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Shaper Origin
Handheld CNC

POPULAR Woodworking MAGAZINE

April 2018 ■ #238

Build a Chippendale Chair

With Solid Joinery &
Beautiful Curves

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PLUS

- The Beauty of Utility Dovetails
- Mitered Mortise & Tenon
- Great Workshops: Debey Zito

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tenon mastery
from the bench
of Jeff Miller

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Box for
combination plane



Blade box

Combination plane blades



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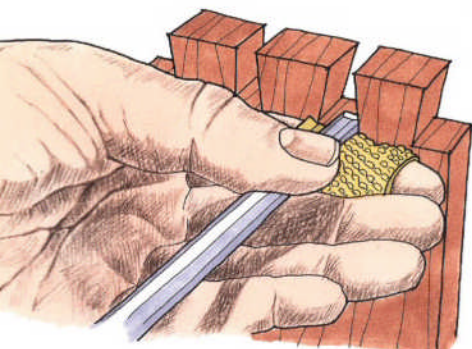
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POPULAR
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MAGAZINE

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- Approx. shipping weight: 527 lbs.



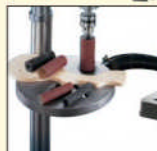
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Blade



W1819 10" 3 HP Table Saw with Riving Knife

13" 3/4 HP, BENCH-TOP OSCILLATING DRILL PRESS

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- Overall height: 38"
- Spindle travel: 3/4"
- Swing: 13 1/4"
- Drill chuck: 5/8"
- Speeds: 12, 250-3050 RPM
- Table: 12 3/8" dia.
- Table swing: 360°
- Table tilt: 45° left & 45° right
- Approx. shipping weight: 123 lbs.



W1668 13" 3/4 HP, Bench-Top Drill Press

12" X 15" VARIABLE SPEED BENCH-TOP WOOD LATHE

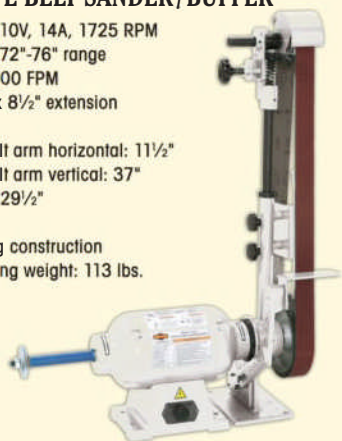
- Motor: 3/4 HP, 110V, single-phase, universal motor
- 12" swing over bed
- 15" between centers
- Two spindle speed ranges: 500-1800 RPM & 1000-3800 RPM
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- Belt size: 2" x 72"-76" range
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- Height with belt arm horizontal: 11 1/2"
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- Overall width: 29 1/2"
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- All ball bearing construction
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New

W1843 Knife Belt Sander/Buffer

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- Table tilt: 5°, 45°
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- Max cutting height: 14"
- Max throat capacity: 13 1/2"
- Max cutting width with fence: 12"
- Overall size: 29"W x 32 1/2"D x 76"H
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New

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Strut Your Stuff

I have the great privilege of ringing the opening bell for this year's PWM Excellence Awards – and the joy of telling you that your work will have a chance at winning the \$1,000 grand prize. Submissions will be accepted from April 1 - June 16, at popularwoodworking.com/2018excellence.

Entrance to the contest comes at no cost – all you need to enter is photos of your work, a title and a short description, including the materials used in its construction and its dimensions. This year, we've revamped the categories. They are:

- Casework, Cabinets & Bookcases
- Seating
- Tables
- Boxes, Smalls & Miscellaneous
- Best Beginners

Let me clarify the last two categories:

The "Boxes, Smalls & Miscellaneous" category is where the object you've made that isn't furniture will fit in – these can be turned ornaments, shop-made tools, sculptures, humidors, spoons, snob sticks, etc.

The "Best Beginner" category is new to this year's contest. Any type of work can be submitted to this category, with the qualification that it was made in the maker's first year of woodworking. If you've picked up the woodworking bug for the first time since last year's awards, attended your first schooling in the craft or finally got around to making instead of daydreaming, this is your chance to show the world your new skills!

To be clear – you cannot have been in the practice of working with wood before last year's call, with a firm cut-off at April 1, 2017.

The staff and contributors of *Popular Woodworking Magazine* will review and select our favorites, alongside our readers. Your online voting for the Reader's Choice Awards will open on June 20, and your votes will determine a winner in each of the five categories. Six prizes of \$100 will be handed out to the five editor's picks in each category and to the one overall reader's choice winner – as that big grand prize award of \$1,000 selected by the editors.

Last year's contest was inspiring – we had makers from around the globe with all manner of backgrounds and expertise, who submitted gorgeous work. Al Spicer's Morning Glory Demi-lune Table (pictured here) took home the grand prize, with its astounding veneer and marquetry work, delicate form and attention to detail.

One tip to those interested in entering this year's contest – quality photography is important! We want to have everything at our disposal to discuss the fine points of your work – do your work justice and take good photos. Neutral backgrounds, sharp focus and good lighting will help the judging process – and if you win, we'll be looking for high-resolution photography for the magazine's November issue.

The rest of the contest details, including directions on entering, can be found on our website, popularwoodworking.com/2018excellence.

The staff – and your fellow readers – are looking forward to you strutting your stuff! **PWM**



Al Spicer

PHOTO BY AL SPICER

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Dishwasher-safe Finish for Wood?

We have wood-handled silverware, which gets washed in a dishwasher. In the past I have refinished the wood using General Finishes Salad Bowl Finish. That worked well in the beginning, but now years later it has totally worn off, and the handles are back to bare wood. The salad bowl finish seems to wear off evenly without flaking.

We want something that lasts longer but doesn't end up flaking off and looking unsightly, maybe a finish that cures in the wood, not on the wood. What finish do you recommend for this application? I was thinking to use boiled linseed oil, or do you think I should just stick with the salad bowl finish and reapply every few years?

If nothing holds up to a hot, soapy dishwasher—is there a recommended wood finish that would last longer if I wash by hand? Maybe a two-part epoxy as a finish, or is that not food-safe when cured?

Bill Law,
Cincinnati, Ohio

Bill,
I'm surprised the finish lasted as long as it did. Salad Bowl Finish is varnish thinned half with mineral spirits. You'll get a little build after a few coats. An oil finish won't build, but I would think it would disappear very quickly in a dishwasher.

You seemed to have good results from what you did previously. I would stay with thinned varnish, and recoat when needed.

The problem I have responding is that you seem to want something close to permanent, and nothing is.

Building a thicker finish will lengthen the time before the finish wears off, but if water can find a way underneath, it will cause the finish to peel and get pretty ugly. Polyurethane would be easier to apply than epoxy. Both will block water penetration as long as they are in good shape, but it's not the penetration that's the issue. It's the wear.

If you're willing to wash by hand, I would do that and continue using the wiping varnish.

Bob Flexner, contributing editor

Hardwood Dustpan

I'm building Christopher Schwarz's "Dovetailed Dustpan" from the June 2017 issue of *Popular Woodworking Magazine* (#232), and I'm wondering if I could substitute 1/4"-thick hardwood for the hardboard you used for the top and bottom.

Will this work or will the wood be to likely to split off at the bevel? Also would I have trouble with it warping?

Tim Abbott,
Otsego, Michigan

Tim,
You can indeed use hardwood for the top and bottom — with some precautions.

I recommend quartersawn stock to minimize wood movement. Also, I would orient the grain from left to right (instead of front to back). And attach the top and bottom with screws. When drilling the clearance holes for the screws, ream them out a bit from front to back to allow for some wood movement.

Christopher Schwarz, contributor

Takes a Licking?

I just finished watching your video test of the Lixie Dead Blow Mallet (on the popularwoodworking.com shop blog). I'm wondering if the interchangeable heads you show in the video will keep their hardness and structure over time.

I've noticed that cheaper soft-blow hammers get soft over time — mine certainly did. Do you think the Lixie's heads hold up over time?

Daniel Smith
via email

Dale,
What I can relate on durability is maybe too small a sample size to be viable as a "study," but the mallet we had at College of the Redwoods (now the Krenov School) was at least a few years old when I used it, and felt (if my memory is correct) identical to the brand-new mallet I used in this test.

That said, Lixie has been around for some time, and I'm pretty confident that, if the mallet heads do wear or soften, I'll be able to get replacement heads, and they're

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not too costly (\$10 or so). But I have seen no sign of wear on the mallets I've used, and I've heard good things from several furniture makers who have used them for a long time.

Brendan Gaffney, interim editor

Reclaimed Fencing

I really enjoyed Nancy Hiller's article concerning salvaged wood on the popularwoodworking.com shop blog. My question is about salvaged fencing and storm-felled lumber.

The recent hurricanes here toppled my fence, lots of weathered 2x4s, 4x4s, even a couple of 6x6s, as well as 100 5/8"x 5"x 72" cypress boards. It would be a shame to trash them. Are they safe to use?

Brian Donaldson
Melbourne, Florida

Brian,
Safe to use for what, would be my question. Are they natural (untreated) cypress? In that case, they should be OK to use for outdoor structures such as fencing, gates, picnic tables or planters.

I would be concerned about moisture content if you're considering using them for indoor furniture or millwork. If they were milled for fencing, they were probably not dried for use as interior furniture lumber.

The other consideration is fasteners. You would obviously want to make sure you've removed all fasteners before running fence lumber through any of your machines.

Nancy Hiller, contributor

High-Stakes Woodworking

I'm an aspiring woodworker, and I've been following Brendan Gaffney's Instagram feed as he builds various projects inspired by "The Anarchist's Design Book."

I write with a question about your coffee table build. In Christopher Schwarz's book, he talks about using a sliding dovetail piece to add depth to the tabletop for the staked leg. However, I saw that you simply glued blocks under the table for depth.

I was about to cut those dovetailed pieces for my standing desk project when I saw your move. Your blocks look far simpler than trying to nail the fit on those long dovetails.

Has your impression been that the glued blocks are sufficiently strong to support the staked legs?

Also, it looks like you ran your blocks across the grain of the table top. Did you have a particular reason for doing this?

My desk is going to be tall, 22" deep and made with 8/4 poplar.

Benjamin Ice
Auburn, Indiana

Benjamin,
The table was small enough that blocks were sufficient to add thickness to the tabletop, without causing wood movement issues. That said, I'd recommend the sliding dovetailed battens, which I did on my staked worktable, for a few reasons.

For one, if you're making a standing desk, the legs will be pretty long. Therefore, any cupping across the top will result in tippy legs pretty quickly. They don't need to be dovetailed, though – you can nail them or affix them with tabletop buttons (something that accommodates movement).

Also, such long legs will add leverage on the tenons – and one misplaced stride might have the power to do some damage. Better to reinforce the joint with added thickness. PWM

Brendan Gaffney, interim editor

ONLINE EXTRAS

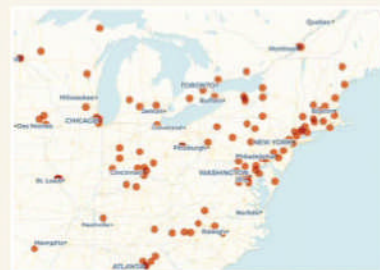
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Highly Recommended

A good local lumberyard can be the difference between a good project and a great process. Woodworking starts from a board of wood, and finding the right people with the right stuff can be a godsend.

During the past few months, I've put together a map and directory of lumberyards across the United States (and a few from abroad) with reviews from our readers. If you're still looking for that great yard, take a look, at popularwoodworking.com/local-lumberyard-map.

— Brendan Gaffney



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Staff Favorites

Like many of our readers, the staff of *Popular Woodworking Magazine* and I look forward every issue to seeing what our readers and authors will send our way for the “Tricks of the Trade” column.

So this month, I put the call out to our staff for their favorites tricks from the past few years. We all have reasons to love ours—it may be a trick

we’ve come to love through usage or one we just think was a great example of thinking outside of the box.

As for my favorite trick—it’s the amazing talent of our illustrator, Martha Garstang Hill, whose work you see on these pages. Enjoy her drawings, and enjoy your work!

Brendan Gaffney,
interim editor

Sander Circle Jig

I love this trick—and when David Lyell and I went to shoot a video for it, we came up with our own addition. We made the stop that controls the diameter of the disc moveable, which lets me easily vary the disk sizes I can sand.

Jake Motz,
online content developer

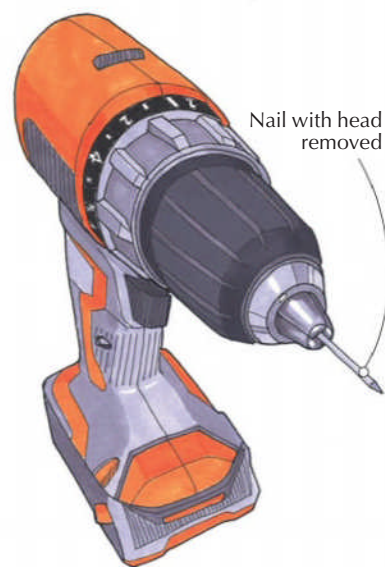
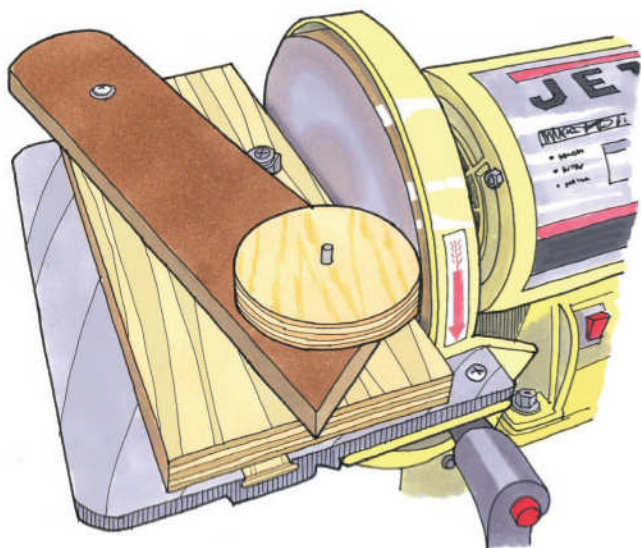
I find myself needing a lot of small circles for use on wooden toys. When I cut those disks out with a circle-cutting jig on the band saw, the edge is a little too rough, so I’ve made a fixture for the disk sander that makes quick work of sanding the wheels perfectly round and smooth.

A ledger strip on the bottom plate of the fixture fits into the sander’s

miter slot to hold it in place. Atop that is a moveable arm, secured in place loosely enough so that it can freely pivot. At the working end, I cut off an 1/8" drill bit that fits through holes in the center of the rough disks; it’s epoxied in place to the swing arm. In front of the arm is a stop that controls the diameter to which the disks are sanded (it’s simply screwed in place, and can be easily moved as needed).

I slip a rough disk onto the cut-off drill bit, then swing the arm into the rotating sander until the disk contacts it. The motion of the sander rotates the disk at high speed and sands it round in seconds, while the stop keeps it from getting too small.

Dan Martin,
Galena, Ohio



Use the Nail to Drill the Pilot

Finding the right pilot hole for a cut nail or Roman nail can be a series of experiments with drill bits and scrap wood. Or you can just nip the head off the nail and chuck it in your drill.

Too many times we look for complex solutions when the answer is right in front of our eyes.

Christopher Schwarz,
contributing editor

This is an old trick, but a good one—drilling pilot holes for nails using the nail itself. It works with both wire nails and cut nails.

With a pair of lineman’s pliers, clip the head off of one of the nails from the box you’re using. Make sure that it is good and straight, and that there are no protrusions around the area where the head was clipped.

Chuck this “headless” nail in your drilling tool of choice and use the nail itself to “drill” the hole. With wire nails, you can stop the hole when you get through the moulding. With cut nails, it’s best to make the pilot one-half to two-thirds the length of the nail.

This will result in perfectly sized nail holes every time.

Grant Burger,
Boston, Massachusetts

CONTINUED ON PAGE 12

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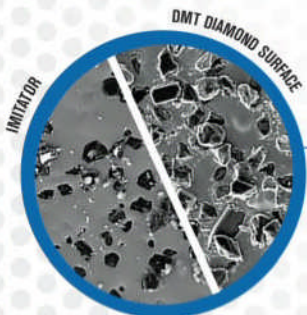
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Rust-free 'Ruler Trick' with High-density Polyethylene

I like putting a small back bevel on my plane irons, à la "The Ruler Trick"—but I don't love the messy rulers laying about. This trick solved my problem—on the cheap.

David Lyell
online content director

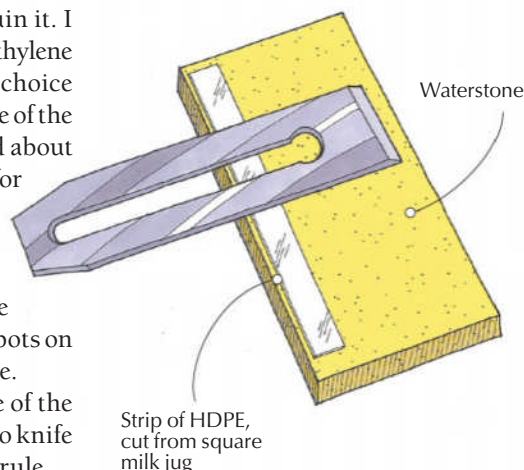
For the past two years, I've been using a modification of the "Charlesworth Ruler Trick" for sharpening that I think is a significant improvement. I never liked the idea of rubbing a steel plane iron along a steel rule. It's rubbing metal on metal and the swarf (fine abrasive slurry) from the stones 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 waterstone 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



ONLINE EXTRAS

For links to all online extras, go to:

■ popularwoodworking.com/apr18

TRICKS ONLINE: We post tricks from the past and film videos of some Tricks of the Trade in use in our shop. They're available online, free. Visit popularwoodworking.com/tricks to read and watch.

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Cash and prizes for your tricks and tips!

Each issue we publish woodworking tips from our readers. Next issue's winner receives a \$250 gift certificate from Lee Valley Tools, good for any item in the catalog or on the website (leevalley.com). (The tools pictured below are for illustration only and are not part of the prize.)

Runners-up each receive a check for \$50 to \$100. When submitting a trick, include your mailing address and phone number. All accepted entries become the property of *Popular Woodworking Magazine*. Send your trick by email to popwoodtricks@fwmedia.com, or mail it to Tricks of the Trade, *Popular Woodworking Magazine*, 8469 Blue Ash Road, Suite 100, Cincinnati, OH 45236.



Protect Your Hands From Chisel Lands

We've seen tons of clever tricks over the years, but personally I love this simple idea for protecting fingers from chisels—just because of all the nicks I have from practicing my dovetails.

Scott Francis
Popular Woodworking books editor

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.

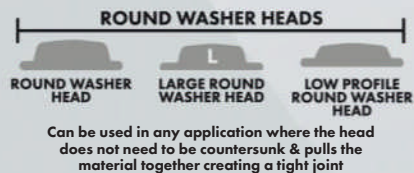
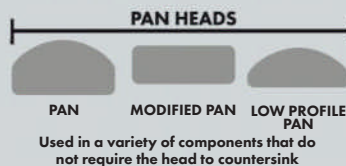
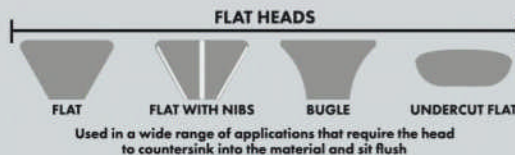
I cut off the tip of a rubber finger pad (sold at office supply stores to guard against paper cuts) and slide it onto my index finger for use as a guard against the chisel edges. It doesn't interfere with feedback and control, and I no longer suffer from cuts—even if I hold the chisel tightly. **PWM**

Charles Mak,
Calgary, Alberta

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Shaper Origin Hand-held CNC

Introducing a new kind of CNC, happy in the hands of a woodworker.

