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POPULAR Woodworking MAGAZINE

November 2016 ■ #228

Danish Campaign

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Comes Apart for Easy Transport

Small Table,
2 Big Secrets

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Jobsite Table Saw

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- Maximum depth of cut @ 90°: 3"
- Maximum depth of cut @ 45°: 2 1/4"
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G0555X ~~\$839.00~~ SALE **\$795.00**

17" HEAVY-DUTY BANDSAW with CAST-IRON WHEELS

- Motor: 2 HP, 110V/220V, single-phase, TEFC capacitor start induction, prewired 220V, 60 Hz
- Power transfer: Belt drive
- Precision-ground cast-iron table size: 23 1/2" x 17 1/4" x 1 1/2" thick
- Table tilt: 45° R, 5° L
- Floor-to-table height: 37 1/2"
- Cutting capacity/throat: 16 1/4" left of blade
- Max. cutting height: 12" • Blade size: 131 1/2" L
- 2 blade speeds: 1700 & 3500 FPM
- Approx. shipping weight: 418 lbs.

EXTREME SERIES



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G0513X2 ~~\$1125.00~~ SALE **\$1050.00**

10" HYBRID TABLE SAW with RIVING KNIFE

- Motor: 2 HP, 110V/220V*, single-phase, prewired to 220V
- Amps: 16A at 110V, 8A at 220V
- Precision-ground cast-iron table 40" W x 27" D
- Table height: 34"
- Footprint: 20" L x 21 1/2" W
- Arbor: 1/2" • Arbor speed: 3850 RPM
- Capacity @ 90°: 3 1/4" • Capacity @ 45°: 2 1/4"
- Rip capacity: 30" R, 12" L
- Overall size: 36" W x 60" D x 40" H
- Approx. shipping weight: 416 lbs.



* Converting to 110V requires purchase of T23999 conversion kit.

G0715P ~~\$850.00~~ SALE **\$825.00**

10" CABINET TABLE SAWS with RIVING KNIFE

- Motor: 3 HP, 220V, single-phase, 12.8A • Precision-ground cast-iron table with extension: 27" x 40" (G0690), 27" x 74 1/4" (G0691)
- Table height: 34" • Arbor: 1/2"
- Arbor speed: 4300 RPM
- Max. dado width: 1 1/8"
- Capacity @ 90°: 3 1/4", @ 45°: 2 1/4"
- Rip capacity: 29 1/2" R, 12" L (G0690)
- Rip capacity: 50" R, 12" L (G0691)
- Approx. shipping weight: 530 lbs. (G0690), 572 lbs. (G0691)



WITH RIVING KNIFE

G0690 ~~\$1525.00~~ SALE **\$1450.00**

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17" HEAVY-DUTY BANDSAW

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- Amps: 20A/10A
- Power transfer: Belt drive
- Precision-ground cast-iron table size: 17" x 17" x 1 1/2" thick
- Table tilt: 45° R, 10° L
- Floor-to-table height: 37 1/2"
- Cutting capacity/throat: 16 1/4" left of blade
- Maximum cutting height: 12 1/4"
- Blade size: 131 1/2" L
- Blade sizes available: 1/4"-1" wide
- 2 blade speeds: 1700 & 3500 FPM
- Approx. shipping weight: 342 lbs.



G0513ANV ~~\$895.00~~ SALE **\$850.00**

14" 2 HP DELUXE BANDSAW

- Motor: 2 HP, 110V/220V, single-phase, 1725 RPM, prewired 220V, 19A at 110V, 9.5A at 220V
- Table size: 19 1/4" x 14 1/4" x 1 1/2" thick
- Table tilt: 45° R, 8° L
- Floor-to-table height: 42 1/4"
- Cutting capacity/throat: 13 1/2" left of blade
- Maximum cutting height: 10"
- Blade size: 106" L
- Blade width: 1/4"-3/4"
- Overall size: 29 1/4" W x 29 1/4" D x 73" H
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- Approx. shipping weight: 234 lbs.

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10" JOINTER/PLANNER COMBO

- Motor: 2 1/2 HP, 220V, single-phase, TEFC, 3400 RPM, 9.9A
- Max. depth of cut: 1/8" (jointer), 3/8" (planer)
- Max. width of cut: 10 1/4" (jointer), 9 3/4" (planer)
• Max. planer cutting height: 8 1/4"
- Jointer table size: 12 1/2" x 40 1/8"
- Planer table size: 9 3/4" x 23 1/2"
- Cutterhead speed: 6500 RPM
- Cutterhead knives: 2 HSS
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- Min. stock thickness: 3/8"
- Min. stock length: 8" (G0453W), 6" (G0453ZW) • Max. cutting depth: 1/2"
- Feed rate: 16 and 20 FPM
- Cutterhead speed: 5000 RPM
- Table size: 41 3/4" x 16"
- Overall dimensions: 38" W x 42" D x 42 1/2" H
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BY CHRISTOPHER SCHWARZ

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Secret Compartments

When I was a kid, my mom dragged me to antique malls and furniture auctions on what felt at the time like a daily basis (it was probably four times per year). I would entertain myself on these seemingly interminable occasions by searching the case pieces for hidden drawers and compartments. I'm sure the dealers loved having some snott-nosed kid poking around in their stuff.

I knew early on that the most likely place for hidden drawers was in the center gallery section of a desk or secretary. I could usually tell if there was a "secret" by sticking my hand inside the central cavity to see if the assembly moved at all – a dead giveaway one could pull it out (also a quick way to get the owner to come running). And panels on desktops that slide back to reveal a cavity (sometimes with drawers)? Those, thanks to tell-tale scratches in the finish on old pieces, were pretty easy to uncover.

It took me a little longer to realize there are often little drawers hidden behind the visible ones on either side of center, and that sometimes the scrollwork on a pigeonhole slides out to reveal a small tray attached behind.

Hollow lopers? A dealer showed me that trickery.

But of course hidden compartments aren't limited to desks (though they seem to be the most common form with multiple secrets). Spice boxes often have a row of hidden drawers (never understood that, really; one could easily pick up an entire spice chest and walk away with it, secrets and all). And substantial case pieces sometimes have

false bottoms in drawers, with space underneath for a stash; the depth of a large drawer makes it easy to overlook a size discrepancy between the interior and exterior. Ditto on blanket chests. And don't overlook mouldings; a crown, plinth or a reeded column is an excellent place to hide a shallow drawer.

Sometimes furniture "secrets" are, like Poe's purloined letter, hiding in plain sight. I have a massive Empire revival sideboard (courtesy of my mother) that's been in my possession

for more than a decade. While moving houses last summer, I realized that a little ring pull I thought some fool had added to the top moulding as a place to hang a towel or some such nonsense was actually a handle to access an extension table hidden in the trim. This flat-topped piece is almost 6' long; I can't imagine needing it larger...which I guess is why it never

before occurred to me to grab that ring.

All of the above is to say that no matter what kind of furniture you build, you can almost always find a place to include a clever surprise (which may or may not be discovered years from now by an inquisitive kid...or half-blind adult).

One of the authors in this issue, Matthew Dworman, has built a substantial business doing just that, but, given that he reveals his methods beginning on page 32, I suppose at least two of his secrets are now public knowledge. PWM



Megan Fitzpatrick

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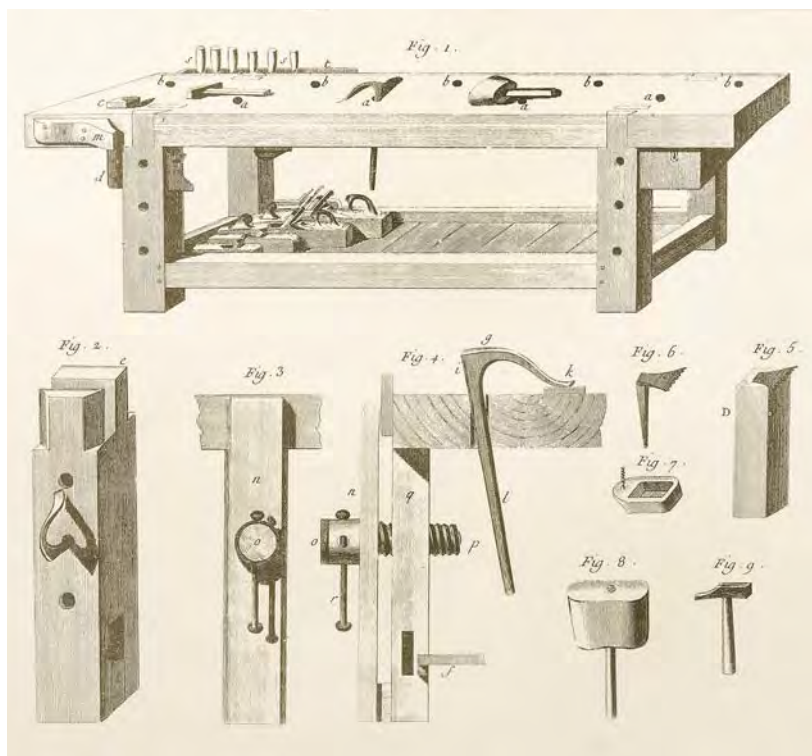


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What's New in the New 'Workbenches?'



There is an article on the Knockdown Nicholson Bench in the November 2015 issue (#221); this bench is also in the revised edition of Christopher Schwarz's book "Workbenches: From Design & Theory to Construction & Use."

My question: Is all the information in the book about that particular bench also in the article? I own the first edition of "Workbenches," so would like to put off buying the second if what's in the magazine will be enough to help me build that bench.

Stephen Pinney,
via email

Stephen,
There are many additional views of the measured drawings in the book,

and some extra photos and words – but you can absolutely build the bench from the instruction and images in the magazine. (Note: You can download the SketchUp model for the bench to export whatever view you'd like; see the link to our SketchUp Warehouse at popularwoodworking.com/nov15.)

But one bench in the revised edition of "Workbenches" that you won't find elsewhere is "The Ancient Roubo"—that is, the soup-to-nuts build and drawings of a Roubo bench exactly as shown in Plate 11 of "l'Art du menuisier."

Plus, Christopher revised and updated the information on workholding and appliances to reflect changes in the market and new information gleaned from his research.

Megan Fitzpatrick, editor

Double Spring Pole Lathe Wedged Joint Design

Roy Underhill's "Double Spring Pole Lathe" (August 2016, issue # 226) is a great article, and I have wanted to build a spring lathe for some time. But I've a question: The tusk wedges that hold together the lathe in the article are different than the ones Roy uses in the lathe-building course at the Woodwright's School.

The wedges in the design for the course run parallel with the ways, instead of being mortised through them as is shown in the print article.

Why the difference, and is one design better than the other?

Grant Hull,
Chickamauga, Georgia

Grant,
Both knockdown joints do the job equally well. The difference is in looks and length.

The wedged tusk tenons used in the article look great, but for strength they must extend well beyond the face of the posts. As a consequence, they remove more wood from the usable length of the lathe rails.

The dovetail-notched joints with parallel wedges are less familiar, but can work with just stubs of the rails extending beyond the posts. When you use the parallel wedge, you can get five more inches between centers with the same length of rail.

So why not just choose the better-looking joint and make the rails a bit longer? It depends on what you're turning and how much you travel. Limiting the rail lengths to 4' makes the lathe easier for me to pack when it is disassembled (I use a knockdown joint in the tall post), and the parallel wedges give me a few critical inches sometimes needed for chair post turning.

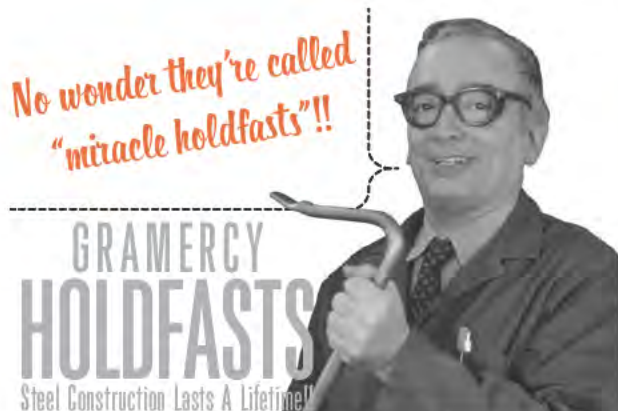
That said, I like the wedged tusk tenons better, because they look so good!

Roy Underhill, contributor

Reliable Information on a Child-safe Finish for Crib

I'm building a crib for my new granddaughter and am trying to find some

CONTINUED ON PAGE 10



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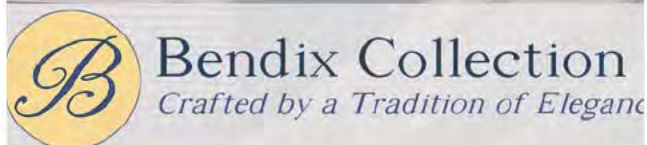


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information on the safest finishes. There's a lot of conflicting information out there and searching the Internet and this magazine's website returned little information.

My question: Is it true that all finishes are inert and non-toxic after curing? That is, if I stain the wood and coat it with polyurethane, Watco, Waterlox or basically anything, will there be no safety concerns if she chews on it?

Allan Grant,
Atlanta, Georgia

Allan,
I was moving along well until you mentioned stain. I would be careful of both pigment and dye stains. I would guess your granddaughter would have to do a lot of chewing to get to the dye or pigment, but both can be a problem. You'd have to find a manufacturer who assures food safety, and I don't know of any for stains.

Concerning the finish, I believe it's true that the finish is safe once it has fully cured.

But you should know that I've encountered some pushback for that statement, notably by a pediatric oncologist (how do you argue with someone like that?). He has no evidence of any problems, but says there's always a chance of problems because people (children) are different and will react differently to various things.

So I was pushed back into having to prove a negative, having to prove that there can't be any exceptions, and of course I can't do that.

I think you're OK as long as you let the finish dry well. (Lots of baby cribs are painted, which contains pigment and also the finish that binds the pigment together.)

But the good doctor made me take a step back from being absolute.

Bob Flexner, contributing editor

Tote Handle Dovetail Joint Orientation

I enjoyed reading Bill Heidt's "Finger-jointed Tote" (October 2016, issue #227) and really like the piece.

My concern is that the dovetail

pins are on the top of the handle, and it seems that the design is relying mostly on the glue for strength. The load is pulling down, which is not the strength of this dovetail configuration. Would putting the pins on the sides be a stronger choice?

In that case, the load would actually pull to the strength of the dovetail joint.

Tom Balph,
Mesa, Arizona

Tom,
The reason that the handle dovetail is configured as it is owes to my original tote that has the handle's center piece thicker (about 1 1/4") at the ends, making it less practical to put the tail on the upright.

When I then designed the light-duty tote, I stayed with the same arrangement. This has been adequately strong for the intended purpose.

But, the dovetail in the upright would provide some mechanical strength, although one must keep in mind that a good portion of the pins have been lost to the radius and had this been the tail, those fibers would be in shear and therefore weaker.

Regardless of orientation, a glue failure would be necessary for the joint to fail and that is not likely with the epoxy and the amount of surface area.

Bottom line: Either joint orientation will work just fine in this light-duty application. PWM

Bill Heidt, contributor

ONLINE EXTRAS

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Highly Recommended

Unless you're extremely organized, odds are good you've misplaced a driver tip or two in your time. I am constantly putting them down when I switch to a bit in my drill, both at work and at home. So I bought a couple contractor packs of both slotted and Phillips driver tips. That way, I (almost) always know where to find the tip I need. A pack is about \$8 for 20 Phillips and \$12 for 20 slotted – not much money for headache avoidance.

— Megan Fitzpatrick

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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.

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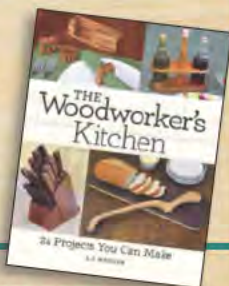
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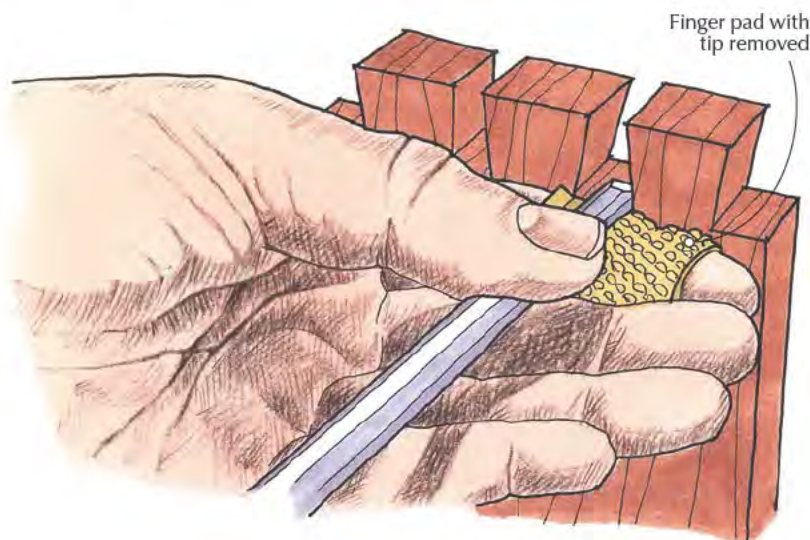
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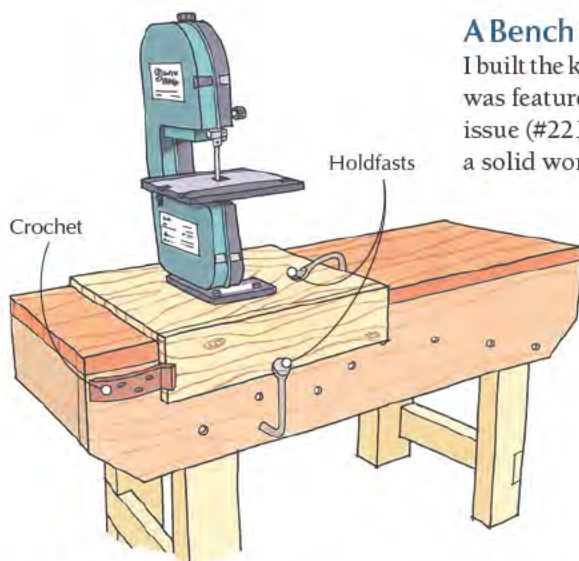
Protect Your Hands From Chisel Lands



Many new chisels, especially most premium-quality chisels, have sharp lands (the beveled side edges). Some people wear cotton gloves to protect their hands when using these, but I don't like the loss of feel and sensitivity with gloves. So I came up with a simple solution to avoid getting cut by these edges.

