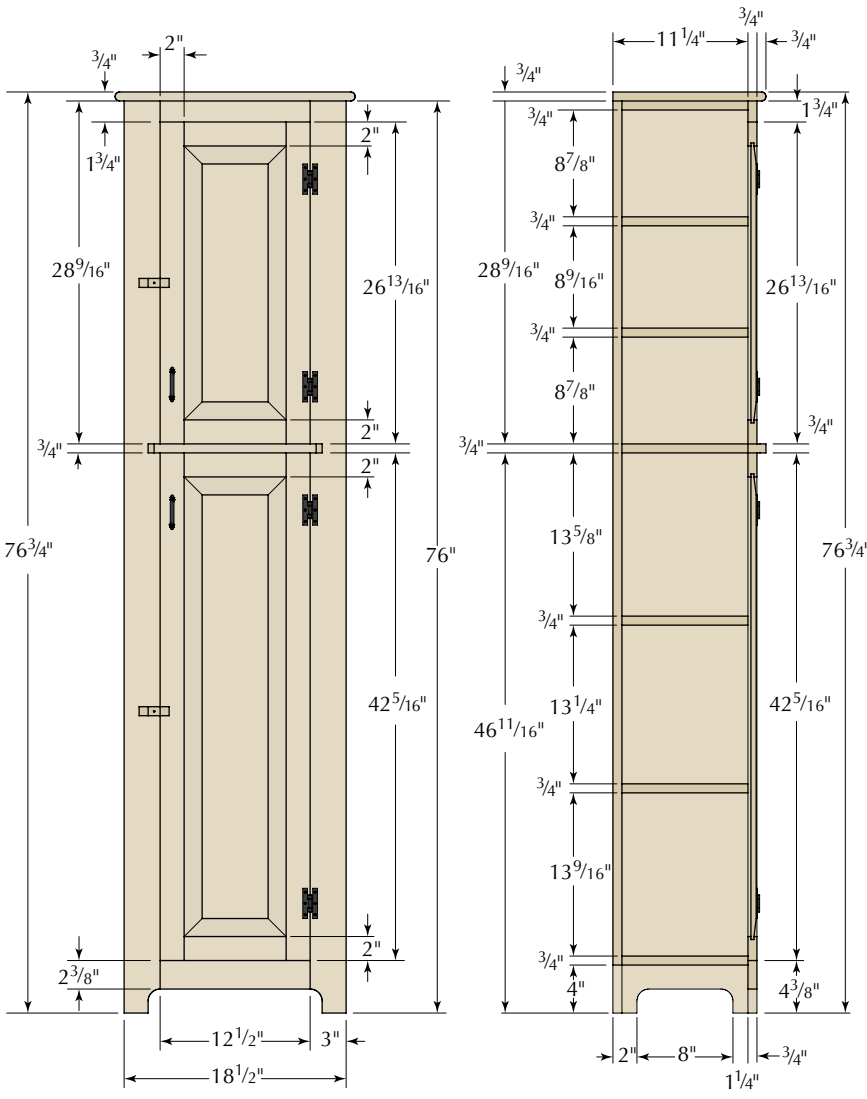
Lock the shelves with nails. *Align the wedge shape of the cut nails with the long grain of the case sides to prevent the sides from splitting as the nails are driven. Drive the nails in at opposing angles to lock the shelves in place, just like a dovetail.*

the shelves. After gluing and nailing the first side, flip the case over then glue and nail the shelves on the other side. Once all of the nails are driven (and set, if you plan to fill the nail holes), flip the case onto its back, check the diagonals to make sure the case is square, then make necessary adjustments if it isn't.

Tongue-&-Groove Backboards

While the glue on the case is drying, turn your attention to the backboards. These boards have tongue-and-groove edges that help to align them while still allowing for movement. The center board has a tongue on one edge and a groove on the other edge. The two outer boards have the matching half of the joint to fit the center board. Traditionally, a bead or bevel is planed on the insides of the backboards to disguise gaps that grow or shrink during seasonal changes. I chose to add a small bevel at the edges of my three boards.

The backboards are attached to the case with nails only. The outer boards are nailed to the backs of the shelves close to the boards' outer edges. The center board is nailed right down its middle. I leave about a dime's thickness between the boards in the summer, or



Match the backboards. *The tongue-and-groove joinery on the backboards is made with a pair of match planes. One plane cuts the tongue and the other cuts a matching groove. The joint is sometimes called a match joint because of this.*

up to two nickels' thickness during a really dry winter.

Face Frame Adds Strength

Adding a face frame to the case helps to define the upper and lower sections. It adds rigidity to the case to prevent racking. The face frame is constructed with mortise-and-tenon joinery then glued and nailed to the case. I like mortise-and-tenon construction for face frames because it's a strong joint. However, if you're not comfortable with mortises and tenons, half-laps work, too. I think half-laps are harder to get right, though, and they're not as strong a joint.

Cut stiles 2" longer than needed to provide support to the end grain as you mortise. The added "horns" are cut off after the frame is assembled. The 1/4"-wide mortises are centered on the thickness of the stock. Locate the mortises vertically by transferring the finished length from the case onto the stiles then subtracting a 1/4" from each end to account for the shoulder of the tenon. Mark the width of the rails directly on the stiles and leave another 1/4" shoulder at the other end of each mortise.

To cut the mortise, I start at the center and chop in a V-shape to the mortise's full depth. I sight from the end of the rail while chopping to ensure that I'm holding the chisel plumb. With the center of the mortise at full depth, I chop toward the ends of the mortise and lever out the chips. The last two chops are made with the chisel held perfectly vertical. I cut right at the scribe lines to denote the ends of the mortise.

To lay out the tenons, scribe the shoulders deeply on all four edges. Scribe the cheeks with the same mortise gauge setting that was used to scribe the mortises, referencing the gauge off of the same face as when marking the mortises. Then transfer the width of each tenon directly from its mating mortise.

I saw all four shoulders of the tenon on the bench hook by working around the tenon, turning the stock 90° after each cut so every subsequent saw cut has a kerf to start in. After the shoulders are sawn, I cut away the cheeks by sawing down one edge at an angle, turning the stock around and then sawing down the opposite edge at an angle. Finally, I secure the stock vertically in the vise and saw out the triangle of waste that remains between the first two saw cuts.

Dry-fit the face frame and make any adjustments necessary to get everything to fit snug. Check each corner to make sure the face frame lies flat when assembled. If necessary, make adjustments to any out-of-plumb mortises to ensure that everything goes together flat. (Loose-fitting tenons can be shimmed with plane shavings.) When the dry-fit looks good, go ahead and glue up the face frame.

Chimney Cupboard

NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
❑ 2	Case sides	3/4	11 1/4	76	Pine	
❑ 7	Shelves	3/4	10 1/2	17 3/4	Pine	
❑ 1	Backboard	3/4	7 5/8	72	Pine	
❑ 2	Backboards	3/4	5 5/8	72	Pine	
❑ 2	Face frame stiles	3/4	3	78*	Pine	
❑ 1	Upper face frame rail	3/4	1 3/4	14 1/2	Pine	1" TBE†
❑ 1	Lower face frame rail	3/4	2 3/8	14 1/2	Pine	1" TBE
❑ 1	Center face frame divider	3/4	1 1/2	14 1/2	Pine	
❑ 1	Top	3/4	12 3/4	20	Pine	
❑ 2	Upper door stiles	3/4	2	28 13/16*	Pine	
❑ 2	Upper door rails	3/4	2	10	Pine	3/4" TBE
❑ 2	Lower door stiles	3/4	2	44 5/16*	Pine	
❑ 2	Lower door rails	3/4	2	10	Pine	3/4" TBE
❑ 1	Upper door panel	1/2	9	23 5/16**	Pine	1/4" TAS‡
❑ 1	Lower door panel	1/2	9	38 13/16**	Pine	1/4" TAS
❑ 2	Toggles	3/4	3/4	2 1/2	Pine	

*Face frame and door stiles are 2" longer than the final height needed; **Door panel sizes determined by adding 1/2" to opening in dry-assembled door frame to account for the grooves; †TBE = Tenon both ends; ‡TAS = Tenon all sides

"If there is any lesson of a practical kind to be learned from the study of old work, it may be considered to consist principally in the fact that the worker made the most of his opportunities, and that apparently he was not in a hurry."

—David Denning
"The Art and Craft of Cabinet-making" (1891)

Chopping a mortise. *I chop a V-shaped chip from the center of the mortise until the center is at full depth. The last two chops are right at the knife lines to define the ends of the mortise.*

Pare the shoulders. *Imperfect shoulder cuts are easily pared by putting a sharp chisel right into the knife line. A slightly undercut shoulder ensures that the joint closes tightly at the outer edge.*

Check for wind. *If the case is twisted at all, the time to fix it is before the face frame is glued on. Check with winding sticks and plane down any high corners until everything is nice and flat.*

Pare the cove. *An in-cannel gouge makes quick, clean work of shaping the decorative coves on the ends of the case divider. This can be done with a coping saw and files as well, but the gouge is faster and cleaner.*

While the glue in the face frame dries, turn your attention back to the case. Plane the fronts of the shelves flush with the sides of the case. Check the front edge of each shelf with a straightedge to make sure it's not humped in the middle. Also check the case at several points with winding sticks to make sure the front of the case is coplanar. You don't want any surprises as you attach the face frame.