Up to now, CNCs were large, heavy, complicated tools that took up a lot of space in a shop. The Shaper Origin is something quite different. It's a hand-held, easy-to-use CNC that you take to your work, instead of the other way around.

All CNCs need to know their precise location within their work space. Conventional CNCs work on their own platforms, with rails and guide systems that keep track of their position.

The Origin (assembled in the U.S.) takes a different approach. On the front of the machine is a high-resolution camera that scans for domino-like position markers printed on a special paper tape that the user lays out on the work every 3"-4" in front of the machine (two 150'-long rolls are supplied with the machine, and additional rolls can be bought from Shaper Tools for \$18).

By using the camera to monitor the markers on the tape, the Origin can keep track of its position. This allows the machine to stick to the path that the user traces on the screen while moving the tool over the work. While the user follows the line, the Origin's spindle cuts and moves within the tool to compensate for any user error in tracing and makes the cut. It isn't hard to follow the paths displayed on the monitor – you only have to come within about 1/4", which is easier to do than it sounds. The process is not unlike following a router template.

Shaper Origin

Shaper Tools ■ shapertools.com or
888-281-1012

Street price ■ \$2,199 (preorder price)

■ **BLOG** Follow along with the author as he dives into this tool and puts it to the test.

Prices correct at time of publication.



Ease of Use is a Key Feature

The Origin brings more than portability to the party – Shaper Tools puts a major emphasis on ease of use. Screens are easy to understand and setting up a cut is simple thanks to a well-designed interface. Once you scan for markers, position your design, set cutting parameters and establish the cutting depth, you're good to go.

The company takes ease of use a step further with a collection of projects at their Shaper Hub – with a few clicks, your choice is downloaded right into the machine. You can also create your own designs and import them via a USB flash drive. The Origin uses SVG (Scalable Vector Graphic) format files that can be created in the computer drawing program of your choice. A one year subscription to Fusion360 is also included with your purchase.

Is the Shaper Origin Right for You?

Comparing the Origin to a fixed CNC in its price range is difficult because the machines are so different. A comparable

New methods. The Shaper Origin takes a new approach to CNC routing – a camera scans for patterned tape to locate the machine and the spindle compensates for error while the user follows an on-screen guide.

small conventional CNC works on its own with higher precision and can cut in 3D, whereas the Origin's workspace limits are best measured by the length of an extension cord, works in 2D, is user-driven and easier to learn and use.

Keep in mind that the Origin, with its small footprint, needs to rest on a sizable flat surface. At first glance, this limitation makes it better suited for cutting plywood or MDF, rather than thick, solid wood boards of random widths and lengths. However, if you combine the Origin with smart use of other tools plus new methods and techniques, you can work past many of the limitations.

With its simplicity, exceptional ease of use, small footprint and unlimited workspace, for many, particularly those who see a CNC as a digital tool to support other woodworking methods, it could be a great fit.

— Tim Celeski

CONTINUED ON PAGE 16

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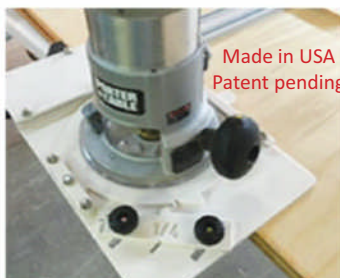
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Yost M9WW 9" Rapid Action Woodworking Vise

Before I admitted I was a woodworker, I accomplished all of my woodworking in a Craftsman bench vise. I remember buying my bench vise as a young man who wanted to give the heaviest (and therefore, the most meaningful) gift to my father for Christmas that I could.

Having spent some time with wood, I've come to see that bench vises are not a total solution to workholding for woodworking. They do, however, work well for a variety of tasks around the shop—and are straightforward to install.

M9WW Rapid Action Vise

Yost Vises ■ yostvises.com or
616-396-2063

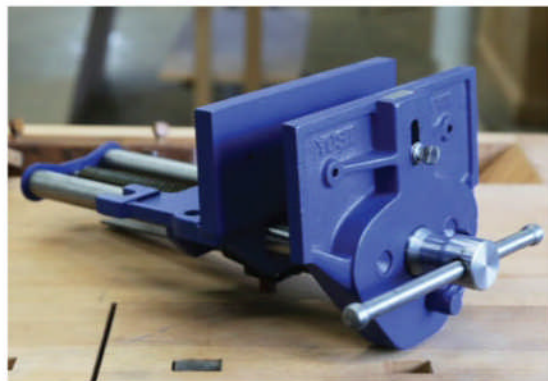
Street price ■ from \$64 to \$99

■ **WATCH** See how the author installed this vise, and how he uses it for woodworking.

Prices vary—above is the range as of publication.

The Chinese-made Yost M9WW delivers solid design at a fair price—the MSRP is \$99, but it's frequently on sale from online retailers (I picked mine up for \$64). The solidity of the castings and hardware are apparent, and the buttress threads tell me that I won't have issues with the lead screw. I couldn't detect any slop when opening the vise to its full 10".

Another thing I like about the Yost stems from my machinist background—I have failed to acclimate to the traditional quick-release mechanism where a counterclockwise turn disengages the thread. Perhaps it's my upbringing, but I enjoy the trigger-activated quick release. This vise operates normally, with no gimmicks until you decide to



pull the trigger to the right of the handle and pull the jaws wide open. That's an operation that makes sense to me.

The paint on my vise isn't perfect and there are minor scuffs on the handle, but for this price I'm more than happy to entertain minor cosmetic blemishes—and I look forward to putting my own marks on the vise, for years to come.

—David Lyell

Ray Iles Large Drawknife

In October of 2017, I took a chair-making class with Larry Barrett, a student of Jennie Alexander's who has built on the beautiful designs and methods used in the Alexander-style ladderback chair. When I was looking through my tool kit in preparation for the class, one tool needed replacing—that rusty old drawknife I had only ever used to debark logs.

I had a number of recommendations on what drawknife I might enjoy most—but in the end, I went with this tool from Lincolnshire toolmaker Ray Iles.

Ray Iles Large Drawknife

Tools for Working Wood ■
toolsforworkingwood.com or
800-426-4613

Street price ■ \$79.95

■ **WATCH** Tricks to sharpening a drawknife.

Prices correct at time of publication.

If you've bought tools from Ray before (as I have many times, through Tools for Working Wood) you know the deal—they are no-nonsense tools. In keeping with the Sheffield tradition, this drawknife is no different—great steel, simple design and comfortable handles.

The knife shines particularly bright in the steel department—after being sharpened, it held a razor edge through hours of work. The handles, which are turned from beech and finished with linseed oil, are comfortable, but not so polished that you lose your grip.

With an 8"-wide and 1⁵/₈"-deep blade, this drawknife was a bit larger than what other students brought with them to the class, but this was only a disadvantage when it came to carving a



very tight radius. Otherwise, the longer cutting edge was very comfortable and allowed for a lot of lateral movement when taking slicing cuts. Since the class, I've used the tool in all manner of shaping tasks, and it's held up wonderfully. At \$79.95, it pays for itself by coming sharp, flat and ready to use—no need to grind and scrape the rust off of granddad's old beater. **PWM**

—Brendan Gaffney

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nano-grain carbide material. This extremely fine-grained carbide can be polished to a mirror finish, yielding a cleaner, sharper edge. Yet it is tough enough to hold that edge longer than virtually every other insert on the market.



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Keep the tool flat on the tool rest and level to the ground for fast stock removal and basic shaping cuts.

For ultra-fine finishing cuts, roll the tool right or left until it lands on the 45° bearing surface. Now, take a light pass with the tool still level. You'll be amazed at the clean cut and smooth finish.

Detail tool has two styles of tips, full sharp (supplied as standard) for creating precise vee lines and radius point for making small beads and coves (optional).

Whether you're a beginner or an experienced turner, turn large bowls, pens or tiny miniatures, you'll find *Ultra-Shear* tools will eliminate the drudgery of sharpening and dramatically increase your confidence and success at the lathe. For more details and to see the tools in action, visit our website: www.woodpeck.com/ultra-shear

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Design by Touch

While design is dominated by the eye, the hand plays an important role.

Most of what I've written about design has focused on how we look at it. Yet good design often has multiple layers that speak to all of our senses. We tend to think of the visual sense as the dominant player, but our sense of touch can also help us take our designs to another level.

Our ability to see with our fingers is remarkable. We can reach into our pocket and tell the difference between a dime and a penny. We can run our hands across a freshly planed board, feeling the smallest plane track that's invisible to our eyes. When we say that we work with our hands, it's more than just wielding a chisel or mallet. Our hands are a portal to how we interact with the tools and the work.

Much of what we do at the bench is dependent on what our hands tell us. It's almost impossible to imagine working without the sense of touch. But that goes beyond running our fingertips over a joint to feel whether the parts are flush and tight. We constantly make aesthetic judgments with our hands, which are always looking for connections. Our sense of touch is always on, much like our nose that catches a whiff of something that brings a smile, frown or empty indifference.



Like butter. The curves on this wooden butter paddle are a treat to the eye but even better to touch.

Good Skipper

I can remember as a boy searching through the rocks on a gravel beach for good skipper stones that I could sling across the water. Often, as I picked through the sand and stones, I'd stumble across one with an odd shape that felt just right in my hand. I'd roll it around my fingers and, without thinking, it became a keeper and went in my pocket instead of the lake bottom—much to my mom's chagrin, when she later found it rattling in the washing machine.

We make judgments about our environment through all of our senses, each one giving us a piece of the picture of the reality before us. And, three of them (sight, sound and smell) are feedback mechanisms we use from a distance.

We make visual judgments about a chest of drawers or table from across the room. Often our impressions are about how the object relates to the space it sits in. We find that our visual judgment is often influenced by sunlight streaming through a nearby window and how the surfaces reflect that light. Feedback we get from a distance tells us how the object relates with its surroundings. Furniture has always been strongly linked to architecture—how it relates to its surroundings ties into that.

Up Close & Physical

Our sense of touch is a different animal. It's always a close-up encounter. It differs from visual judgments because we are not comparing how the piece interacts with its surroundings, we are responding to how the piece inter-



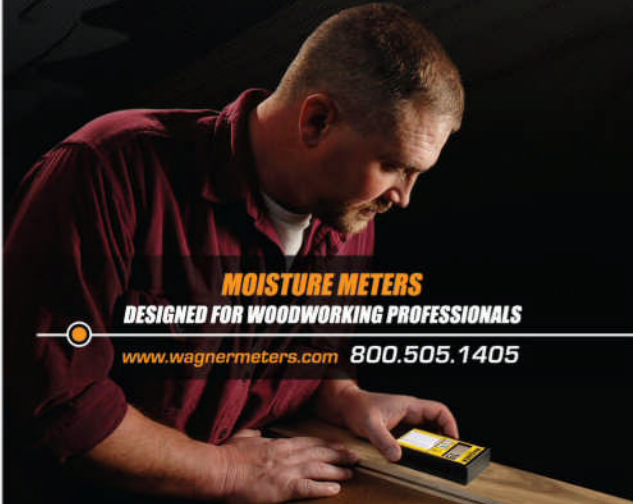
From a distance.

Much of our visual interpretation of a design is from across the room and about how it fits into the neighborhood, as with this dresser in its period surroundings.

CONTINUED ON PAGE 20

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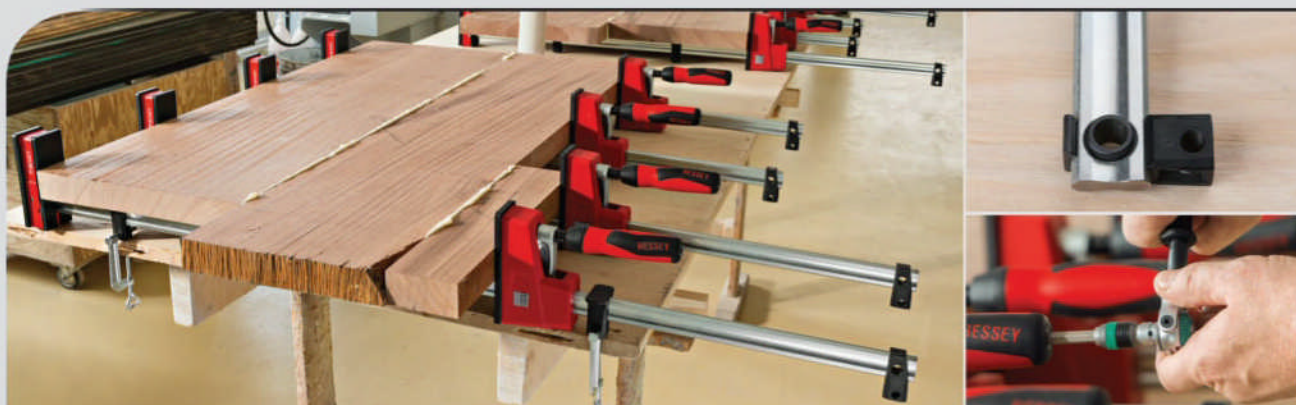
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acts with our bodies. We are taking in some complex and sophisticated signals through the nerves in our fingers, which often strike a chord inside us that is difficult to explain. Why does a wooden handle seem friendlier to our grip than an injection-molded plastic handle? The latter feels hollow and dead.

From our earliest moments our fingers help us understand and relate to our world. It's a subjective thing, but like our sense of hearing there are some universals that we connect with. With hearing we may have a wide range of preferences, but universally we tend to connect more with a songbird than a sound of a dentist's drill or a jackhammer. With our sense of touch we also have a wide range of shapes and textures we connect with—and we typically connect more with curves than sharp corners and ragged edges.

Shapes

Designers have long recognized this powerful connection and, despite our advances in technology, it's still a force to be reckoned with. I once spoke with an engineer from Kodak who spent decades working on designs for hand-held cameras. He joked that the overarching goal was always to design a camera shape that felt like a bar of soap.

Think about it. Look at many of the small technical items meant to interact with your hands, like the mouse you use with your computer. It's just a plastic bar of soap. That shape is telling us something just like a smooth stone that found its way into a child's pocket. We respond profoundly to curved surfaces



The mouse that roars. The small carved details on this chair arm speak louder than their size would suggest.



The handle challenge. In a blind test, for which would our hand vote – the carved wooden handle on this antique wooden plane or the plastic tote on this modern hand tool?

that our hands can explore and connect with. Whether it's the arch on the back of an old wooden scoop or the gentle curved termination on the arm of a chair, our hands send us messages that make us smile inside.

I know that when I pick up a bowl and feel the curves on the inside of the vessel, if the curve feels like something that I scooped out with my bare hand, a little music goes off in my head and I find that I connect with it. The same goes for the curves on the outer surface. Sometimes the shape of a bowl or turned vessel feels like it's embracing my hands, not the other way around. I try to forget about what my head is saying and listen to what my hands are telling me.

See With Your Hands

If you have read this column for any length of time you know that I'm always challenging you to open your eyes to see deeply. Whether it's with a sketchbook or camera, or exploring with a pair of dividers, I'm always encouraging you with methods to gain fresh insight.

Here's another way to broaden your horizon. Use your sense of touch to deliberately train your inner eye. Don't be embarrassed to close your eyes and use your hands to make mental notes about the shape of a drawer pull or the edge of a chair's back splat. Use your fingers to compare. Take note of transitions that feel delicious compared to ones that seem mechanical and dead.



The right curve. Are my hands holding this hewn bowl or are the curves on this bowl embracing my hands?

You probably already do this without thinking—but try to slow down and do it deliberately, paying attention to what your hands are telling you. Just make sure that drawer pull doesn't end up in your pants pocket, rattling around in the washing machine. **PWM**

George is the co-author of three design books and writer of the By Hand & Eye blog (with Jim Tolpin).

ONLINE EXTRAS

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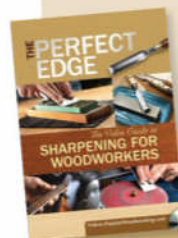
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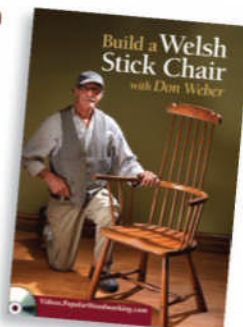
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Mitered Mortise & Tenon

This joint brings an English charm to a New England-style chest.

For me, the timing of writing for a magazine is hard to wrap my head around. The season that I write in is never the season my stuff gets read. As I write this column, it is late November in New England, and the column is for the April issue of the magazine. So we're just heading into the other side of the winter as you read this.

As I worked in the shop today, I was thinking about how fall and winter are some of the best times for this work. Spring and summer have many distractions, and the heat and humidity of full summer are often overpowering for this getting-older green woodworker. I'd rather split big oak logs in cooler weather. They stay green longer then, too – no need to hurry. And the shop is an inviting place on dreary fall days.

Today, I'm working on a joined chest for a client. This one is not a copy of any particular chest, but just a generic example. I decided to add an English flair to it (as opposed to New England, my usual vantage point) by using a mitered shoulder on the tenons that overlap a beveled edge on the mortised parts. The full effect of this format is



to create a beveled frame around each carved panel. Not at all unusual in old England, this technique stands out like a sore thumb when we find it on New England chests. I know of one

very large group of chests, referred to as "Hadley" chests, that always feature this joint on the chest front.

The framing on the sides and back have 90° tenon shoulders meeting square-edged mortised members. There's perhaps 200 or more of these chests, and I've never seen one of them without the mitered front joints. Other than the Hadley chests, I know of exactly one other New England chest that uses this joint. Not one other group of chests, just one chest. All the others use square-edge framing and 90° shoulders. Sometimes these have stopped bevels around the panel openings, sometimes moulded edges fading in and out around the panel openings. But always 90° at the joint.

I haven't cut this joint in maybe 10 years, so I practiced a couple to get the hang of it. It's frustrating, because I'm



***In situ.** A joined chest with a drawer, maybe 1680-1710, from the Connecticut River Valley in Massachusetts. The front of the chest uses mitered mortise-and-tenon joints to create the distinct beveled look around the panels.*



Full tilt. The sawn angle of the front angle is tricky – a chiseled trench guides the saw. Get close to the correct angle, but tune up the fit by planing the rail to fit.

so used to my joints going together right off the saw and chisel, with nary a test-fit. This joint has me almost back to square one.

First I lay out the front shoulder across the muntin. Then I use a mortise gauge to strike the thickness and “setback” of the tenon, in this case the tenon is $\frac{5}{16}$ " thick, set back from the rail's face $\frac{3}{8}$ ". Now I use a miter gauge, or an adjustable bevel set at 45° to strike from the front shoulder to the front of the tenon. Then I use a square to carry this point back to create the rear shoulder.

Undercutting that front shoulder is the kicker. It's really about tilting the saw over a good bit – more than I think. I score across the shoulder with a knife, then pare behind this line with a chisel to make a slight trench for the saw to lean in while I'm cutting this shoulder. Then the rear shoulder is back to nor-

mal. I always cut these just behind the line, so they don't hit the mortised part. Then I split the cheeks and pare across the tenon faces to bring the tenon to its final thickness. I lay out the planed bevel with a marking gauge. I usually set it so the bevel almost but not quite reaches the panel groove. You have to tilt the plane over more than you think, same as sawing the shoulder. I keep checking my progress with the miter gauge or an adjustable bevel.

I chop the mortise with a $\frac{5}{16}$ " mortise chisel and a mallet. There's a slew of methods to chopping mortises; I stay out of any debate about one method versus another. It's like the joiners' version of pins versus tails.