I cut off the tip of a rubber finger pad (sold at office supply stores to guard against paper cuts) and slide it onto my index finger for use as a guard against the chisel edges. It doesn't interfere with feedback and control, and I no longer suffer from cuts—even if I hold the chisel tightly.

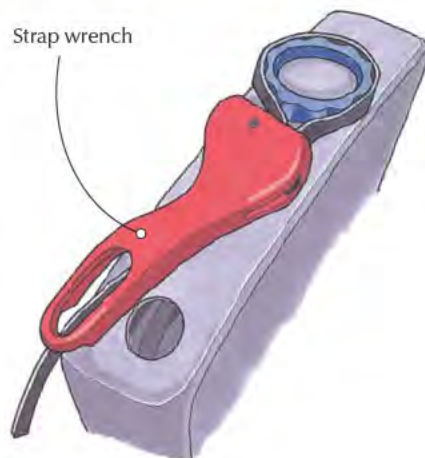
Charles Mak,
Calgary, Alberta



A Bench for Benchtop Tools

I built the knockdown workbench that was featured in your November 2015 issue (#221). In addition to providing a solid worksurface, the crochet and two holdfasts makes it a snap to secure my benchtop power tools for use.

Cy Kammeier,
via email



Strap Wrench

I'm an older woodworker who suffers from neuropathy, so my grip is not as strong as it used to be. I have difficulty with some machine adjustments, such as tensioning my band saw. I discovered a foolproof method: a cheap strap wrench. It may be crude, but it's effective.

Jack Collins,
via email

Accuracy from a Dumpster

One of my most useful measuring tools is from IKEA. Well, that's not entirely true. IKEA made it, but I rescued it from the curb one day on my morning run.

It's a steel rail supplied with IKEA's modern-day press-board beds. The steel rail attaches to the wood-like rails of the bed and holds the box spring in place.

I use it as a straightedge for truing long edges and big surfaces.

The bed rail is an excellent size, consisting of two 1³/₈" legs joined at a right angle. Mine is almost 75" long.

It is remarkably accurate and stays that way because it has been moulded at the factory to take abuse and bedtime monkey-business. It's lightweight. And as long as I don't abuse it, it never has to be trued, which can be difficult with a long wooden straightedge.

Christopher Schwarz,
Covington, Kentucky

Rust-free 'Ruler Trick' with High-density Polyethylene

For the past two years, I've been using a modification of the "Charlesworth Ruler Trick" for sharpening that I think is a significant improvement. I never liked the idea of rubbing a steel plane iron along a steel rule. It's rubbing metal on metal and the swarf (fine abrasive slurry) from the stones gets between the metal pieces and chews them up. This ruins the steel rule and it makes it difficult to read later. Plus, leaving the rule on a wet stone invites rust. The rule becomes just one more thing to clean up and wipe down when you finish sharpening.

Small 6" rules are cheap, but I had only one and didn't want to ruin it. I decided that high-density polyethylene (HDPE) would be a far better choice than steel. I wanted a small piece of the material that was thin, flat and about the same size as the steel rule for which

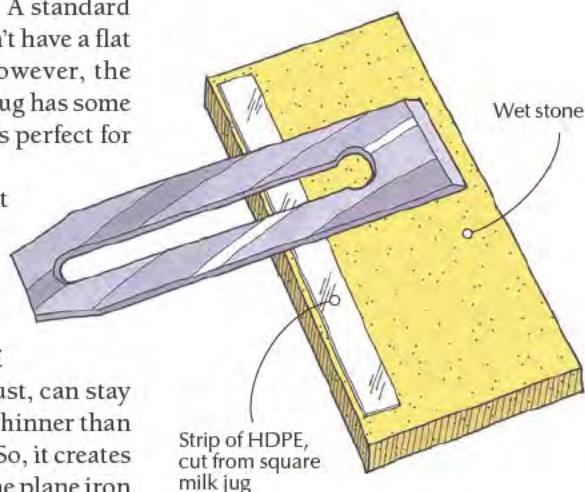
it was being substituted. A standard American milk jug doesn't have a flat spot anywhere on it. However, the newer style square milk jug has some flat spots on the sides; it's perfect for this use.

Cut a strip from the flat side of the milk jug with a scalpel or X-Acto knife then trim it to size with a steel rule.

This new strip of HDPE is low friction, doesn't rust, can stay on your wet stone and is thinner than the steel rule it replaces. So, it creates a smaller back bevel on the plane iron that is being sharpened.

Jonathan White,
Port Angeles, Washington

Editor's note: You'll find David Charlesworth's "The Ruler Trick" free on our website: popularwoodworking.com/techniques/the_ruler_trick.



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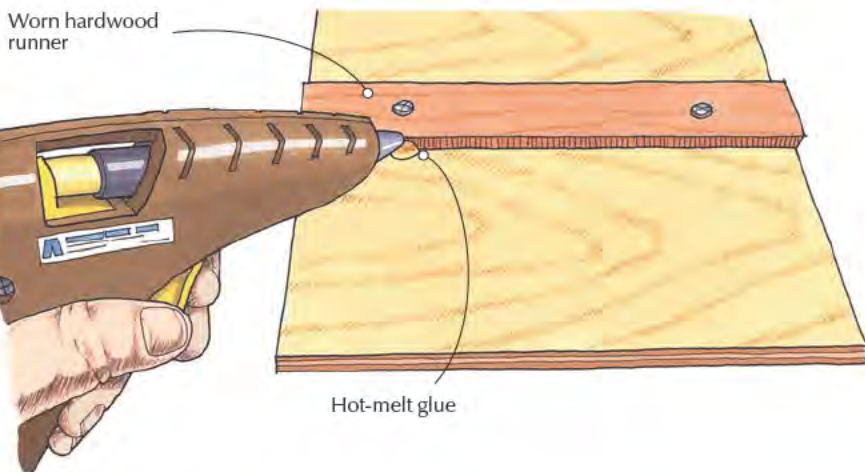
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Sloppy Runner Fix

I have a lot of jigs in my shop, and many, such as my crosscut sleds, use hardwood runners that fit into the miter slots of a table saw. The problem is that over time the runners get worn and become sloppy. I tighten up the loose runners with hot-melt glue.

Just apply a blob at the ends of the runners and quickly press them into

the miter slots. The hot glue cools and fills the gaps, making a tight, smooth-sliding fit.

The glue adheres to the wood, but not to the steel saw table – but if you have concerns about it adhering to miter slots, first apply a thin coat of oil to the surface. **PWM**

Bill Wells,
Olympia, Washington

Bosch Reaxx Jobsite Saw

New safety mechanism leaves your sawblades and hands unscathed.

As a retired safety professional turned woodworker, I want a saw with flesh-sensing technology, but I don't have room for a cabinet saw. In 2015 SawStop introduced its jobsite saw. Shortly after, Bosch introduced the REAXX jobsite saw.

I bought my REAXX saw in July. It took a few hours to get the saw ready and assemble the mobile base. The factory settings and alignments were right on. No adjustments were required.

The saw includes both high- and low-tech safety features. For example, locating the push stick in a convenient front holster encourages you to use it.

The throat plate, adjustable-height riving knife, guard and anti-kickback pawls are removed, installed or positioned without tools. The guard and pawls store under the table. (It takes only a minute to put them back on, improving the likelihood that they will remain in use.) The split guard provides a clear view of the blade, and work passes underneath without binding.

The Active Response Technology provides the high-tech safety defense. When the saw senses "flesh contact," the activation cartridge "fires." A piston contacts the saw's drop arm and within milliseconds drops the blade below the table. Power is simultaneously disconnected. The undamaged blade spins to a stop below the table, and the saw can be reset in minutes.

The dual-cylinder cartridge permits



Old school meets new. Easy-to-use guard system and flesh-sensing technology converge in a top quality, high-performing saw.



two activations before needing replacement, and there is onboard storage for another cartridge. The same cartridge is used with a dado stack (SawStop requires a different cartridge for that setup).

The LED information panel is easy to understand. Green means the system is armed and the saw is ready. Yellow means that the system has been bypassed (for cutting conductive or wet wood—Bosch, unlike SawStop, does not have a conductivity test feature). Red indicates a user-correctable problem and blue that service is needed.

If you prefer "old school," the on/off and bypass switches can be padlocked. Or, you can use a smart phone app to lock out or limit saw operation.

The saw has a 25" rip capacity. You need only lift the lever at the front and slide out the multi-position extension table. My favorite feature is the adjustable outfeed with 18" of support.

The self-squaring fence is solid and

locks easily. The rectangular shape and removable faces permit use of a sacrificial fence or shop-made fixtures. The robust miter gauge runs in a T-slot that supports the gauge when crosscutting wider stock.

I'm used to saws with a crank to adjust the blade angle. On the REAXX the trunnion swings free when you release the locking lever. Although it is easy to swing and lock the blade to the desired angle, this will take some getting used to. The SawStop's squeeze handle and fine adjustment design is preferable.

The saw is smooth-running and vibration-free and easily cuts through 8/4 oak. After upgrading the blade, it ripped 8/4 cherry without burning.

REAXX is a quality saw with a small footprint and good mobility. It allows woodworkers to acquire a saw with flesh-sensing technology, or "finger insurance" as I like to call it, at a reasonable price point.

— Peter Marcucci

CONTINUED ON PAGE 16

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Walke Moore Tools Router Plane

Based on the Preston 2500P, this bronze tool will last longer than a lifetime.

Router planes are the Swiss Army knives of joinery, cleaning out dados, leveling lap joints and trimming tenons with speed and surgical precision. The new Walke Moore Tools 2500 excels at all of the things you want a router plane to do, and a few you might not expect. While no tool is perfect, there are several things about the 2500 that set it apart in its class.

To begin with, size matters. Drawing its DNA from the desirable but discontinued Preston 2500P router plane (patented in 1907), the Walke Moore 2500 offers a generous 8½" x 3½" rectangular footprint, giving it an expansive reach and rock-solid feel.

The historic form is reimagined here in some innovative ways, beginning with a manganese bronze casting intended to add both durability and mass to the tool while protecting against rust. Bronze tools don't rust, but they do oxidize, and the test model left some dark marks on the surfaces of lighter colored wood. This may or may not be a problem for you.

I came to appreciate how the shorter, wide-set knobs of the tool resulted in a lower center of gravity and a more direct transfer of force to the cutting edge. It felt powerful and precise. Walke Moore offers a choice of two sizes of knobs and, although I have large hands, I preferred the feel and control of the smaller knobs. As on the Preston plane, the knobs are designed to be easily re-



Vintage reimagined. The Walke Moore Tools 2500 router plane is based on a Preston model, and built to last. The blade and handles can be repositioned for use in tight spaces.

moved and repositioned on the tool, which makes it reconfigurable, but they sometimes worked loose in my hands during use.

Versatility is the name of the game with the 2500. There are four possible cutter positions (closed throat, bullnose, inside and outside the end posts), but the cutter itself is the star of the show. The head of the cutter has been engineered to rotate and lock in 90° increments, which makes it possible to reach all sorts of places most router planes wish they could go. The lock for this adjustment is on top of the cutter, making it simple to change the orientation of the blade, and it never came loose while in use. When the cutter is mounted on a side post, some leverage is lost, but it feels

like an even trade for the functionality and improved range of use.

Setting the tool up in the alternative configurations seemed a little tricky to me at first, but what the tool lacks in intuitive ease of use it more than makes up for in flexibility and utility.

At the time of publication, accessories and specialty cutters are limited for this plane, but the included adjustable fence and depth stop work flawlessly, and the sharpening jig makes short work of putting a razor-sharp edge on the cutter.

The question is, do you need a \$285 router plane? I can't answer that, but I can say with certainty that this tool is worth the price of admission. **PWM**

—James McConnell

No. 2500 Router Plane

Walke Moore Tools ■
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Street price ■ from \$285

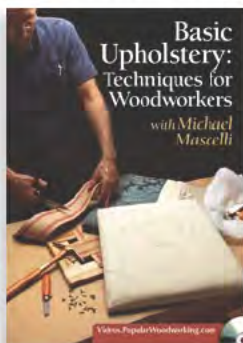
■ ARTICLE Read "Mighty Router Planes," free on our site.

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Designer's Workhorse

Proportions do all the heavy lifting – a bit of drawing can develop your eye.

There is a saying among artists: Values (light and shadow) do all the work in a painting, while colors have all the fun. Though cobalt blue and crimson red may dazzle, light and shadows give meaning to our eyes. The same can be said of poetry. Words are the playthings of poets, while meter is the structure that makes a poem work.

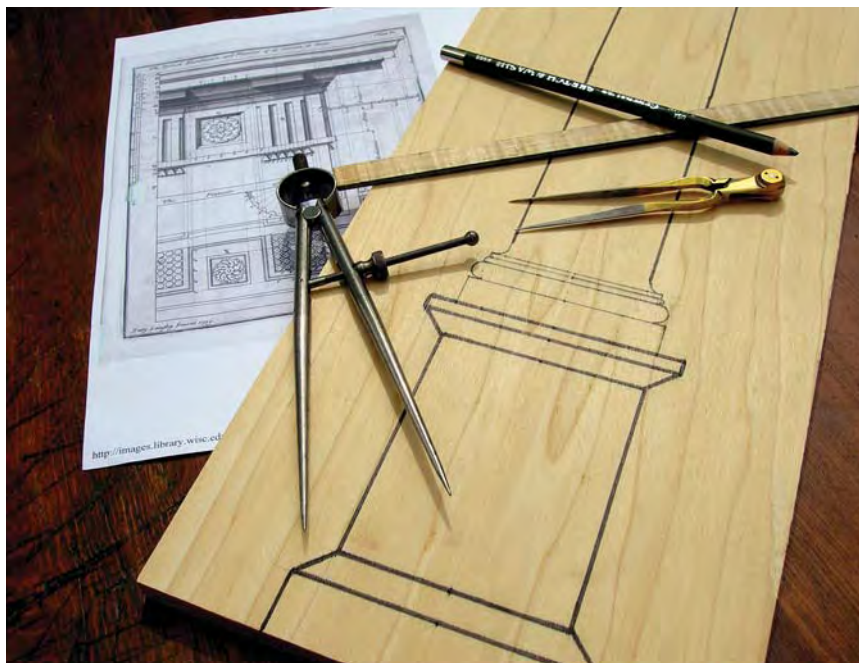
Woodworkers also have a number of toys to play with. We can have fun with carving, marquetry, figured grain, colored woods, stains, textures, finishes...the list can go on and on, but what really ties everything together is proportion. It's the one factor that determines whether a design succeeds or fails. Looking back to the 18th century, we might think era artisans went overboard with carving and embellishment, but design literature of the day was quick to point out that no amount of carving or glorious figured wood could make up for bad proportions.

Regardless of whether you aim for something sleek and clean, or you push your carving skills to new heights, it's all for nothing if you don't get the proportions right. For many years I felt perplexed by these cornerstones of good design – proportions seemed like a secret code no one bothered to explain but everyone agreed was important. And this begs the question: How can a woodworker master proportions?

Like Riding a Bike

First, becoming fluent with proportions is nothing like learning multiplication tables or following a recipe.

Mastering proportions is sort of like learning to ride a bicycle or getting good at casting with a fly rod. No matter how much you've read or how well a mentor coaches you, that effortless balance on two wheels or a silky smooth cast can



Learn by hand. Good news if you learn better by doing than listening – your hand can teach your eye much about proportions.



Standard order.

This drawing of a Corinthian order is one of five standards that artisans drew and studied to develop the eye.

never fully be captured with words or formulas.

An understanding of design is one of those things you best gain by doing, by putting your hands and eyes in motion. So how did our woodworking ancestors learn about proportions? The answer is they learned to ride a bike...well, sort of. For many centuries, a woodworker's version of riding a bike was to draw and study something called the classic orders.

The orders are iconic forms from architecture that are self-contained proportional symphonies. Just as musicians study and play well-composed music to develop their ears, the orders were revered for their ability to unlock imagination and inform judgment. This was such a part of traditional training that cabinetmaker Thomas Sheraton complained he could not get investors

CONTINUED ON PAGE 20



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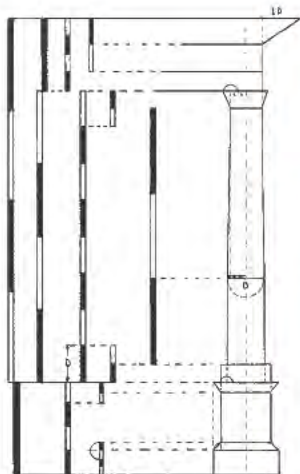
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Block for height. Block in the big parts of the overall height with dividers.

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to finance his furniture design book unless he included a section on the classic orders. Obviously, his backers felt the text wouldn't be taken seriously without them.