After the glue in the face frame has dried, trim the horns then cut the feet. Align the face frame with the case and mark them both for easy realignment. Apply glue to the front of the case sides and to the first 2" of each shelf. Put the face frame back in place, aligning your marks. Drill pilot holes and nail the face frame to the case using fine finish nails. Once the glue dries, plane the face frame flush with the sides and top of the case.

SUPPLIES

Horton Brasses
horton-brasses.com or 800-754-9127

1 ▪ 2" fine finish nails (1 lb./200 nails)
#N-21, $8.75

Lee Valley
leevalley.com or 800-871-8158

2 pr. ▪ H-hinges, 3" x $1^{13}/_{16}$" smooth flush
#01X35.10, $10.80/pair

2 ▪ spear handles, 5", smooth
#01X37.20, $4.90 ea.

3pkgs. ▪ #7 slotted pyramid-head screws,
#01X38.76, $2.30 ea.

Prices correct at time of publication.

The final piece of the face frame is the decorative divider that separates the top section from the bottom section. Cut the divider to size, saw the notches to fit around the face frame, and shape the small coves on the ends. Glue and nail (or clamp) the piece to the front of the shelf that divides the upper and lower sections.

Simple Raised-panel Doors

The process for making the door frames is almost identical to that of the face frames, with two minor differences. First, the rails and stiles of the door frames must be grooved to accept the appropriate door panel. This is accomplished with a plow plane. The $1/4$"-wide x $1/4$"-deep grooves can be plowed before or after the mortises are cut. The second difference is that because of the groove in the stiles, the tenons on the rails need to have a haunch in order to fill in the groove in the stiles.

Once the door frame is made, the panel can be sized to fit the opening. The panel should fit snug without being too tight. You want the panel to be able to expand and contract with the seasons. You can make it snug during a humid summer, but during a dry winter, leave room for expansion.

Assemble the doors. Glue only the mortises and tenons of the frames. The panels should be allowed to float in the grooves. Make adjustments for square by checking the diagonals. If desired, the tenons can be pegged for a little added strength. Once the glue is dry, trim the horns and plane the doors to fit their openings.

Haunched tenon. *The haunch is a small protrusion where the outside shoulder of the tenon would normally be. Its purpose is to fill in the groove in the door stile.*

Fit the doors. *To fine-tune the fit of the doors in the opening, I aim for a reveal around all four edges of the door that is only two or three playing cards in width.*

Toggles Keep Doors Closed

I opted to go with simple wooden toggles to latch the doors. The profile of the toggles is the same as the profile on the case divider and is shaped the same way. To attach the toggles, I used #10 roundhead wood screws. Tighten the toggles just snug enough to keep them from spinning freely, but not so tight that they're difficult to turn.

Top it Off

The chimney cupboard top really adds no functional value to the cupboard (though of course you can store stuff up there). It does, however, add a bit of shadow and visual interest. It's nothing more than a board that is slightly oversized with a bullnose profile on the front and side edges.

This profile can be made with moulding planes if you have them, but it's simple enough to just round the edges over with a smooth or block plane. Once the edges are shaped, the top is glued and nailed to the top of the case.

Finish Adds Age

To finish my cupboard, I opted to go with a traditional linseed-oil based paint. My paint was made from a mixture of linseed oil, varnish, turpentine, whiting and yellow ochre earth pigment. I brushed on five thin coats of the paint, allowing each coat to dry thoroughly. I scuff-sanded with #400-grit sandpaper between coats.

After the final coat of paint dried, I added a little age, color and character to the finish with a dark brown paste wax. Working in small sections and using #0000 steel wool as an applicator, I rubbed a liberal coat of the wax into the painted finish. I allowed excess wax to collect in low areas such as the corners of the raised panel doors and in any scratches or dents. This finish technique simulates years of dust and dirt accumulation in areas that could not be easily cleaned.

As the wax began to dry, I lightly buffed off the excess with a clean pad of steel wool, blending adjacent waxed sections together. The final buffing was done with a soft cotton cloth (old flannel bed sheets work great) to bring the waxed surface to a nice satin sheen.

I really hope you build one of these cupboards for yourself. They're a ton of fun to build and a fantastic way to work on your hand-tool skills – not to mention, they're a really useful addition to just about any small space. **PWM**

Bob has been building furniture for almost two decades and now works entirely by hand. Read his blog and listen to his podcast at logancabinetshoppe.com.

RAISED PANEL BY HAND

Raised panels add an elegant touch to a cupboard door and prevent a tight door from binding in the opening during seasonal fluctuations. All it takes to make them is a marking gauge and a rabbet plane.

Begin by sawing and planing the panel to its final size (the panels for this cupboard are 1/2"-thick). Next, decide on the bevel width. (I usually go for a 1 1/2"-wide bevel, or whatever width my moving fillister plane can cut at maximum blade exposure.)

Set your cutting gauge to the width of the bevel and scribe the front of the panel on all four edges to define the field (the flat section) and the bevels. Reset the gauge and scribe the field's depth about 1/16" from the top of the panel on all four edges. Then reset the gauge again and scribe the bottom of the bevel on all four edges about 7/32" from the back of the panel.

Secure the panel to your workbench and plane 1/16"-deep rabbets to define the field. Plane the cross-grain rabbets first so any spelching is removed when the long-grain rabbets are planed. If your plane has a fence, use it to guide the width of the rabbet. If it doesn't, clamp a stick to the top of the panel and run the plane along it.

Once the rabbets define the field, use the same plane to establish the bevels. If your plane has a fence, readjust it a hair wider. Planing the bevels by eye isn't hard; take your time and watch the scribe line on the edge. Plane the cross-grain bevels first so any tear-out is removed by planing the long-grain bevels. Adjust the plane's angle continually so that the last stroke will take a full-width shaving from the edge of the field to the edge of the panel. Make adjustments with the plane set very fine until the side and end bevels meet perfectly at the corners. — BR

Raised-panel layout. *With nothing more than a marking gauge and a rabbet plane, you can easily make raised panels.*

Adjust by eye. *Make minor adjustments to the approach angle of the rabbet plane to sneak up on the bevel. Watch the corners; they will tell you where more wood must be removed. The adjacent bevels should meet in a straight line from the corner of the field to the outside corner of the bevel.*

ONLINE EXTRAS

For links to all online extras, go to:

- popularwoodworking.com/jun13

BLOG: *Visit the author's blog for more on period work and working by hand.*

BLOG: *Read what the author has to say on mortising techniques and dado planes.*

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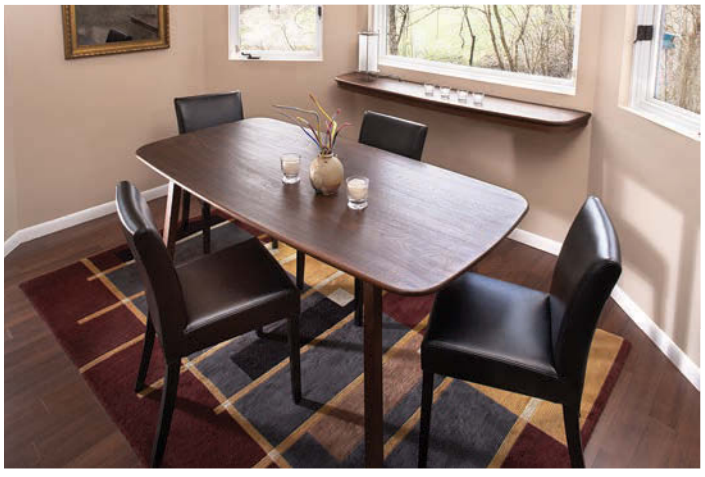
Wall-mounted Server

BY STEVE SHANESY

A neat trick magically suspends this dining room project.



As empty nesters, my wife and I recently said goodbye to the family homestead and downsized to a smaller house. Our generously sized dining room was traded for "dining space" at the new place. Our dining room furniture wasn't going to fit.

My challenge quickly became apparent – design and build a new table and sideboard. But how to optimize the smaller space took a lot more time to figure out. In fact, my early conclusion was there wasn't space for a sideboard.

Once I settled on a table, I turned my attention to the sideboard. A small cabinet as narrow as 15" deep could work, as long as it hung on the wall. It then struck me that a dining server could double as a counter and be perfect for morning coffee or a light lunch.

The shape of the server is taken from the dining table and mimics its super-elliptical form. I had a great piece of walnut for the top, and walnut veneer to face the curved, built-up front. But how to wall-mount the server required a bit of engineering.

Fingers of Steel

Years ago while working in a commercial cabinet shop, I learned a neat trick that appears to magically suspend a piece on the wall: Drill into the wall's wooden studs to install a few steel rods, then sleeve the shelf on to the rods via built-in, open pockets.

I had a length of 3/4"-diameter steel rod on hand, and matching 3/4"-thick material for the build-up is easy to find. The strength of this method is remarkable. I wouldn't hesitate to rest my 175 pounds on the server after it's fixed in place.