After chopping the mortise, I plow the panel groove and then plane the bevel. When I'm planing this bevel, I keep checking the progress by inserting the tenon and seeing how the bev-

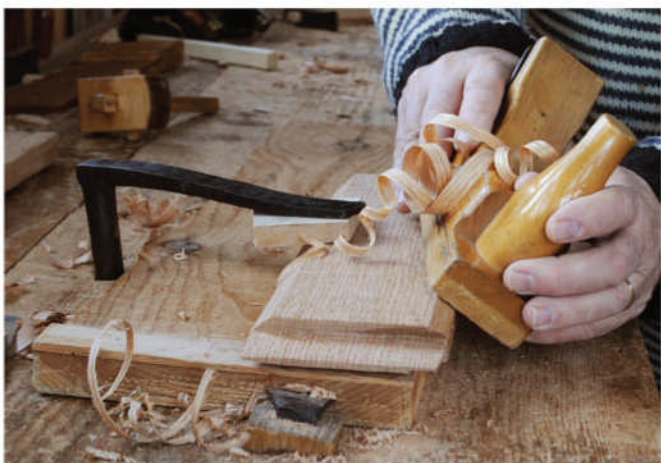
eled shoulder is meeting the bevel on the mortise. Check often, make small adjustments.

It takes me some fiddling around as I test-fit this joint to get it the way I want it. Ideally the tenon's long sloping shoulder slips right over the bevel on the mortised member. The test joints helped me get warmed up to this joint again. By the time I was cutting the chest front (eight joints) I was getting back up to speed. Now the sensible thing to do would be to make them on my next chest too. Nah, that's not me. **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.



All together now. One of the chest's joints during a test fit. This is as good as it needs to be.



Bevel planing.

After the mortise is chopped and the groove is plowed, bevel the edge of the parts. Check the fit as you go, and make small adjustments.

ONLINE EXTRAS

For links to all online extras, go to:

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BLOG: Read Peter Follansbee's blog.

ARTICLE: “The Best Oak Money Can't Buy.”

About this Column



“Arts & Mysteries” refers to the contract between an apprentice and master – the 18th-century master was contractually obligated to teach apprentices trade secrets of a given craft (and the apprentice was expected to preserve those “mysteries”).

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The Chippendale Challenge

BY JEFF MILLER

Creative thinking and dirt-simple jigs make the joinery a straightforward task.

I tend to think of Chippendale chairs as highly ornate. But there are startlingly simple examples of the style as well. After encountering some of the simpler versions of these chairs, I became fascinated. I love the interplay of curves and angles, the simple yet bold form and the feeling that this chair could fit in almost anywhere. So I decided to build my own moderately faithful version.

Interestingly, the joinery found on the originals is in some ways easier to execute by hand. Using some tools and processes about which I've written before (see the Online Extras), along with some simple additions, cutting accurate joinery is easy and reliable. This article will focus on that joinery and how to make it simple to execute by hand.

Features of the Chair

The most notable design features of this chair – and most chairs in the Chippendale style – are the splayed and curved back legs and the twisted side rails and stretchers. There are also the “ears” that provide some additional material in the crest rail for the joint with the rear legs.

Structurally, the most interesting elements are the angled mortises and straight tenons with angled shoulders found on the side rails and side stretchers. These are not much harder to cut by hand than an ordinary mortise-and-tenon joint, but grow in complexity when cut by machine. The splay of the legs comes from the angled shoulders (from top to bottom) of the back rail – these,



Twisted side rails. The splayed back legs are an obvious feature of this chair style. Less obvious is the twist in the side rails that accommodates the splay of the back legs. In most circumstances, this feature is invisible. But in the right light, it appears like magic.

too, are easily cut by hand, but aren't much harder by machine.

The Back Legs

Start work by making two patterns for the back legs and lay out this profile on the backs of the two legs. Cut the profile and smooth the convex and concave curves.

Lay out the flat section on the front of the legs where the side rails will join the legs. Mark an X from opposite corners. Plane the center of the X until you reach the limit lines of the flat section.

The Front Legs

Mill the front legs 1" overlong for now. You'll cut the extra off after mortises have been chopped and the tenons fit.

Now lay out the locations for the side rail, front and lower back rail mortises. Lay out 1/4"-wide mortises for now; you'll re-scribe and pare to the 5/16" finished dimension after chopping. Additionally, lay out the mortises for the lower back stretcher.

Not Quite 31 Mortise Flavors

There are lots of different mortise-and-tenon joints in this chair:

- Basic joints (front rail to the front legs, crest rail)

- Joints where the mortise is the same as in a basic joint but the tenon has

an angled shoulder (lower back rail to the back legs and lower back stretcher)

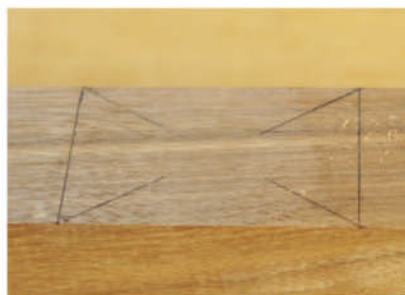
- Joints where the mortise is cut at an angle to the surface, the tenon is cut parallel to the rail but the shoulders are angled (side rail to leg joints)

- And variations on these flavors where the tenons have only one shoulder (the side and back stretchers).

A few simple jigs make the mortising easier. They are quick to build, and they produce accurate results when used with sharp chisels.

Chopping & Paring

On all of the chair mortises, I chop first, then pare with the chisel held tight to a paring block. After the first paring cut, slide the chisel over about 1/8" and make the next cut with the



Make a flat place. The first passes are to plane away the center of the X. Plane away the legs of the X evenly until they disappear and then take another pass or two.

ON BUILDING CHAIRS

Chairs are complex. You should approach them differently than other projects. Although there are plans included here, chairs are not generally built from plans. You're better off with patterns.

Chair patterns work like story sticks, in that they not only have the information about the shaping and sizing of curved parts, they also contain information about the joinery on these parts. You should also work through most of this chair project without paying attention to specific angles. This chair does have one exception to this: the angles at both ends of the lower back rail should be 5°. Because this angle only becomes critical once you've chosen it, a protractor is fine for setting your bevel for this angle. The length of this rail (at the top) is 12".

All other angles and lengths should come directly from the chair itself as the project progresses.



Are you flat? Check that the flats on the two legs are the same by placing the legs with the planed flats on a flat surface. The tops of the legs should be the same height off the surface. The leg bottoms don't matter as much.

Chippendale Chair

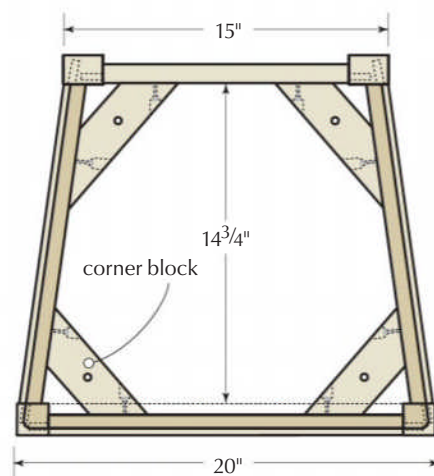
NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL	COMMENTS
		T	W	L		
❑ 2	Front legs	1½	1½	18	Rift Walnut	Rough length*
❑ 2	Back legs	1¾	4¼	39	Walnut	Oversized**
❑ 2	Side rails	1	2¾	17	Walnut	Rough length
❑ 1	Front rail	1	2¾	20	Walnut	Rough length
❑ 1	Rear rail	1⅜	2¾	15	Walnut	Rough length
❑ 2	Side stretchers	1⅞	1⅜	17	Walnut	Rough length
❑ 1	Center stretcher	1⅞	1⅜	17	Walnut	Rough length
❑ 1	Rear stretcher	1⅞	1⅜	13	Walnut	Rough length
❑ 1	Crest rail	1⅜	2⅛	22	Walnut	Rough length
❑ 1	Shoe	1¼	1	12	Walnut	Rough length
❑ 1	Back splat	¾	4	18	Walnut	†
❑ 1	Corner block blank	1	2½	24	Hardwood	‡
❑ 1	Slip seat	⅜ or ½	16	20	Plywood	

*Parts should be fit and trimmed in place. **Can be nested and pulled from one 6"-wide board. †Two matched pieces or one wide board. ‡Rough length of total stock needed for 4 corner blocks.

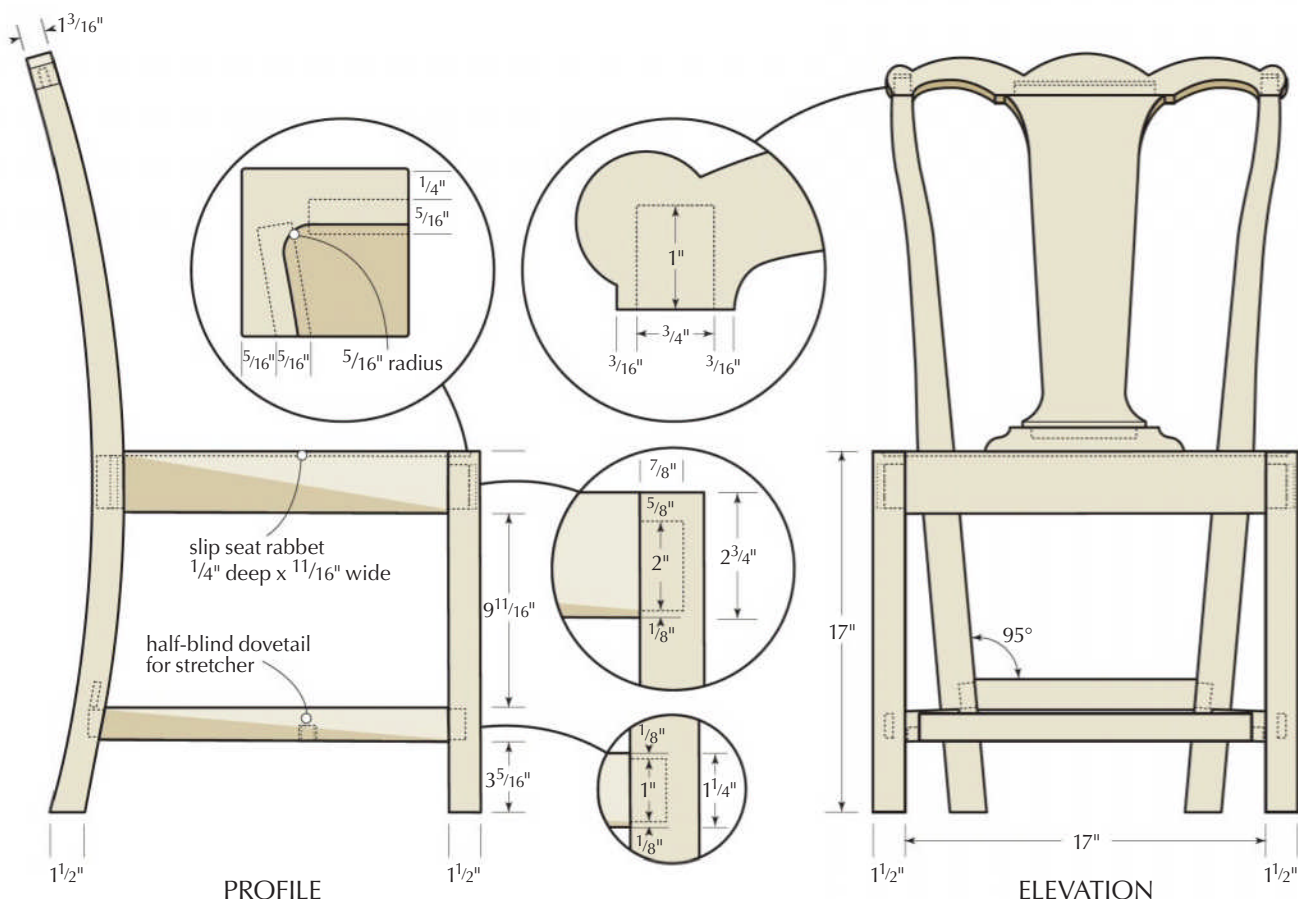
Editor's note: As Jeff notes above in "On Building Chairs," the angles and lengths used to build this chair should be determined through the process of construction. Measurements below have been supplied for reference, and correspond to Jeff's full-sized drawings (which are also included in the "Online Extras" for this article).

"A chair is a very difficult object. A skyscraper is almost easier. That is why Chippendale is famous."

—Ludwig Mies van der Rohe
(1886-1969),
German-American architect



SEAT DETAIL





In line with the back. The setup on your bench is important to the success of mortising. Make sure you can see that you're holding the chisel vertical (or angled appropriately).

tool's leading edge. Overlapping cuts require less force, and this leads to greater accuracy.

Plain Vanilla Mortises

The least intimidating mortises on the chair are those on the inside faces of the front legs. Follow these with the mortises for the lower back rail in the rear legs. Chop them perpendicular to the front surface of the legs.

The smaller mortises for the lower back stretcher are also "vanilla." Pare all of the side walls using the paring blocks. Although the mortises in the crest rail are also simple, wait until you've dry-assembled the back rail and the two back legs to lay them out.



Scrap support. When you chop the mortises in the back legs, you'll want to support the legs against the pounding. Use the offcut from band sawing the leg.



The easy way. You can do it the hard way, or you can do it the easy way. All of these jigs make it easier to get great results.

More Interesting Flavors

Chopping the angled mortises for the side rails (in the front and back legs) is similar to the straight mortises. The easiest way to deal with the angles is to rely on the angled paring block as a chopping guide. Keep the chisel about $\frac{1}{32}$ " away and watch the gap between the block and the chisel. Any inaccuracy will get pared away.

Don't cut the angled mortises for the stretchers yet. These are not at the same angle as the side rail angle. You'll need to wait until the basic chair frame is dry-fit to get that angle.

Tenoning

Angled shoulders on the lower back rail provide the leg splay. The twist on the faces of the side rails will be this same angle. Set your bevel gauge to 5° .

The simplest ways to cut consistent angles on a chair is to create a wedge. Start with $1\frac{1}{4}$ " x $2\frac{1}{2}$ " x 12" stock. Square up one end of the stock, then place the bevel gauge against the end grain and mark the angle. Cut and smooth the



A block guides you. Pare the side walls to final size. Most of the time I use a paring block, and stagger my paring cuts.

wedge. Lay out and cut the angled ends of your lower back rail, then use the wedge to shoot these ends accurately.

Lay out the tenons on the ends of the rail, then saw the cheeks and shoulders. Fit the tenons to the lower back mortises. There are a lot of tools that will work well to clean up the tenon



Some holds barred.

Put all of the pressure on the handle over the rail stock. Two fingers are enough for the out-board handle – this will help you avoid tipping the router plane.



Slightly twisted. This shows the completed layout of the twist in the side rail. Note that we're looking at the bottom of the "passenger-side" rail from the rear of the rail. If your rail doesn't look like this...

cheeks, but the best of these for chair work is the router plane.

Clamp the rail between the legs. It helps to make up a couple of scrap wedges at 5° out of a soft wood and faced with #220-grit sandpaper so the clamps don't slide or damage the legs. Measure the overall width of the back assembly at the top of the rail.

Prepare the Side Rails

The splay angle of the back legs requires you to create a "twist" in the side rails. This is one of the most interesting features of the chair, but it's one few people notice unless you proudly (or annoyingly, according to my kids) point it out.

Determine the orientation of your rails. Mark the top edge and the outside face. Place the bevel gauge (set at 5°) against the back end of one of the side rails and draw an angled line from the top outside corner to the opposite edge. Mirror this on the other side rail. Transfer the lines around from the ends onto the bottom edges, then draw a line from this point to the front bottom corners of the rails. Complete the layout

of the twist by drawing a line on the outside faces of the rails from the back top corner to the front bottom corner.

All of this layout defines the wedge of wood that you will plane off to create the twist in each side rail. Hold your plane at approximately the 5° angle and take tapering cuts. Proceed carefully until you hit the lines.

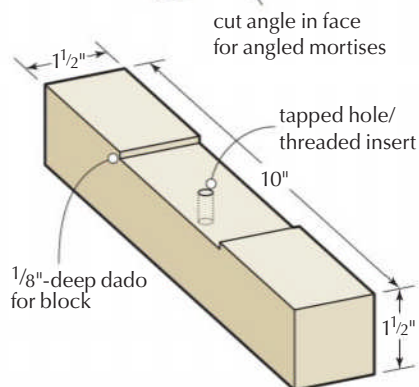
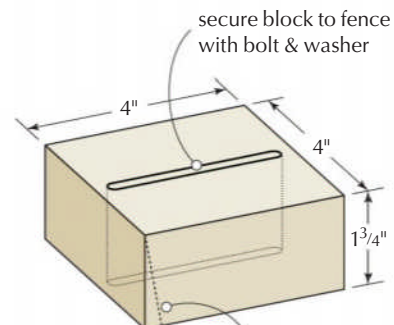
Side Rail Lengths & Angles

I drew up a simplified plan view of the chair on a scrap of plywood ripped to 14³/₄" (the perpendicular distance between the inside of the front and the back legs) and at least 10" long, with the edges squared up. This will determine the length and angle for the side rails.

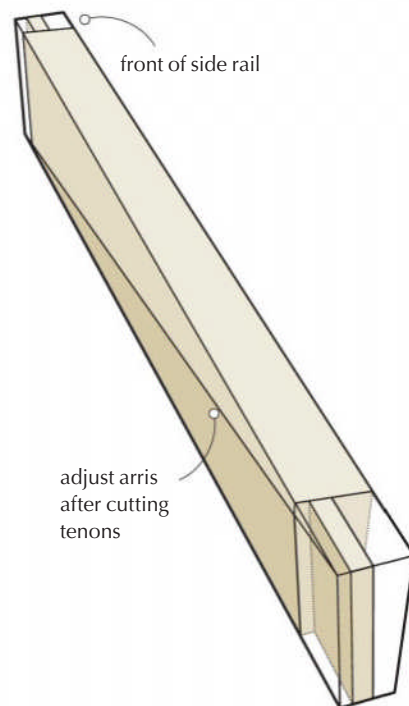
On one of the short edges of the plywood, mark off half the width of the back leg assembly at the top of the rail (this should be close to 15¹/₂"). On the opposite edge, mark off 10" – half of the 20" intended front width of the chair. Connect the marks and you'll have both the angle and the length of the rail between shoulders. Set a bevel gauge to this angle.

Start your layout at the back of the side rails with the twisted tenons. The cheeks are marked out parallel to this face. To lay out the shoulders, measure the depth of the side rail mortises in the back legs, subtract 1/32", then lay out the shoulder lines straight across the angled face and beveled across the top and bottom edges with the bevel gauge. Mark the inside face to meet the beveled lines.

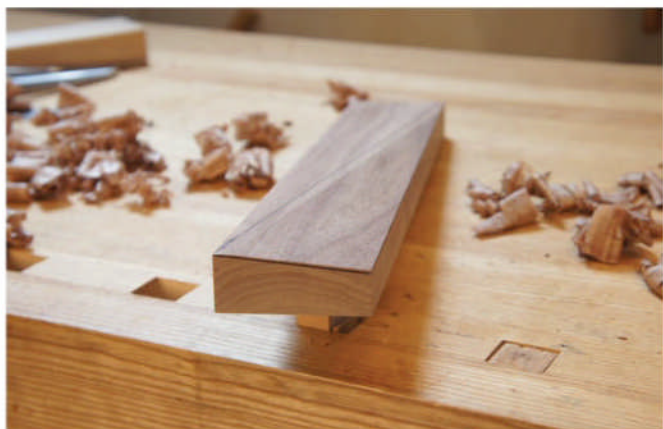
Mark out the front shoulder location based on the length you just determined with your drawing. Scribe the outside



ADJUSTABLE PARING BLOCK



SIDE RAIL TENON LAYOUT



Almost twisted. This is what the side rail should look like a few passes before you're done.

face of the rail square, then the edges at the same bevel angle as at the back of the rail. Mark the inside face, then scribe the cheeks.

Cut the Tenons

Cut the tenon cheeks. The easiest way to cut the shoulders is with the Tenoning Frame and Chairmaker's Saw (which I built in "Perfect Shoulders," an article that is linked to in the Online Extras), but you can cut and pare the shoulders freehand or with an angled block as well.