A mentor once explained to me that many things we want to learn just won't sink in until we are ready. We need to arrive at a place where our minds can receive.

The process of learning about proportions can be like that. Much of what you try to take in will not click until your imagination is ready to fit the pieces together.

That's what drawing the classic orders does—it readies your imagination

like a gardener preparing soil before planting seeds.

A Doric Assignment

So here is your first assignment. Visit my website and download a PDF file with the details of a Doric classic order: byhandandeye.com/product/diy-poster-classic-order.

Print out those details and use them as guides to draw a version of your own. I'd encourage you to draw this order on a clean board approximately 10" wide and 3' long.

Using a straightedge and pencil, establish a top and bottom for your drawing and mark out a centerline that spans

much of your board's length. Drawing this order has a sequence similar to the process of working up any design: You establish the overall height of the form first, then flesh out the major parts. Use dividers to step off the vertical boundaries of the big parts, such as the pedestal below the column (it's one-fifth the overall height), then step off the heights of the other major parts.

Once the boundaries of these major parts are established, you can divide the column height into eight parts. This

gives you the column's diameter (signified on the guide drawings by the letter D), which is also a proportional module echoed throughout the entire form. Use this module to draw a key at the bottom of the drawing, stepping off the module into halves, quarters, thirds, etc.

This can be helpful for filling in small design details. Once the vertical heights are established, step off the horizontal parts. After you have the overall form stepped off, you can begin to flesh out the order's detailed parts, starting with the biggest and working down to the smallest.

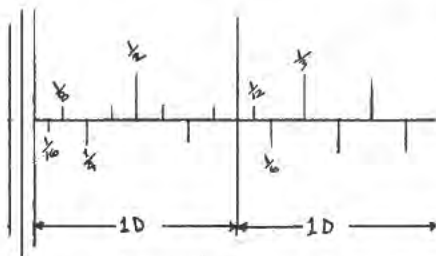
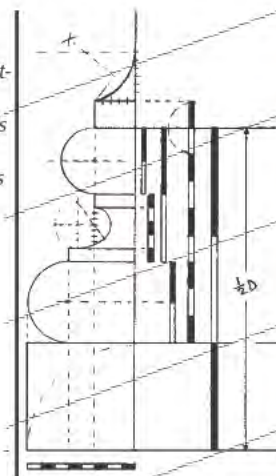
Establish your lines using a pencil, then go back over everything with a felt marker. Don't fret if you flub it up—just plane your board clean and start anew.

You're sure to take a tumble or two, but that's all part of training your imagination to see how proportions are intertwined. And once your drawing is complete, you can proudly hang it on the wall of your shop.

Batty Langley, a writer of some popular guidebooks for workers in the 18th century, recommended drawing each order a half-dozen times. Just like value studies for painters, this exercise can be your gateway into the world of proportions. **PWM**

George is the author of two design DVDs (Lie-Nielsen Toolworks) and writer of the Design Matters blog.

Proportional clarity. Once you get comfortable with proportions, details such as these base mouldings will become clear.



The module key. A module is one proportion woven throughout a design. This key helps break up the whole into smaller parts.

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Design Matters dives into the basics of proportions, forms, contrast and composition to give you the skill to tackle furniture design challenges with confidence.

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Shrink Pots: A Touch of ‘Magic’

These traditional Swedish cylindrical forms are an addictive pastime.

I have too much to do. Building a shop by hand, in my spare time, is slow-going. Add in custom work, teaching (and the travel that goes with it) and spoon carving, and my days are pretty full. It's a good feeling, knowing there's plenty to do, but what happens when inspiration comes along? I can't just tell it to leave me alone because I'm busy.

I recently taught at the Plymouth Center for Restoration Arts and Forgotten Trades' (CRAFT) first-ever Greenwood Fest. This was a three-day event filled with demonstrations, classes, impromptu sessions and general camaraderie surrounding various green woodworking crafts. We had a host of instructors from the U.S., England and Sweden.

While I should be working on shingling the roof of my shop or making the furniture some of my clients are waiting for, I'm too inspired to focus. So today, I took some time to start more shrink pots. “Shrink whats?”

Shrink pots. These little (usually) cylindrical boxes are another piece from the Swedish traditions that are the source of my spoon-carving.

Cylindrical Section

Take a small sapling, crosscut a section and bore a hole through it end-to-end. Then with various knives, hollow the inside walls of the pot. Then cut a groove on the inside, just above the bottom edge. Scribe and cut a thin, dry, bottom board. Pop it in place and stand back. The cylinder shrinks onto the bottom, then you have a pot.

I choose a fresh blank that has no knots, branches or other disturbances in its grain. I tend toward the softer spoon-carving woods; lately for me that's birches: grey, yellow, black. I've done some in American sycamore, too.



Shrink pots: deceptively simple. Bore then carve the green interior, pop a dry bottom in place, then wait. (And perhaps add a few decorative touches and a lid.)

I then crosscut the blank, usually at both ends to remove any checking or hairline cracks on the end grain. I mount the workpiece upright in a bench vise, then bore a hole all the way through from end to end. I use a large auger, 2" in diameter. When the lead screw pokes through the bottom end grain, I flip the piece end for end, then bore from the bottom to where the holes meet. Then I go to work hollowing the insides.

I keep the bark on while I work the piece; it makes it easier to grip than if you peel the bark off. To hollow, I typically use spoon carvers' hook knives. (Some use a Sloyd knife, others in-cannel gouges.) I hold the knife vertically and wrap the pot onto it, then turn the knife counterclockwise in my right hand and the pot clockwise in my left.



Boring bit. Use a 2"-diameter auger bit to remove the bulk of the interior waste.



Wrap cuts. My hands turn in opposing directions as I hollow the interior with a hook knife.

Cutting the groove is the most difficult part. Some make a sort of croze, like the tool coopers use to fit barrel bottoms. I usually just score a pair of lines that will define the upper and lower edges of this groove, then, using the tip of a Sloyd knife, cut out a half-V-shaped groove.



Get in the groove. After scoring the defining edges of the groove for the bottom, I use a Sloyd knife to remove the waste between.



Pop in place. With a bit of pressure, pop the bottom in place to align with the grooves. Then wait for the pot to dry and shrink around the bottom.

A Dry Bottom is Better

The bottom board needs to be a dry bit of wood. I use whatever scraps I have around, again leaning toward softer rather than harder stuff. Because the shrink pot is an irregular shape, making the bottom can be a bit challenging.

I dress the bottom board to about $\frac{3}{8}$ " thick, then stand the pot on its upper face and scribe around the inside of the pot onto the bottom. I sometimes make a registration mark that gets me back to the same orientation when it's time to test-fit the bottom.

I have cut the shapes out with coping saws, turning saws and hatchets and knives. All these methods (and others) work. Once the bottom is cut to shape, I bevel the underside so that the piece is thin enough all around its edge to more easily slip into the groove on the inside of the pot.

But it takes a bit of wrangling and fussing to get the bottom to fit inside



Shaped bottom. Scribe the shape from the pot on a $\frac{3}{8}$ "-thick dry piece of wood, then cut it to shape. Bevel the underside with a knife. Bevel the bottom of the pot too.



the cylinder. You need to press and pop it up from the bottom, and when it just lines up with the groove, quit. Set the whole thing aside and wait for the pot to shrink onto the bottom. It's like magic.

De-bark & Decorate

Often this is the time I remove the bark. My carving knife, followed by a spokeshave, gets the outside surface shaved to where I'm happy with it. But as is usual for me, it's not done until decorated. I lean toward a chip-carved treatment for these. Some I have painted first, then carved through the paint for a bold look.

Like the bottoms, lids require some fussing. These are made from a thick piece of dry softwood, carved to include a flange inside the pot, and overhanging the lid beyond the pot's rim. With a knife, carve a handle that attaches to the lid with a wedged through-tenon.

Watch out, these can be quite the rabbit hole. I was warned about the tendency to make way too many of these. I thought, "Not me...." But I soon had a couple dozen shrink pots in various stages, and ideas for more. Inspiring stuff. **PWM**

Peter has been involved in traditional craft since 1980. Read more from him on spoon carving, period tools and more at pfollansbee.wordpress.com.

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Danish Modern Campaign Chest

BY CHRISTOPHER SCHWARZ



Built to move (and to last), this piece blends classic proportions and clean lines.

When the British Empire began taking over the world in the 18th century, one vexing problem at its tropical holdings was the monsoon season. When it hit, applied carvings and ornaments fell off the furniture, or the glue was consumed by insects.

Undeterred, the Empire developed a new kind of robust and unadorned furniture—what we now call campaign furniture—to hold the undergarments, brandy and books of the Empire's subjects in all four corners of the globe.

What is most interesting about campaign furniture is how it inspired many early 20th-century makers to create Danish Modern and other contemporary styles that were extremely well made but unencumbered by ornament.

This chest of drawers explores that link between the 19th and 20th centuries by starting with pre-Industrial proportions for chests of drawers and stripping away everything that is not needed.

Like most campaign chests, all the pulls and lifts are flush to the carcass, though in this case they are cutouts backed with darkened brass. Also like campaign chests, the entire thing breaks apart to be moved easily to a new apartment (or tent in the desert). But unlike 19th-century campaign furniture, this chest embraces contemporary joinery to make the chest a cinch to build.

How it Goes Together

The two carcasses are joined with Festool Dominos, though almost any other carcass joint will do. I've built many traditional campaign chests with full-blind rabbeted dovetails. You might also consider biscuits or dowels.

The exterior panels are made of quartersawn white oak. The interior panels are pine or pine with a strip of white oak glued on the front edge. This construction saves on weight and expense. The backs of the carcasses are captured in grooves in the tops, bottoms and end pieces. Once the two car-

cases are assembled, they stack on top of one another. To keep the top carcass from sliding around, it rests on dowels sticking up from the bottom carcass. Gravity does most of the work.

The plinth, or base, is simple. Two strips of wood are screwed to the underside of the lower carcass. The four legs—tapered octagons—are friction-fit into holes bored in the strips.

Like the case, the drawers are also built using Dominos, with the drawer bottoms captured in grooves. All in all, it's a surprisingly quick project to build, especially if you own a Festool Domino. Begin by gluing up any panels you might need for the tops, bottoms, ends and dividers in the cases. Cut these casework pieces to finished size and prepare to cut the grooves for the backs.

Grooves: Stopped & Through

The grooves that hold the back are $\frac{1}{2}$ " wide and $\frac{1}{4}$ " deep. The grooves in the end pieces run through from end to end without stopping. The grooves in the top and bottom pieces, however, stop about $\frac{3}{8}$ " from the ends so the grooves don't show when the case is assembled.

As you study the cutlist and draw-

ings, you'll see a subtle difference in the way the backs go into the grooves in the top carcass versus the bottom carcass. In the top carcass, the back can be slid into the carcass after it is glued up because the bottom of that carcass is a little narrower. On the other hand, the back for the bottom carcass is captured all around and must be inserted during assembly. The reason for this difference is cosmetic and prevents an odd notch from appearing at the back of the bottom carcass.

I usually cut grooves with a plow plane, but because these grooves are stopped, I turned to my plunge router. I chucked a $\frac{1}{2}$ " straight bit in the collet and clamped a fence to the work to guide the router's base.

The through-grooves in the end pieces are simple to make. But you have to pay attention when cutting the stopped grooves in the top and bottom pieces. It's easy to overshoot and groove the boards all the way through.

Before diving into the Domino joinery, it's best to make the half-moon cutouts in the ends that serve as chest lifts. Because there are 12 of these cutouts, I made a template from MDF to both mark and rout the cutouts. The



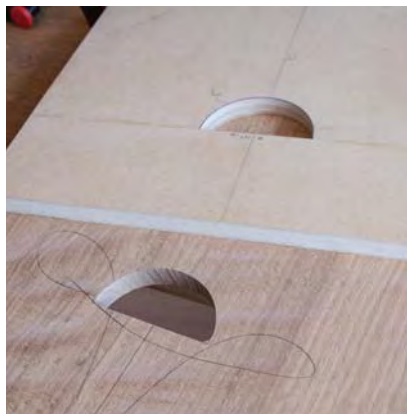
All the way through. The through-grooves in the ends of the carcass are easy to make with a router and a fence to guide the tool's base.



Stop here. When routing the grooves in the top and bottom pieces, you have to make sure the grooves do not go through the ends of the boards. I do this by eye because all this will be hidden in the glued-up carcass.



Mark & bore. Use your template to trace the half-moon shape on the work. Waste away as much waste as possible with a drill bit.



Then rout. Use the template to guide a router with a pattern-cutting bit to complete the shape.

top of the cutout shape is a straight line 4" long. The curve below is a 2" radius.

Use the template to mark the four cutouts in the end pieces. Then remove as much waste as possible with a Forstner or other drill bit. Then clamp the template to your end piece and use a pattern-cutting bit in your router to finish the shape.

Domino Joinery

Though I use traditional hand-cut joinery for most things, I cannot deny the Domino is a legitimate way to make excellent joints. I bought the machine for production work when it was first introduced and have been impressed with it. It is superior to a dowel or biscuit machine and produces a robust loose-tenon joint with ease.

For this piece, I used 5mm x 30mm Dominos to join the tops, bottoms, ends and the dividers between the drawers. I recommend at least five or six Dominos per joint.

Note the trickiness when it comes to attaching the bottom panel of the top carcass. It's $\frac{3}{4}$ " narrower than both the top panel and horizontal drawer divider. And it is captured between the end pieces. This small complication allows the finished piece to have only one horizontal drawer divider showing between the top and bottom cases. (See the "Detail – Second Drawer" illustration on page 28.)



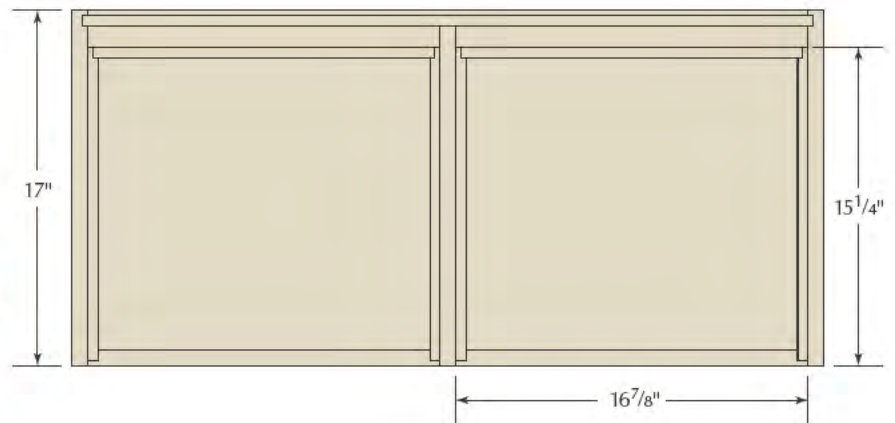
Into the end. Though this is a modern joint, traditional workholding is still my favorite way to keep the parts clamped to the bench.

Danish Modern Campaign Chest

NO. ITEM	DIMENSIONS (INCHES)			MATERIAL
	T	W	L	
TOP CASE				
❑ 1 Top	3/4	17	36	Oak
❑ 2 Ends	3/4	17	16 1/2	Oak
❑ 1 Bottom	3/4	15 1/2	34 1/2	Pine
❑ 1 Horizontal divider	3/4	16 1/4	34 1/2	Pine, oak edge
❑ 1 Vertical divider	3/4	16 1/4	7 7/8	Pine, oak edge
❑ 1 Back	1/2	16 3/4	35	Pine
LOWER CASE				
❑ 2 Top & bottom	3/4	17	36	Oak
❑ 2 Ends	3/4	17	16 1/2	Oak
❑ 1 Horizontal divider	3/4	16 1/4	34 1/2	Pine, oak edge
❑ 1 Back	1/2	17	35	Pine
TOP DRAWERS				
❑ 2 Fronts	3/4	7 7/8	16 7/8	Oak
❑ 3 Sides	1/2	7 7/8	15	Poplar
❑ 2 Backs	1/2	6 7/8	16 3/8	Poplar
❑ 2 Bottoms	1/2	14 3/4	16 3/8	Poplar
SECOND DRAWER				
❑ 1 Front	3/4	7 7/8	34 1/2	Oak
❑ 2 Sides	1/2	7 1/8	15	Poplar
❑ 1 Back	1/2	6 1/8	34	Poplar
❑ 1 Bottom	1/2	14 3/4	34	Poplar
BOTTOM DRAWERS				
❑ 2 Fronts	3/4	7 7/8	34 1/2	Oak
❑ 4 Sides	1/2	7 7/8	15	Poplar
❑ 2 Backs	1/2	6 7/8	34	Poplar
❑ 2 Bottoms	1/2	14 3/4	34	Poplar
PLINTH				
❑ 2 Base pieces	1 3/8	3	33	Pine
❑ 4 Legs	1 1/2	1 1/2	6 1/2	Oak



Divider trick. Use the drawer dividers as a fence to guide the Domino when cutting the mortises in the end pieces (left). Then turn the machine 90° and use the same layout marks to make the mortises in the drawer divider (below).