Torsion-box Strength

The base that supports the top and houses pockets for the steel fingers is similar to a torsion box, a structurally strong, wooden sandwich of lightweight materials. It is made up of

OPENING PHOTO BY AL PARRISH; STEP PHOTOS BY THE AUTHOR; ILLUSTRATIONS BY ROBERT W. LANG FROM THE AUTHOR'S MODEL

Dual-purpose dining. *The answer to a space-challenged dining area with no room for a sideboard (left, inset) is a wall-mounted server. Plus, it doubles as a counter for light meals while taking in the scenery (left).*

What's inside the box? *The server base has open pockets for steel fingers to slip into and support the server. Each of these steel rods are buried in a wall stud. Collectively, they support an amazing amount of weight.*

a 3/4"-thick build-up that surrounds the perimeter (except for the back), fit between two layers of 1/2"-thick plywood. Additionally, there are five crosspieces that complete the base.

Before the base can be assembled, the top and bottom plywood pieces are cut to the curved shape. I began with a template for the server top (see "Pattern Routing Curved Shapes" on page 44). For the server base, I made a second template to provide the 7/8" setback, and used a jigsaw to carefully cut on the line before smoothing any irregularities. Before moving on, transfer the centerline locations from the top template to the base template.

With the second template complete, I traced the pattern onto the top of a two-plywood stack. I then used my jigsaw to remove most of the waste, and completed the work using a router with a pattern bit to trim to the template.

I used the bottom piece of plywood to position my build-up and crosspieces. To establish the cutlines on the build-up pieces, I held each in place then penciled on the curved design. At the band saw, I cut these pieces slightly outside the marked lines so I could trim everything flush with a router after the parts were assembled.

When positioning your crosspieces, make sure you don't put one where a steel finger is planned. That, of course, means you must first determine where on the wall the shelf mounts and where the studs are located. For the pockets, I left plenty of space for the steel fingers.

The build-up and plywood top and bottom are glued and fastened using 1 1/4"-long narrow crown staples (though brads could be used). Before fastening all the parts, make sure the centerlines on the top and bottom plywood align.

Along the back edge, your crosspieces should set in a smidge – you don't want them holding the base away from the wall.

Once the glue sets, use your router and a bit with a top-mounted bearing to trim the build-up flush to the plywood, which acts as the template. (If your bit isn't long enough to trim to the bottom of the build-up, make one pass, then lower the bit to make a second cut using the trimmed area as your guide.)

Trimming the curved edge this way ensures it is square to the top and bottom. This is important when gluing veneer to a curved edge. If your face isn't square, the veneer heads off in a direction you can't control.

Flush it up & keep it square. *The build-up sandwiched between the plywood top and bottom is trimmed using a router with a top-mounted bearing, flush-trim bit.*

Veneer the Curve

The veneer needs to cover the entire front without a seam. I had 1/16"-thick veneer on hand, but there's no reason you can't use today's thinner veneer. In fact, it's easier to use thin veneer around the tighter-radius corner curves.

Allow a 1/4" overhang on each edge; then, even if you're off a bit as you attach the veneer, you should have enough width to cover the face.

Contact cement makes a good bond and is easy to use. Apply cement to both the back of your veneer and the face of the base then let it dry before sticking the veneer in place.

To stick the veneer, mark the center of the strip so you can easily align it to the center of the base. Because a long strip of veneer can be unwieldy, set a series of short sticks of wood across the glued face of the base and set the veneer, glue-side down, on them. Starting from the center, remove a few sticks at a time as you work your way along the edge. Hold the veneer strip so your fingers allow you to gauge the amount

Cover up. *Walnut veneer, applied using contact cement, covers the face of the base's curved front and side edges.*

"Mankind is not a circle with a single center but an ellipse with two focal points of which facts are one and ideas the other."

Victor Hugo (1802-1885)
French poet, novelist and dramatist

of overhang, which should be equal on both sides. Get one half applied then work the other half.

Once the veneer is cemented in place, you should increase the bond strength by pressing it with a J-roller, or use a mallet to tap a wood block along the surface.

I trimmed the veneer overhang using my router and a straight bit with a bottom-mount bearing.

Make the Top

Mill and size your top to a final thickness. Mine was 7/8". Use your template, router and a pattern bit to shape the top, then round the top and bottom edges using a 3/8"-radius roundover bit.

Finish & Install

I like to add color to walnut, so I stained the server with General Finishes "Candlelight" oil-based stain. After letting it dry overnight, I ragged on three coats of oil-based varnish thinned 50 percent with mineral spirits, lightly sanding between coats using #320-grit aluminum oxide sandpaper.

PATTERN ROUTING CURVED SHAPES

Except for the back edge, my dining server design has no straight lines. The front edge is a sweeping curve, the ends are a more subtle curve and the corners have a large bend to join the two. This design mirrors one edge of my dining table, so I simply used that portion of the table pattern to shape the server.

How are these fair curves generated? On a large sheet of craft paper, I found the curve I wanted for the table's long edges by bending a narrow strip of 3/8"-thick plywood between fixed points. With my bending stick set to a pleasing curve, I transferred the shape to my paper.

To determine the corner radius I used trammel points and, by trial and error, found a radius that looked nice to my eye, then blended the lines into one seamless curve. Then I carefully cut the shape from the craft paper.

To make the top template, I used a piece of 1/4"-thick MDF. (The template needs only to be slightly more than half the server's length.) I taped the paper to the MDF then traced the outline as shown at left above. I also marked the centers of the front and ends; these centerlines are important for aligning the template when moving it from one section of the top to the other.

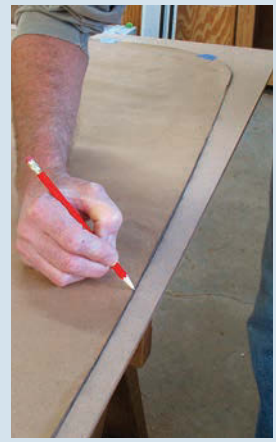
Next, I used a jigsaw to cut the MDF at the pencil line. I took my time, knowing that any irregularities required block-sanding the edge to fair the curve. (Imperfections in the template will transfer to your finished work because the router bit bearing rides on the pattern to guide the cut.)

To use the template, align the centerlines of the template with your workpiece then transfer the shape with a heavy pencil line. Using a jigsaw, cut the part staying outside the pencil mark by about 1/8".

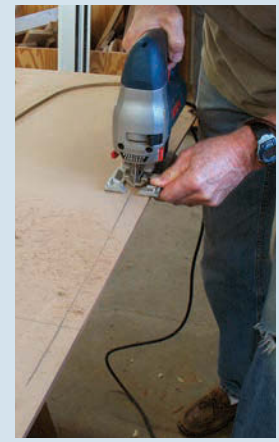
Clamp the template in place using the centerlines for accurate positioning, then use a router and pattern bit to trim to the final edge. I used a bit with a bottom-mount bearing to shape my top. (You could, instead, position your template on top of the workpiece then use a top-mounted bearing bit to trim the base unit.)

Though you could make the cut in a single pass, it's better to make several light cuts until the bearing meets the template edge.

Once one section of top is completed, use the centerlines to reposition the template for the next section. —SS

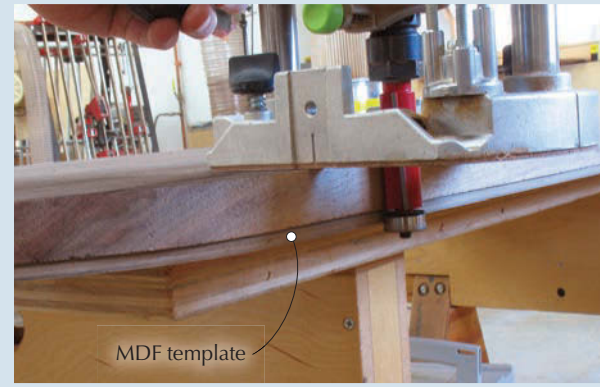


Paper transfer. *Once satisfactory curved shapes are achieved on paper, the shape is traced on to MDF to create the template.*



Cut out. *Carefully cut the template with a jigsaw, staying tight to the line transferred from the paper.*

Fair is fair. *Any irregularities on the template edge are sanded smooth to ensure a fair curve.*



Get in shape. *Jigsaw the top close to the layout lines, then clamp the template in place. Use a router and pattern router bit to trim the top to its final shape.*

Roundup. *The profile of the front edge is created using a 3/8" roundover bit run on both the top and bottom edges.*

Hang the finished base on the wall before fastening the top. Cut the five steel rods to a length of 11½". (Deburr the ends of your rods to ease any sharp edges.) Also, drill four 1½"-diameter holes through the base bottom to provide easy access for the screws used to attach the top after it's positioned. (Make sure you avoid any crosspieces.)