The Front Rail

If all has gone perfectly, the front of the chair will measure 20" from the outsides of the front legs. If not, adjust the length of the front rail so it fits between the legs. That's why you left this rail until last.

The front rail's tenons are straightforward: straight tenons and right-angle shoulders. Whew! Celebrate by carefully dry-assembling the frame.

Stretchers

While the chair is together, work on the side stretcher mortises. Clamp the chair's joints tight. Make a block of $\frac{3}{4}$ " x $3\frac{5}{16}$ " x 18" and use this block to mark the bottom of the stretchers, then measure up $\frac{1}{8}$ " and $1\frac{1}{8}$ " for the location of the bottom and top of the mortises on



Flat to the floor. The layout in the back legs for the two side stretchers should be perpendicular to the floor, not parallel to the legs.



Quick-&-dirty layout tool. The angle for the slat stretcher is different than that for the side rail. An improvised shop-made bevel gauge is an easy way to figure out this angle.



Double angles. To make things interesting, the back of the side stretcher has a compound angle. This gives you the secondary angle you need.

both the front and back legs.

The stretcher mortises in the back leg are different than the side rail mortises; they are perpendicular to the floor, not parallel to the edge of the leg. This is to account for the bare-faced tenons, and are different from the side rails. Use a square on the bench to lay out the mortise sides. The top of these mortises should be $\frac{1}{2}$ " to $\frac{7}{8}$ " away from the outside faces of the legs.

The faces of the stretchers should wind up inset $\frac{1}{16}$ " from the edges of the legs.

Complete the layout by scribing the sides of the front stretcher mortises $\frac{1}{8}$ " and $\frac{7}{8}$ " away from the outside edges of the legs. Don't chop anything just yet.

The Stretcher Angle

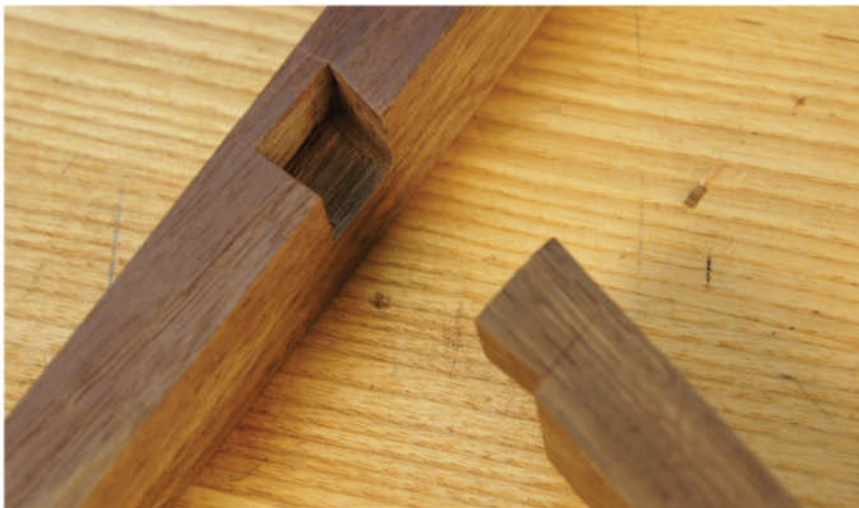
The stretcher mortises must be chopped at the stretcher angle, which is different from the side rail angle, because the rear legs sweep back. The height of the stretcher on the leg is important in figuring out this angle.

I made up a shop-made bevel gauge for this and placed it on top of the $3\frac{5}{16}$ "-wide layout block, and aligned it with the front outside corner of the back leg and the rear outside corner of the front leg.

You'll also need to set a second bevel gauge for the angle between the straight-edge and the sweep of the back legs.

Measure the length between the legs at the bottom of where the stretcher will go. This will be the longest shoulder to shoulder distance between tenons. Because these are much smaller mortises, I didn't bother with the paring block.

Instead, use a cut-off from band sawing the legs to support the leg and position it. Fit the side rail into its mortise and be sure that the top and bottom edges of the rail are perpendicular to your bench. Align your chopping with the rail so the mortise goes into the leg parallel to the rail (as seen from the side). The angle in plan view is different, and is guided by your oversized bevel gauge.



Hidden strength. A bonus half-blind dovetail joint is underneath the stretchers.

The mortises in the front legs are easier because you only need to worry about the angle from the bevel gauge.

The Side Stretcher Twist

Before you can cut the tenons on the side stretchers, plane the same 5° twist into them that you created on the side rails. The process is the same as it was for the rails.

Note that the stretcher tenons are half-tenons (or bare-face tenons). Mark the tenon cheeks from the inside face of the stretchers.

Start with the front tenon (the easier one), and mark out the splay angle on the top and bottom of the stretchers, the straight outside shoulders and the tenon thickness. Saw and pare away the waste.

Measure the shoulder-to-shoulder distance on the bottom outside corner of the stretcher. Use the two bevel gauges to scribe the compound-angled shoulder of the rear tenon. Scribe the tenon thickness, then cut away the waste. Pare to your shoulder lines, adjust the fit of the tenon and see if the stretchers fit.

The Rear Stretcher

The rear stretcher is easier. Clamp together the back of the chair and hold your slat stock up to the legs so the mortises are centered. Clamp the slat stock in place, then scribe the shoulder lines. Verify that these are the same 5° angle as the lower back rail. Lay out

and cut the rabbet that will make the tenon on the front face of the stretcher. Test the fit.

The Cross-stretcher

All that remains on the undercarriage of the chair is the cross-stretcher. Dry fit the rails, stretchers and legs, and clamp everything up. Flip the chair assembly upside down.

Measure 6" back from the front legs and lay out dovetail sockets for attaching the cross-stretchers. This dovetail



Joinery insurance. Make sure that the shoulders at the tops of the legs are aligned perfectly with a setup like this.

will also be also bare-faced, in that the front face of the cross-stretcher makes up one side of the tail. Cut the dovetail sockets and chisel out the waste.

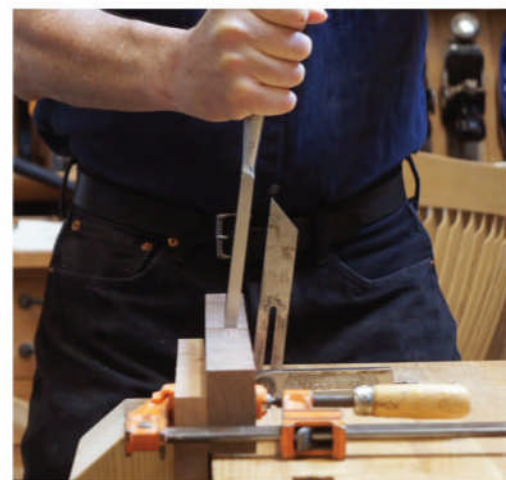
Set a bevel gauge to the angle between the center and side stretcher and cut the bevel on one end of the center stretcher. Scribe the other end to the correct length and bevel it as well. Lay your cross-stretcher stock on the side stretchers so that the front face is in position over the dovetail socket. Scribe the beveled shoulders, then lay out the depth of the notch that will allow the cross-stretcher to fit flush with the side stretchers. Lay the center stretcher in place and scribe the angled faces from inside the sockets.

Chisel away the wood that makes up the angled face of the dovetail. Then cut the rabbet that allows the stretcher to sit flush with its companions. Fit the stretcher.

The Crest Rail

Clamp the back legs and lower back rail. Lay this assembly on the blank for the crest rail and mark where the legs will meet it. Lay out the mortises based on these marks, about 1/8" in from the outside edges of the legs and centered on the thickness of the rail. Chop the mortises to depth, then clean up the side walls.

Measure up 17 1/8" from the top of the back rail and make marks on the inside back corner of the legs for the crest rail



Guided by the bevel. Watch the negative space between the bevel gauge and the mortise chisel to get the angle right.

shoulders. Lay out the cheeks at right angles to the shoulders, and saw these a little outside the layout lines. Fit the leg tenons to the crest rail mortises. Dry-fit the crest rail in place with the rest of the back assembly.

The backsplat will need to be angled back so it aims for the lower back rail and shoe. Use a straightedge to set a bevel gauge at the angle for the splat. This will be the angle of the long mortise in the crest rail for the back splat, and for the shoulder of the open-faced tenon of the top of the splat.

Chop and pare the long mortise for the back splat. Lay out the crest rail shape. Cut the rail to shape, then smooth with spokeshaves, rasps, scraper and a chisel for the meeting points of the curves. Leave a little bit of extra wood where the crest rail meets the legs to trim after glue-up.

The Shoe

The shoe is a shaped component separate from the lower back rail, into which you cut a long mortise for the bottom of the splat. The bottom of the shoe is planed to fine tune the fit of the back splat to the chair. Lay out the long mortise for the splat, then chop and pare. The mortise is at right angles to the top surface. Fitting the shoe – and angling it – comes after the work on the splat.

The Back Splat

Determine the rough length of the splat and smooth its faces before cutting the joinery. Cut bare-face tenons on the back of the board at the top, and the front at the bottom. Cut back the angled shoulders on the upper tenon away from the line, then carefully pare to the scribed lines.

Cut the bottom as you did the top, but without the angle. Saw out the shape of the splat, and smooth its edges.

Fit & Shape the Shoe

Assemble the back of the chair with the lower back rail, crest rail, shoe and splat. There will be a gap between the shoulders of the rear legs and the crest rail flats. Mark and plane the angle on the underside of the shoe to get a perfect fit. Finish shaping the shoe.



A quick fit. Paring the angle along the face of the splat is easier than it looks. There's not much wood to remove, and you can undercut the shoulder. A sharp, wide chisel will help you keep the lines straight and clean.

Beyond Joinery

The joinery is done. Before assembly, rabbet the tops of the rails and the front legs for the drop-in seat. Assemble in stages to keep things under control. The sides of the chair come first.

Spread glue in the mortises and lightly on the tenons, then assemble a side and clamp tight. Once both sides are done, add the front rail and the lower back rail and back stretcher to complete the next stage of the glue-up. Then add the crest rail. The splat and shoe are next. The final step is to add the dovetailed center stretcher underneath.

Final Steps

The hard stuff is done, but there are more details to take care of. Add corner blocks to reinforce the joinery and provide an (optional) attachment point for the seat. You also need to level the legs on the chair so it sits reliably flat. Cut the slip seat from $\frac{3}{8}$ " or $\frac{1}{2}$ " plywood (and send it out for upholstery – or do it yourself).

Apply your choice of finish to the chair. And finally, add glides to the bottom of the legs to protect the legs and the floor. **PWM**

Jeff is a Chicago-based furniture maker and author of many articles and several books on woodworking.



A fine fit. You should be able to push the shoe into place snugly without opening the crest rail-to-leg joints when it all fits.

ONLINE EXTRAS

For links to all online extras, go to:

■ popularwoodworking.com/apr18

WEBSITE: See Jeff's original, full-size drawings that he uses to make this chair.

ARTICLE: "Perfect Shoulders," by Jeff Miller – learn how to cut tenons with this shop-made tenon saw and can't-fail jig.

TO BUY: "The Foundations of Better Woodworking" by Jeff Miller.

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Hold Everything

(With Almost Nothing)

You can hold anything on your workbench with just pegs, wedges & notches – no fancy vises required.

BY CHRISTOPHER SCHWARZ

It's difficult for most woodworkers to imagine a workbench without screw-driven vises. But for most of human history, that's how you worked. No matter what you were building – furniture, wagons, barrels or houses – the workbench was typically a strong table with a collection of pegs, wedges and notches.

While screw-driven vises have existed since Roman times, they don't show up on workbenches until about the 14th century. And even in the 18th century, many woodworkers still preferred simple benches without screw-driven vises.

For today's woodworker, I think there are many reasons to understand and consider alternatives to the modern workbench. For one, they let you transform almost any surface into a workbench—even a picnic table. So, you don't have to leave your shop behind while on vacation.

They also are a great way to get a fully functional bench without spending much money. All of these contrivances use scraps—plus maybe a holdfast or clamp. So, you don't have to spend \$3,000 on a bench to build your first birdhouse.

Finally, these workholding methods are just as effective as modern vises. In some cases they are actually superior. Let's begin with my favorite—the single-point planing stop.



The lockjaw stop. This French bench uses rusty nails to secure the work. I have yet to cut myself on a metal planing stop during the last 12 years. So, this looks worse than it really is.



Wide planing stop. Add a thin batten in front of your planing stop, and you've made an effective planing stop for wide panels.

The Planing Stop

On early workbenches, the planing stop is the foundation for all the other bits of workholding. In fact, some benches are equipped with only a planing stop.

Most planing stops are comprised of a square stick that's long enough to penetrate the benchtop and give you enough height for planing boards on edge—3" x 3" x 12" is typical. The stop is adjusted up and down with mallet blows so it needs to be a durable wood and dry.

You might think that fitting the planing stop requires you to consider how wet the benchtop is and the current season. Will the stop and benchtop (or both) shrink as they dry? There are formulas and lots speculation for how tight or loose to make things. Ignore them.

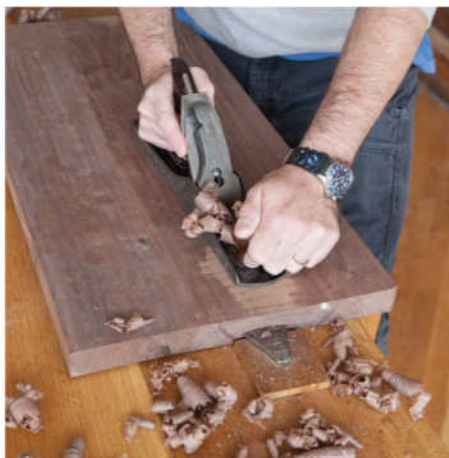
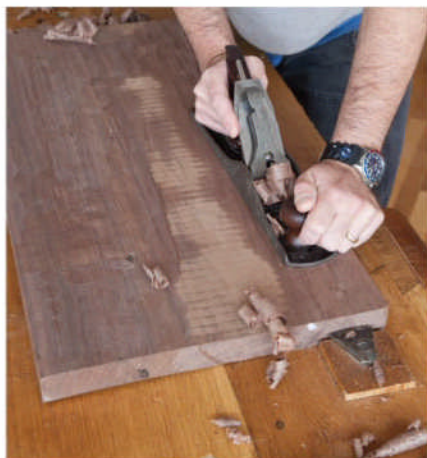
When I fit a planing stop, I assume

that I'm going to have to adjust it later on if it becomes too tight or make a new one if things get too loose. So, I focus on getting a good snug fit that day. I want the stop to move about 1/8" with each heavy mallet blow.

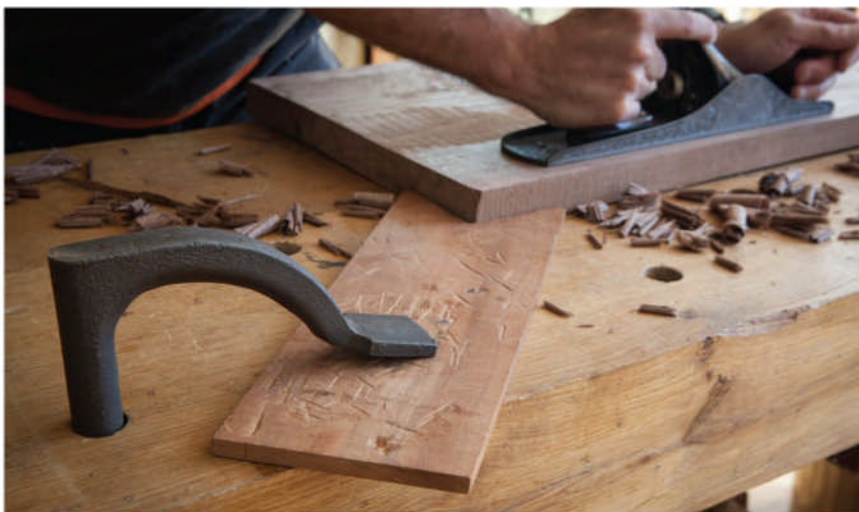
After I get that fit, I simply pay attention to how it functions. If the stop becomes almost impossible to move, I remove it and plane it a tad. If it's too loose, you can glue some veneer onto the existing stop or make a new one. In time, the wood will settle down and your planing stop will do the same.

The Bitey Bits

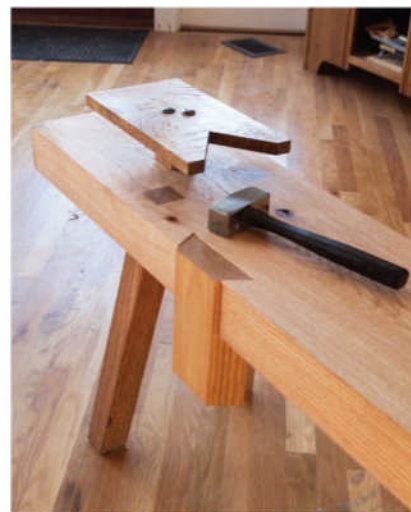
Most planing stops have some toothed metal on their tops to help secure the work. This can be as simple as a few nails driven through the stop. Other woodworkers attach a bit of saw steel to



It's in the hip. This is how I typically deal with wide stock. Keep the plane in line with the planing stop and shift the board toward you as you work. When you reach the far edge, use your hip to press the board against the stop. If you have a face vise, move its jaw out to help support the board as well.



A kick to your backside. With the doe's foot behind the work you can plane wide panels parallel to the grain or across it.



The palm. This versatile planing stop can be used for dressing faces or edges of boards.

the top of the planing stop and file teeth into it. Still others use a blacksmith-made stop or a commercial version.

They all work. File the teeth sharp and your work will move a lot less. And before you start planing a board, give the board a whack on its far end with a mallet so the teeth bite hard into the end grain of your work.

If you want to avoid getting teeth marks in a particular piece of wood, muzzle the teeth with a stick of wood. I use a stick of wood that is as long as my benchtop is wide. One end goes against the teeth. The other end is secured with a holdfast. It's an instant wide planing stop.

The wide planing stop is a crutch, and sometimes you really need it. But

I suggest you try to plane wide boards with the stop alone and see what you can get away with. By slightly shifting the work, you can control fairly wide boards. With practice, 8"-wide boards are no problem. Then shoot for 12".

Once you install a planing stop, the first accessory you should make for it is a "doe's foot," a simple appliance that plays nice with the planing stop. I covered the doe's foot in the November 2017 issue (#235) if you want to read about it in detail. The doe's foot is simply a piece of wood of almost any size with a 90° notch cut into its end. The device works by allowing your workpiece to get snagged in the notch between the two "toes" of the foot, immobilizing it from behind.

The Movable 'Palm'

When a doe's foot is used in front of the work instead of behind it, it's sometimes called a "palm." The word comes from the Chinese legend of how planing stops were invented. (Hint: It involved making a device instead of using a person's palm to secure the work.)

Palms show up on many early workbenches and are an extra-fancy version of a planing stop. I made one that can be moved up and down like a planing stop, and it works great.

It's about 1/2" x 7" x 13" with a "V" cut into one end. I attached the palm to the top of a 2" x 2" x 8" planing stop with glue and nails.

Because the palm is thin, I took pains to attach it to the planing stop so it wouldn't be wrenched off—planing stops take heaps of abuse. So, this palm is attached via a shallow mortise, glue and two beefy Roman-style nails.

Chop a 1/4"-deep mortise in the underside of your palm to receive the end of the planing stop. Use a router plane to ensure the bottom of the mortise is flat so the palm and planing stop will join at right angles.

Roman nails hold like the dickens but will split the work if you are careless in drilling pilot holes and clearance holes. While the palm is disassembled, drill clearance holes in the mortise for two beefy nails.

Glue the planing stop into the mortise, checking to ensure the stop is



Every little bit helps. This shallow mortise in the underside of the palm helps prevent the palm from coming loose from the planing stop.