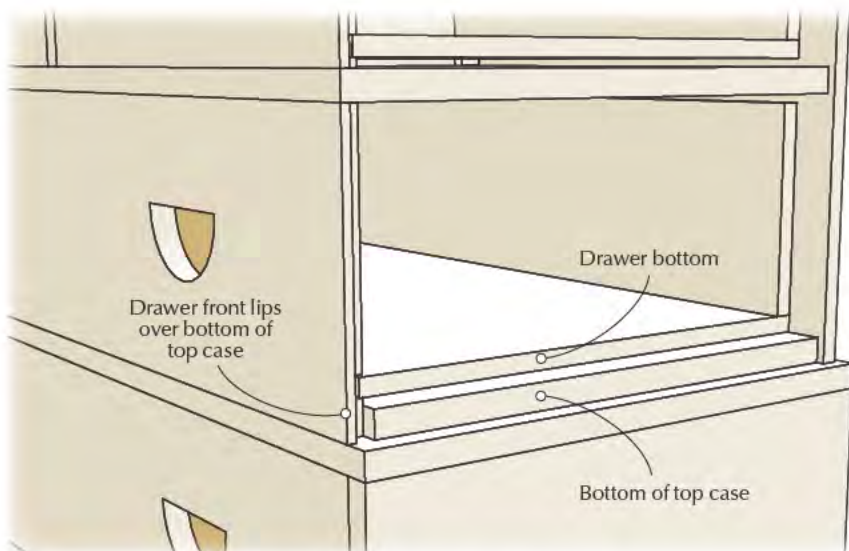


PLAN SECTION



PROFILE SECTION

ELEVATION



DETAIL – SECOND DRAWER

The trickiest part of the joinery for the case is the vertical divider between the two top drawers. The first hurdle is getting the drawer divider the correct height. Here's how: Once the horizontal divider is mortised, clamp up the carcass without glue. Place the over-tall vertical drawer divider up against the end piece and use it as a ruler to mark

the finished height with a knife. Saw and shoot the divider to finished height.

The last major operation before gluing the carcass parts together is to relieve the interior of the half-moon handle cutouts. This relief, which is made with a cove bit in a router, gives a place for your fingers to go when lifting the carcass.



Saw & shoot. Use the ends of the case to mark the finished height of the vertical drawer divider. Then saw and shoot to the line (traditional habits die hard).



"The details are not the details. They make the design."

—Charles Eames (1907-1978), American architect & designer

Assemble the Carcasses

Before assembly, use a smoothing plane to remove all the ugly machine marks from the panels.

While I used modern joints on this piece, I opted for traditional glue. Liquid hide glue is an outstanding glue for Domino, biscuit or dowel joinery. Unlike yellow glue, hide glue doesn't tend to swell and lock your joints—it's much more of a lubricant. It also sets up slowly (which is great when you work by yourself) and it is reversible (which is great when you mess things up by yourself).

Assemble the carcasses by working from the center out. Glue the horizontal dividers to the ends and clamp them together. Then add any other dividers, plus the top and bottom. After clamping everything together, check each carcass to ensure it is square.

The only big difference between the assembly process for the top and bottom carcasses is that the top carcass has a vertical drawer divider (the bottom carcass doesn't). And with the bottom carcass, you'll need to insert the cabinet back in place during assembly (as mentioned earlier). So don't forget to do that.

After the glue has cured, remove the clamps. Slide the 1/2"-thick back into



Get a grip. Use a cove bit set to make a 1/2"-deep cut to relieve the inside of the cutout.



Take your time. Using liquid hide glue allows you to take up to 45 minutes to complete the assembly before the glue sets. This makes for easy one-person assembly jobs.



Tape guides the way. I use blue tape to temporarily mark out where my nails should go. Then I re-roll the tape back on the roll to use it again.

the top case and nail the backs to the carcass members. I used 4d die-forged nails, which hold tenaciously but let the wood move without cracking.

Domino Drawers

I think it's been about 15 years since I made a drawer without using dovetails. But after much thought, I concluded

that a drawer made with Dominos could be incredibly strong. And I came up with an easy method that requires little layout or tricky cuts.

Here's an overview: It begins by making a simple rabbeted drawer and gluing it together. The drawer front has $\frac{1}{2}$ " x $\frac{1}{2}$ " rabbets at both ends. The $\frac{1}{2}$ "-thick drawer sides have $\frac{1}{2}$ " x $\frac{1}{4}$ "

rabbets cut on their back ends. Then, to hold the $\frac{1}{2}$ "-thick bottom, make $\frac{1}{2}$ " x $\frac{1}{4}$ "-deep grooves in the drawer sides and drawer front.

Glue up the drawer. After the glue is dry, use the Domino to cut 5mm x 28mm-deep mortises through the drawer sides and into the drawer front and drawer back. Glue in 5mm x 30mm Dominos and cut them flush after the glue dries.

This creates, for lack of a better word, a through-Domino joint, which works much like a "pin and crescent" joint – also called a Knapp joint.

First cut all your drawer parts to finished size and check them against your glued-up carcasses to ensure they fit into their drawer openings. Make the cutouts for the drawer pulls and rout the coved relief on the inside – just like you did on the ends of the carcasses. Then cut all the rabbets and grooves for all of the pieces. Then assemble the drawers with glue and clamps.

After the glue has cured, level the joints and bevel off the top rear corner of the drawer sides. This makes it easier to insert the drawer into the carcass.



Drawer parts. Here you can see the rabbets and grooves that make up the drawers. I'm smooth-planing the drawer back before assembly.



First, glue alone. Assemble the drawers with glue and clamps – no nails, screws or Dominos. The glue alone will hold the parts together for the Domino joinery later.



Drawer detail. Make this bevel with a chisel. The bevel (plus the fact that the drawer back is a bit narrower) makes for a drawer that's easy to operate and insert into the carcass.



Plunge in. The Domino cuts a deep mortise through the drawer side and drawer front.

Note also that the drawer back isn't as tall as the drawer sides. This detail makes the drawer easier to close.

Now fit the drawer bottoms into the drawers and secure them with a couple 4d nails through the bottom and into the drawer back.

Cut the Drawer Mortises

With the drawers assembled, you can cut the 5mm x 28mm mortises for the Dominos in the finished assemblies. I used four Dominos at each front corner of the drawers with three at each back corner.

Clamp the drawer to your bench with the drawer front facing up. Then lay out and cut the four mortises at each corner. If you own the Domino Support Bracket, which attaches to the under-



Drawer stops. My drawer stops are $\frac{3}{16}$ "-thick poplar, which was scrap from making the drawers. Tack the stops in place with $\frac{1}{2}$ " brads.



Paint the Domino. Use plenty of glue. I paint glue in the mortise and on the Domino. Glue is cheap; broken drawer joints are not.

side of the machine, this is the time to use it. The bracket will reduce the chance of the machine tipping down, ruining the joint.

Now paint glue on the Dominos and hammer them into the joints. Here I used yellow glue. Why? I was out of hide glue. When the glue dries, cut the Domino flush to the drawer side and plane things smooth.

Now the Details

Fit the drawers with a plane. Once they move smoothly, tack some drawer stops in the carcass to keep the drawers in place when closed. I opted to have my drawer fronts $\frac{1}{16}$ " recessed from the front edges of the carcass. This hides small errors and prevents you from having to flush up any irregularities



A hole to pilot you. A $\frac{1}{16}$ " pilot drilled through both carcasses makes it easy to drill the 1"-diameter holes for the dowels. (The little block of wood? It's covering the flutes on a countersink bit – the only $\frac{1}{16}$ " bit I have with a hex shaft to fit my right-angle drill.)



A flush finish. A flush-cut saw makes quick work of removing the extra 2mm protruding from the drawer sides. A plane finishes the job.

over all the drawer fronts.

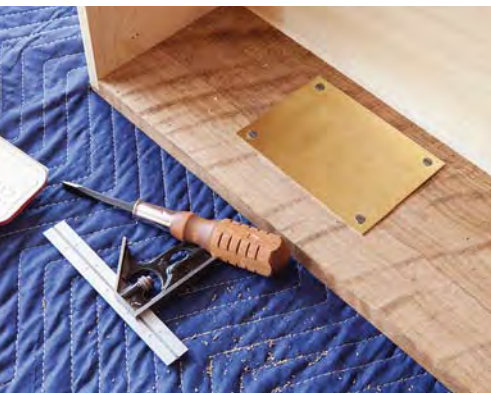
The next detail is connecting the top case to the bottom carcass. As mentioned before, this is done with two 1"-diameter dowels that stick up from the bottom carcass that nest into matching holes in the underside of the top carcass. Here's how to make that happen with almost no measuring:

Clamp the top carcass to the bottom carcass so they fit as flush as possible. Now mark on the bottom of the top carcass where you want your dowels to go – about 2" in from the ends and 3" in from the front is fine. Drill a $\frac{1}{16}$ " hole through both carcasses at each of these marks. Now unclamp the cases.

You can now use these $\frac{1}{16}$ " holes to guide the tip of your 1"-diameter Forstner bit. Drill $\frac{1}{2}$ "-deep holes in



Follow the pilot. Put the tip of your Forstner in the pilot hole and drill $\frac{1}{2}$ " down. Keep the drill as plumb as possible.



Brass backplate. I considered mortising these into the inside of the drawer front, but that wouldn't have left enough space for your fingers to get into the coved area between the backplate and drawer front.

the underside of the top carcass and the top of the bottom carcass. Cut two bits of 1"-diameter oak dowel to about $\frac{7}{8}$ " long. Glue those into the holes in the bottom carcass. If you drilled the pilot holes plumb, then the top case should drop on the bottom case with a nice thunk.

If it doesn't, rasp the dowels until things fit nicely.

The last detail before leaving the carcass is to add the brass backplates to the cutouts in the drawer fronts. I used $\frac{1}{16}$ "-thick brass and painted the front black. You can use wood, of course, but I wanted the fingers to find the cool and smooth brass inside the pulls.

I cut the brass to size with a hacksaw and filed the edges smooth – you don't want lacy underwear to catch the corners. Then cut clearance holes and countersinks in the brass – all of this can be done with your woodworking tools set to slow speeds.

Screw the brass in place with #8 x $\frac{5}{8}$ " screws.

The Plinth

I experimented with several plinths before settling on this simple one. The second-place plinth used 5" rubber casters that were affixed to $\frac{3}{4}$ " x 5" x 5" blocks on the underside of the carcass. It made the whole project easy to move.

The first-place plinth is also easy to make. It consists of two base pieces that are $1\frac{3}{8}$ " x 3" x 33". I beveled the ends at 14° then bored $1\frac{1}{8}$ "-diameter



Plane to taper. Mark the final diameter on the underside of your legs using dividers. Plane down to that line.



Tight fit. Screw the two base pieces of the plinth to the carcass from inside the case. Then fit each leg tightly into its mortise.

through-holes near the ends for the legs. Then I screwed the two base pieces to the bottom of the carcass.

The legs are $1\frac{1}{2}$ " x $1\frac{1}{2}$ " x $6\frac{1}{2}$ " long octagons. I turned a tenon on the end of each leg to match its mortise, and I made the tenon a tight friction-fit. Then I planed the octagons so they tapered to $1\frac{3}{8}$ " at the floor.

I wanted the legs to fit tightly so friction would keep the legs in place while the piece was being used. Yet you can remove the legs with a good tug to move the piece. If you want more holding power, consider embedding a rare-earth magnet in the top of each leg and at the bottom of each mortise.

Finishing

The finish is simple. I used a black aniline dye to color the plinth. Then I sprayed two coats of super-blond shellac on all the parts (sanding lightly between each) and added a coat of beeswax thinned with linseed oil.

The finished piece was intended to be a spec piece that I could sell to help

pay my daughter's college tuition. But my wife, Lucy, liked it so much that she claimed it for herself. She doesn't much look like the British Empire's Queen Victoria, but (like Victoria) she gets what she wants. **PWM**

Christopher is the editor at Lost Art Press, a contributing editor to this magazine and author of the book "Campaign Furniture," among others.

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Art of Concealment

BY MATTHEW DWORMAN



This table hides your laptop,
jewelry and other small valuables
in plain sight.





Go for looks. In a small piece like this table, consistency of color and grain is important. Luckily, I was able to get all the body parts out of a single board. I mark out all the parts on the board in chalk and rough the parts out on a band saw.



In sequence. The drawer front, top and bottom rails are sequentially ripped from the same board for consistency of grain pattern, but the drawer face is planed $\frac{1}{16}$ " thinner to create a shadow line when assembled. I marked a cabinetmaker's triangle on the parts before separating them from the board.

Hidden compartments—just saying those words puts a smile on the face of most woodworkers. There is something magical about a secret space that reveals itself to only the person who knows about it. Since the origins of furniture, hidden compartments have been used for storing valuables, documents and other important belongings. With modern safes, security by obscurity is no longer commonplace. Finding it both fun and challenging, designing and building hidden compartments has become my specialty, and I incorporate hiding spots into nearly every piece I make.

I integrate them in one of two ways: either taking advantage of an otherwise wasted space, or designing into an area that appears to be structural, but isn't. In this seemingly simple Shaker-style table, we will use some trickery from the practice of magicians—misdirection and illusion—to do both. The end result is a hidden compartment that is unlocked by pressing a button hidden

in plain sight. A door pretending to be an apron falls open to reveal it, and a secret drawer masquerading as a front rail provides additional storage.

Legs & Layout

After surfacing and cutting the carcass pieces to final size (note from the cutlist that there are several different thicknesses required), start on the legs.

Lay them out, marking the sides that will be tapered, and mark the lo-

cations for the dados that accept the lower stretchers. With stretchers and tapered legs, it's easy to get mixed up. I mark out in big bold letters which sides get tapered and where the dados go.

It's much easier to cut the dados for the stretchers before the legs get tapered. Set up a $\frac{3}{4}$ "-wide dado stack, and with a crosscutting sled cut $\frac{3}{4}$ "-deep dados. (After tapering the legs, the dados will be only about $\frac{3}{16}$ " deep.) It's also easier to cut the mortise for the stretchers now, though not critical.

Next, taper the legs. I use a simple tapering jig, ending the tapers about 7" below the top of the leg. The aprons will be $6\frac{1}{2}$ "-wide, so this leaves room to clean up sawblade marks with a hand-plane and bring the taper up to $6\frac{1}{2}$ ".

The right rear leg will contain the locking latch for the side compartment. The catch is operated by pressing on what appears to be a peg from a pegged tenon, but is in actuality a free-floating dowel operating as a small plunger that engages the hidden elbow-catch.

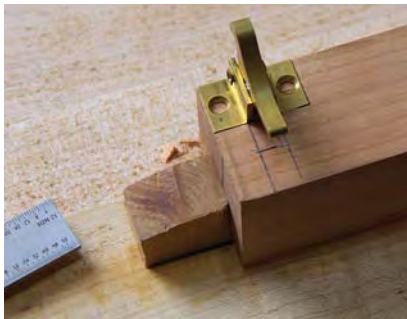
Begin by marking out its location inside the leg, and mortising for the base. This is not much different than mortising out for a hinge—quick work with a marking knife, chisel and small router plane.

Once the base of the catch fits nicely, mark out a recess to accept the body of the catch itself, and remove enough material to house the catch's main body at the hollow chisel mortiser. Because



Quick cuts. A crosscut sled with a stop block makes quick work of dadoing the legs. Then a simple tapering jig helps me to taper the legs.





Catch layout. Mark the location for the catch, using the catch itself as a reference to set a marking gauge and router plane.



Cut the recess. Hollow out a recess for the catch at the mortiser, allowing just enough room for the body of the catch itself.



Hack it off. Brass cuts easily with a hacksaw. Mark it, cut it, perfect fit.

the opening is on two sides of the leg, cutting from both directions creates a clean bottom.

The tail on the catch is longer than what is needed to operate it, and I don't want to remove more wood than necessary from the leg, leaving too much weak end grain. Brass is easy to cut, so I mark the catch with a Sharpie and cut off the extra catch length with a hacksaw.

Next, drill for the dowel. I've found that small Miller dowels are perfect for the catch release; they are stepped and the shoulder creates a perfect stop for

the dowel that prevents it from escaping the leg. Mark the dowel location and drill a hole at the drill press from inside the catch mortise, using a Miller dowel bit. Enlarge the hole slightly with a twist bit from the outside of the leg, just large enough to allow the dowel to slide freely.

I use a bench hook and a backsaw to safely cut the tiny part to fit. Using a shooting board allows me to remove a few shavings at a time from the length until it mates precisely with the catch. I want it to just touch the catch. If it is too long, it will create too much ten-

sion, and it won't operate smoothly. Too short, and it will not extend back into position. Sand one side of the dowel's shoulder flat to let it register against the catch.