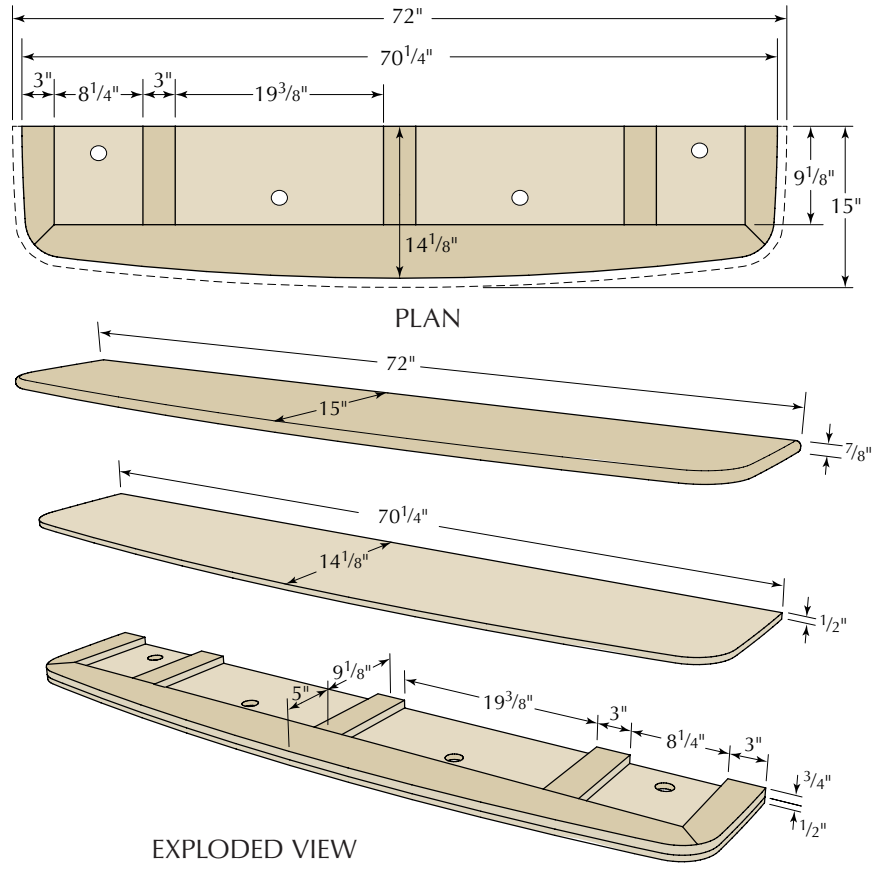
Strike a line on the wall to establish the height of the top edge of the base, then measure down half the base's total thickness to find the vertical center of the rod holes. Verify the centers of your studs by driving a finish nail along both sides of each stud, then drill your holes at the stud's center (it's good to have a friend watch to help you keep your drill at 90° to the wall). The hole depth, including drywall, should be 2½". Tap the steel rods into the holes.

Sleeve the base onto your rods. The fit should be snug, with no need for additional fastening. The unit can be removed if needed, but there is little chance it will slide about.

Position your top, then fasten it through the access holes using #10 x 1" screws. And if you like, drill a 1½" hole through the entire server to accommodate a wire management grommet.

We've had the server installed now for a couple of months. It's been great when guests are over for dinner and we've enjoyed a few lunches using it as a counter. It's a terrific solution for our downsized dining space. **PWM**

Steve is senior editor for this magazine and can be contacted at steve.shanesy@fwmedia.com.



Wall-mounted Server

NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑ 1	Top	7/8	15	72	Walnut
❑ 2	Base top/bottom	1/2	14 1/8	70 1/4	Plywood
❑ 1	Build-up blank	3/4	3	72*	Pine
❑ 1	Build-up front	3/4	5	72**	Pine
❑ 1	Veneer	1/16 or 1/32	2 1/4	98	Walnut

*Sufficient stock to cut pieces to fit; **Length depends on unit size

Now that's easy. *With the steel rods installed, the base slides in place and is held tight against the wall. Attach the top, drill for a grommet if you like, and you're done.*

ONLINE EXTRAS

For links to all online extras, go to:
■ **popularwoodworking.com/jun13**

BLOG: *Get the story on how and why the server and table came to be, including the fate of the author's Thos. Moser table.*

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Mortises by Router 3 Ways

BY GARY ROGOWSKI

Machined mortises are quick to cut and accurate.

My old friend from college is a physicist who launches rockets into the sky for a living; let me just say that he is a very bright fellow. But he has also told me that the router is the quickest way for him to ruin a piece of wood. Well that can be true for anyone who doesn't pay attention to some simple facts about the tool. Proceed with accuracy and clarity, and the router makes flawless cuts every time.

Here are three methods for router-cut mortises that guarantee success.

Cutting Geometry

Routers pull themselves into a board and cut the softest wood available, tearing a path without regard for the beauty and simplicity of a straight line. You need to restrain them and show them the way to cut to get good results.

First, you must understand cutting geometry. When making a top-side cut the bit spins clockwise. If you are using a fence or bearing-guided bit, this direction of rotation pulls the bit in tight to the work as you move the router from left to right along the piece.

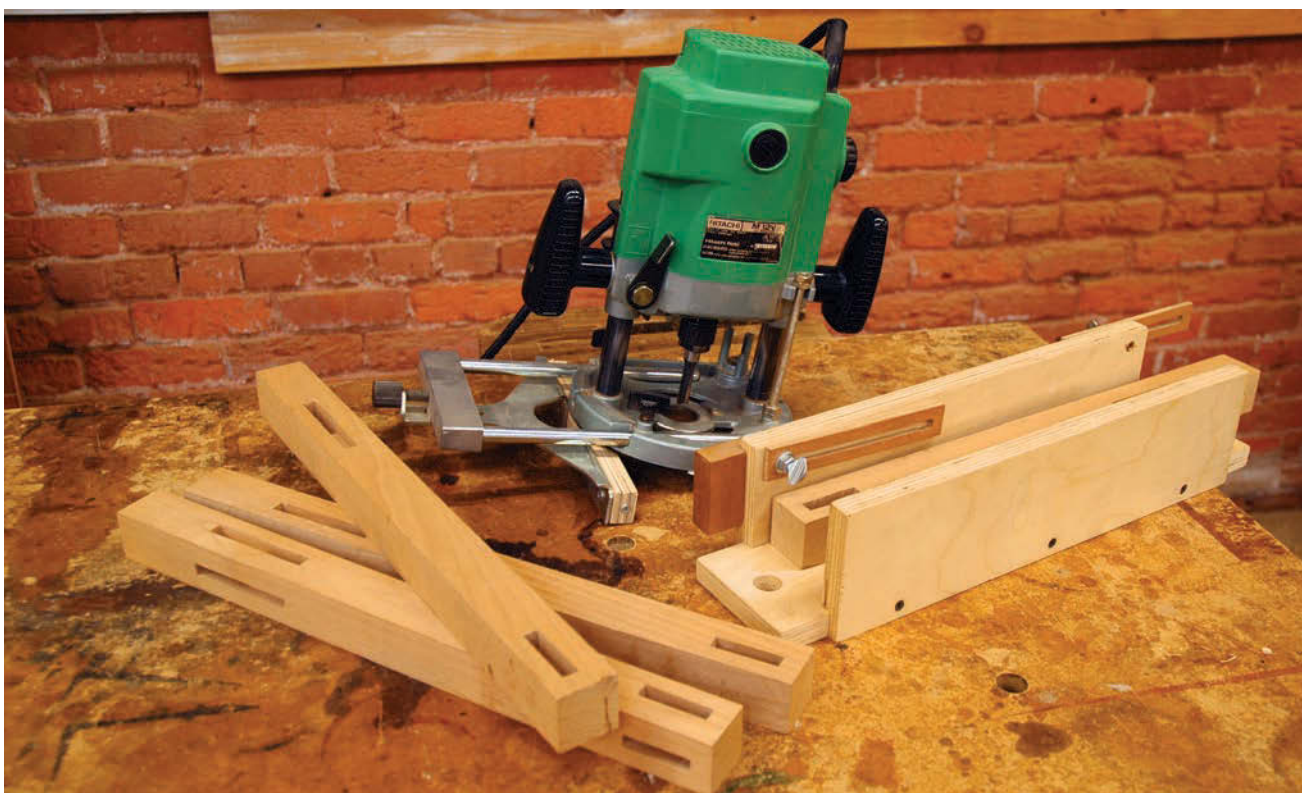
All this gets reversed when you move to the router table because there, your router is mounted upside down. As you look at the router table, the bit spins counterclockwise, so you then move your work from right to left into the rotation of the bit.

Now that you understand the cutting dynamics of the router, let's look at three ways to use it to make mortises.

Router Table Shim Method

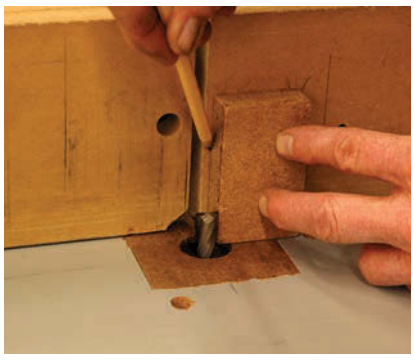
I use the router table for one of my mortising methods. With this approach I prefer to take tiny nibbles – about 1/8" deep in a hardwood such as oak or maple. But the problem with making a series of cuts is that I would often get a step on one side of my cut due to slop between the motor and the base as I adjusted the depth of cut upward. If, like me, your router doesn't move precisely and without a hitch, there's a trick to get good mortises using a router table – shims.

To achieve the smoothest mortise cuts, choose a spiral flute bit. Set the bit to its final depth of cut. There can be a scary amount of bit showing, so



Cutting geometry. *Move right to left when cutting at a router table.*

Shims step your cuts. *Set your bit for its final depth of cut and use shims to surround it. Remove a shim after each cut to make the next cut deeper.*



Bit of rotation. *As you rotate the bit by hand, it pushes your scrap piece away. When the scrap stops, you've found the starting point of your cut. Align your mortise layout on these marks.*

Stop it. *To set the length of your mortise, clamp stops to the fence. Start with the workpiece tight to the right stop and plunge down onto the bit. Once you are at depth, move across the bit to the left stop.*

clamp as many 1/8"-hardboard shims as you need around the bit until only 1/8" of it shows.