Don't monkey around. Here is a reproduction of the painting of Karl Schreyner made by my daughter, Katy Schwarz. Note that Schreyner wasn't a monkey – Katy just drew him that way.

perpendicular to the palm all around. Once the glue is dry, drill pilot holes into the end of the planing stop. The depth of the holes should be equal to about two-thirds the length of your nail (about $1\frac{1}{2}$ " deep in my case) and slightly smaller than the shaft of the nail. Nail the palm to the planing stop and you are done.

Side Stops – the Schreyner System

In addition to the doe's foot and palm, there are other ways to prevent the work from spinning to the side while you plane it. One of the simplest is a method shown in a painting circa 1425 of woodworker Karl Schreyner at his bench.

His bench shows two round pegs at the end of the bench that work like simple planing stops. Then there are two additional pegs that restrain a board from the side. This painting is part of a series of 1,171 famous paintings of Nuremberg craftsmen now called The Mendel and

Landauer Hausbücher, and are a rich source of information on early crafts.

While many craftsmen are shown in the Mendel and Landauer Hausbücher working at their benches, the painting of Schreyner is the only one I'm aware of where the workbench has these pegs to the side of the work. And so I call these "Schreyner pegs" until I find an earlier source (or a catchier name).

Here's how I installed the Schreyner pegs on my benchtop. I started with a 1"-diameter x 36"-long oak dowel I bought for \$4.99. Then I sawed it into seven 5"-long bits. Then I laid out the positions of the 1" holes. The end stops are located where a simple planing stop would usually go. One is $4\frac{1}{2}$ " from the front edge of the bench. The second is 11" from the front edge.

The pegs for the side are all $13\frac{1}{2}$ " from the front edge of the bench. The first peg is 3" to the right of the end stops. The remainder are positioned on 12" centers.

Drive the 1" pegs into the holes. They should require mallet taps to move them up or down. Now you have a system of pegs that can handle traversing or planing with the grain.

The Roman Side Stops

Similar to the Schreyner pegs are the "side stops" found on the earliest surviving workbench (circa 187 A.D.) at the Roman fort in Saalburg, Germany. Like pegs, these stops move up and down and restrain the edges of boards and work in conjunction with the planing stop.

I first found these Saalburg side stops on a Roman bench that was both low and narrow, but they can be installed on workbenches of any height (they show up in historical paintings on taller benches). Like the Schreyner pegs, they can be used on their own for traversing



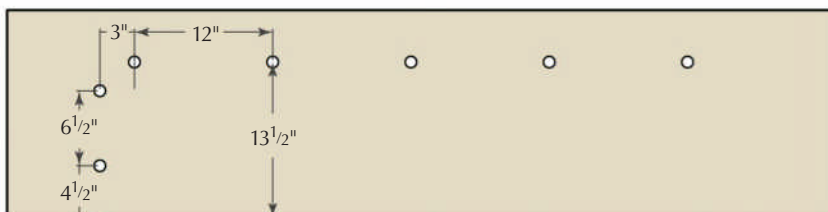
Across the board. For short boards, you'll need to shift the work left or right occasionally to keep the board under control. This is not a big deal.



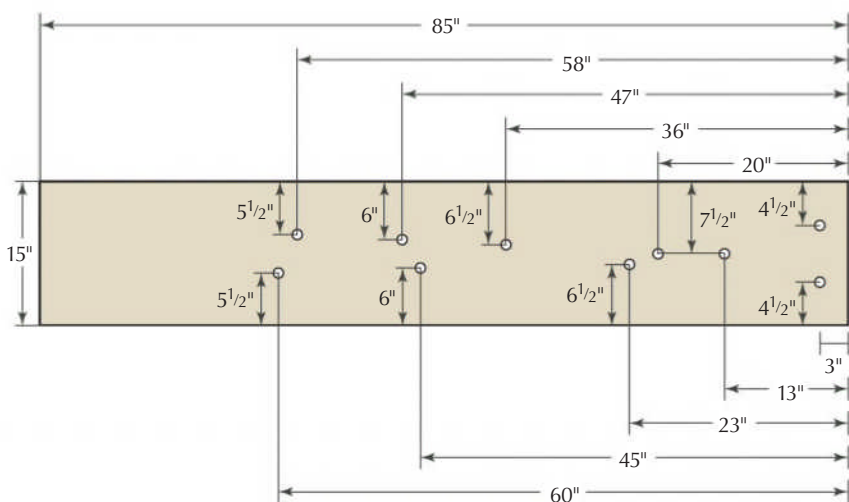
With the board. Planing boards 6"-10" wide can be a little tricky because the work is restrained by only one end stop and can rotate. You can fix this by putting a batten in front of the two end stops, making a wide planing stop.



Be seated. When traversing boards on a low bench, sit on a sawbench (or any low seat) to get the job done. Yes, it's OK to sit when you work.



SCHREYNER PEG LAYOUT



ROMAN BENCH PEG LAYOUT

boards with a handplane. Or they can be used in conjunction with a planing stop to prevent wide boards from spinning while planing them.

They also can be used like a bench hook for sawing joinery. Press the work against the side stops and cut tenon shoulders or dado walls.

Other Ways to Use Pegs

Many early benches, especially knee-high ones, feature a series of peg holes that form a long and shallow V-shape

down the middle of the benchtop's length. I've been working with this system of holes and pegs for a couple years and have found it surprisingly versatile.

The pegs for these holes can be as much as 6" tall, which allows them to support work when you work on the edge of a board. Here's how that works: Put one peg at the bottom of the "V." Place your board on edge against that peg. Now look down the two legs of the "V" for two holes—one on each face of the board—and put pegs in those holes. These pegs support your work from both sides. Now you'll find it remarkably easy to edge plane boards.

For working on the faces of boards, many of these benches had two movable pegs at the end of the bench that could be used much like the Schreyner pegs mentioned above. While many of the operations are the same as with the Schreyner pegs, you also use your body to restrain the work when you plane long boards.

Once you get into boards that are longer than your arms can reach, you sit on the work. With workpieces longer than 40" I begin by processing the stock close to the planing stops as shown at right. When that section is planed, I scoot backward about 3' and repeat the process.

Traversing boards with a fore plane is also fairly easy with the low bench. You brace the work against the planing stops, then use your knees to lock everything tight against the stops. Finally,



Double planing stops. Face planing a board against two adjustable stops embedded in the benchtop (from "Woodworking in Estonia").



Bench stops. Traversing short boards is simple; with longer stock I use a stool or sawbench to support the end hanging off the benchtop.

plane the area between your legs. An outboard sawbench helps support long stock or when you are at the beginning or end of a particular board.

You can also use the pegs at the end to secure your work similarly when sawing dados or chiseling waste across the grain.



I've got this pegged. By having a selection of pegs that vary in length and girth you'll find it easy to secure most boards on the benchtop.

Notches & Wedges

In many old woodworking paintings, you'll see benches that have no vises but instead have a large rectangular notch cut into the edge or end of the benchtop. In many cases, these notches are used as face vises. You put the work in the notch and then use a wedge to immobilize it. I've had great—actually, quite spectacular—success using these notches for cutting tenons and shaping the work with chisels, rasps and files.

It took a little experimentation, however, to get the wedges right. In the end, I went to my scrap pile and grabbed a white pine 2x4. I sawed it to 12" long and tapered one edge with a jack plane (I later measured the angle at 2°). Then I drove it into a notch.

It cinched down as hard as any screw-driven vise I've used. It worked so well that I laughed out loud.

If you are interested in making these notches, here are some details. On some benches, the notches are in the end of the benchtop. In others, they are cut into the edges. I tried both. They both held just fine.

Making the two kinds of notches, however, is quite different. The end grain notches take twice as long to make because the wood is fighting you the entire time. You have to rip saw the walls of the notch and then chisel out the waste like cutting a huge dovetail. There is a lot of chopping and splitting. It's not a horrible task, but it's more difficult than creating a notch in the edge of the benchtop.



Quick work. With the notch on the edge, you saw the walls and pry the waste out easily with a chisel. Then clean the long grain of the notch with paring cuts.

There you crosscut the walls (cross-cutting is easier than ripping). Then you split the waste with chisel chops. Splitting wood along the grain is always easier than chopping across it.

Here are the measurements for my notches. Don't feel compelled to copy me, however. The end-grain notch is 4½" wide and 2½" long. The edge notch is 4¼" long and 2" wide. I have a variety of softwood wedges scattered about that can handle work from 1" wide to 3" wide.

Belts & Ropes

One bonus operation: You can hold assemblies to the benchtop to work on their faces using a rope (or a belt)

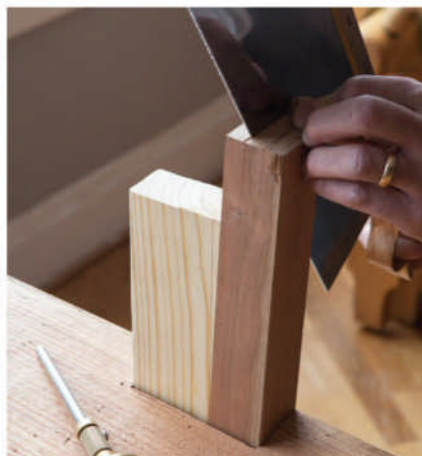


Gag order. A rope makes a surprisingly good hold-down, as seen in this old photograph, where a cooper has made a simple slab-style bench into an effective shavehorse (from "Woodworking in Estonia").

and your feet to create a primitive vise. I first saw this in an Egyptian painting. I've also been experimenting with using a leather belt to hold the work down. I have found that the belt and rope work best when holding objects that are fairly tall (as shown above in the historic image from "Woodworking in Estonia"). With thin stock, the edges of the benchtop interfere with the grip of the rope or belt.

Workbenches don't have to be fancy to do their job gracefully. Our ancestors could build masterpieces with simpler tools and workbenches, and so can we. It just takes a little imagination and an open mind. **PWM**

Christopher Schwarz is the editor at Lost Art Press and author of the forthcoming book "Ingenious Mechanics: Early Workbenches & Workholding."



Tap that. Knock the softwood wedge between the work and the benchtop and the work is secure enough for any operation.

ONLINE EXTRAS

For links to all online extras, go to:

■ popularwoodworking.com/apr18

BLOG: Read about how to turn a bureau into a workbench with simple workholding tricks.

BLOG: Read more about the doe's foot and using it on your bench.

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***It's not the tools.** Wondering how to step up your game with better measurement? Chances are, you've already got the right tools – but they may not be the ones you reach for.*

PRECISION

in the

Woodshop

BY RANEY NELSON

You're measuring wrong,
and making it more
difficult to do good work.

If the title has you expecting high-tech procedures or suggestions for expensive measurement gear that'll get you closer to angstrom-level measurements, then let me disappoint you quite thoroughly before paragraph one ends. This isn't that kind of party.

That shouldn't suggest that I'm going to advocate anything remotely resembling a lazy, "close-enough" approach, though. Not even a little. In fact, I think the most common source of problems in the shop is in taking and working with measurements – sloppy doesn't cut it.

What I am going to suggest is that there are a lot of misconceptions about the whole idea of "precision" that are not doing anyone any favors – misconceptions that are thoroughly tangled up with an inherited approach to measurement that could really use a head-on evaluation.

Before getting to any concrete suggestions, though, you'll have to grant me a bit of latitude in the trail we take to get there. Is my route the best one, or just the result of adult ADHD? Probably both – but that's your call. It's the only way I know to make the case properly.

Two Ends of the Spectrum: Both Wrong

On either end of any good argument about precision in woodworking, there are two persistent myths. They can be hard to spot once the hazy logic and armies of straw men start to show up, but in my experience, they're always there.

■ **Myth 1:** Precision is like clamps, money or paper towels – you can never have too much.

It's easy to see the appeal of this notion. If precision is good, then more precision is better. And once that's settled, then obviously precision should be gathered and hoarded at all costs.

But it's a woefully shallow take on things – a cost-benefit analysis that ignores cost. Precision, like most things, carries a price – usually paid in time, money or effort – all finite resources being eaten up for more refined capabilities. And, like all such transactions, the smart take is to find the "sweet spot" where you're getting results you need, but not too far past the point of diminishing returns.

That sweet spot varies spectacularly with the type of work, obviously. The sweet spot for yard fencing and luthiery are nowhere near each other. Nonetheless, the approach is the same.

■ **Myth 2:** Anything more precise than $\frac{1}{8}$ " or so is a waste of time; the material is going to move more than that every time the seasons change.

Phrases like this are the reason I mutter under my breath. One reason, anyway.

We all know wood moves, but that doesn't mean it sets the agenda. We have several millennia of hard-won

"Have no fear of perfection – you'll never reach it."

—Salvador Dali (1904-1989),
Spanish surrealist painter

collective knowledge about all manner of ways to accommodate, mitigate and work with wood movement. The collection of techniques for attaching bits of wood to one another is so central and unique to woodworking, it has its own name: joinery. Joinery is why woodworking is not bricklaying, and why woodworking texts are longer than the phrase "use glue."

If that doesn't appeal, or seem worthwhile, then woodworking seems an odd way to spend your time.

The difference between perfectly fit dovetails that remain tight all year and a self-destructing drawer doesn't lie in being sloppy with measurement. It's in knowing and using the techniques of joinery.

You Keep Using That Word...

If we're going to get serious about delving into measurement, then sooner or later we've got to address the biggest source of confusion in the whole mess – which is what, exactly, "precision" is.

The problem is not that we don't know what precision is. The real problem is that our understandings aren't compatible. In fact, I've noticed that even one person's working definition



Divide and conquer. I dragged this old toolbox carcass out to fit it for a bank of drawers.



Tricky division? I want eight equal drawers, so if the opening is a light $27\frac{3}{8}$ ", how big should each drawer be?



It's not a number. This big. A pair of dividers gets me the answer faster than I can write the calculations on paper. How many inches? Who cares.

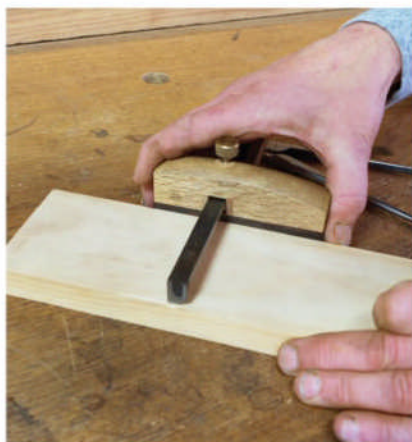


Is the opening square? Makeshift pinch rod (two sticks with beveled tips and a clamp) tell me everything I need to know faster, and more accurately, than any protractor, square or laser will.

seems to shift radically from one context to the next. I am not, of course, talking about either you or me here – but if we look at everyone else, it's clear as day that their understanding of “precision” is shockingly imprecise.

At around this point, someone as astute as you and I can't help but notice that in use “precision” seems to look less and less like a word than like some sort of foreign spy with a sophisticated cloaking device. Which explains a few things.

In semiotics (the study of “signs,” which is popular with academic pinheads and indiscriminate pseudo-intellectual toolmakers) such words are called “floating signifiers.” Floating signifiers are usually so familiar and so self-evident that it's a feat of effort to even notice their most interesting characteristic—which is a glaring lack of specific meaning.



Still no numbers. I transfer my divider calculation to a marking gauge, and mark the drawer face for the right height.

In use, they're like a bizarro-world version of communication. Rather than convey a meaning that we interpret and respond to, they trigger a response, and their vague meaning shifts to whatever best reinforces the response.

So before we move on, we need to pin down a precise definition for our terminology if we want to get anywhere. In this case, we can look to metrology (the study of measurement, which is popular with a different batch of pinheads, who refuse to eat lunch with the semiotics pinheads) for its very specific definitions.

In metrology, precision is always defined alongside the term “accuracy.” It's hard to have any clarity on one without the other. The common explanation uses the analogy of target practice. Imagine you're competing, and you shoot five bullets, arrows or spitballs at a bullseye target.

Accuracy is about how close to the bullseye any specific shot hits.

Drawer, meet carcass.

The simplest route is the best: drawer width is as easy as holding the face in place and marking it. The result is a perfect press-fit measurement.



Precision, on the other hand, is about how closely together your shots landed; it's your “grouping.”

Precision in this sense has nothing to do with accuracy – it doesn't even make sense for any single shot. You need a group of shots to say anything about the precision of your shots. It's a measure of your consistency.

Bringing it back to measurement: Imagine making a photocopy of a ruler at half-scale. If you measure a 6"-wide board with it, that ruler would read as 12". So, your half-sized ruler is ridiculously inaccurate. If you were careful in how you used it, though, and got very consistent measurements every time, then it would still be a precise ruler, consistent with itself.

So, now that we have made the distinction between precision (consistency) and accuracy (um – accuracy) – which one is more important in the shop?

Two Approaches to Taking Measurements

This is where things get interesting, and it's what most woodworkers should think about when they consider measurement. There are two different approaches to the question, and most of us default to the wrong one.

1. Standardized Units

In the modern world, most of us take up woodworking without considering how we measure things. We start with a system we were indoctrinated into through our entire education, in our workplaces and everything we are surrounded by.



Many parts, one line. Gang-cutting is a form of direct measurement, too.

In that system, all length measurements are in universal standardized units. Inches, feet, millimeters – all of those units are standard, and it's the only way most of us have ever dealt with measurement. It's an approach that is so universal, it's a huge stretch just to realize that it IS an approach.

There is a good reason for the absolute dominance of standardized measurement in the global manufacturing world. That system is absolutely critical to every industry on the planet.

But in the lone woodworker's shop, where the entire path from plans to finished piece never leaves, those standards don't apply a lot of the time.

2. Measuring Without Units

This can seem silly. Talking about "direct measurement" can feel like slapping a name on the simplest thing in the world and pretending it's a discovery. Simply putting a board next to the space it needs to fit, and then marking that length... it hardly seems like a "system." It sounds like common sense.

The problem, though, is that most people have an ingrained bias to prefer standardized measurements. Many times, I've watched someone use dividers to get a direct measurement and then turn around and double-check things with a ruler "just to be safe."

If you look back at your experiences, how many "new" techniques have you picked up that involved direct reading in preference to standardized measures? Marking gauges, bevel gauges, story sticks, pinch rods – even the use of the sliding head on a combination square? Now consider how many times

you've dismissed some form of direct marking in favor of measuring with some graduated standard.

That's what I thought. Here's the fix.

Some Rules of Thumb

Not all measurements are created equal, of course. It would be impossible (and boring) to give an exhaustive list of techniques here. What I can do is give you some things you might find on a poster for the Angry Inch Society.

- Use contact, not vision. Eyes lie. Any time you visually align something, or even just read a scale, the chances for error go up. Direct physical contact is more accurate and precise.

- Math is not your friend. Not only do calculations open the door to errors, those errors are often cumulative. Dividers are one secret weapon. There are plenty of strategies to avoid having to do math. Find them and use them.

- Don't "transfer" a measurement from one device to another when you don't need to. In other words, if you plan to scribe a given measurement with a marking gauge then use the gauge to take the measurement if you can.

- Have a system. All else being equal, I always use the top or left of a piece as my reference surface (sometimes called the "datum"). Often you don't get the luxury of picking, but when you do get to pick, pick the same way every time.

- Don't use more instruments than you need. Having a dozen squares of different lengths is great – but for any given measurement-to-marking process, don't mix them.

- No more steps than necessary. This is the most general, and most important, guideline I can pass along. Measurement is the first step in a layout chain that usually ends with marking something else. Every single step in between is a potential for error and degraded accuracy – so make the chain as short as possible.

This isn't a screed against standardized measurements – or against expensive, high-tolerance metrology instruments. I am a toolmaker, after all. I routinely work to thousandth-of-an-inch tolerances, and smaller on occasion. I have more surface plates than I care to admit, and an affection for



Don't mix your measuring tools. How many squares should you have? One per measurement. Don't use two (or three) tools to measure one thing. And don't "transfer" measurements among them.

Swiss test indicators that is unhealthy.

It is, however, the best case I can make that most of us have our default modes completely backwards.