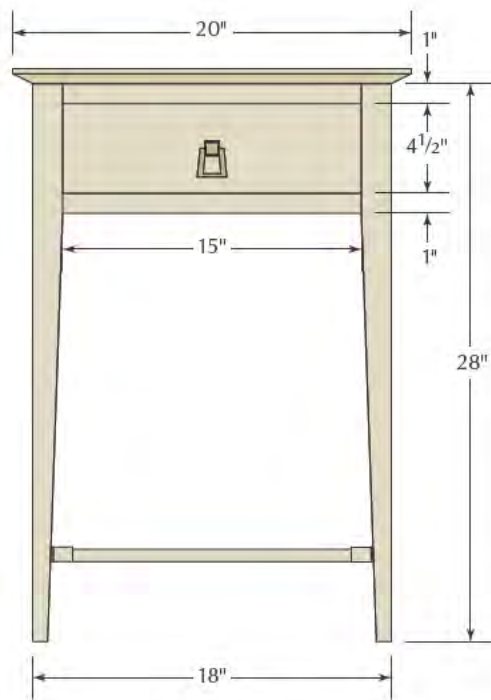
The table would look pretty funny with just one peg in one leg, so drill holes in the remaining legs to match, to make it look as if the aprons are joined to the legs with pegged tenons. The location of the Miller dowel in relation to the catch will now determine the layout and location of the faux pegs in the remaining legs. A little misdirection, and abracadabra – a lock release

Side Table with Hidden Compartment

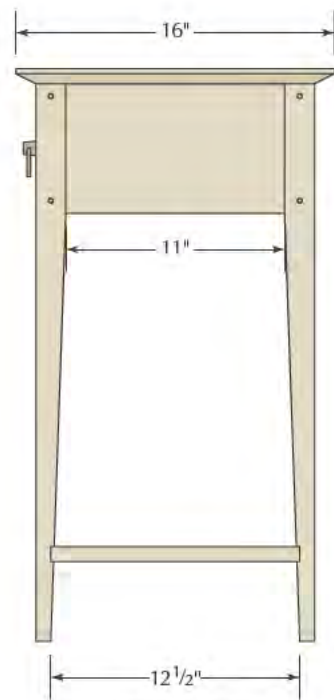
NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL
		T	W	L	
❑ 1	Top	7/8	16	20	Cherry
❑ 4	Legs	1 1/2	1 1/2	28	Cherry
❑ 1	Back apron	3/4	6 1/2	15	Cherry
❑ 1	Inner (hidden) apron, left	11/16	6 1/2	11	Cherry
❑ 1	Inner (hidden) apron, right	11/16	4 3/4	11	Cherry
❑ 1	Inner (hidden) top rail	5/8	2	15	Cherry
❑ 2	Outer side aprons	3/4	6 1/2	11	Cherry
❑ 2	Outer front rails	3/4	1	15	Cherry
❑ 2	Lower shelf stretchers	3/4	2	12 1/2	Cherry
❑ 1	Lower shelf	11/16	7	14	Cherry
❑ 2	Drawer runners	3/4	1	12 1/4	Cherry
❑ 1	Drawer front	3/4	4 1/2	15	Cherry
❑ 2	Drawer sides	1/2	3 1/2	12 7/8	Maple
❑ 1	Drawer back	1/2	3 1/2	15	Maple
❑ 1	Drawer bottom	3/8	12 1/2	13	Cherry
❑ 2	Hidden drawer sides	3/4	1	12 1/4	Cherry
❑ 2	Hidden drawer front/back	3/4	1	13	Cherry
❑ 1	Hidden drawer bottom	1/4	11 1/4	13	Baltic birch ply
❑ 1	Hidden compartment bottom	1/4	12 3/16	15 1/2	Baltic birch ply



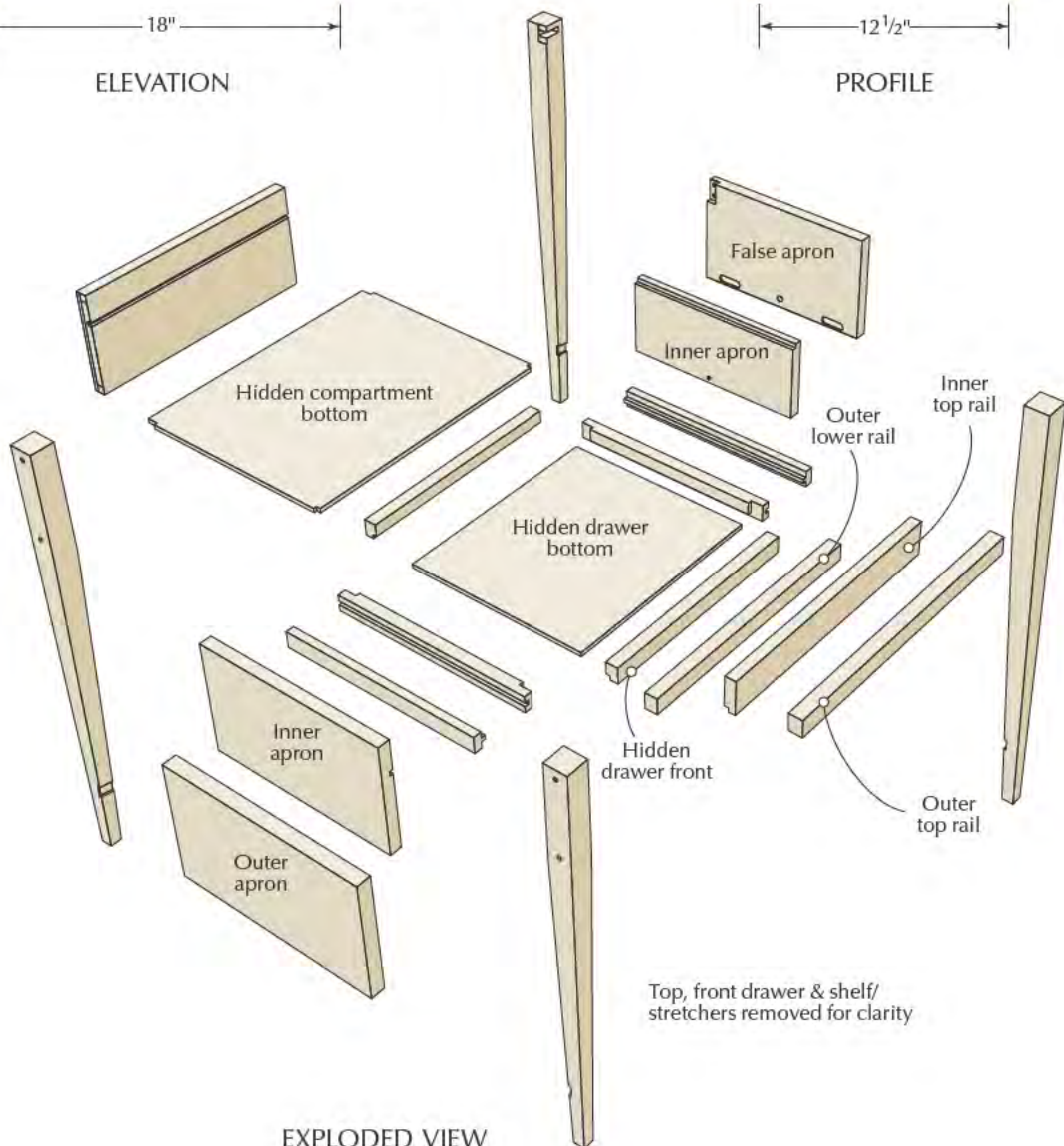
Catch-release hole. Drill a hole for the dowel from the inside, then enlarge it slightly from the outside.



ELEVATION



PROFILE



EXPLODED VIEW



Confirm fit. Check that the dowel fits freely, and stops securely. I use a bench hook to safely cut it and a shooting board to trim it to perfect length.



Soss hinge gains. I mark out the locations with a pencil, using a marking gauge to mark the centerline. Then drill out the mortises and clean the shoulders with a chisel.



hidden in plain sight.

Drill the holes, insert dowels with a dab of glue, and trim them flush with a flush-cut saw.

Soss Hinges

Now you need to mortise the right inner (hidden) apron and false apron to accept a pair of Soss hinges. These are beautifully engineered hinges that can be completely hidden and flush when closed—but they allow for zero adjustment. In this scenario, if the hinges are off by even 0.010", the false apron will bind and not operate. To compensate for a less-than-perfect fit, create room for adjustment in the mortises by making them about $\frac{1}{16}$ " wider than necessary; that allows $\frac{1}{32}$ " adjustment in either direction.

Mark out the locations with a pencil, use a marking gauge to mark the centerline, and drill out the mortises at the drill press using a Forstner bit. Clean up with a chisel and check the fit.

Put it Together

With all that fiddly stuff out of the way, we can finally get on to some assembly. Though I used loose-tenon joinery for this table (Festool Domino), there is no reason you can't use traditional mortise-and-tenon joinery (just adjust the lengths of the rail aprons accordingly).

Cut $\frac{1}{4}$ "-wide x $\frac{1}{4}$ "-deep grooves in the inner left apron and back, and rabbets of the same size in the inner right apron and inner top rail to accept a piece of $\frac{1}{4}$ " Baltic birch plywood that will become the base of the hidden compartment. (I recommend Baltic ply because it is good quality and super stable.)

Now mortise for the inner side aprons, back and inner top rail. Place the mortises for the back apron to leave a $\frac{1}{16}$ " reveal at the rear, and mortise for the other parts to make them dead flush with the legs' inner faces. You'll add the false outer rails and aprons to these later. The front rail is 2" wide and acts to secure the plywood compartment



Faux pegs. Drill holes for the faux pegs, insert the dowels with a dab of glue, and trim them flush with a flush-cut saw. (For the dowel that acts as a button, insert it from the inside, and trim it flush while pulling it tight.)

bottom. But a 2"-wide front rail would look funny, be out of proportion and possibly give away the location of the hidden compartment; so to hide this set it flush with the back of the front legs, and later glue a 1"-wide false rail to it. When the drawer is closed, there appears to be only a 1"-wide rail, and nobody is the wiser—presto-chango. As the Doctor says about the Tardis, "It's bigger on the inside than the outside."

Notch out the corners of the plywood to fit around the legs. After the glue dries, attach the front rail and back apron to one of the side assemblies, spread some glue in the grooves, slide in the Baltic birch base and clamp up the carcass.

Check everything for square, and



Side assemblies. These glue-ups reveal that all is not as it will seem.

"What the eyes see and the ears hear, the mind believes."

—Harry Houdini (1874-1926),
American illusionist

securely clamp the plywood to the rabbet in the front rail. Let that assembly dry, then glue the upper false front rail to the inner top rail.

Next, attach the lower shelf-and-stretcher assembly. I do this after assembling the carcass because things always tend to shift a little bit during glue-ups. I want the openings for the drawer and hidden compartment to be perfectly square, and without a rail below the drawer opening, there is still enough flex to move things around. Once this lower assembly is installed, everything locks up securely. I left the stretchers a little long so that I could tweak them with a shooting board to a precise fit. This allows me to spread the legs a tiny bit to widen the opening for square (if necessary).

Once you've checked and fit everything, glue up the stretcher/shelf assembly, apply a few drops of glue in the dados then slide the stretcher in from one side, persuading it gently with a mallet. Again, check everything for square, make any further adjustments, and clamp it until the glue dries.

With some Miller dowels still on hand, I used four of these to toenail the stretcher rails to the legs. Be careful doing this—if your angle is wrong, it is easy to go through the top of the rail or the leg (don't ask me how I know this... ugh). Once it's all dry, smooth plane the rails flush to the legs.

Hidden Drawer

Next, make the drawer runners—which have two purposes. Cut a $\frac{1}{4}$ " x $\frac{1}{4}$ " tongue on one side to mate with a groove that will be in the hidden drawer. Cut the runners to length, then glue and clamp them in place, flush with the bottom of the aprons. Then cut the parts for the hidden drawer to length, and cut a $\frac{1}{4}$ " x $\frac{1}{4}$ " rabbet to receive another piece of Baltic birch ply for the drawer bottom.

Cut rabbets on the ends of the



Clamp it up; check for square. Use cauls to prevent clamp marks on the legs. Once the carcass is dry, glue and clamp the false rail in place.



Add the shelf. Attach the shelf to its stretchers (I used Dominos), then slide the stretchers into their dados. I secured them from underneath using leftover dowels as wooden nails.

drawer sides, then glue and clamp up the drawer.

With that still in the clamps, I use more Miller dowels to secure the rabbets in the drawer sides to the drawer front and back. This is a tiny drawer and certainly doesn't need dovetails. Flush things, and once everything has dried, cut $\frac{1}{4}$ " x $\frac{1}{4}$ " grooves in the sides to mate with the tongues on the run-

ners. Check for a smooth fit, and attach the false front, which will pretend to be a lower rail. Use a shooting board to fine-tune the fit, and clamp it in place while the glue dries.

With the body of the table now complete, turn your attention to the drawer. Having left the parts a little oversized, I trim them to fit the opening with a shooting board, plow a groove for the



Runners. Glue and clamp the runners flush with the bottom of the aprons. The tongue will also mate with the hidden drawer.



De-square. Placing a small shim (a couple shavings) under the board, or between the board and the fence, allows me to intentionally plane the door out of square and trim it to fit, one shaving at a time.



Place & drill. Put the hinges in the mortises, and use a Vix bit to drill for screws.



drawer bottom, and lay out the parts for dovetails.

This drawer goes together a bit differently than most because the front has a 1" lip above the drawer sides that conceals the inner top rail. I mark the tails, then use the tails to lay out the pins on the drawer front, making sure that they are dead flush to the bottom. Taper the drawer bottom at the table saw (in effect, you're creating a raised panel), and assemble the drawer. Plane the sides flush, and slide it into the opening to keep everything square while it dries.

Complete the Assembly

Despite your best efforts, the side will almost always be a hair out of square—not enough to be visible, but enough to prevent the side false apron from opening freely. Again, I use a shooting board to remedy this. Placing a few shavings as shims under the apron creates a small back bevel. A shaving or two in between the apron and the fence will present it to the plane a fraction of a degree out of square. You need a gap that is large enough to allow the door to open freely, but small enough to not be seen. The

best result is one that is only a few thousandths of an inch wide. The only way to achieve this is with a shooting board, removing one shaving at a time.

With the false apron fit, it's time to install the Soss hinges. Because of the little slop in the mortise, the false apron can stay where it needs to be without any pressure on the hinges. Use a self centering Vix bit to drill the holes for the screws, and test-fit again.



Strike. Mark out the size with a knife, and mark the locations for the screws with a small center punch. Drill them out with a countersink bit, and cut the strike to size with a hacksaw (or metal cutting blade on the band saw). File the edges, then sand the surface smooth.

SUPPLIES

Lee Valley Tools
leevalley.com or 800-871-8158

1 ■ Small Miller dowels, walnut
#41K32.24, \$15.50/40

1 ■ Soss hinges, 1/2"
#00H02.02, \$19.30/pair

Rockler Woodworking
rockler.com or 800-279-4441

1 ■ Elbow catch
#10893, \$6.99

MSC Industrial Supply
mscdirect.com or 800-645-7270

1 ■ .064" x 2" x 12" brass strip
#54055306, \$11.52

Prices correct at time of publication.

The false apron door is now fit, but you need to install a strike plate for the elbow catch—and the strike that comes with the catch (see Supplies) will not work in this application. So I make one from some 1/16"-thick brass stock. You'll need two more of these as cleats for the leather lid stay, so make three.

With the false apron in place, mark out the location of the catch on the top, and mortise for the brass plate. I use a small router plane again, allowing me to sneak up on the perfect fit. But before you install that plate, chop a small mortise behind it—just enough to allow clearance for the catch to grab the plate's edge (two chops with a chisel at most).

Next, drill a 3/16" hole through the side of the inner apron and into the side of the hidden drawer about 1/2" into the



Strike install. One of three little brass pieces is the catch for the false apron's latch.



Drawer lock. A brass rod acts as a lock for the hidden drawer. Mark its length, cut it to size, and chamfer the ends using a small file and a drill, guiding it with a hole drilled in a piece of scrap. Mark where it ends on the inside of the false apron, and drill a hole, then countersink the rim.



side. Insert a $\frac{3}{16}$ " brass rod to act as a lock for the drawer, mark it, protruding about $\frac{1}{2}$ ", and cut it to length with a hacksaw. Chamfer the end by drilling a $\frac{3}{16}$ " hole through a scrap of wood to act as a guide, chuck the rod in a cordless drill and spin it through the hole while holding it against a small file. Clean it up with some fine sandpaper.

Mark its location inside the false apron, bore a $\frac{3}{8}$ "-diameter x $\frac{1}{2}$ "-deep hole with a Forstner bit, and chamfer the rim with a countersink bit. This allows the false apron to close with the pin in place. (To access the hidden drawer, open the apron and pull the pin.)

A strip of leather prevents that false apron from swinging open too far when opened; it's attached at either end with those two additional brass cleats – a simple little solution.

Finally, it's time to cut the top to final size. I opted for $1\frac{1}{4}$ " overhang and a

20° , $1\frac{1}{8}$ "-wide underbevel, cut at the table saw with a tall auxiliary fence. Clean up the bevels with a handplane.

The top gets attached with a cleat screwed to its underside that has three Dominos that fit into mating mortises inside the back apron. Two screws through the bottom of the front false rail lock the top in place, and the Dominos allow it to expand and contract.

Finishing Touches

If you've smooth-planed each part along the way, there's little clean-up needed. Go over everything with #180-grit sandpaper as needed, then apply a finish. I used three coats of lacquer, sanding between coats.

After adding a polish with some wax, I installed a hand-cast bronze pull to complement the wild curly cherry grain. Two brass bullet catches installed in holes drilled under the top rail act as stops for the drawer so that it can't

easily be removed and expose the hidden drawer.

This small table is simple in style, and beautiful in form, but complex in construction, with double the number of parts as a comparable table without the secret compartments. But my hope is that you can see from this example table that incorporating a secret compartment or two into your designs can be as simple as utilizing some wasted space behind a rail. Looking at this table, nobody would ever guess that there are two good-sized compartments hiding in plain sight. If you build one, it's up to you to keep the secret. **PWM**

Matthew is the chief gadget officer at QLine Design, where he designs and builds custom furniture, specializing in the art of concealment.

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WEBSITE: See more of the author's work at qlinedesign.com.

CLASS: Take a class on incorporating hidden compartments with Matthew Dworman at the Marc Adams School of Woodworking in May 2017.

VIDEO: Take a video tour of this table.

PLAN: Download a free SketchUp model of this project.

IN OUR STORE: "A Winchester Desk: Joinery Inside & Out," by Jeff Headley and Steve Hamilton.

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Protect your feet. A $\frac{1}{8}$ " x $\frac{1}{8}$ " chamfer around the bottom of all the legs protects the feet from chipping as you move the table.

Cabriole Legs by Hand

BY ZACHARY DILLINGER

You don't need a band saw to shape these classic furniture gems.

Readers of this magazine are no doubt familiar with the cabriole leg. One of the hallmarks of the Queen Anne and Chippendale styles of furniture, the cabriole is a complex curved surface that can be a daunting task to the hand-tool only woodworker.