After each pass, simply remove one shim.

Work between stops on the router table fence and never move backward in the cut (left to right). The bit could grab your piece and pull it away from the fence – and even send it shooting across the shop.

To set the fence stops, use this simple trick: Unplug the router and hold a piece of scrap so it touches both the bit and the fence. Rotate the bit backward or clockwise, and it pushes the scrap piece away. When it stops moving, mark that position on the fence. That's the starting point of your cut.

Do the same thing on the other side of the bit to find the end point. These two marks are equal to the diameter of the bit. Mark the mortise on the top of your board to see where your cut starts and stops. Align those marks to the marks on the fence to set your stops.

> "Accuracy is the twin brother of honesty; inaccuracy, of dishonesty."
>
> —*Nathanial Hawthorne (1804-1864), American novelist*

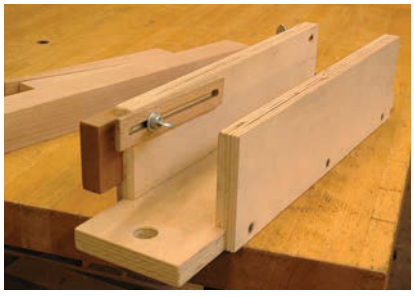
Universal Mortising Jig

The plunge router was designed to cut mortises. It pushes straight down into a cut. When routing with a fence attached, you can cut a decent mortise. For accuracy and repeatability, a plunge router works better with a mortising jig set up for a variety of cuts.

Make the jig from flat, 3/4" Baltic birch plywood or MDF. Cut a rabbet into the bottom edge of the side walls to make gluing it to a base more accurate. My jig is approximately 6" tall x 18" long. At this height, I usually need shims to raise the workpiece closer to the top edge of the sides. (You could make the sides shorter but you then limit the variety of stock thicknesses the jig accommodates.)

On the outside of your jig, glue a stop at one end then mount an adjustable stop at the other. On the inside of the jig, add a second adjustable stop to index the end of every cut.

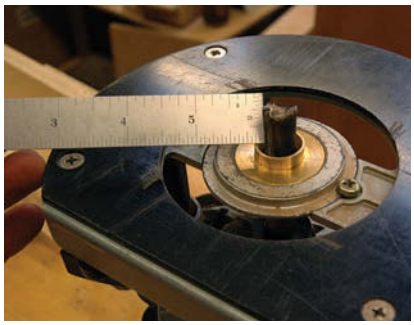
Mark the mortise on your workpiece then set the part in the jig tight against one side wall. Attach a guide fence to your plunge router then place the unit on top of the jig with the guide fence riding against the jig's outside wall. Slide the router until its bit lines up with your mortise layout area. Lock the router fence in this position. Move the jig fence into the fixed end stop; this is one end of the mortise.



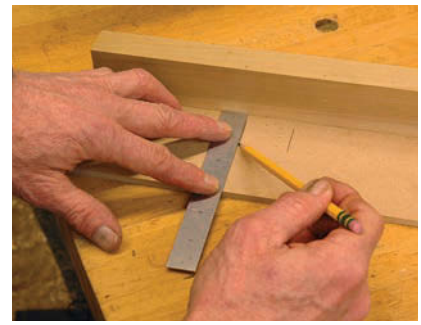
Rabbets join the jig. *Cut a rabbet into the side walls of the universal jig for support. Clamp the joints together, but check to make sure your sides line up square to the base.*

Three stops. *A fixed stop attaches at one end with an adjustable stop at the other end. An adjustable stop on the inside of your jig registers your workpiece.*

Line 'em up. *After the end of the mortise layout is aligned with the bit, lock the workpiece in place using wedges.*



Do the math. *The difference in the diameters of your guide bushing and your router bit figures into your template opening size.*



Draw it & drill it. *Mark out the template slot on the inside of the template. Then drill a hole at the starting point of your mortise template.*

Compensation. *Clamp the mortising template into place remembering that its slot is longer than your mortise.*

Adjust the workpiece to align your mortise end with the bit, then clamp the part against the walls of the jig using wedges.

Move the router along the jig until the bit lines up with the other end of the mortise layout, slide the adjustable stop tight to the fence then lock the stop.

Making the cut is straightforward, but if your attention wanders or if you make too heavy a cut, you could push your router away from the jig. Make sure the fence stays tight to the jig throughout the cut. Also be sure the bit is fully retracted before lifting the router off a cut.

Mortise Templates

It may take a little extra time to make a dedicated mortise template, but once you're done you always have it ready to cut a particular sized mortise. Start by mounting a template guide in your plunge router's base and again, use a spiral flute bit. The template guide follows the template as you cut. Because there is an offset of the bit to the template guide edge, you need to know how much that offset is and make allowances for it in your template opening.

The template consists of a piece of 1/4" MDF and a fence for use as a reference edge. The fence must have parallel sides and one square edge. Nail the MDF to the fence. It need not align perfectly. Just make sure it doesn't overhang the outside face of the fence.

To cut the mortise opening in the MDF, set up your router table with the outside face of your fence against the router table fence.

Mark out the slot on the underside of the MDF. If, for example, your mortise is centered on 3/4" and is 1/2" wide x 1 1/4" long, and you are using a 1/2" bit and 3/4" template guide, there will be a total of 1/4" offset. The slot is cut with a 3/4" bit to match the diameter of the guide and is 1 1/2" long to make a 1 1/4" mortise. Mark out the slot. (To more easily see the bit in the router table when starting the cut, drill an undersized hole at the start point.)

Get the feel of it. *Use your fingertips against the columns to feel how deep each new pass is as you ramp cut your mortise.*

Set the router table fence at the proper distance. I always make a practice cut at the top of the template then measure to confirm I'm in the right spot. Start and stop the slot cut by eye.

Mark your workpieces for the mortises then add the offset mark for the longer template slot. In this example it would be 1/8" at each end. Align the template to your layout marks and clamp the template to your wood. (You can make the cut with your router moving in either feed direction because the router is captured in the template slot.)

I use what I call a ramp cut. I slowly plunge the bit as I move back and forth in the template. I feel the plunge depth with my fingertips on the router base columns.

The only downside to the mortise template technique is that chips can clog the template slot. You need to clear the chips after a few passes so the guide bushing can fully engage both ends of the template slot.

Whatever router mortise method you decide to employ in your shop, you'll get repeatable accuracy and smooth mortise walls while knocking them out in no time at all. **PWM**

Gary operates the Northwest Woodworking Studio, a school for woodworkers, in Portland, Ore.

ONLINE EXTRAS

For links to all online extras, go to:

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VIDEO: *See how glue dries in a mortise that's made with a window in a short online video, "Where Does the Glue Go."*

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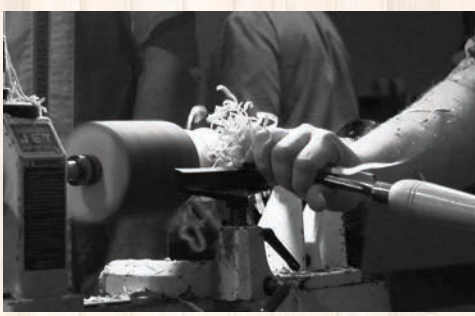

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GORILLA GLUE

Hand-stitched Rasps

Learn how to choose and use these essential shaping tools.

Rasps are simple tools, yet incredibly versatile. With a good rasp, you can remove band saw marks from a curved surface, shape a cabriole leg, round over an edge, tweak a tenon and modify a mortise. Powered by hand, they are quite efficient, and unlike the dozens of power-tool alternatives for these tasks, rasps offer a tremendous degree of control.

As with many seemingly simple tools, rasps come in a range of shapes, styles and sizes and the differences among these variations can be subtle. The good news is that you don't need them all. Depending on the type and scale of work that you do, two or three will likely serve your needs.

For quality tools, individual rasps aren't cheap. But what these tools allow you to accomplish makes them a real value. You probably have your share of flap sanders, sanding discs and other devices that promised to make life easier, but these sit gathering dust in some corner of your shop. A few good rasps cost less, and rasps deliver on the promise of control while shaping. And they get you close to a finished surface.

Quick & controlled. *A good rasp makes quick work of shaping and refining curved surfaces.*

Sink Your Teeth in It

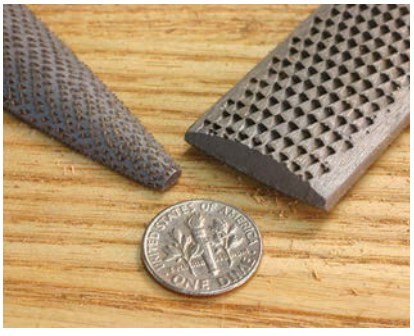
Rasps start out as a shaped blank of steel that is soft enough in which to raise a sharp tooth if hit just right with a harder steel punch. Teeth are punched by machine or "stitched" by hand. After the teeth are in, the tool is hardened. The machine process is fast and inexpensive. There was a time when decent machine-cut rasps could be found, but those days are gone (see "Stay Away From These Pretenders" page 53).