For the one-person shop, direct measurement is superior in almost every way. It's simpler, cheaper, more consistent/precise and it sidesteps the most common and serious errors in any shop.

When you have to – and you will – shift to standardized measurement, do it. We live in the real world, and most projects will have at least one or two places where avoiding standardized measures is silly. The height of your tables need to match the other furniture in your house – plus furniture you might not own yet.

And if you order hardware, you can't send a story stick with your credit card info. **PWM**

Raney makes handplanes for Daed Toolworks and is a toolmaker for Crucible Tool in Greenfield, Ind.

ONLINE EXTRAS

For links to all online extras, go to:

- popularwoodworking.com/apr18

WEBSITE: Visit the author's website to see his work as Daed Toolworks.

BLOG: Read about the author's five-step design process.

TO BUY: Plans for André Jacob Roubo's wooden square featured in this article.

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8 Common Hinges

BY NANCY HILLER

Every door needs a hinge – Nancy Hiller shows you which hinges to use, the advantages of each type and how to install them.

Wherever there's a door, there must be hinges – and just as there's a galaxy of door types, there is a variety of hinges and modes of installation. Even when we narrow the field to those used in furniture and built-ins (as distinct from entry doors or gates designed for cattle), the options are many. In this article we'll describe the uses and installation of several common varieties. In the June 2018 issue (#239) we'll add five that are less common.

Butterfly/Applied Hinges

Surface-mounted hinges are decorative, often having strong period associations – especially with built-ins

from the early 20th century – and are simple to install. They come in two main varieties, for either inset or half-overlay doors.

First, determine the position of the hinges on the door. Many butterfly hinges have sloppy-fitting pins that allow for more movement than is desirable. (Stay tuned – I'll address this later.)

Set one flap of the hinge on the door, positioned so the barrel is just under halfway onto the door's hinge stile. Leaving the barrel a little less than halfway over the edge of the door will create a small gap between the door and the cabinet side or face frame.

Drill for two screws in each hinge using a Vix bit (a specialty bit that drills

holes centered on a hinge's mounting holes), then insert two steel screws of the same size as those you will use in your final fitting. Leave the third hole alone in case you need to adjust the position of the hinge.

Set the door in its opening on shims. For this demonstration I used pennies. I also taped pennies to the hinge stile to create a gap of the same width. Hold the door steady with one hand and drill two holes in each hinge with the other. Then insert screws and check the fit.

If there's too much play in the barrel, adjust the fit by moving a screw to the third hole, pulling or pushing the door up or down until it hangs as you want it.

Once the door is fitted, mark the holes for final hanging, remove the hinges, sand and finish. Then insert the finish screws.

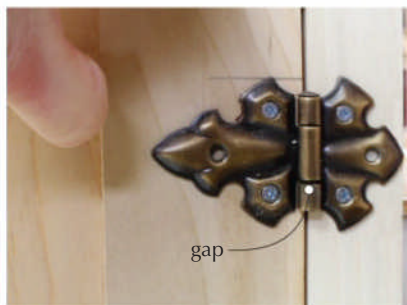
You can use the same method for half-overlay doors; just insert the coins under the ledge of the rabbet.

Butt Hinges

Butt hinges are common on furniture and built-ins. Although they come in a variety of sizes and types, most are installed according to a basic sequence of steps.

The simplest form of butt hinge is the surface-mounted variety that does not require a mortise. They're so easy to install that we won't cover them here.

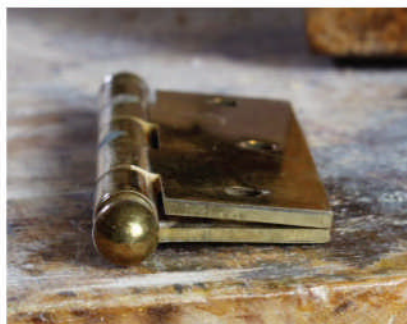
Traditional butt hinges come in two types: swaged and non-swaged. Whether or not a hinge is swaged can



Vertical play. This hinge had a lot of vertical play. The larger gap below the center section of the barrel is from my holding the door up. Compensate for this play when inserting the screws, or the door will sag.

be figured by how it sits when fully opened – a swaged hinge has a gap (as seen below) when closed.

The most common type of hinge we used in England was the fixed-pin non-swaged butt, which we mortised into the door stile only (I'll describe an application where this is called for later in this article). In the United States we



Swaged. A swaged hinge has leaves that are bent inward toward the center of the barrel.



Inexpensive shims. The door is resting on a pair of pennies that act as shims; another pair of shims is taped to the hinge stile to create the desired gap between the door and the frame.

mortise these half into the door and half into the cabinet, so this is the technique I'll describe in detail.

Fixed-pin, Non-swaged Butt Hinges

Determine the position of the hinges. Next, square the line for the end of the hinge around to the face of the hinge



Non-swaged. Hinges that are not swaged have their leaves in line with the barrel.

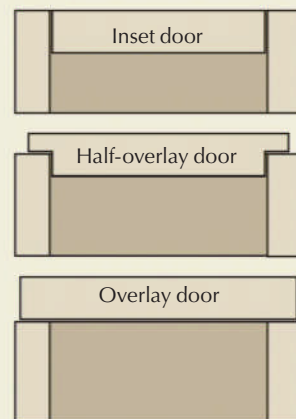
INSET, HALF-OVERLAY & OVERLAY DOORS

This article references a number of cabinetmaker's terms concerning three different configurations of doors relative to their carcase – inset, half-overlay and overlay. Before we dive into each hinge, it's worth indicating what these terms mean. (Note: Other hinge types can be used for these applications - this sidebar deals only with those in this article.)

Inset doors lie within the cabinet. This style can be used with both frameless and face-frame cabinets. Traditionally, furniture with inset doors would use butt or butterfly hinges (though other varieties such as strap or rat-tail hinges are common in older furniture). European hinges may be used for inset doors in modern cabinets.

Half-overlay (also called half-inset) doors have rabbets that allow half the door's thickness to be enclosed inside the carcase. These doors can be hung on butterfly or European hinges. Because there is no visible gap around the door, these hinges make for easy fitting.

Overlay doors hang proud of the face frame (or frameless opening). European hinges are commonly used for this application.





Scribe the width. To lay out the mortise width, set a marking gauge from the edge of the hinge leaves to the center of the pin in the middle of the barrel. Mark this width between the outer lines.



Scribe the thickness. Set the gauge to just under half the thickness of the barrel. However much your pin (or cutting wheel) is short of the hinge pin's center will be half the gap you'll have around the door.



Easy does it. When cutting across the grain to break up the waste, stop just short of the baseline to avoid going too deep.



Waste away. Pare away the waste, taking extra care as you place your chisel tip in the gauged line to remove the final shavings.



Put in place. With the door shimmed in place, mark the hinge positions on the cabinet frame using a knife. I also circle my knife marks with pencil to make them easier to see.

stile. Lay each hinge in place and scribe the location of the opposite end of the leaf with a marking knife.

Set a marking gauge for the width of the mortise and scribe the edge of the hinge stile.

If you have two marking gauges, set a second to the mortise depth: Hold the hinge leaf against the gauge's reference face and adjust until the pin (or cutting wheel) is just shy of the pin at the center of the hinge barrel.

Now that you can see the mortise depth, scribe a line across the door face from each end of the hinge.

Use a wide chisel to chop out the waste. Begin with a series of cuts across the grain. Stay a bit away from each end

to prevent marring those shoulders. You'll pare them later.

Next, use your chisel bevel up to pare the waste. After you've removed the bulk of the chips, pare to the baseline, staying away from the bit of waste left at each end.

Hold your chisel vertical with the bevel facing the inside of the mortise and pare away the bit of waste at each end, going down to the baseline. Finish up by paring that waste down to the line. Check the fit, and pare more material away if necessary.

Use temporary screws while fitting doors. Just be sure you use screws that are the same size or slightly smaller than those you'll use for the final instal-

lation. Here I used #6 x $\frac{5}{8}$ " Twinfast screws, which are easy to insert and remove. Use a Vix bit to drill holes for the two outside screws in each hinge. Leave the third hole alone. If you need to adjust the position of the hinge, you can drill a fresh hole later.

Set the door in its opening, shimming as necessary to get the gap you desire at the bottom. (I used a pair of pennies.) Mark the top and bottom corner of each hinge with a knife.

Turn the cabinet on its side to finish the mortise layout.

Repeat the steps above to lay out the hinge mortises on the cabinet. When you've finished cutting the mortises, test the fit.

Loose-pin, Swaged Ball-tip Hinges (Mortised into Door & Carcase)

The process of installing loose-pin hinges is similar to that described above, but with a few differences. Loose-pin hinges tend to be swaged. They also diverge from non-swaged fixed-pin hinges in terms of their barrel's position on a door – whereas the hinges in the first example above are mortised so that the outer edge of the door stile hits the barrel of the hinge approximately at its center, loose-pin swaged hinges are installed with the entire barrel clear of the door's edge; this way you can tap the pin's finial gently from below with a screwdriver and mallet to remove it.

Because the pins are removable, it's important to install the hinges so that the pin drops down into the barrel. For example, ball-tip hinges have one fixed finial that goes on the bottom; the pin with the other finial fixed to its end should drop in from above.

Start by setting a marking gauge to the mortise width. In this case, though, the mortise will be only as wide as a single leaf, because the barrel will protrude from the cabinet.

Mark the mortise width. Next, set the other gauge to the thickness of the mortise – in this case, the thickness of a single hinge leaf.

Scribe the thickness on the door and repeat the processes as described above to complete the layouts.

When you have screwed the first leaf into each mortise, lay the door in its opening on shims and transfer the hinge positions onto the cabinet as in the first example and cut the mortises. Now you're ready to try the fit.

Fixed-pin, Non-swaged Butt Hinges (Mortised Only into the Door)

Some jobs call for non-swaged butt hinges to be mortised fully into the door. Although it's uncommon in the United States, this is a method used often in England. It saves labor but is arguably less durable, especially for heavy doors, because the entire weight of the door is borne by the screws. My Arts &



Sliding home. Place the door so that the hinge leaves fit together, then drop in the pins.



Leaf, no barrel. To lay out the width of a swaged loose-pin hinge mortise, set your gauge to just the width of each leaf.



Full depth. The swaged loose-pin hinge is mortised flush with the wood, so set your gauge to the thickness of one leaf.



Revealing. Fixed-pin, non-swaged butts will be let into the door with the cabinet-side leaf protruding by the amount of your desired gap around the door, so I am setting the gauge shy of the barrel's thickness by about $\frac{1}{32}$ ".

Crafts sideboard in the November 2017 issue is an example of a situation that calls for this method. Because the doors are set back about 1" from the front face of the cabinet, they would not work if they were mortised halfway into the cabinet as well as the door.

This method is basically the same as the first butt joint method, except that the marking gauge for the mortise thickness should be set to just under the thickness of the entire barrel. If you want a gap around the door of, for example, $\frac{1}{32}$ ", you should set the gauge for the thickness of the barrel minus $\frac{1}{32}$ ".

Mark out and cut the mortise as in the first example above.

To transfer the hinge positions to

the cabinet, set the door in its opening on shims, but mark with a sharp pencil instead of a knife. Remove the door and mark the leaf width onto the cabinet side using a marking gauge; this will guide you in aligning the door from front to back.

Because the hinges have fixed pins, hanging the doors in this method is a little awkward: You have to hold the door with one hand while drilling the hinge holes with the other. It can take more than one try. I find it best to drill the first hole in the upper hinge, then insert a screw in the top hole. I hold the door steady and close it so I can check whether the face of the door is flush with the face of the cabinet. If it's

HINGE REFERENCE GUIDE

HINGE TYPE	GOOD FOR	NOTES ON INSTALLATION & USAGE
Butterfly/applied hinges	Inset or half-overlay doors and period applications, such as matching original hardware.	Easy to install. Your face frame and door stile must be wide enough to accommodate leaves. These hinges can have some slop.
Fixed-pin, non-swaged butt hinges (mortised in door & carcass)	Inset doors for high-quality traditional furniture and built-ins.	Require precision installation. Order hinges that will leave at least $\frac{3}{32}$ " of wood in thickness at the back of the mortise.
Fixed-pin, non-swaged butt hinges (mortised only into the door)	Cabinets where the door is recessed relative to its surrounding framework.	Fully-recessed doors can only open 90° and can't support heavy loads.
Loose-pin, swaged ball-tip hinges	Inset doors for traditional furniture and built-ins, especially early 20th-century styles.	Being able to remove the door makes this type of hinge ideal for easy installation and fitting. Especially good for heavy or awkward applications.
Piano hinges	Long doors or lids requiring full-length support.	Easy to install, and can be trimmed to fit.
European hinges (Inset door on frameless cabinets)	Built-in cabinets with inset doors that don't need to match an existing style.	Easy to install and adjust, and hidden when the door is fully closed.
European hinges (Full-overlay door on frameless cab.)	Overlay door applications, when paired with a mounting plate.	The same as above – and varying mounting plates allow differing amounts of overlay.
European hinges (Face-frame cabinets)	Cabinets where the hinge-side face frame stile protrudes into the door cavity.	Can also be used, in a pinch, with a cabinet where the stiles don't protrude, with a thin applied strip.

proud, I use a bradawl to mark the center of the next hole down a little farther back, remove the door, drill a hole in that new spot and try again. When the face of the door is where it should be, I drill the bottom-most hole in the lower hinge, insert a screw and repeat. Once you have a screw in the top and bottom hinge, you should be home free.

Piano Hinges

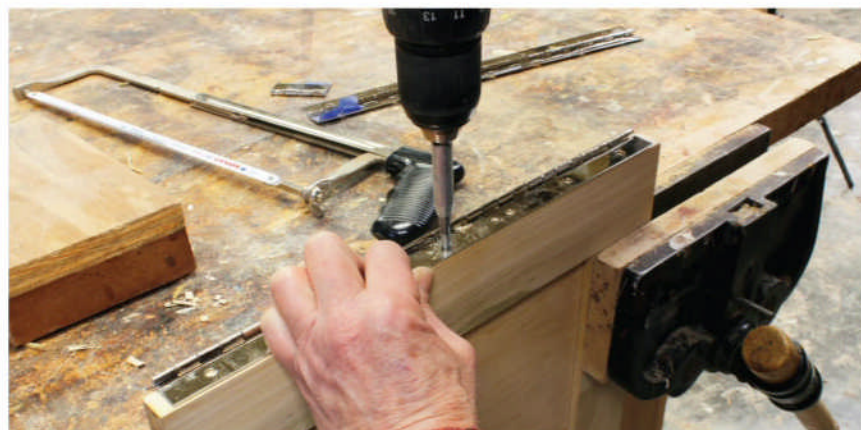
Piano hinges provide continuous support for doors and large box lids. They can be cut to length with a hacksaw, then mounted directly to the edge of a door or lid without mortising.

Piano hinges are made with a series of holes along their length. Sometimes a few holes are elongated to allow you to adjust the position of the door. This works when you use the entire length of the hinge, but many jobs call for cutting the hinge to a custom length. In these cases the result will be neater if you center the holes on the door or lid you're fitting.

After you have inserted enough screws in the door side to hold the hinge in position, hold the hinged door against the cabinet in its final position. The barrel should protrude by exactly the same amount on the cabinet as it does on the door (or not protrude at all, if that's how



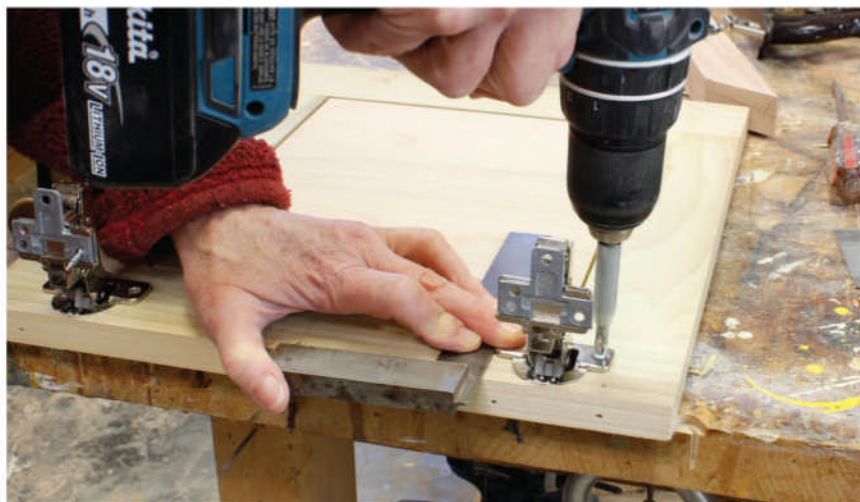
On center. The center of the door's length is marked in pencil and the hinge is positioned so that its center hole falls over that line.



Careful work. A Vix bit will work on piano hinges, though their leaves are on the thin side, offering less meat for the countersink on the bit to land – so make sure the bit registers properly on the hinge's hole.



Big holes. First drill the holes for the hinge cups using a 35 mm Forstner bit. A drill press with a fence enhances accuracy. The edge of the hole should be 1/8" from the edge of the hinge stile.



Little holes. As with the other hinges, I use a Vix bit to drill the mounting screw holes, once the larger holes for the hinge cups have been drilled. Alignment is easy, as the hinge sits in the larger holes for the hinge cups.



Open back. It's easiest to install these hinges before you affix the cabinet back. Simply set the door in its opening, shim with a wedge to hold it in place and drill the holes from the cabinet interior.



Looks familiar. As with the European hinge for inset applications, the overlay version for frameless cabinets involves a hinge and a mounting plate.

you fitted the hinge on the door). Drill a hole at one end and insert a screw, then repeat at the other. If you need to adjust the door a little to either side to even up the hinge relative to the cabinet, remove a screw, move the hinge, drill and insert a screw into the hole nearest the first one. When you're happy with the fit, drill and insert the rest of the screws.

European Hinges

European hinges come in a dizzying variety, each designed to work in different situations. Most consist of two parts – a hinge and a mounting plate –

though those designed for cabinets with face frames have an integral mounting plate. Depending on which combination of hinge and mounting plate you use, these hinges can work with doors that are inset, half-overlay (sometimes, confusingly, called “half-inset”) or full-overlay, in which the full thickness of the door is proud of the cabinet face.

And there are more – lots more – variations: A full-overlay door may overlay the cabinet face by 1/4" or 1 1/4", depending on the mounting plate you use. Doors can open 95° or as much as 165°. They can be free-closing (these

do not hold themselves closed but require a catch) or self-closing. Some of these hinges are even available with a soft-close feature that shuts the door for you once you give it a gentle push.

Despite the huge variety, all of these hinges have the same pattern for drilling the hinge cup mortise in the door: a hole drilled to the depth of the cup (about 1/2") with a 35 mm Forstner bit. The edge of the hole should be 1/8" away from the door stile edge.

First decide where you want the hinges. Keep in mind any fixed shelves or other interior features that may be



Slip fit. Face frame hinges differ from other European hinges in that the mounting plate on the cabinet side fits over the edge of the face frame.

in the way. These hinges and mounting plates occupy more interior cabinet space than many other types.

If you are using a drill press, set the depth to stop at the thickness of the hinge cup. Then drill for the screws using a #5 Vix bit. Insert the screws.

After this initial work is where the method of installation diverges, depending on your style of European hinge and installation plan.

Inset Doors on Frameless Cabinets

Although this method works for frameless cabinets, it works just as well for those with face frames, provided that the face frames do not protrude into the door opening. And, even if the face frame does protrude into the opening, you can still use this method if you shim out the mounting plate so that it lies in line with the face frame's inside edge.

Most doors will need some adjustment after installation. All European hinges offer easy vertical adjustment, and most now allow you to adjust the fit laterally as well as in and out.