Compound curves are among the most difficult things to pull off for those of us who pretend it is 1725 and the band saw hasn't yet been invented, but craftsmen of the period pulled it off, and we certainly can do the same today.

I've tried a couple methods. One is based on making curved cuts with bowsaws, coping saws and frame saws to cut the compound curves close to lines drawn on the leg blank using a template. The other—the one detailed in this article—calls for making straight cuts that approximate the tangent line of the curves, then shaping and smoothing the curves with drawknives, rasps, chisels and scrapers.

In my experience, cutting the curves with a bowsaw takes more time than

cutting straight lines with a rip saw and, because you have to shape and smooth the resulting blanks either way, I choose the easier and faster roughing-in method. A good rip saw is the quickest way to accomplish this task in my hand-tool only shop.

Just as important as the speed and efficiency of this method is the joy it brings. It is truly a pleasure to take a roughly sawn, angular blank and transform it into a smooth, sinuous surface with little but your own fingertips and eyes to guide you.

Stock Prep

As you know, it can be time consuming to achieve with hand tools an absolutely flat, completely square surface that is parallel with the opposing surface at some exact thickness. But this is usually an unnecessary use of your time if you become familiar with the concept of reference surfaces.

A reference surface is simply a face or edge (you need one of each) on which you focus your time and effort. You need to rely on those surfaces being flat, straight and square to each other. Mark those edges with a pencil once they're prepped, and those surfaces are the ones from which you take measurements or lay out cuts or joinery. The success of your project depends on your ability to make and use your reference face and edge correctly.

For my project, I started with a wide plank of 12/4 walnut and resawed the blanks at about 3" x 3" x 18³/₄"—that's 3" longer than the legs, but after saw-





Curves to the corners. Orient your leg blanks so the curves radiate like ripples in a pond; this will locate a pleasing grain pattern at the knee of the cabriole.

ing to lengths, those 3" offcuts are set aside for use as knee blocks; that way, the grain and color will match.

For cabriole legs, what will be the inside faces of the legs are your reference surfaces, because this is where the joinery for your project will be. So take your time and verify these are as perfect as possible. Choose the leg orientation so that the curve of the end grain faces the outside corner.

The outside two faces of each leg blank require little to no planing – just enough so that you can draw on them with a pencil. Those faces will be sculpted away while shaping your legs.

Now saw your leg blanks to final length (and don't forget to save those offcuts).

Layout

Prepare a template in 1/4"-thick pine or something else sturdy that's easy to shape with hand tools. (You'll use this template for the layout on both reference faces on all the legs for your project.) Draw your own, or use the "Leg Pattern" shown at right, which is for the Queen Anne stool in my book "Saw, Plane & Chisel" (Popular Woodworking).

Cut out the template with a bowsaw and smooth to the line with rasps, files and sandpaper.

Now place the template on one of your reference faces, with the rear of your template flush with the corner between the two reference faces.

Trace around the template with a



Corner meeting. To lay out the curves, align the back of your template with the interior corner of the blank (that's your 90° corner) and trace.

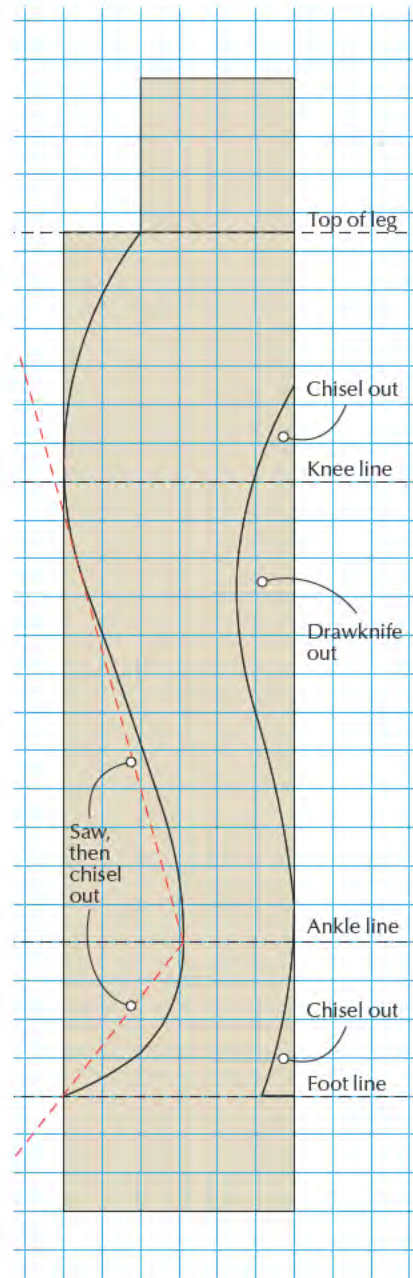


One down. Here's one leg with the layout complete; now mark the others.

pencil or white charcoal – whatever will be easy to see on your stock. Remove the template and flip the blank 90° so that the other reference face is up; flip the template over, and align the same template edge with the reference corner.

Next, using a marking gauge (set to 2" if you're using the leg for my footstool), bring the squared portion of the leg across the top end of the blank to mark the square top of the leg (where the joinery gets cut).

Again, trace around the template. Now the leg shape is defined on both reference faces, with the front curve pointing away from the square corner



LEG PATTERN
One square = 1/2"



Make a shelf. Pare a small shoulder at the start of the diagonal cuts (at the foot and knee). That gives your saw something on which to register as you begin your angled cuts for rough stock removal.

between reference faces.

Repeat these steps on the three remaining blanks, taking care to run your marking gauge fence along one of the two reference surfaces.

You also need to mark across both reference faces the widest location of the knee, the ankle and the top of the foot. Note that with the exception of the joinery block (because the four must match), I locate these lines by eye; minor variations say “handmade.”

Connect the knee line with a diagonal line that meets the ankle line about midway on the outside faces of the leg. Connect that point to the line at the top of the foot. (See the “Leg Pattern” on page 41; the dotted lines indicate the layout lines.)

Rough it Out

Now you’re ready to start roughing out. Use a chisel to pare a small shoulder at the knee lines and foot lines (see above); this will make it easier to start your saw at an angle. Now use a rip saw to remove most of the waste on both faces from knee to ankle, and ankle to foot.

Use a crosscut saw to cut $\frac{3}{4}$ " deep at the knee lines, then sketch the desired curve on both faces from the edge to the bottom of your saw cut to indicate



Define the foot. Cut to your angled line with a rip saw to rough out the foot.

the back of the knee. Use a chisel bevel down to remove the waste, following those pencil lines.

This should be done evenly on both reference faces, or the leg will look lopsided – but if you make a small mistake

here it can be evened out during the rest of the process.

Now remove the remaining waste on the back of the knee – I like to use a drawknife bevel-down to remove the wood quickly as I cut smooth curves.

This completes the rough stock removal.

Fair Your Curves

Every corner of the leg must now be rounded off to some extent, beginning with the ankle and foot transition. To guide your work, mark a centerline on each face at the ankle (I like to use white charcoal for this, because it’s easy to see).

On the two front faces, continue the line up the ankle toward the knee, keeping the line approximately the same distance from the front corner. Draw another line up from the ankle to the knee, parallel with the back of the leg. This line should be roughly half the ankle’s thickness in from the back face of the leg. Next, draw a line half-way between one of the edges and the closest parallel line, then do the same on the other side of your centerline.

Each face gets four guidelines.



Stop cuts. These crosscuts will provide a “stop” for your chisel as you use it to round off the backs of the legs.



Chop. Use a bevel-down chisel to rough out the curve on the back of the legs behind the knees. Then fair the curve with light cuts.



Clamp the leg in a pipe clamp and then secure the clamp in your face vise. Use a cabinetmaker's rasp to bevel off all four corners on each leg, using the innermost lines as your guide.

As you work, make sure you keep the bevels even along their lengths. Once you have the initial bevels done, smooth them with a fine-cut rasp to make them round, working to the second set of lines drawn on each leg face.

Make each corner of the leg a smooth radius without facets, utilizing a mill file and scrapers if necessary to achieve a fair curve.

Finally, use the round side of the file to smooth the curve of the ankle into the foot.

Foot Options

Using my cabriole leg approach leaves the foot block square at the end of the leg. That means you can now choose just about any type of foot: ball-and-claw, slipper, pad or trifold can all flow from the block. Cut your feet of choice. The original footstool upon which my legs are based featured a rather crude version of the classic trifold foot, so that's what I reproduced. (See "Simple Trifold Feet" at right for a pictorial overview.)

Knee Blocks

Knee blocks are the final pieces to complete your cabriole legs; these small but important pieces of wood fill in the space between the leg and the bottom of the rails (in my project, the seat rails). Now grab those leg-blank offcuts you set aside earlier.

In a piece like my footstool, the grain of the knees should run vertically to match the grain in the legs themselves. Saw the blocks on a diagonal, leaving a flat of about $\frac{3}{8}$ " at the top and bottom.

Locate the reference face on the matching block blank, then hold that face to the inside face of the right front leg, with the end of the block flush against the bottom edge of the seat rail. Trace the shape of the knee onto the side and front surface of the knee blocks.

Using the traced lines as a reference, remove most of the waste on the front face of the block with backsaw and chisel cuts before rounding it off close



Guidelines. Four lines on each face will guide your rasp work as you shape the leg corners.



First bevel. Here's the leg with the first corner beveled to the outermost guidelines on two faces.



Second bevel. Here's the leg with the first bevels faired to the second set of lines, resulting in a rounded profile.

SIMPLE TRIFID FEET

With a square foot block remaining after shaping the cabriole legs, you can choose any foot shape you like. But here's how I carved the simple trifid feet for my Queen Anne footstool – which replicates the vernacular look of the original from which I reproduced my copy. —ZD



1 Template. Cut a template out of a thin piece of stock, then trace that shape on the bottom front corner of the foot. Carry the lines up the sides and top of the foot.



2 Stop cuts. Make shallow backsaw cuts to define the toes.



3 Carve. Use an in-cannel gouge to define then cut the round shapes between the toes.



4 Define. Round off and undercut the toes, then fair the transition from the ankle to the foot.

"Always I have had more regard for the form and good construction ... than their decoration, which, as I already said, is rather arbitrary and subject to many changes."

—André-Jacob Roubo (1739-1791),
from "l'Art du menuisier"

Fair curves. Except for some minor tool mark removal and smoothing, the legs are shaped; it's time to carve the feet.



to the line with a rasp. Glue and nail the block in place and allow it to dry before continuing. Repeat these steps for all eight knee blocks.

Once the glue is dry, the final shaping of the knee blocks can begin. Because you did most of the shaping already, it is simply a matter of removing a small amount of wood to get the blocks and legs to flow together smoothly. To

do this, I like to use a paring chisel (as deadly sharp as you know how to make it) diagonally across the grain to smooth the glue line between the block and the leg.

I shape the bottom of the block in the same manner, before scraping or sanding.

This style of block is quite simple compared to later styles – a smooth

convex curve that connects the cabriole leg to the bottom of the seat rails.

Most of the work is done with a rasp and guided by eye, but make a template if you don't feel confident in your ability to do this without a guide. However you choose to proceed, make the bottom curve smooth, both to the eye and to the touch.

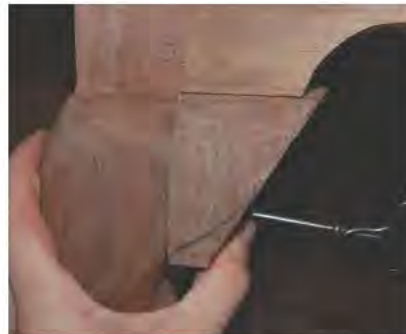
A Series of Steps

I hope that you take away at least two things from this article. The first is that it is important to always seek the least labor-intensive method to accomplish a task. This applies no matter how you like to work (power tools, hand tools or both). The second is that, no matter how complex or difficult a task seems, it is possible to accomplish it using the technology of the past if you think logically and break things down into simple steps. After all, they did it then. Wood is still wood and tool steel is still tool steel. The only variable is you. **PWM**

Zachary is the author of "With Saw, Plane & Chisel: How to Build Historic American Furniture With Hand Tools." Visit his website at theeatoncountyjoinery.com.



Matched offcuts. The offcuts from your legs can (and should) be used to make the knee blocks. Cut them on the diagonal, and keep each set together and with the leg from which they were sawn.



Pilot. Use a gimlet to drill a pilot hole for a nail. The nail will help hold the knee block in place while the glue dries.



Glue then round. After shaping the top of each block to match the curve at the top of the knee, glue and nail them in place.



Smooth transition. This leg is done, except for final smoothing and finish.

ONLINE EXTRAS

For links to all online extras, go to:

■ popularwoodworking.com/nov16

WEBSITE: Visit the author's site to see more of his work and read his blog.

ARTICLE: "Trio of Trifids," by Chuck Bender.

ARTICLE: Christopher Schwarz uses a powered approach to cabriole legs in "Creole Table."

VIDEO: "Carve a Pierced Ball and Claw Foot," by Alf Sharp.

IN OUR STORE: "With Saw, Plane & Chisel: How to Build Historic American Furniture With Hand Tools," by Zachary Dillinger.

Our products are available online at:

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From Redwoods to Red Brick

BY CATHRINE O. FRANK

Brendan Bernhardt Gaffney: Ruler of Ancient Rules

At burnHeart, in a converted textile mill on the banks of Maine's Saco River, Brendan Bernhardt Gaffney rifles through a box of stainless steel "lady legs" (a.k.a. "Dancing Master" calipers) that were laser cut in a shop up the road. Overhead, lengths of Maine maple share space with other local woods that will become the Krenov-style cabinet he's finally begun or the standard edition of his sought-after line of rules.

"To have a business where I can go to the guy who cut down the tree, and then speak individually with every person buying them and make the thing myself is such a nice, complete picture of making things," he says. If it's a picture that taps into the vogue for holistic approaches to production, independent business models and, of course, craft, it also marks the junction of Gaffney's diverse experiences.

The DIY Student

Making things is second nature to Gaffney, whose family includes an artist, poet, weaver and woodworker. "We've had a woodshop my whole life," he says. This thanks to his dad who, before finding a career in advertising, worked "all sorts of funny jobs" across Staten Island, including a stint in a puppet shop. "I grew up around people making things," Gaffney says. "That was always going to be some angle of

***A modern maker.** "I've always had this idea that whatever it is I'm going to be studying, I want to be making it."*



Well-read. “I have as many books about trees and forestry as I do about woodworking because it’s such a cool part of the process.”



what I was interested in doing.”

After high school, Gaffney attended Skidmore College where, true to form, he designed his own major in “Sound,” bringing art, physics, neuroscience and computer science to the study of music. In his master’s work in computer science at the University of California, San Diego, he worked on programming and designing both physical and digital musical instruments. “I’ve always had this idea that whatever it is I’m going to be studying, I want to be making it,” he says. Opportunities were not lacking: He built analog synthesizers and worked as the “wood guy” for the San Diego Fablab, a community fabrication space.

But building prototypes for other entrepreneurs left him wondering, “When do I get to make things?”

Still in California, he applied to College of the Redwoods (CR) and spent a year making his tools, working on that “fair curve” and confirming “wood was my medium.” He returned to New York and spent four months at the manufacturer and retail store Tools for Working Wood where, as a woodworker among machinists, he talked shop with customers and gained experience in marketing and sales along the way.

Equal parts wanderlust and desire for his own shop pushed Gaffney to Maine, where he worked for a violin and guitar maker. Working with a luthier offered “the wonderful marriage of woodworking and music” and, even more, the “small, delicate, nice work” he was looking for.

A Series of Good Ideas

Gaffney’s interest in making unique woodworking tools dates to his time at CR. “I was in love with this,” he says of making those first planes. “As much as making the cabinets was exciting, making the tools to make the cabinets was really fulfilling. And then using the tools you’ve made – it’s such an awesome, holistic thing to take that full journey.”

But as a business venture, tool-making was something of a pipe dream. His first line of “period correct antique rules” – the Japanese kanejaku is nothing if not “small” and “delicate” – began as “a fun idea” to share on social media, but when the first run sold out in a half-hour, Gaffney realized, “This is not necessarily a one-time, funny, art design project.”

Joining the kanejaku are an Egyptian cubit and span and a Roman cubitus. Based on well-researched, well-established sets of measurements, these “rulers of the ancient world” (the pun is intentional) offer a unique point of access to their respective cultures.

Four thousand years ago, Egyptian builders would have used tools almost identical to ones used today, “other than the measurement system,” Gaffney explains, which goes some way toward explaining the rulers’ popularity. There’s an even split between buyers excited about having “a tangible object representing a system that’s 4,000 years old” and others who need it because they actually want to make a Roman bench.

Plus, they’re nice to look at and



Sound design. burnHeart’s logo recalls his days building synthesizers: a sine wave, triangle wave and square wave.

touch. Each is handplaned, hand-rubbed with India ink and French polished. The standard editions are made of local rock maple, and there is a limited edition in period correct woods: African blackwood (a form of rosewood the Egyptians took in “tribute”) for the cubit and span, Japanese cedar for the shaku (another name for the kanejaku) and European sycamore for the Roman cubitus.

Building on the rules’ success, Gaffney looked to Victorian-era tool design and the practice among woodworkers and machinists of ornamenting their tools. Enter the Dancing Master calipers. “Instead of putting up Playboys in the shop,” he explains, making little leg calipers may have been the most risqué thing they could do. Like the handwork that goes into the rules, he drills, smooths, polishes and rivets each set by hand.

Design, Craft & Mechanical Reproduction

Asked about his favorite tool, Gaffney answers immediately: handplane.