Hand-stitched rasps are often referred to as having the teeth punched at random. That's a poor choice of words because the teeth are arranged in rows and are as neatly spaced as possible. The small variations in this intricate work result in teeth that are not directly in line with one another.

Almost every tooth in a hand-stitched rasp is working, which leaves behind a scored but uniform surface. With a machine-cut rasp, the first tooth makes a rut and the following teeth deepen that rut. You can remove a lot of wood in a hurry with a machine-cut rasp, but there is a great deal of work left to do to achieve a smooth surface.

The size and spacing of the teeth in a hand-cut rasp are referred to as the "grain" of the tool – the lower the number, the coarser the cut. If you're using a rasp on what will eventually be a finished surface, you'll get the best results with a series of two or three grains. Remove most of the material with a 9- or 10-grain, then follow that with a few strokes from an 11- or 12-grain.

The surface can be brought closer to smooth with an even finer rasp, a couple of grains higher. The rasped surface may look rough, but the sharp



Man vs. machine. *The teeth on the hand-stitched rasp at left are finer and sharper than on the machine-cut rasp on the right.*

Regularly random. *Hand-stitched teeth on rasps are in rows, but slight variations in the spacing allow more teeth to work to leave a smooth surface.*

CONTINUED ON PAGE 52

OPENER & CHART PHOTOS BY AL PARRISH, STEP PHOTOS BY THE AUTHOR

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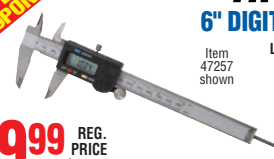

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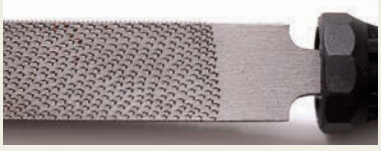
CONTINUED FROM PAGE 50

Auriou

We first wrote about these French rasps in our November 2004 issue (#144) and named them among the "Best New Tools" for that year. The high-quality tools are stitched by hand and available in a variety of shapes, sizes and grains. After a brief business interruption, Auriou rasps are again available. These tools are clearly at the head of the rasp class, both in quality and in price.

- Online prices average $110 for a 10", 10-grain rasp, available from Highland Woodworking (highlandwoodworking.com), Lee Valley Tools (leevalley.com), Lie-Nielsen Toolworks (lie-nielsen.com) and Tools for Working Wood (toolsforworkingwood.com).

Blondell



While not as refined as the more expensive tools in this group, the Blondell is a good introduction to what a rasp can do. The blade end is squared off instead of ending in a taper and the plastic handle is a bit small. If you're on a budget, and not looking for a variety of shapes or a super-smooth finish, these rasps are hard to beat for the price. The teeth are slightly more irregular, with more space between the teeth than on the more expensive tools. Blondells are effective as a coarse rasp.

- 10" rasp is $35.40 at Lee Valley Tools.

Gramercy

Gramercy rasps don't come in as wide a range as the French rasps, but there is a good selection of the most common configurations. The quality of these tools is right up there with Auriou and Liogier, but there are some slight differences. The handles are smaller in diameter, but this isn't considered significant by two out of three of our editors. Our staff member with the smallest hands considered the size to be a slight advantage. The blades are made from stainless steel, which might be a plus if you have a rust-prone shop.

- 10" rasp is $105 from Tools for Working Wood.

Liogier

Liogier has been around for a long time in France, but the company has only recently begun selling in the United States. Liogier does not have an American distributor at this time, but sells directly through its English-language web site. The site is quite informative, offering charts of sizes and grains that rank configurations from "indispensable" to "specialized" use (as identified by the maker). Liogier also offers an upgrade from the standard finish that is harder, sharper and more resistant to corrosion.

- 10" rasp, 10-grain is $98 + shipping direct from manufacturer (liogier-france.fr/?lang=en).

teeth leave tiny hills and valleys. Finer rasps leave more shallow grooves. After the initial cut, you aren't working on a solid surface, you're only shaving off the high spots. A card scraper makes quick work of shaving off the tiny hills left by the rasp. (Yes, there actually is a use for those curved scrapers that came in the set you bought.)

Hold on There

The techniques for shaping with a rasp are similar to those used in sawing – and like a Western saw, a rasp cuts on the push stroke. Use a relaxed grip on the handle and let the weight of the tool do the work. Your off hand controls the opposite end of the tool, again with a light grip. As with any cutting tool, grain direction matters as much as the way a curved cut crosses the grain. It is necessary at times to reverse the tool in your hands, pulling it instead of pushing.

There is also a similarity to using a plane. On a band-sawn surface, a rasp quickly shaves off the high spots and when the saw marks are gone, it is easy to judge, by the marks from the rasp, where the hollows are. Push the tool

STAY AWAY FROM THESE PRETENDERS

If this article made you curious enough to want to add a rasp or two to your tool kit, don't be misled by the rasp-shaped metal objects you find at your local home center. These inexpensive imitators only waste your time and money, and are a far cry from the real thing. They range from nearly useful to ridiculous. Here is what we found at our home center.

The worst of this bunch is the Nicholson combination chisel and rasp (not shown). It's a bad chisel that can't be sharpened and a worse rasp that can't be held. Also available are the 4-In-Hand and the Special Purpose Wood Craft Half Round rasp, also from Nicholson. Down the block at a second store is a similar tool and a nearly identical half-round rasp, both manufactured in China and sold under the Kobalt name.

So what exactly is so bad about these? While the 4-In-Hand was never considered a tool for high-end woodworking, it is a handy thing to have around the house for odd jobs. But what is being made today is a far cry from what was available when these were made in the United States. In all of these examples, the machine-cut teeth are large, not very sharp, don't extend to the edge of the tool and have varying degrees of bluntness within the same tool. As they cut, they are hard to push, difficult to control and leave deep, uniform grooves.

The half-round rasps have a vestigial handle, but they are far too small to grip comfortably. The round side of the rasp is more of a slight hump than a useful arc, and it is on this side only that the triangular rasp teeth are located. The flat side has coarse bastard-cut file teeth, but they are not coarse enough to remove the ruts left by the teeth on the other side. The different tooth configurations make achieving a uniform surface nearly impossible, even if one had the perseverance to push one of these long enough. Unless you need a seriously ugly paperweight, stay away from these rasp-shaped objects. — RWL

Rough start. *A coarse rasp removes a lot of material in a hurry, but leaves a surface that looks rough.*

Off the top. *A finer-grained rasp follows and quickly refines the surface by cutting off the peaks between the valleys.*

Getting close. *The surface begins to develop a sheen as an even finer rasp removes the marks from the previous tool.*

Easy scrape. *A card scraper shaves off the high spots left by the finest-grain rasp. This is quick work because only the ridges left by the rasp need to be removed.*

Loose & light. *Hold the tool with a relaxed grip, and push forward rather than down (the tool cuts on the push stroke only). This adds control and allows the tool to do the work.*

Follow the leader. *Register the flat face of the rasp on the curved surface and maintain contact through the cut to remove saw marks and fair the curve.*

along the length of the curve; it follows the curve and leaves it fair.

The teeth cross the surface of the tool in diagonal lines, and the tool is often used by skewing it rather than pushing it in line with its body. The direction of the tooth lines in most rasps is "right-handed," but the French rasps can be ordered in "left-handed" versions, with the diagonal lines going in the opposite direction.

Either direction works most of the time, but with some shapes in some woods, the quality of the cut can be improved by switching from a dexter to a sinister tool.

Rasps aren't limited to working on curved surfaces; they also excel at removing small amounts of material on flat surfaces, such as when fitting mortise-and-tenon joints. It is easy to feel when the flat surface of the tool is in contact with the wood and a simple push takes down the high spots. Rasps work well on both flat-grain and end-grain surfaces.

Get a Good Start

Tempting as it may be to purchase a set of rasps, if you're new to these tools you're better off starting with one, or at most, two. Select a size and grain in the middle of the range and use it for a while. You'll quickly find out if you want more rasps, and if you want something coarser, finer or both.

For our comparisons we picked cabinetmaker's rasps in this range from four sources. This is the most common and most versatile form of rasp, with one flat side, one half-round side and a tapered shape. The flat side can be used on flat surfaces, or rolled over an edge to form a convex curve. The other side can form and smooth concave curves.

Modeler's rasps have the same configuration, but are smaller and thinner. Specialized rasps come in nearly any imaginable form, round and curved shapes, and grains that range from very coarse for hogging off large amounts of material quickly, to delicate tools for cleaning up details in small carvings.

Lay it down. *Rasps also work well for refining the final fit of joints. It's easier to keep a rasp than a plane or chisel flat on a tenon cheek.*

Gravity works. *Through-mortises are just as easy to tweak. Hold the flat face of the tool against the wall and let it drop slowly.*

If you're familiar with rasps, you might expect to see the Nicholson #49 and #50 included in this article. However, the current Nicholson product is made overseas, which in itself is not an issue. (None of the tools in this article is made in the United States.) What is an issue is the lack of quality control that precludes these tools from being ones we can recommend.