Full-overlay On Frameless Cabinets

The method for overlay doors is similar to the method for inset doors, though you need to buy a mounting plate for the amount of overlay you desire (that is, the amount of the cabinet that is covered by the door). Here I used a zero-height plate with a straight-arm hinge for a 3/4" overlay. Once again, this can be used on cabinets with face frames.



Fix it in post. Clearly this door at top right needs some work. No worries – European hinges are made for just this type of situation. Screws on the hinge will move the door in and out, laterally or vertically. After this adjustment (shown at bottom right), the reveal around the door is even.



Set and shim the door in place as it will hang. Then, follow the steps used to install and adjust the inset doors.

Face Frame Hinges

Face frame hinges are made for applications where a face frame protrudes into the door opening. These hinges have mounting plates that simply fit over the edge of a 3/4"-thick face frame. (If your face frame is thicker, you can notch the frame.) Drill for the hinge cup and screws, then attach the hinge to the door.

Takeaway Lessons

There are many ways to hang a door – and these are just a few of the common hinges. In reality, here's how to narrow the choices:

- Will your doors be inset or overlay?
- Should the hinge be hidden from view? If so, consider European hinges.
- Are you matching an existing door? Existing door hardware will guide you.
- What is your budget? A 4' section of piano hinge might be \$10, while hanging a 4' door with three quality reproduction ball-tip butts can cost \$50.
- How much adjustability would you like? Mortised butt hinges give you

virtually none; European hinges offer adjustability in three planes.

■ If your shop set-up is minimal, consider a piano hinge, which requires a drill and screwdriver. If you have a traditional hand tool setup, go for fully mortised butts.

■ The ultimate decider: What is available?

Finally, of course, don't forget those pennies. **PWM**

Nancy operates NR Hiller Design Inc. near Bloomington, Indiana.

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A Lifelong Love Affair

BY LAURA MAYS & DEIRDRE VISSER

Debey Zito produces fine Arts & Crafts furniture and cultivates aspiring craftswomen from the hills of Northern California.

To find Debey Zito's workshop you give yourself over to GPS, which steers you west into the coastal hills north of San Francisco, between Petaluma and the Pacific Ocean. As the roads narrow and become poorly paved, you notice they increasingly bear the names of apple varieties.

You pass small ranch houses, each with a quarter-acre of apple trees beside them – which, on a March day in the rainiest year in recent memory, is breathtaking, promising abundance to come. Eventually you arrive at what you are assured is your destination, push open a tall, weathered wood gate and arrive in the lovely compound of furniture maker Debey Zito and her partner Terry Schmitt. The blossoms within the gate are equally delightful, two dogs wag their welcome and the pet rabbit hops at your feet.

Zito is an expert in both the American and English Arts & Crafts movements, and is also strongly influenced by Asian aesthetics. She wields an impressive portfolio of museum-quality work and decades of grateful students. The journey into woodworking was often arduous, but she has arrived.

Against the Odds

Zito grew up with furniture from the other end of the quality spectrum her current work embodies – cheap, industrially produced pieces, with drawers that became parallelograms when pushed in. As a young maker she was captivated by traditional furniture's promise to endure.

Her discovery of wood as a material, and fine woodworking as an endeavor, came about by chance: when she disliked her high school sewing teacher, her then-boyfriend made an offhand suggestion that maybe she try the woodshop classes instead. In 1972 (it would be a year before Title IX outlawed gender discrimination in educational settings) she walked into class and the instructor declared, "I knew with this women's lib we were going to get a girl in here eventually!"

Without Title IX protection, it was his choice to take her and she was luckier than her peers who had hoped to take auto or machine shop. Zito immediately began what would be a lifelong love affair with wood for its warmth, durability and connectedness to cycles of death and rebirth.

After high school, eager to get away from home, she made her way to San Diego State to study Industrial Arts, majoring in woodworking and metalworking with a minor in women's studies. Of the 500 students in the program, five were women, all of whom faced considerable sexism and misogyny.

That experience shaped her subsequent career – she decided to make her way to San Francisco to obtain a teaching credential. She wanted to create a supportive environment for learning, with particular attention to creating a space where women felt safe to learn.

As part of her teacher training, she had one day every week with Art Carpenter, in whom she found a kindred spirit with a similar down-to-earth attitude. Carpenter was a pivotal figure in the West Coast furniture movement of the 1970s, and a founding member of the Baulines Craftsman Guild. He made one-of-a-kind pieces that were direct, almost primitive, strong and functional, taking pride in the fact that they were not inordinately expensive or difficult to make. In contrast to the contemporaneous studio furniture movement which challenged formal and structural

ARTISTIC & FINELY CRAFTED

Debey Zito's work derives its forms from a variety of influences, including the Arts & Crafts stylings of English and American makers such as C.F.A. Voysey and Greene & Greene, alongside traditional Asian furniture. These pieces are further accentuated by relief carvings by her partner Terry Schmitt, who is inspired by traditional botanical illustrations.



Voysey desk & chair



Voysey inspired chair



Aesthetic cabinet



Modern aesthetic coffee table

convention, he “wanted a chair where he knew where to put his butt.” This resonated with Zito; she shares the same no-nonsense attitude to furniture.

In parallel with her career as a furniture maker, Zito has been teaching woodworking since gaining her credential in 1978. After a challenging first year teaching in a public high school, she moved to teaching continuing education at San Francisco's City College. Her heart, however, lies in the “Woodworking for Women” classes she runs at her shop. These are weekend sessions with female students from a diversity of backgrounds. Some have never used power tools or worked with wood before; others come back again and again. In these classes, held at her

idyllic home north of San Francisco, Zito creates the learning environment she wishes she'd had as a student.

The Dream Workshop

Zito crackled with exuberant good cheer and hospitality, with both her brain and body moving quickly as she gave us a tour around the property. The agglomeration of timber buildings, her home and workshop, interlock in the casual flowing manner of which modern architects dream. The deck wraps the house, carefully constructed to allow existing trees to come up through it.

It is a few dozen steps to the large purpose-built workshop. Rooflit, the airy, 1300-square-foot building is divided into two spaces, a bench room and a machine

room. Zito and Schmitt moved to this expansive setting from San Francisco in 2010, after decades in cramped quarters in the city. Large double doors hung with beads on long cords (to keep birds out) open to the garden.

The machine room is equipped with traditional shop standards – sturdy and well-tuned machines (table saw, jointer, planer and band saw) and an enviably organized wood and scrap storage. As with many shops there is a division between machine room and bench room that separates power tools from hand tools, noise from quiet.

The courses Zito offers place a strong emphasis on hand tool use, making the bench room the teaching heart of the shop. With its sliding barn doors opening to the herb garden, the spacious bench room also reflects the symbiotic relationship between Zito and Schmitt's work. Articles and photos pinned neatly to corkboards reflect not only the 30-year history of their course offerings, but a broader story of women in the field of woodworking, and the idiosyncratic history of the home they've made their own.

Tradition & Collaboration

During our visit, Zito had a project on her bench with a looming deadline, a side table in walnut with several drawers. Typical of her work, the piece is a uniquely balanced blend of Arts & Crafts and Japanese influences, with both restraint and attention to detail.

This sideboard, like many of her pieces, incorporates low-relief carved panels by Schmitt (seen at right), who is a talented woodcarver. One of these panels, a crane in the tall grasses at a pond's edge, was in progress in the bench room and displayed Schmitt's expertise and interest in botanical illustration and traditional motifs.

In the structure of her work, Zito is committed to using solid hardwoods and traditional joinery – mortise and tenons, dovetails and the like. The grain and color of the wood is carefully chosen to emphasize harmony, symmetry and proportion in an understated way. The wood is polished with a hand-rubbed finish.



Mahogany cabinet. This cabinet exemplifies Zito's furniture and Terry Schmitt's carvings.

The small mahogany cabinet pictured above is, like much of Zito's work, clearly influenced by Greene & Greene—architects from the turn of the 20th century who were, in turn, inspired by Japanese design references. It is visually spare compared to Greene & Greene—Zito designed it without their distinctive pinned tenons and without the breadboard ends on the top. References to the early 20th-century architects are evident in both form and detailing, however, including the distinctive cloudlift curved motif on the lower rail and in the door frames.

There is also an Arts & Crafts clarity in the articulation of elements, the structure and joinery and the color and carefully composed grain of the mahogany. The edges are softened, almost rounded, and are inviting to touch. Schmitt's

carved panels bring a delicate touch absent from Greene & Greene, indeed from most furniture—an invitation to come closer and spend more time with the piece. It is low relief carving with extremely delicate texturing. The motif is a slightly stylized Northern Californian oak tree, illuminating a sense of place and echoing the cycle of the making process from tree to domestic interior.

The scale of the pair's work ranges from small pieces like this, to a 50'-high by 51'-long artwork for the Alameda West End Library, a PWA (Public Works Administration) building built in 1936.

Their collaboration is clearly delineated. Zito is a furniture maker, or as she puts it, "I don't carve or turn or do lots of other kinds of working with wood; I make furniture." While Zito



In session. Zito has held classes on furniture making, hand tool usage and traditional joinery for women at her shop for more than 30 years.

deals with form, structure and the overall aesthetics, Schmitt contributes the representational low-relief panels. The clear distinction between their areas of specialization maximizes the potential for collaboration and relieves the prospect of competition or friction.

Zito's path in furniture has been long, her recognition and steady client base hard-won. She is increasingly drawn to designing, and not just to singular pieces of furniture, but to whole rooms and environments—to which she brings her considerable expertise in how things go together, and a well-researched knowledge of Arts & Crafts furniture.

She will continue to teach classes for women, and to inhabit her own beautiful portion of the earth, a spring of beautiful work and eager craftswomen. **PWM**

Laura is a furniture maker and the director of The Krenov School in Fort Bragg, Calif. Deirdre is a woodworker and San Francisco-based curator.

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WEBSITE: See more work from Laura Mays and Deirdre Visser, and more on their upcoming book on women woodworkers.

WEBSITE: Visit Zito and Schmitt's website to see more of their work and how to sign-up for classes at zitoschmittsdesign.com.

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Busy bench. This was what Schmitt's bench looked like when we visited. The walnut carving is an elegant example of the botanically-inspired relief carvings that Schmitt contributes to Zito's works.

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How to Repair Water Damage

Water can cause many problems to finished and unfinished wood.

As woodworkers, most of us have come across problems caused by water that we may be asked to repair. The problems can occur in the finish or in the wood if the water gets through the finish.

Here are some of the most common problems and methods of handling them.

Milky-white Watermarks

Probably the most common is water rings – light gray to white marks in the finish that destroy the transparency. These marks are almost always very near the surface of the finish film. There are two ways to remove them: by abrading or redissolving.

On all finishes except some very high-performance ones such as catalyzed varnish, which are often impossible to repair, cut the finish film back to below the damage. Rub using #0000 steel wool or any rubbing compound—even non-gel toothpaste if the damage is superficial. The finer the grade of abrasive, the slower the cutting and the glossier the sheen you will leave.

On shellac, wipe the surface lightly with a cloth barely dampened with de-



Watermark. Probably the most common damage from contact with water is a color change in the finish, often caused by sweaty glasses, but also by water just not being wiped dry quickly enough. The most surefire way to remove these marks is to rub them with a fine abrasive such as steel wool.

natured alcohol. On lacquer, dust on some lacquer retarder using a spray gun. Aerosols containing the retarder Butyl Cellosolve and labeled “blush remover” or something similar are available from many finish suppliers or online.

Fissures in the Finish Film

It's sometimes possible to repair fissures by sanding the ridges level and applying more finish on top. Sand with very fine sandpaper (#320 grit or finer) so you don't remove more of the finish than necessary. It's best to sand the entire surface to scuff and clean it so the new coat will bond well.

You can apply any finish. But if the finish contains lacquer thinner, begin with very light mist coats because the lacquer thinner may blister an existing finish if applied really wet.

Peeled Finish

When the finish begins to separate from the wood, there is no way to reattach it.

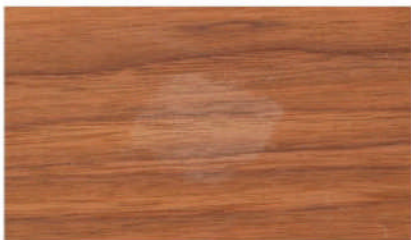
The finish has to be replaced. Begin by removing all the loose finish. If you can bring the color back to the bare areas by wiping them with a non-destructive liquid such as mineral spirits, then all you have to do is apply a clear finish to complete the repair.

If the color of the bare areas is light or uneven, you will have to darken or even it. Sometimes wiping the entire surface with a stain works. Other times you can brush stain or spray a toner onto just the lighter areas.

Raised Grain

Fuzzy wood most commonly occurs under oil and wax finishes because these finishes are so thin. Unlike a thicker film finish, they aren't good at preventing water penetration.

The raised grain caused by the water reflects light so that the area appears lighter, but not as light as milky-white watermarks. Correct the problem by smoothing with #000 or #0000 steel



Raised grain. Close in appearance to milky-white watermarks is raised grain in a thin oil or wax finish. Water penetrates these finishes quickly because they are so thin, and it raises the grain, which reflects light differently and makes the area appear lighter (center). You need to smooth the raised grain with an abrasive and apply more finish.

CONTINUED ON PAGE 60

SCIATICA BACK PAIN?

Are radiating pains down the back of your leg, or pain in your lower back or buttocks making it uncomfortable to sit or walk? Millions of people are suffering unnecessarily because they are not aware of this proven treatment.

MagniLife® Leg & Back Pain Relief combines four active ingredients, such as Colocynthis to relieve burning pains and tingling sensations. Although this product is not intended to treat sciatica, it may help with the pain. *"I am absolutely amazed at how it works and how fast it works."* - T Martin. Tablets dissolve under the tongue. *"Those little tablets are like relief in a snap."* - Patsy, CO.

MagniLife® Leg & Back Pain Relief is **sold at Walgreens, CVS/pharmacy, Rite Aid, Albertsons and Walmart**. Order risk free for \$19.99 +\$5.95 S&H for 125 tablets per bottle. **Get a FREE bottle** when you order two for \$39.98 +\$5.95 S&H. Send payment to: MagniLife S-PW, PO Box 6789, McKinney, TX 75071 or call **1-800-516-3481**. Satisfaction guaranteed. Order now at www.LegBackPain.com

PAIN AND INFLAMMATION?

If you suffer from pain due to inflammation related ailments such as arthritis, tendonitis, sprains or swelling, you should know that help is available. Many people are putting up with the pain because they are not aware of this new, innovative treatment for topical pain management.

73% of study participants found MagniLife® Pain & Inflammation Relief Gel's proprietary formula to be more effective than their current treatments (including prescription drugs) at reducing pain. Non-greasy formula is aspirin-free and menthol-free.

MagniLife® Pain & Inflammation Relief Gel is **sold at select Walgreens**. Order risk free for \$14.99 +\$5.95 S&H for a 2 oz. tube. **Get a FREE tube** when you order two for \$29.98 +\$5.95 S&H. Send payment to: MagniLife IC-PW, PO Box 6789, McKinney, TX 75071 or call **1-800-516-3481**. Satisfaction guaranteed. Order at www.InflammationGel.com

SHINGLES PAIN OR ITCH?

Are you suffering from burning or tingling pain or itching even after the shingles rash is gone? Many people are putting up with the discomfort and itching because they are not aware of this new advancement in skin care.

MagniLife® Pain & Itch Relief Gel contains 16 powerful ingredients such as arnica and tea tree oil to deliver fast relief. Although this product is not intended to treat or cure shingles, it can help relieve pain and itching. *"The MagniLife [gel] is the only thing that gave me relief after my case of shingles."* - Michele G., CA.

MagniLife® Pain & Itch Relief Gel is **sold at Rite Aid Pharmacy**, located in the first aid section. Order risk free for \$19.99 +\$5.95 S&H for a 1.8 oz jar. **Get a FREE jar** when you order two for \$39.98 +\$5.95 S&H. Send payment to: MagniLife SH-PW, PO Box 6789, McKinney, TX 75071, or call **1-800-516-3481**. Money back guarantee. Order now at www.PainfulRashRelief.com

AGE SPOTS?

Are unsightly brown spots on your face and body making you uncomfortable? Liver spots, also known as age spots, affect the cosmetic surface of the skin and can add years to your appearance. Millions of people live with dark spots and try to cover them with makeup or bleach them with harsh chemicals because they are not aware of this topical treatment that gently and effectively lightens the shade of the skin.

MagniLife® Age Spot Cream uses botanicals, such as licorice root extract to naturally fade age spots, freckles, and other age-associated discolorations, while protecting skin from harmful external factors. *"It is fading my liver spots. This product actually works!!!"* - Patricia C, NJ.

MagniLife® Age Spot Cream can be ordered risk free for \$19.99 +\$5.95 S&H for a 2 oz jar. **Get a FREE jar** when you order two for \$39.98 +\$5.95 S&H. Send payment to: MagniLife AC-PW, PO Box 6789, McKinney, TX 75071, or call **1-800-516-3481**. Complete satisfaction guaranteed. Order now at www.AgeSpotSolution.com

OVERACTIVE BLADDER?

If you experience minor leaks or a sudden urge to urinate, help is now available. 25 million Americans suffer from incontinence problems, which may lead to a limiting of social interactions to avoid embarrassment.

MagniLife® Bladder Relief contains seven active ingredients, such as Causiticum for adult incontinence, and Sepia for the urge to urinate due to overactive bladder. Tablets can be taken along with other medications with no known side effects. *"Love these pills. It is the first thing in a long, long time that is helping me. Thank you!"* Margeret S., FL.

MagniLife® Bladder Relief is **available at Rite Aid**, located in the vitamin section. Order risk free for \$19.99 +\$5.95 S&H for 125 tablets per bottle. **Get a FREE bottle** when you order two for \$39.98 +\$5.95 S&H. Send payment to: MagniLife U-PW, PO Box 6789, McKinney, TX 75071 or call **1-800-516-3481**. Satisfaction guaranteed. Order now at www.BladderTablets.com

FIBROMYALGIA JOINT PAIN?

Are you one of 16 million people suffering from deep muscle pain and tenderness, joint stiffness, difficulty sleeping, or the feeling of little or no energy? You should know relief is available.

MagniLife® Pain & Fatigue Relief combines 11 active ingredients to relieve deep muscle pain and soreness, arthritis pain, aching joints, and back and neck pain. Although this product is not intended to treat fibromyalgia, it may help with the pain and fatigue caused by fibromyalgia. *"These tablets have just been WONDERFUL. I'd recommend them to anyone and everyone!"* - Debra, WV.

MagniLife® Pain & Fatigue Relief is **sold at CVS/pharmacy and Rite Aid Pharmacy**. Order risk free for \$19.99 +\$5.95 S&H for 125 tablets per bottle. **Get a FREE bottle** when you order two for \$39.98 +\$5.95 S&H. Send payment to: MagniLife F-PW, PO Box 6789, McKinney, TX 75071 or call **1-800-516-3481**. Satisfaction guaranteed. Order now at www.PainFatigue.com



Black watermarks. When water gets into the wood through a finish (or because there's no finish), the water can cause unsightly black marks. It's hard to imagine them being worse than this (left). But they can usually be removed entirely by brushing on a hot solution of oxalic-acid crystals. Then wash off the residue crystals when the solution dries.

wool or fine sandpaper. With an oil finish you can lubricate the abrasive with some of the same oil. Then add more coats of oil to the entire surface.

Black Marks

Dark stains are caused by water, in combination with metal residue, getting through the finish and staining the wood. You can remove these marks with oxalic acid. But you usually have to remove all the finish first so the acid can penetrate evenly.

Dissolve some oxalic-acid crystals, which are available at paint stores or online as “wood bleach,” to a saturated solution in hot water. Brush the hot solution over the entire surface, not just over the stains, so the bleaching will be even.

Let the solution dry, then wash the crystals off the wood with a hose or well-soaked sponge or cloth. (Don't brush the crystals into the air or you may inhale them and choke.) Wash the surface well with water. I've never found it necessary to neutralize the acid residue in the wood.