Hybrid approach. Though 90 percent of Gaffney’s work is with hand tools, he relies on powered machinery for roughing out and CNC for etching.



Research everything. The Egyptian measurement is based on a cubit rod taken from an architect's tomb. "Someone can hold my ruler up to the ancient artifact and say, 'Oh yeah, it's the same.'"

Planing is, he says, "Such a rewarding process versus sanding," adding that 90 percent of what he does – from making tools to building furniture – is handwork. But with multiple runs to fabricate, Gaffney is quick to point out how machines factor into production and design: band saw for ripping and rough dimensions, CNC for etching the rules and so on.

From his undergraduate major to his professional logo, Gaffney's love for design comes through. Turning an idea into a physical product is, quite simply, "so much fun." If the experience of making a cabinet has a downside for Gaffney, it's only that "you're realizing it once."

This is where iterative design comes in. By mixing modern tooling with

"When I was bound apprentice,
And learned to use my hands,
Folk never talked of measures
That came from foreign lands."

—William John Macquom Rankine
(1820-1872),
from "The Three Foot Rule"



Handwork. Gaffney trues an Egyptian rule using one of his handmade planes.

hand processes, he gets to "scratch the itch of making a cabinet." "The rulers are handplaned and I'm shooting the edges" – work he'd be doing on a cabinet, he explains – "but then I'm also etching them. I'm drawing on the computer and drawing by hand." With between 20 and 40 rules in each batch (and he's done seven so far), he gets to rethink and redesign, make a new tool to improve the process and ultimately improve the product. Idea, Produce, Sell, Reiterate, Redesign.

"It's part of that total process."

A Modern Maker

Using a plane he made himself, Gaffney smooths an Egyptian ruler. "As much as having the Egyptian ruler made in African blackwood tells a story about that culture, that ruler and that system, having the other rulers made in maple tells a story about me, my process and where I am," he says.

Having recently relocated to the red brick North Dam Mill, what's ahead for burnHeart? A Japanese elm dovetailed cabinet, for one. Now that he has his own shop, he's got the space to do it. He will continue his line of calipers, niche rules and custom rules (personal cubit, anyone?) and is also in conversations with furniture designers about devel-

oping tools specific to their projects – using André Roubo's copperplates, for example.

Taking furniture commissions, designing products for museum exhibitions, even experimenting with a line of tool lubricants using wood-derived oils – Gaffney loves the flexibility that independence brings but eyes the balance between "the romantic view of being a woodworker in a shop and the practicality of being self-employed." A regular process in itself, tool making is both "a nice way to support my more speculative projects" and integral to a larger search for sustainability. **PWM**

Cathrine lives in South Portland, Maine, where she's rehabbing an early 20th-century Cape Cod (it's full of antiques she's repaired and refinished).

ONLINE EXTRAS

For links to all online extras, go to:

■ popularwoodworking.com/nov16

WEBSITE: Visit Brendan Gaffney's burnHeart site at burn-heart.com.

BLOG: Christopher Schwarz gives a short history of measurement.

IN OUR STORE: "Measure Twice, Cut Once" ebook by Jim Tolpin.

Our products are available online at:

■ ShopWoodworking.com

Woodworking Excellence



Award-winning inspiration from the 2016 competition.

With so many excellent entries in the 2016 PWM Excellence Awards, selecting the Editors' Choice winners and Grand-prize winner was incredibly difficult. All the editors and contributors have different aesthetic tastes, and the excellent craftsmanship displayed in the top vote getters didn't help settle the discussions. In several cases the winner was chosen by a margin of a single vote; I wish I had room to also print the runners-up (and I will on our extras page at popularwoodworking.com/nov16). But choices had to be made, so here they are: the Grand-prize winner, and the Editors' Choice and Readers' Choice winners in each of our five categories.

— Megan Fitzpatrick



GRAND PRIZE

Circular Seating 10' diameter x 35" h

Alex Sutula
Cleveland, Ohio

Though many emulate the organic-looking joinery of Sam Maloof's work, to do so on a piece of this scale? Well, we found that impressive indeed. Plus, the seating so perfectly complements the space for which it was intended that we were convinced it was the winner. It was constructed in three pieces and was assembled on-site.

Alex Sutula became a full-time professional woodworker about eight years ago after graduating from the University of Dayton with a business degree. He figured it would be easier to start out in the craft he loves rather "than one day have to walk away from the financial security and stability a more traditional job would provide."

So he set up shop in a 400-square-foot garage in Cleveland and had moderate success selling work at art festivals around the region. He now shares a 900-square-foot shop, which gives him not only more space and access to more tools and machinery, but the luxury of someone off whom to bounce new ideas, he says.

"I build the way I do mostly out of fear... I am afraid a client would see a tool mark, a blotch of glue, inconsistent spaces, ill-fitting components and inquire as to why it is there? So I end up putting in a lot of time to make sure it's a polished piece inside and out," he says.

furnituremakerleveland.com

Instagram: [@furniture_makers](https://www.instagram.com/furniture_makers)



Companions & details. Sutula's piece exhibits clear DNA from the work of Sam Maloof, writ large. Sutula also designed and made side tables, and a central table with a live edge top, to accompany the circular seating piece.



Boxes & Smalls



EDITORS' CHOICE

Arts & Crafts Cedar Chest

20" d x 35³/₄" w x 21¹/₂" h

Phillip Schmidt

Los Angeles, California

Phillip Schmidt has his daughter to thank for his award-winning piece; she encouraged him to design his own furniture rather than continue to reproduce work shown in Wallace Nutting's "Furniture Treasury." So, drawing on inspiration from the Arts & Craft tradition (and in particular the designs of Charles and Henry Greene), he came up with this Honduran and African mahogany chest with ebony, basswood and .999 silver inlay. The floral inlay motif is a nod to the designs of Harvey Ellis, but was mostly inspired by a vase in Schmidt's house.

Schmidt caught the woodworking bug more than 50 years ago from a high school shop teacher and pursued the craft in his spare time when his day job in the aerospace industry allowed. Now that he's retired, he plans to take a few woodworking classes (because, he says, he has to catch up with his daughter's shop skills).

READERS' CHOICE

Jointer Plane

3¹/₂" w x 23¹/₂" l

Kenneth Bakley, Jr.

Sewell, New Jersey

Kenneth Bakley began "serious" woodworking (as he calls it) about 15 years ago with small boxes, then a portable writing desk, then a dovetailed step stool for his daughter. And when possible, he began making instead of buying tools when he needed them. Bakley has made his own mallets, marking gauges, a tool chest and bench, as well as a router table and drill press. And recently he began making planes, including a rabbet plane and this walnut, maple and mahogany jointer that features shop-made inlay.

But that's not all builds for the shop—he also puts his homemade tools to work; right now, Bakley is making a "Gwent" game table for a co-worker, based on the card game from "The Witcher" series by Andrzej Sapkowski.



Seating



EDITORS' CHOICE

Hans Wegner's 'The Chair'

30" d x 24" w x 20" h

Derek Cohen

Perth, Australia

Two of our judges called the execution of this copy of an iconic piece “perfect” – but what’s more astounding is that Derek Cohen did his with hand tools; the production versions were made with machinery and specialized jigs.

The only difference we can see is the seat; Wegner’s were caned (and some versions had solid seats), whereas Cohen used woven Danish cord (a material used in other Wegner pieces). It is a truly stunning homage to the influential Danish designer’s work.

Cohen, in addition to his work as a child psychologist, teaches hand-tool classes and has written a number of instructional articles, tool reviews and more. He’s also designed a full line of commercial marking knives that are made and sold by Vesper Tools.

inthewoodshop.com

READERS' CHOICE

Side Chair

18" d x 20" w x 40" h

Tom Hollis

Winston-Salem, North Carolina

Tom Hollis credits Lonnie Bird with much of his woodworking success, calling him “a spectacular teacher.” That success is on fine display in this walnut reproduction of an 18th-century Pennsylvania chair with a hand-carved shell motif and ball-and-claw feet, and a pierced and carved back splat.

Hollis, who has been a woodworker for 25 years, has designed and built a few contemporary furniture pieces, but says he’s most inspired and challenged by the curves and carvings of 18th-century furniture – a look he says feels timeless. A primary goal with every one of his projects, he says, is to stretch his skills by learning a new woodworking technique.

tomhollis.com



Tables



EDITORS' CHOICE

Art Deco Chess Table

24" d x 24" w x 34" h

Craig Thibodeau

San Diego, California

You've likely seen Craig Thibodeau's work (including this table) before; he wrote an article on its cove-moulded profile for *Fine Woodworking*, has had his work featured in numerous other magazines and has won many awards for his work, including grand prize in the 2016 Veneer Tech Craftsman's Challenge.

This stunning table is veneered in quartersawn walnut with a playing surface of walnut burl and holly veneer decorated with ebony and holly trim, and features a drawer for chess piece storage. The walnut-veneered legs are capped with holly feet banded with ebony string inlay to create a more delicate feel.

Thibodeau studied mechanical engineering in college and has taken woodworking instruction with Paul Schurch, Patrick Edwards and Brian Newell.

ctfinefurniture.com

READERS' CHOICE

Maloof Side Table

24"-dia. x 20" h

Jeff Clark

Elon, North Carolina

This tiger maple side table was inspired by the work of Sam Maloof, who Jeff Clark counts as a primary woodworking inspiration, along with Wharton Esherick, George Nakashima, Michael Fortune, Seth Rolland, Judson Beaumont and other modern notables.

After getting hooked by his father's restoration work and his eighth-grade shop class, Clark took a number of woodworking classes over the years, and served as vice president of the Piedmont Triad Woodturners Association from 2011-2014. He counts "rising to a challenge" among the things that drive him. So, with only a few woodworking classes under his belt, but after reading that a Maloof-inspired rocker was "one of the pinnacles of woodworking," he signed up for a course therein. "There were three of us taking the course and I was much too inexperienced and intimidated, as the others in the course were much more advanced woodworkers," he says. But he was the first to complete his rocker. That experience "provided the confidence that I can build anything based on a photo," Clark says.



Casework, Cabinets & Bookshelves

EDITORS' CHOICE

Half-scale William & Mary Highboy

11" d x 19" w x 32" h

John Bowling

Mechanicsville, Maryland

The only changes from the inspiration piece to this half-scale tiger maple and maple burl period highboy is the number and arrangement of the drawers in the top section, to emulate the smaller footprint of a spice chest. The brasses are from Londonderry Brasses.

John Bowling began woodworking as a teenager, working in the stair shop of his father's building supply and lumberyard. After graduating from the Roberto Venn school of Luthiery in 1998, he honed his precision skills as an acoustic guitar maker at Collings Guitars before turning to antique restoration.

Since 2007, Bowling has owned Dellabrook Woodworking & Restoration, where he builds on average about 40 pieces for customers per year (this highboy is one of them), along with restoration work.

dellabrookwoodworking.com



READERS' CHOICE

Cantilevered Night Stands

18" d x 16" w x 21" h

Richard Wile

Bedford, Nova Scotia

A custom metal bracket with slotted holes for movement is the magic behind these “floating top” figured-cherry night stands that Richard Wile designed for his son. The magic also captured the fancy of online votes – Wile is the overall winner in the Readers' Choice voting.

Wile has been an amateur woodworker for more than 30 years. Initially, he was drawn to 17th through 19th-century Western European furniture, but he's spent a lot of time in Europe recently and now finds inspiration in contemporary work – Danish modern in particular.

richard-wile.blogspot.ca



Turnings, Carvings & Objets d'Art

EDITORS' CHOICE

Flowing Fascination
20" d x 20" w x 47" h

James Duxbury
Graham, North Carolina

This cherry and maple floor-model kaleidoscope (that breaks down for portability and storage) has a 30°, 60°, 90° mirror system, 333mm eyepiece, interior lighting and a removable, oil-filled object cell. A crank arm rotates two sets of wooden gears turning the object cell, and features an 11-position locking elevation harp with 360° horizontal swivel. The fluted stand features a Celtic knot inlay.

James Duxbury, who first learned woodworking from his finish-carpenter father, was a sheet-metal worker, HVAC contractor and properties manager before “retiring” to his shop, where he turns almost every day. He also holds two patents, including one for his Resp-O-Rator, a mouthpiece respirator designed to function well even with beards, as with ear and eye protection.

duxterity.com/ec



READERS' CHOICE

Whitetail Woodlands
48" w x 36" h

Tom Kaldunski
Farmington, Minnesota

Tom Kaldunski designed the woodland theme for this piece, which uses 19 varieties of wood chosen for their various colors (along with some bark for texture) that range in thickness from 1" to 2". Each piece is individually cut and shaped, with special attention paid to grain direction to better evoke a natural look.

Kaldunski's first pictures in wood were painted plywood puzzles he made with his daughters. After inheriting some publications featuring the intarsia work of Judy Gail Roberts, Kaldunski was inspired to combine his furniture-making and puzzle skills and give it a try. He's made more than 50 works of intarsia since. Though he hasn't counted the pieces in "Whiteland Woodlands," he knows there are many. Each piece was handled at least eight times during his process, and he spent more than 220 hours on the project. **PWM**

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Contemporary Console Table

This slender table maximizes minimal space.

My family recently left our sprawling farmhouse for a compact ranch. We left our farmhouse-sized stuff too, and now we need new furniture. This little console table, under 4' wide and just more than 1' deep, fits nicely below a wall-mounted TV to maximize floor space, and the removable shelf provides valuable storage space.

Stock Prep

Four 47"-long pieces make the top and shelf. I bought two 1x8s, which is just enough but leaves little room for cutting off checks and cracks – consider buying a longer piece (but 8' is max for many vehicles). You'll also need two 6' 1x6 boards for the side, front and back aprons, as well as two 6'-long 2x6s.

To make the legs, crosscut one 2x6 to two lengths of 31 1/4" on the miter saw. Set a combination square at 1 1/2" and mark a line on the long edge. Align your jigsaw blade (or circular saw blade) to your mark, then align and clamp a straightedge with the edge of the saw's shoe. Rip four legs.

When the legs are ripped to width, bundle them together to decide on and mark your final leg orientation.

Next, cut two long aprons from the



Leg rip. Use a straightedge as a saw guide and rip four 1 1/2"-square legs from the 2x6s.

1x6 boards. Set a stop at 44" at the miter saw and chop both pieces to length. Cut the remaining 2x6 for the long stretchers to that same length.

Reset the stop to 11 1/2" and cut two short aprons from the remaining 1x6. Cut a 2x6 piece to the same length for the short stretchers.

To determine pocket-hole placement, measure and mark the center and 3/4" in from both edges on the inside of your apron faces. Drill three pocket holes on each end.

Now drill a line of pocket holes along the top inside edge of each apron: two on the short aprons, three on the long aprons. Ream the holes (wiggle the bit slightly up and down in long ones, side to side in short ones) to allow for seasonal movement of the top.

Rip the shelf stretchers to 1 1/4".

Finish-sand everything to #180 grit. It's easier to do now than after assembly.



Assemble Aprons & Chamfer

Using a combination square set to 1/4", mark a line, parallel to three edges, on both sides of each of your four legs for chamfers (small bevels). Leave the inside edges square.

The aprons are inset 1/4" on the legs, aligned with the chamfers. The inset presents a challenge in holding the aprons in the correct position for assembly, but here's a simple solution.

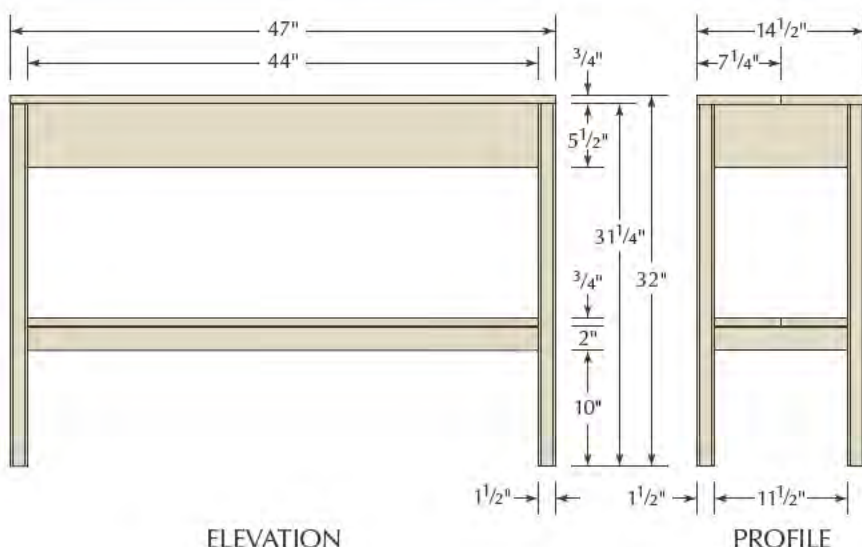
Start by assembling the end pieces. Clamp a leg in your Workmate, leaving



Pocket power. Carry marks up to over the jig top, then drill pockets at your apron ends.

Contemporary Console Table

NO. ITEM	DIMENSIONS (INCHES)			MATERIAL
	T	W	L	
❑ 4 Top & shelf	3/4	7 1/4	47	Pine
❑ 2 Long aprons	3/4	5 1/2	44	Pine
❑ 2 Short aprons	3/4	5 1/2	11 1/2	Pine
❑ 4 Legs	1 1/2	1 1/2	31 1/4	Pine
❑ 2 Long stretchers	1 1/4	2	44	Pine
❑ 2 Short stretchers	1 1/4	2	11 1/2	Pine
❑ 2 Battens	1	1	11	Pine



enough of it above the bench to secure F-style clamps to your workpieces.

Find a 1/4" thick scrap and cut two lengths for "keys." Put a scrap on each apron side and clamp to the leg face.