If you can find a vintage Nicholson rasp, made in the U.S., it's a tool worth owning even if you have to remove some rust and send it off to be chemically sharpened. These venerable tools were once the standard – a few years ago we would have included and recommended them. **PWM**

Bob is executive editor of Popular Woodworking Magazine. *He can be reached at robert.lang@fwmedia.com.*

Inside out, upside down. *The tapered half-round shape of a cabinetmaker's rasp allows you to work on almost any shape.*

ONLINE EXTRAS

For links to all online extras, go to:

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VIDEO: *See how rasps are made in this video from Liogier.*

BLOG: *Read about using rasps for shaping curves on our editor's blog.*

About This Column

Woodworking Essentials takes a close look at the tools, materials and processes of woodworking. You'll discover the fine points for the basics and beyond, and you will learn which tools are worth buying and which tools to avoid.

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Modern Chest, Period Methods

In the end, are period tools right for post-Industrial materials?

I began my machinist's chest project with the intention of using it to commune with the greater modern woodworking world. I wasn't kidding. The chest is designed to hold the miscellaneous tools that I think of as non-traditional, but in reality are the essential tools for 99.9 percent of woodworkers. (There's no place in my traditional tool chest for hex wrenches, machinist's squares, metal rules, plastic-handled screwdrivers and the like.) I think the finished machinist's chest is both useful and attractive. In this article, I'll cover some of the details of the drawer integration and finish work that I hope will help you when you construct your version.

But of equal or greater importance to me is the journey I undertook as I worked through this project. What fits or does not fit into my 18th-century tool chest has less to do with what tools the chest can physically hold, and a lot more to do with my reluctance to try modern woodworking approaches. For me to consider new tools or new methods, I feel as if I need a new tool chest in which to store them, and a context in which to use them.

While I recognize my approach to woodworking is decidedly unique, I suspect we are all a little alike – stuck in our own woodworking paradigms, reluctant to venture out and always desirous of fitting new tools and skills into our previous tool chest…regardless of whether they fit or not.

Drawer Strategies

In my last column, I wrote about mounting plastic strips to the insides of the case to serve as drawer runners for side-hung drawers. These drawers were known in medieval times and you'll find them being used in construction today. I borrowed a few design details from early drawers and ran into a few problems as well.

Custom chest. *I designed the bottom drawer in my machinist's chest to hold a No. 8 plane on its side. Shallow drawers provide neat and ready access to myriad small tools. The case is deep enough so that the drawers can hold full-length carving tools. Beneath the felt on the underside of the lid I installed a corkboard.*

I used maple for the drawer sides, grooving the sides with a plow plane and finishing with an old widow's tooth router. The position of the groove is critical to the alignment of the drawers.

I planed all the sides to finished dimensions then, using the lower edge of each drawer side as a reference face, I plowed the groove. The material was hard, and the pieces were small and difficult to hold. Though the design was roughly similar to other projects I've done, the materials, scale and precision required were not.

I used dovetails only at the front corners of the drawers, where they are needed the most. The backs are simply glued between the sides. The drawer bottoms are attached flush to

Grooves. *Plowing the grooves in the hard maple sides was no easy proposition. An 18th-century style router was used to perfect the depth of each groove.*

Gauging the drawer fit. *Using a marking gauge, I gauged from the central horizontal divider to the bottom of each drawer side. I planed the bottoms of the drawer sides, not the grooves, to ensure the correct position of each drawer bottom.*

PHOTOS BY THE AUTHOR

the underside, instead of in grooves, to save interior space. Taking a cue from 18th-century drawer construction, I made my drawer sides a shade narrower than the fronts and rounded the tops with a hollow plane. This makes a nice-looking drawer and helped me fit the drawer fronts.

Hardware Installation

Work on this chest has not been terribly difficult or impressive. The key to making pieces such as this stand out is how nicely you integrate the hardware. You can build one of these chests without recessing any hardware, but I don't think that looks as nice. Inspired by campaign furniture, I chose flush, campaign-style hardware.

I traced the recessed hardware at its location with pencil lead, test-fit, then gently carved away to the marks. The hardware is 3/8"-thick and the part I'm fitting it to is less than 1/2" thick. I wanted to leave as much wood as possible. Each piece of hardware presented me with the opportunity to severely damage my project. I think this is what David Pye meant when he wrote about the "workmanship of risk."

Finish

In keeping with the goal of this machinist's chest series, I wanted to try a modern finish, preferably something from a can. I purchased a variety of products from Minwax and picked up a can of Behlen's Pore-O-Pac grain filler, then spent two weeks making samples. But in the end, I went with what I know.

First, liberally apply boiled linseed oil to bare wood using a foam paintbrush. I applied the oil only to the mahogany. You cannot leave standing oil on the surface; excess must be wiped off, and it's best to do this at the time of application. Let this dry for one day, then apply a second coat. Give the second coat one day to dry. (As always, dispose of oil-soaked rags carefully. Spread them out to dry on a hard, flame-retardant surface.)

Moxon style. *Using a paring technique described by Joseph Moxon, I carefully excavated to my knifed line. Once the cavity was roughed in, I smoothed it with my router.*

Next, apply several light coats of shellac. While I typically use homemade brushes, this time I used foam brushes. While they don't hold up well, the finish quality was excellent. I applied a single coat to the maple drawer sides and any surface to which I was going to glue felt.

After six coats or so of shellac, I leveled the then-bumpy, glossy surface with a dull card scraper, then applied a final coat of shellac.

To buff a surface and reduce shellac gloss, I typically use linseed oil and pumice or rottenstone. You just sprinkle them on the surface, then rub with a soft cloth moistened with oil. Steel wool (#0000) or even a piece of corrugated cardboard can be substituted. The entire finish process was quick and, in my opinion, beautiful – and it involved no sanding.

Felt

I applied 100 percent wool felt to the drawer bottoms and the top till using wallpaper paste. The concern among some machinists is that synthetic felts and some glues can actually promote rust instead of protecting against it. The theory behind the wool is that it contains natural oil that helps stave off rust. The paste makes felt liners easy to remove should they become damaged. I dry-fit the felt as best as I could, leaving little or no excess. I painted the paste on with a brush, then smoothed the felt, working it into the corners using an old credit card as a squeegee. You can stretch the wool a bit with this process if you cut it too small. It is easy to trim any excess with a sharp knife, but this is best done after the paste is dry.

Conclusion

The construction of this project highlighted for me the significant differences between modern and 18th-century woodworking. Small, seemingly insignificant choices to use yellow glue, plywood, butt joints and miters for panels challenged my tools and my patience. Never before have I needed more clamps. My scheme for integrating drawers really required the sort of precision best achieved by a well-tuned machine. Where I encountered difficulty, I relied on my hard-won hand skills and an unreasonable amount of labor to remedy the situation. Though I'm pleased with the result, I couldn't recommend this project to other hand-tool users in good conscience. This project just isn't a good fit for hand tools. Though my modern tools do fit nicely into it. **PWM**

Visit Adam's blog at artsandmysteries.com for more discussion of traditional tools and techniques.

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About This Column

ARTS & Mysteries

Adam covers 18th-century shop practices and tools in his own, inimitable style. The phrase "Arts & Mysteries" refers to the contract between an apprentice and master – the 18th-century master was contractually obligated to teach apprentices trade secrets of a given craft (and the apprentice was expected to preserve those "mysteries").

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How to Choose a Finish

Your decision is simplified by the process of elimination.

Application method narrows choices. *Though there are seven categories of wood finish, you will most likely choose from just four, depending on your application method. If you're using a spray gun, choose among shellac, lacquer, water-based finish and catalyzed finish (left). If you're using a rag or brush, choose among oil, varnish, shellac and water-based finish (right).*

At some point as you progress in woodworking, you begin to realize that there are many finishes to choose among; you probably ask yourself if you are using the best finish for your project.

Choosing is not as hard as it seems because there are only seven basic types of finish used by woodworkers: wax, oil, varnish (including polyurethane varnish), shellac, lacquer, water-based finish and catalyzed or two-part finish.

It gets easier. You can eliminate wax for almost all projects except small decorative objects such as turnings and carvings that aren't handled much. Wax doesn't work well as the sole finish because when buffed out thin, it isn't water-resistant (only water-repellent) and grime gets ground into it when touched repeatedly by hands. (Wax is an excellent polish over another finish, however, because it adds shine and creates a slick surface that resists scratches.)

With wax out of consideration, you can then eliminate two more finishes based on the application tool you use: rag, brush or spray gun.

If you use a spray gun, you wouldn't apply oil or varnish because they are very messy. They dry so slowly that the

Poor durability. *Finishes such as shellac, lacquer and water-based finish break down from repeated contact with the acids in body oils and sweat, as shown in this close-up of a lacquered crest rail from a chair.*

Oil finishes*. Oil and oil/varnish-blend finishes are popular because they are so easy to apply. Simply wipe them on and wipe off the excess.*

PHOTOS BY THE AUTHOR

uncured overspray settles on and sticks to everything it comes in contact with.

Moreover, the appearance and durability of oil and varnish can be easily matched with faster-drying finishes. For example, an oil finish can be imitated with one or two thinned coats of a satin finish, and the superior durability of polyurethane varnish can be matched with any catalyzed finish.

If you use a rag or brush, you wouldn't apply a catalyzed finish and you would rarely apply lacquer because of the fast drying and the strong odor of both. (Brushing lacquer, which dries more slowly, could be thought of as an exception.)

So if you use a spray gun, the choices are narrowed to four: shellac, lacquer, water-based finish and catalyzed finish. If you use a rag or brush, the choices are also narrowed to four: oil, varnish, shellac and water-based finish. Notice that shellac and water-based finish are the only ones applied both ways.