Sometimes, a second or third application after the previous one has thoroughly dried is necessary.

Peeling Veneer

Veneer usually separates first around edges. Blisters in the middle of surfaces are more difficult to repair.

If you can get under the veneer, remove the old glue by sliding a folded piece of sandpaper (#100 grit to #180

grit) back and forth between the veneer and the substrate while pressing on the veneer. If the veneer has cupped and won't lay flat, moisten the top side enough so it will.

Blow out the dust and insert new glue under the veneer using a putty knife, strip of veneer or a syringe. Then clamp it using a flat block (curved if the substrate is curved) and a piece of waxed paper between the block and the veneer to prevent them sticking together.

You usually can't get under blisters to remove the old glue, so you will have



Warped top. Besides watermarking table and chest tops, water can cause warping if it comes in contact with a wooden surface often enough. The repeated wetting and drying out of the wood causes it to non-intuitively shrink rather than swell and expand due to the phenomenon of compression shrinkage. The cupping can often be reversed by repeatedly wetting and drying the bowed side.

to reglue without cleaning. Dampen the veneer if necessary to make it flexible enough so that it can be pressed without splitting.

Warp & Splits

Repeated wetting and drying, especially on one side only, causes wood to cup. The wood cells on the wetted side become compressed due to “compression shrinkage.” Eventually the stress is so great that splits appear.

You see this cupping and splitting most commonly on cutting boards and wood decks though it also happens on the tops of tables and chests.

Although it involves a significant degree of work, the most effective method of flattening warped boards is to expose the opposite (bowed) side to the same sequence of wetting and drying.

Joint Failure

Though it usually takes extended contact with water for joints to fail, this problem is seldom difficult to fix as long as the joints still fit. Simply remove any remaining old glue and reglue.

Waterlogging

When wood becomes waterlogged, there is nothing to do but let it dry out and see if it is still functional. Solid-wood parts will usually survive. MDF or particleboard usually won't, though sometimes you can add some trim to disguise the swelling. **PWM**

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

ONLINE EXTRAS

For links to all online extras, go to:

■ popularwoodworking.com/apr18

ARTICLES: You'll find many free finishing articles on our website.

IN OUR STORE: “Flexner on Finishing” – 12 years of columns illustrated with beautiful full-color images and updated, and “Wood Finishing 101.”

Our products are available online at:

■ ShopWoodworking.com

New Male Potency Formula Makes "The Little Blue Pill" Obsolete

Soaring demand expected for new scientific advance made just for older men. Works on both men's physical ability and their desire in bed.

By Harlan S. Waxman
Health News Syndicate

New York – If you're like the rest of us guys over 50; you probably already know the truth... Prescription ED pills don't work! "Simply getting an erection doesn't fix the problem," says Dr. Bassam Damaj, chief scientific officer at the world famous Innovus Pharma Laboratories.

As we get older, we need more help in bed. Not only does our desire fade; but erections can be soft or feeble, one of the main complaints with prescription pills. Besides, they're expensive... costing as much as \$50.00 each

Plus, it does nothing to stimulate your brain to want sex. "I don't care what you take, if you aren't interested in sex, you can't get or keep an erection. It's physiologically impossible," said Dr. Damaj.

MADE JUST FOR MEN OVER 50

But now, for the first time ever, there's a pill made just for older men. It's called Vesele®. A new pill that helps you get an erection by stimulating your body and your brainwaves. So Vesele® can work even when nothing else worked before.

The new men's pill is not a drug. It's something completely different

Because you don't need a prescription for Vesele®, sales are exploding. The maker just can't produce enough of it to keep up with demand. Even doctors are having a tough time getting their hands on it. So what's all the fuss about?

WORKS ON YOUR HEAD AND YOUR BODY

The new formula takes on erectile problems with a whole new twist. It doesn't just address the physical problems of getting older; it works on the mental part of sex too. Unlike the expensive prescriptions, the new pill stimulates your sexual brain chemistry as well. Actually helping you regain the passion and burning desire you had for your partner again. So you will want sex with the hunger and stamina of a 25-year-old.

THE BRAIN/ERECTION CONNECTION

Vesele® takes off where Viagra® only begins. Thanks to a discovery made by 3 Nobel-Prize winning scientists; Vesele® has become the first ever patented supplement to harden you and your libido. So you regain your desire as well as the ability to act on it.

In a 16-week clinical study; scientists from the U.S.A. joined forces to prove Nitric Oxide's effects on the cardio vascular system. They showed that Nitric Oxide could not only increase your ability to get an erection, it would also

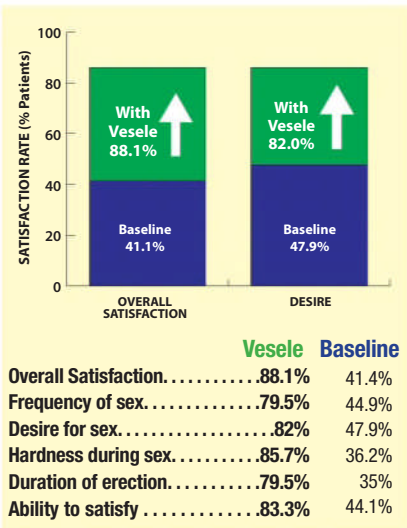
work on your brainwaves to stimulate your desire for sex. The results were remarkable and published in the world's most respected medical journals.

THE SCIENCE OF SEX

The study asked men, 45 to 65 years old to take the main ingredient in Vesele® once a day. Then they were instructed not to change the way they eat or exercise but to take Vesele® twice a day. What happened next was remarkable. Virtually every man in the study who took Vesele® twice a day reported a huge difference in their desire for sex. In layman's terms, they were horny again. They also experienced harder erections that lasted for almost 20 minutes. The placebo controlled group (who received sugar pills) mostly saw no difference.

AN UNEXPECTED BONUS: The study results even showed an impressive increase in the energy, brain-power and memory of the participants.

JAW-DROPPING CLINICAL PROOF



SUPPLY LIMITED BY OVERWHELMING DEMAND

"Once we saw the results we knew we had a game-changer," said Dr. Damaj. "We get hundreds of calls a day from people begging us for a bottle. It's been crazy. We try to meet the crushing demand for Vesele®."

VESELE® PASSED THE TEST

"As an expert in the development of sexual dysfunction, I've studied the effectiveness of Nitric Oxide on the body and the brain. I'm impressed by the way it increases cerebral



New men's pill overwhelms your senses with sexual desire as well as firmer, long-lasting erections. There's never been anything like it before.

and penile blood flow. The result is evident in the creation of Vesele®. It's sure-fire proof that the mind/body connection is unbeatable when achieving and maintaining an erection and the results are remarkable" said Dr. Damaj. (His findings are illustrated in the chart at left.)

HERE'S WHAT MEN ARE SAYING

- I'm ready to go sexually and mentally.
- More frequent erections at night and in the morning.
- I have seen a change in sexual desire.
- Typically take 1 each morning and 1 each night. Great Stamina, Great Results!
- An increased intensity in orgasms.
- My focus (mental) has really improved... Huge improvement.
- Amazing orgasms!
- I feel more confident in bed

HOW TO GET VESELE®

This is the first official public release of Vesele® since its news release. In order to get the word out about Vesele®, Innovus Pharma is offering special introductory discounts to all who call.

A special phone hotline has been set up for readers in your area; to take advantage of special discounts during this ordering opportunity. Special discounts will be available starting today at 6:00am. The discounts will automatically be applied to all callers. The Special TOLL-FREE Hotline number is 1-800-322-7503 and will be open 24-hours a day.

Only 300 bottles of Vesele® are currently available in your region. Consumers who miss out on our current product inventory will have to wait until more become available. But this could take weeks. The maker advises your best chance is to call 1-800-322-7503 early.

Drug Companies Fear Release of the New AloeCure

Big Pharma stands to lose billions as doctors' recommend drug-free "health cocktail" that adjusts and corrects your body's health conditions.

by David Waxman
Seattle Washington:

Drug company execs are nervous. That's because the greatest health advance in decades has hit the streets. And analysts expect it to put a huge crimp in "Big Pharma" profits.

So what's all the fuss about? It's about a new ingredient that's changing the lives of people who use it. Some call it "the greatest discovery since penicillin"!

The name of the product is the AloeCure. It's not a drug. It's something completely different. And the product is available to anyone who wants it, at a reasonable price. But demands may force future prices to rise.

TOP DOC WARNS: DIGESTION DRUGS CAN CRIPPLE YOU!

Company spokesperson, Dr. Liza Leal; a leading integrative health specialist recommends AloeCure before she decides to prescribe any digestion drug. Especially after the FDA's stern warning about long-term use of drugs classified as proton pump inhibitors like **Prilosec®, Nexium®, and Prevacid®**. In a nutshell, the FDA statement warned people should avoid taking these digestion drugs for longer than three 14-day treatment periods because there is an increased risk of bone fractures. Many people take them daily and for decades.

Dr. Leal should know. Many patients come to her with bone and joint complaints and she does everything she can to help them. One way for digestion sufferers to help avoid possible risk of tragic joint and bone problems caused by overuse of digestion drugs is to take the AloeCure.

Analysts expect the AloeCure to put a huge crimp in "Big Pharma" profits.

The secret to AloeCure's "health adjusting" formula is scientifically tested Acemannan, a polysaccharide extracted from Aloe Vera. But not the same aloe vera that mom used to apply to your cuts, scrapes and burns. This is a perfect strain of aloe that is organically grown under very strict conditions. AloeCure is so powerful it begins to benefit your health the instant you take it. It soothes intestinal discomfort and you can avoid the possibility of bone and health damage caused by overuse of digestion drugs. We all know how well aloe works externally on cuts, scrapes and burns. But did you know Acemannan has many of other health benefits?...

HELPS THE IMMUNE SYSTEM TO CALM INFLAMMATION

According to a leading aloe research, when correctly processed for digesting, the Aloe plant has a powerful component for regulating your immune system called Acemannan. So whether it's damage that is physical, bacterial, chemical or autoimmune; the natural plant helps the body stay healthy.

RAPID ACID AND HEARTBURN NEUTRALIZER

Aloe has proved to have an astonishing effect on users who suffer with digestion problems like bouts of acid reflux, heartburn, cramping, gas and constipation because it acts as a natural acid buffer and soothes the digestive system. But new studies prove it does a whole lot more.

SIDE-STEP HEART CONCERNS

So you've been taking proton pump inhibitors (PPI's) for years and you feel just fine. In June of 2015 a major study shows that chronic PPI use increases the risk of heart attack in general population.

UNLEASH YOUR MEMORY

Studies show that your brain needs the healthy bacteria from your gut in order function at its best. Both low and high dosages of digestion drugs are proven to destroy that healthy bacteria and get in the way of brain function. So you're left with a sluggish, slow-to-react brain without a lot of room to store information. The acemannan used in AloeCure actually makes your gut healthier, so healthy bacteria flows freely to your brain so you think better, faster and with a larger capacity for memory.

Doctors call it "The greatest health discovery in decades!"

SLEEP LIKE A BABY

A night without sleep really damages your body. And continued lost sleep can lead to all sorts of health problems. But what you may not realize is the reason why you're not sleeping. Some call it "Ghost Reflux". A low-intensity form of acid reflux discomfort that quietly keeps you awake in the background. AloeCure helps digestion so you may find yourself sleeping through the night.

CELEBRITY HAIR, SKIN & NAILS

Certain antacids may greatly reduce your



body's ability to break down and absorb calcium. Aloe delivers calcium as it aids in balancing your stomach acidity. The result? Thicker, healthier looking hair...more youthful looking skin... And nails so strong they may never break again.

SAVE YOUR KIDNEY

National and local news outlets are reporting Kidney Failure linked to PPI's. Your Kidney extracts waste from blood, balance body fluids, form urine, and aid in other important functions of the body. Without it your body would be overrun by deadly toxins. Aloe helps your kidney function properly. Studies suggest, if you started taking aloe today; you'd see a big difference in the way you feel.

GUARANTEED RESULTS OR DOUBLE YOUR MONEY BACK

Due to the incredible results people are reporting, AloeCure is being sold with an equally incredible guarantee.

"We can only offer this incredible guarantee because we are 100% certain this product will work for those who use it," Says Dr. Leal.

Here's how it works: Take the pill exactly as directed. You must see and feel remarkable improvements in your digestive health, your mental health, in your physical appearance, the amount inflammation you have throughout your body - even in your ability to fall asleep at night!

Otherwise, simply return the empty bottles with a short note about how you took the pills and followed the simple instructions and the company will send you...Double your money back!

HOW TO GET ALOECURE

This is the official nationwide release of the new AloeCure pill in the United States. And so, the company is offering our readers up to 3 FREE bottles with their order.

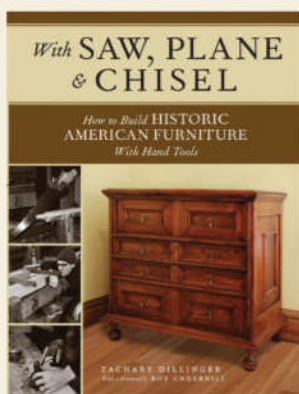
This special give-away is available for readers of this publication only. All you have to do is call TOLL-FREE 1-800-746-2951 and provide the operator with the Free Bottle Approval Code: JC025. The company will do the rest.

Important: Due to AloeCure's recent media exposure, phone lines are often busy. If you call and do not immediately get through, please be patient and call back.



Historic Furniture, Historic Methods

Immerse yourself in the world of traditional woodworking as period furniture expert Zachary Dillinger walks you through the construction of six pieces of classic American furniture. From preparing stock by hand to period-correct joinery methods, you'll learn how our forebears built furniture – and why they did things the way they did – as you create your own heirloom pieces.



Paperback: S0522; eBook: S0523

Order Now at **ShopWoodworking.com**
or call **855-840-5118** (8 a.m.-5 p.m. Mountain Time),
and get a bonus PDF with purchase!

Thanks to BetterWOMAN, I'm winning the battle for Bladder Control.



Frequent nighttime trips to the bathroom, embarrassing leaks and the inconvenience of constantly searching for rest rooms in public – for years, I struggled with bladder control problems. After trying expensive medications with horrible side effects, ineffective exercises and uncomfortable liners and pads, I was ready to resign myself to a life of bladder leaks, isolation and depression. But then I tried **BetterWOMAN**.

When I first saw the ad for BetterWOMAN, I was skeptical. So many products claim they can set you free from leaks, frequency and worry, only to deliver disappointment. When I finally tried BetterWOMAN, I found that it actually works! It changed my life. Even my friends have noticed that I'm a new person. And because it's all natural, I can enjoy the results without the worry of dangerous side effects. Thanks to BetterWOMAN, I finally fought bladder control problems and I won!



ALL NATURAL

Clinically-Tested Herbal Supplement

- Reduces Bladder Leaks
- Reduces Bathroom Trips
- Sleep Better All Night
- Safe and Effective – No Known Side Effects
- Costs Less than Traditional Bladder Control Options
- **Live Free of Worry, Embarrassment, and Inconvenience**



You don't have to let bladder control problems control you. **Call now!**

Also Available: **BetterMAN®**

The 3-in-1 Formula Every Man Needs – Better **BLADDER**, Better **PROSTATE**, and Better **STAMINA!**
Order online at www.BetterMANnow.com.

Limited Time Offer

Call Now & Ask How To Get A
FREE BONUS BOTTLE

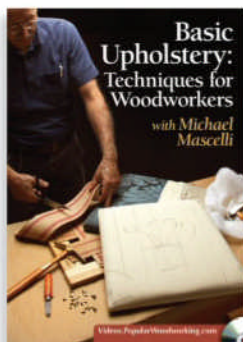
CALL TOLL-FREE **1-888-891-2698**
or order online: www.BetterWOMANnow.com

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Sitting Pretty



With Mike Mascelli's easy-to-follow instruction, you'll learn the simple skills and tool techniques to make a drop-in slip seat – a covered frame that's designed to fit inside the chair frame – from frame to webbing to foam to sitting pretty.



Buy Yours Now as a Download or on DVD at **ShopWoodworking.com**.

It's Not About Perfection

The beauty of utility: coarse and fine combined.

One of my favorite pieces of furniture is a chest of drawers I bought at an antiques store in Reading (the English town, not its Pennsylvania equivalent) circa 1984. At least a century old by now, it's made of deal, a nondescript term for softwoods, with knots and other characteristics usually considered defects. It was originally painted; traces of finish still linger in the cracks. By the time I came across it, a dealer had dipped it in methylene chloride stripper, which did the joints no favors. And yet it has held together during its three decades in my possession.

I love this chest of drawers, not least because it's a mass of contradictions. It was made from defect-riddled paint-grade wood, but aside from the top, which is attached with nails, it was built with traditional joints cut by hand. Sliding dovetails hold the drawer rails in place. Stub tenons support the runners. The drawers themselves are dovetailed front and back; their bottoms, along with the cabinet's back, are also solid. Altogether it's a strange meeting of coarse and fine, at least by our own day's standards.

What endears the piece to me most is the dovetails' imperfection. They taper to a fine point, a mere saw kerf wide – typically considered a mark of high craft. Yet the gauge lines were left in place. What's more, many of the kerfs go well beyond those lines; and some of the joints have gaps. If I produced a set of dovetails similar to these, I would feel obliged to consider tossing the drawer into my version of a bonfire, the woodstove that heats our house.

These dovetails, which were clearly made by an accomplished craftsman intent on getting the job done, remind me that in the universe of making



things, utility is no less worthy a goal than fine craft. Amidst the relentless drive to do better, it's easy to lose sight of the grace that characterizes our very ability to make things, however imperfectly, not to mention the blessings offered by even the most basic material artifacts. Yes, the things we make reflect who we are, at least to a degree – and who wants to be defined by radical imperfection? But there's a conceit in being so wrapped up in the tightness and proportions of a joint that we lose sight of the bigger picture, which includes those who will use the things we make.

I often find I can't look at a piece of my own work without focusing on the parts that should have been done better. Even as I tell myself it's alright to be less than perfect, I feel a pang of self-loathing. Sometimes I get a chance to visit a customer's home years after I've completed a job. I see a table or a set of built-in cabinetry serving its purpose in its intended setting. And I am able to

appreciate my work separate from its reflection of its decidedly flawed maker. It's a valuable corrective, revealing my self-flagellation as a form of vanity.

This is one of the wonders of making. In the end, it's not about perfection. While craft entails much character-building struggle, it's also a practice of learning to accept our failings and appreciate our role as makers who bring useful objects into the world. **PWM**

Nancy is a professional furniture maker and writer – her next book, "English Arts & Crafts Furniture" is due out in June from Popular Woodworking Books. This article first appeared on overthewireless.com.

ONLINE EXTRAS

For links to all online extras, go to:

■ popularwoodworking.com/apr18

WEBSITE: See more from the author at nrhillerdesign.com.

TO BUY: Read Nancy R. Hiller's book "Making Things Work."

Our products are available online at:

■ ShopWoodworking.com

WoodRiver®



KEEP YOUR BLADES RAZOR-SHARP

The WoodRiver® Granite Surface Plate is ideal for leveling small plane beds, flattening waterstones and general sharpening duties. Simply soak a piece of wet/dry sandpaper in water, lay it down on the stone, and the capillary action of the water will adhere the paper to the stone. The A grade Granite Surface Plate has a super flat face, is moisture and corrosion free and easy to wipe clean. Available in three handy sizes:

6" x 18" x 2", 9" x 12" x 2" and
12" x 18" x 3".



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FREUD'S CNC ROUTER BIT SERIES

Freud's new CNC router bits are specially formulated with our exclusive TiCo™ Carbide, unique cutting geometrics and Perma-SHIELD® non-stick coating for unmatched cutting performance and durability on workshop and small CNC machines.



87-208 8 Piece CNC General Purpose Set



87-108 8 Piece CNC Sign Making Set



87-308 3 Piece CNC Fine Detail Set



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