Drive screws into the pocket holes to secure it to the leg, then screw the second leg to that assembly. Do the



Keyed up. Clamp 1/4"-thick scrap "keys" on either side of the aprons as you secure them to the legs – these align the aprons with the layout for 1/4" chamfers.

same on the other end assembly.

Grab your long aprons (and a helper – this part gets a little tricky with just two hands) and attach them to the end assemblies.

Now chamfer the legs (you can do that before assembly, but it makes clamping them in place more difficult). Use a block plane to chamfer to your 1/4" pencil marks. You may, like me, end up working on the floor for a few of these angles – limber up first. The block plane won't allow a full 1/4" chamfer near the aprons, so chisel or sand to remove what the plane can't reach.

Stretchers & Top

Determine your stretcher placement (I went with 10" from the bottom), and cut a scrap piece to this measurement. Use this to lay out your stretcher locations on all four legs.

I secured the stretchers using a pocket hole on each end's bottom and inside edge. Remember to set your pocket-hole jig and bit for the proper thickness. Drill the holes, align the stretchers to your marks and secure them using appropriate screws (2" for the inside face, 2 1/2" for the bottom).

Choose the best-looking 1x8 for the top and lay it lengthwise on the base. Flush one end to a leg face, then mark the other end. That's the length of the top and shelf. Set a stop to this measurement and cut the two top pieces. Secure them to the apron through the pocket holes you made earlier.

Now cut the two shelf pieces to length, flush the ends and screw three scrap battens across the underside – one at each end, one at the center (ream these holes side to side too). Use a combination square to lay out the square notches at the corners, then cut them with a jigsaw. The shelf rests securely on the stretchers and is removable.

I chose a gel stain (it blotches less on pine) and topcoated with wipe-on polyurethane. Paint may look better but, after years painting barns and fences, I really wanted to see the grain. **PWM**

Rodney is managing editor of this magazine and can be reached at rodney.wilson@fwmedia.com.

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Our I Can Do That column features projects that can be completed by any woodworker with a modest (but decent) kit of tools in less than two days of shop time, using materials from any home center. Our free PDF manual explains how to use all the tools in the kit. Visit PopularWoodworking.com/ICanDoThat to download the free manual.

Brief History of Furniture Brasses

A concise chronicle of furniture hardware styles to help you build it better.

One question I am often asked is, “What hardware should I use?” And the answer is usually, “It depends.”

What did you build? Are you refinishing or restoring? Is your work an original or a reproduction?

Whether you’re looking to stick to tradition or break from it, I believe it’s helpful to understand the history behind the hardware – where it’s been and where it started – when selecting knobs and pulls for your pieces.

To provide a little more insight, I’d like to walk through the main historical periods of American furniture brasses. To keep things brief, I won’t get into hardware from other parts of the world (French and German hardware can be quite nice, though). I guess I could explore Shaker hardware, but I just don’t find wood knobs that exciting.

William & Mary

In 1660, England’s King Charles II had just come out of exile to reclaim his throne. (I should note that American furniture brasses, with the exception of the Craftsman style, originated in England.)

This period is known as “The Res-



250 years of hardware history. Pieces from Ball & Ball, Craftsman Hardware Company, Horton Brasses and Londonderry Brasses.

toration,” and we know furniture and hardware from this era as William & Mary style (they took the reign(s) in 1689). The style, at least in terms of hardware, was produced from about 1660 to the early 1700s, and was largely made of brass, with some occasional cast silver pieces.

William & Mary hardware and furniture were generally quite ornate, with features such as Dutch drops or teardrops paired with rosettes in a variety of patterns, from cast florals to hand-chased diamonds to the more subdued round rosettes. Drops were most commonly fastened with cotter pins, although some pieces were fixed

with posts and fingers to create cupboard turns.

Queen Anne

In the years to follow, the hardware world saw manufacturing techniques advance, resulting in shapes of greater detail – a style known as Queen Anne. The Queen Anne era ran from the late 1600s to about 1750. This was also the first time the now-iconic cabriole leg was used on furniture pieces.

Hardware of the era was delicately cast with decorative designs such as piercings or chasings on the face. The chasing patterns were small, decorative stampings, almost always floral, and applied with a hammer. Drawer pulls were typically fastened with either a post and nut or cotter pin. A short and stubby threaded screw was cast into a knob’s back – we refer to this as a breadboard screw, though technically it’s a hanger bolt.



William & Mary drop pulls. Delicate chased rosettes with drops mounted on cotter pins. Dutch drop by Ball & Ball, teardrop by Londonderry Brass



Queen Anne pulls. A pierced pull from Ball & Ball.

Chippendale

As we move into the Chippendale period, some of you might argue for

a variety of specific dates. That's understandable (there's certainly some discrepancy), but here I define the era as 1754 to about 1790 and note that the time periods overlap.

Thomas Chippendale was a man of many talents, most notably design, furniture making and writing. His book "The Gentleman and Cabinet Maker's Directory" defined the era of furniture and its metalwork, providing the definition we still use today.

Chippendale brasses are highly decorative brass plates, often called bat wing brasses, with delicate bails and posts. It is important to realize that in this time period, the metal itself was extremely expensive—a far greater production cost than labor. Larger pulls were typically formal and most commonly found on expensive pieces of furniture. Brasses were always hand-polished, as they better reflected light that way. In the days before electricity, evening lighting was at a premium, so brasses of all types served both form and function.

George Hepplewhite and Thomas Sheraton followed in Chippendale's footsteps. Hepplewhite's book "The Cabinet Maker and Upholster's Guide" (published posthumously in 1788) popularized a new, lighter design style with delicate inlay and curvilinear forms.

A few years later, Sheraton published a four-volume book called "The Cabinet Maker's and Upholster's Drawing Book." The publications were widely influential, and we have come to know the furniture and associated hardware as Hepplewhite, or Federal, style.



Various pulls. Chippendale in a high polish, an oval-shaped Hepplewhite and a typical floral Victorian, all from Horton Brasses.

The tail end of the 1700s and start of the 1800s saw development of new metal-working technology. Tool and die makers of the time were enamored with the fine detail they could now put into metal, resulting in the arrival of stamping as a metal-working technique. Toolmakers started producing beautiful stamped plates and knobs to suit the furniture inspired by Sheraton and Hepplewhite.

American tool and die makers tended toward themes celebrating patriotism (eagles and flags were popular), or imagery such as flowers and wheat that represented the New World's bounty.

It's my opinion that this style of hardware was the finest ever produced.

Victorian

Throughout the 1800s, both Chippendale and Federal styles experienced revivals, and as the West was settled, much of the furniture and hardware produced was utilitarian in nature. The next new period, however, was the Victorian era.

The motto for the Victorian period could have been "anything worth doing is worth doing to excess." Victorian hardware was highly decorative, with elaborate, flashy patterns stamped into very thin metalwork. This was the first era of mass-produced hardware, as thousands of these pieces were stamped, fitted to production-line furniture and shipped everywhere. A downside of mass production, of course, is the too-common drop in quality—a lot of junk got made at this time—but some pieces were quite spectacular. The Eastlake style in particular held up very well.

Craftsman, Arts & Crafts & Mission

What we now know as Craftsman, Arts & Crafts and Mission styles all began as rejections of Victorian excess.

Out went the pretty floral patterns and mass-produced pieces. Designers such as Gustav Stickley, Charles and Henry Greene and William Morris cre-



Authentic Craftsman style. Heavy metal with hammered surfaces made from solid copper and with a patinated finish. (Craftsman Hardware Company, Marceline, Mo.)

ated new, original designs that shared little (save joinery) with the past.

Patterns were typically made from heavy brass, copper and bronze, then hammered and patinated to a very dark finish. At the time, the idea was to let the work show but, ironically, this may be the first time period where the brasses were patinated to artificially create a new look.

So how does this all relate to you, the furniture maker? Knowing what came before can help guide your choices. This applies to joinery, finish and, of course, hardware. You can adhere to or break from tradition—either path can lead to success, but your work will always be better if you first learn your history. **PWM**

Orion has worked in his family's multi-generation hardware business, Horton Brasses (horton-brasses.com), for more than 15 years.

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About This Column

Learn what you must know to choose and install the perfect hardware on your woodworking projects.

Explaining Polymerized Oil

Simple in theory, not in the real world.

A reader of my blog (at popularwoodworking.com) asked me to explain what polymerized oil is. So here goes. On one level the explanation is incredibly simple and on another it's representative of all that makes finishing and finishes so hard to understand. Let's begin with a definition of polymerization.

It is nothing more than the way certain finishes, including oils and varnishes, cure – that is, change from a liquid to a soft or hard solid. Oils cure soft; varnishes cure hard. Polymerizing is simply crosslinking. A whole bunch of monomers, which are single molecules, attach themselves to each other chemically to form polymers. That's polymerization.

The most common way this happens with oils and varnishes is by oxidation. Oxygen enters the finish and causes the molecules to hook up, or crosslink. Metallic driers, which are often sold separately as “Japan drier,” act as catalysts to speed the drying. Boiled linseed oil and all varnishes, including polyurethane varnish, have driers added by the manufacturer. Raw linseed oil doesn't have driers added, so this oil takes a very long time to cure – often months, even with all the excess removed.

Tung oil, the other common drying oil besides linseed oil, doesn't have driers added by the manufacturer. But this oil dries rapidly enough so that it can function as a wood finish. The caveat here is that you have to be careful if what you want is really tung oil. Most of the products labeled tung oil are actually varnish thinned about half with mineral spirits (paint thinner). Instead of drying soft and slowly, they dry hard and much more rapidly. If a thinner is listed on a container labeled “tung oil,” the product is thinned varnish.

Three “polymerized” oils. The three oils that have some claim to being polymerized are too different to be thought of as a category.



It might help to make a distinction between oils and varnishes that haven't polymerized yet and oils and varnishes that have had something done to them by the manufacturer to start the polymerization. Using this distinction, we could create a category. Polymerized oils are those that have been partially polymerized so they will complete their curing faster when exposed to air.

The problem, as you'll see, is that this doesn't work well because the finishes claiming partial polymerization are too different to fit into a category. Nevertheless, this is the definition I'm going to use. Polymerized oils are those that have been partially polymerized – that is, cured – before they are put into the containers.

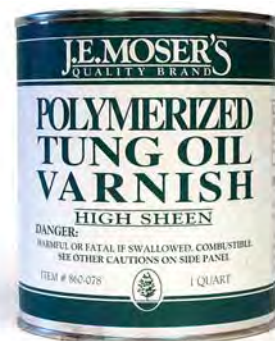
History

Back in the early days of the woodworking renaissance in the 1970s, the word “polymerize” was tossed around a lot, usually to indicate that an oil, most commonly Watco Danish Oil, cured or polymerized “in” the wood rather than “on” the wood. I remember myself

using the word with clients to impress them. I had no idea what I was talking about, but I was using Danish oil, and “polymerize” made it seem special.

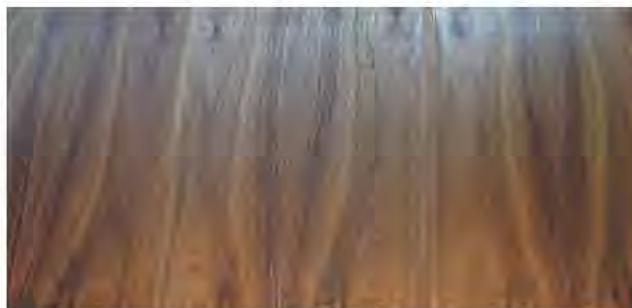
Of course, this is silly. All drying oils polymerize in the wood because they soak in and cure.

Then a product called polymerized tung oil started getting a lot of attention. It's different than regular tung oil because it is put through a cooking process that changes it chemically, making



***Varnish.** Getting in on the polymerized action, and adding to the confusion, Woodworker's Supply sold this varnish for a while in the 1990s with “polymerized” in the name.*

Two coats. I applied just two coats of the three oils (from left: Tried & True, Southerland Welles and Tru-Oil) to this walnut veneered plywood and wiped off the excess. Notice the shine produced by Southerland Welles and Tru-Oil.



it cure much faster, harder and glossier.

The process begins by heating the oil to around 500° Fahrenheit in an oxygen-free, inert-gas environment until the oil begins to gel, then it is quickly cooled. This process changes the chemistry of the oil by causing the carbon atoms to crosslink (different from oxidizing) and thickens the oil considerably, so mineral spirits are added to make the product workable. More or less thinner is added to create “low-lustre,” “medium-lustre” and “high-lustre” versions.

This finish, Southerland Welles Polymerized Tung Oil, developed a following and I included it in both editions of “Understanding Wood Finishing.” To make it a category, rather than just a unique finish, I combined it with Tru-Oil, a gunstock finish that I believe to be linseed oil put through a similar cooking process, though the company won’t confirm this. At least, the two finishes act similarly.

But the category then became unwieldy, and this is part of what makes the term so confusing. In the early 1990s a company called Tried & True introduced several products it claimed were polymerized. In fact, they are little more than raw linseed oil that has been exposed to air for a time to start the curing process.

Though still technically “polymerized” by my definition, this product is about as different as it can be from the other two polymerized oils. They cure fast and hard if kept thin. Tried & True cures much too slowly in my opinion to be useful as a wood finish. It’s essentially raw linseed oil.



Thumbprint. Here is my thumbprint in Tried & True polymerized oil that is 20 years old. The oil barely even gelled.

It got its start with several articles in *Fine Woodworking* touting its food-safe qualities because it doesn’t contain Japan driers, and this is exactly how the company represented it to me. As you might be aware, my take on food safety is that all finishes are food safe when fully cured.

To sum up, polymerization is simply the way oils and varnishes crosslink and cure. Some manufacturers begin



Puddles on glass. I applied puddles of all four products claiming to be polymerized on glass. Notice that Tru-Oil and Southerland Welles dry similar to drying oils, Moser’s Polymerized Tung Oil Varnish dries like varnish and Tried & True didn’t dry at all.

SOURCES OF SUPPLY

Tru-Oil is available from almost any gun dealer or supplier, including Wal-Mart. Southerland Welles is available at southerlandwelles.com and maybe some catalogs. Tried & True is available at woodworking stores and catalogs. —BF

the polymerization before putting the finish in the container and call their finishes “polymerized oil.” But the products promoted this way are too different to be included in the same category. The result is confusion.

Wood Turners

A reader on my blog suggested using Tru-Oil to finish pens right on the lathe – applying the finish like friction polish, holding the oil-damp cloth on the wood to create heat and speed the drying while the lathe is spinning.

I tried both Southerland & Welles and Tru-Oil using this method, and they worked reasonably well. They dried a little slower than friction polish, which is shellac. But they have the advantage over shellac and lacquer of producing a much more durable (body-oil resistant) finish because they crosslink.

I thought Tru-Oil worked better because it produces a better build and higher gloss quicker. **PWM**

Bob is author of “Flexner on Finishing,” “Wood Finishing 101” and “Understanding Wood Finishing.”

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Why I Adore my Machines

Grab your torch and pitchfork; the hand-tool guy has a table saw.

People react with shock and horror when they learn I have electric machinery in my Kentucky workshop.

After all, I've been writing almost exclusively about handwork for almost 20 years now. And yet anyone who is more than an acquaintance knows that I adore heavy iron, and that I coddle my machines like prize French bulldogs. So what's the deal?

I like all the woodworking tools, from chisels to CNC routers. I want to know them all – inside and out – so I can do my best work with the smallest amount of stupidity swirling around in my shop. Here are two simple examples:

Stupid: Making a jig to cut a compound angle on the table saw.

Not stupid: Knifing a line and cutting the compound angle with a carcass saw.

Stupid: Processing 200 board feet of rough lumber with a jack plane.

Not stupid: Using an electric jointer and planer to do the work in an afternoon.

Perhaps I'm just trying to be efficient, but I don't see it that way. I choose different tools or machines to remain a furniture maker at all times. I don't want to become a machinist where jigs, numbers and precision measuring tools guide my work. And I don't want to be a donkey, using the little time I have on this earth to do a mindless chore (ripping 12/4 maple) out of some affectation.

What's also part of this is that I refuse to acknowledge a difference between using hand tools and machines. For me, the tools are neutral. What imbues them with menace or joy is how they are used.

When I worked at a door factory, the radial-arm saw we used to cut stiles and

rails was the symbol of my subjugation there. I was chained to that machine for the entire day, scared witless that I would lose a finger.

In contrast, my table saw at home puts food on the table. It allows me to work for myself – not at some factory – and to spend my day designing furniture, cutting dovetails and assembling bits of wood instead of ripping, ripping and ripping some more.

You might think this attitude would lead me to use machines for everything. Not so. I use handplanes constantly. They touch every surface of my work. I don't use them out of some reverence for the past. I use them because they are faster than sanding (there's only one "grit" – done) and leave a superior surface.

But you only get to see this trade-off if you know both sides intimately – both the drum sander and the smoothing plane.

So why do I write almost exclusively about handwork? That's easy. During the last 60 years, using woodworking machinery has been covered to death and to perfection. We don't need another book of router jigs, or tips on tuning a band saw, or Swiss-Army-knife-like fixtures for the table saw.

The world of handwork is endless – you can never know it all because there is more than 2,000 years of recorded history with these tools to explore. I'm just trying to balance the equation and help return handwork to its rightful place in the shop.

But you can bet that if the pendulum swings too far, I'll be happy to write about the unfettered joy that's possible from a spiral carbide cutterhead. **PWM**

Christopher is the editor at Lost Art Press and owner of a 12" Northfield jointer (neener, neener!).



Circular logic. Is this cutterhead the giant wheel of industrial oppression or the means to escape it? It depends.

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