Choosing within each group of four then comes down primarily to choosing for protection and durability, application ease and color – usually in that order of importance.

Protection & Durability

Protection means resistance to liquid penetration, keeping in mind that thicker films are always more resistant no matter what type of finish is used. Durability means resistance of the finish film itself to damage from scratches, heat, solvents, acids (for example, body oils and sweat) and alkalis (for example, cleaning products). For the most part, finishes that are rated high in protection are also high in durability, so we can consider the two together.

Table #1 (at right, top) compares the protection and durability characteristics of wiped and brushed finishes, from best to worst. Table #2 (at right, middle) compares sprayed finishes.

Ease of Application

Ease of application is an important consideration, especially for beginners. For

Table #1: Protection & Durability, Wiped or Brushed Finishes

FINISH	PROTECTION & DURABILITY
Oil-based varnish & polyurethane	Both offer exceptional protection and durability; polyurethane is more durable than common alkyd varnish.
Water-based finish	Good protection and very scratch-resistant, but not as heat-, solvent-, acid- and alkali-resistant as varnish or polyurethane.
Shellac	Good protection, with dewaxed shellac more protective than shellac with wax included. Durability is weak compared to other film-building finishes but much better than oil.
Linseed oil, tung oil & oil/varnish blend	These cure too soft to be scratch-resistant, or to be built up to provide good water resistance.

Table #2: Protection & Durability, Sprayed Finishes

FINISH	PROTECTION & DURABILITY
Catalyzed finish	All catalyzed finishes are exceptionally protective and durable, with conversion varnish the most so. All are equivalent to, or better than, oil-based polyurethane.
Water-based finish	Good protection and very scratch-resistant. But heat-, solvent-, acid- and alkali-resistance are more like lacquer.
Lacquer	Good protection, but scratch-, heat-, solvent-, acid- and alkali-resistance are only a little better than shellac.
Shellac	Good protection; dewaxed shellac is better than shellac with wax included. Durability is slightly less than lacquer because of the greater vulnerability to alcohol.

Table #3: Ease of Application, Wiped & Brushed Finishes

FINISH	EASE OF APPLICATION
Linseed oil, tung oil & oil/varnish blend	The easiest of all finishes to apply; simply wipe on and wipe off the excess after each application.
Oil-based varnish & polyurethane	The easiest finishes to brush because of the long drying time, but vulnerable to dust nibs; and a strong, lingering odor.
Water-based finish	Easy to brush, but you have to work fast because the finish dries quickly. Also, you have to deal with severe raised grain.
Shellac	Brushing is more difficult than with water-based finish because of fast drying and ridging. Wiping (French polishing) is a difficult skill to master.

example, the popularity of oil and oil/varnish blend finishes, which offer very poor protection and durability, is due primarily to their ease of use.

Table #3 (page 61, bottom) compares the relative ease of application of wiped and brushed finishes, from easiest to hardest. Table #4 (below) compares sprayed finishes.

Finish Color

The color a finish adds to wood can be very important, especially if you don't stain the wood. Because most finishes add some degree of yellow/orange color to the wood, choosing for color hasn't always been a big consideration. But with the introduction of water-based finishes, which don't add any color, this consideration has risen in importance, even becoming the most important in some instances.

Table #5 (at left, bottom) compares the relative amount of yellow/orange coloring all six finishes add to wood, from least to most. **PWM**

Bob is author of three books, "Flexner on Finishing," "Wood Finishing 101" and "Understanding Wood Finishing," plus hundreds of magazine articles.

Table #4: Ease of Application For Sprayed Finishes

FINISH	EASE OF APPLICATION
Lacquer	Very easy to spray, especially because of the variety of solvents available, which can be added to control drying time. A strong and lingering odor.
Shellac	Easy to spray, but no blush-eliminating solvents are commonly available.
Water-based finish	Less easy to spray successfully than lacquer or shellac, but no lingering odor.
Catalyzed finish	Pre-catalyzed lacquer is similar to lacquer. Post-catalyzed lacquer and conversion varnish are easy to spray but require accurate mixing of the two parts. A strong and lingering odor.

Table #5: Choose a Finish For Color

FINISH	COLOR
Water-based finish	Adds no coloring to wood but does darken it a little. The lack of added color can be desirable on white woods, but causes darker woods to look "washed out" unless a stain is applied.
Catalyzed finishes	Catalyzed lacquer adds a light yellow tint because of the included nitrocellulose. Conversion varnish adds almost no yellowing but does darken the wood a little.
Lacquer	CAB-acrylic adds almost no yellowing to wood but does darken it. Nitrocellulose adds a light yellow tint to wood, similar to that of clear and blonde shellac but less than oil-based polyurethane.
Shellac	Clear and blonde shellac add a light yellow coloring to wood. Amber and orange shellac add a distinct orange coloring to wood, more than that of linseed oil and tung oil. Other shellacs are in between or even darker.
Oil-based varnish & polyurethane	These add more orange coloring than lacquer or clear/blonde shellac but less than linseed oil and tung oil.
Linseed oil, tung oil & oil/varnish blend	Except for amber/orange shellac, these finishes add the most orange coloring to wood, with oil/varnish blends adding slightly less than the pure oils. Moreover, they all darken noticeably as they age.

Water-based finish for color. *Water-based finishes provide a unique and attractive look on white woods such as this pine floor because these finishes don't add any yellow/orange coloring.*

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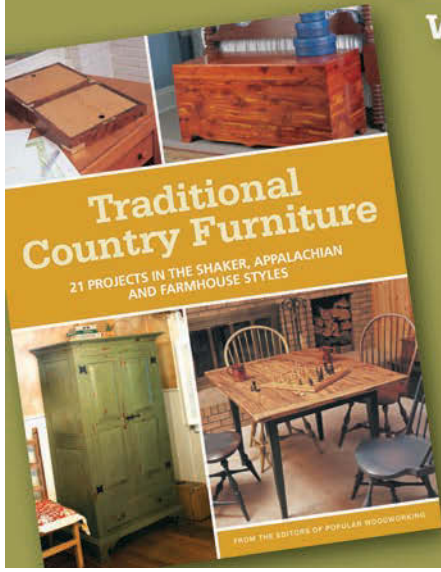

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It's Time

A lifelong dream of woodworking is ready to come to fruition.

I stared up at the silent giant, standing twice as tall as me – polished wood, crystal-clear glass, full of brass gears and weights that seemed like gold to my young eyes. I was waiting for the top of the hour, when this sleeping giant, quiet other than the steady tick of its heartbeat, would come to life and fill the house with a cacophony of chimes and bells before returning again to its dormant state.

My fascination with grandfather clocks began at an early age. Once a month, regular as clockwork (pun intended), we would visit my grandfather's house. These visits were almost ritualistic in nature. We would always arrive at about 11 a.m. My father and grandfather would spend time talking about Formula 1 racing, the current political issues and the latest records that my grandfather had bought. Grandfather was a stereo junkie and always seemed to have some new device every time we visited.

My brother and I had our own routine: A one-mile walk to the store with a few shillings (yes, this was back in England, long before "new pence" and the Euro) in our pockets for sweets, walking my grandmother's dog, and with instructions to buy a block of ice cream for dessert. Of course, we had to run to get back before it melted.

Dinner was always midday on those Sundays and we had high tea in the early evening before being bundled into the back of the car to sleep on the journey home.

The highlight of the day for me was the visit to the neighbor's house. The first visit was with my grandmother to deliver some flowers to Mrs. Wilson and it was then that I met this giant. I was totally fascinated by it; my grandmother eventually had to drag me away. The image of this wood and glass sentinel filled my head until the next visit.

Each visit after that, I would make an excuse to go next door. My grandmother would check her watch (inevitably it was five minutes or so before the top of the hour), smile and nod her approval. When Mrs. Wilson answered my knock on her door, she would check her watch, smile and invite me in, knowing exactly why I was there. After watching her clock perform its hourly duties, I would return, happy, to grandmother's house.

Later, in high school, I had the chance to take a woodwork class once a week. We didn't have the opportunity or the time to make anything too complex, but I remember clearly while I was using the hand and power tools, I was constantly thinking about how each of them would be used to make the parts for a grandfather clock.

College, marriage, children and international travel with my work consumed the years and woodworking was left behind, but the passion to return to it never died. And when the occasional opportunity to work with wood came along, I grasped it with both hands. The desire to one day build a "silent giant" has never gone away.

And so the dream has come full circle. As I approach the end of a working life as an engineer, spent designing and building refineries and chemical plants, I am preparing for retirement.

I can look back at the plants I have helped to create and know that I left something tangible. Now I feel the need to leave something more personal behind for my children and their children. Something that I have created with my own hands. It involves projects of a different kind. This year, I will complete my woodwork shop. I am going to design and build grandfather clocks.

It's time. **PWM**

PENNSYLVANIA TALL CASE CLOCK BUILT BY GLEN D. HUEY, FROM THE COLLECTION OF MR. & MRS. BRAD KASPER, COLUMBIA CROSS ROADS, PA.; PHOTO BY TIM GRONDIN

Mike lives in Magnolia, Texas, and works in the oil and gas industry. He is almost done getting his workshop ready for his retirement and plans to build grandfather clocks – and whatever his wife wants.

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