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Smart strategies for
drawer dividers p. 66



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32 VERSATILE
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66 DOVETAILED
DIVIDERS



56 TRAY TABLE



features

32

COVER
STORY

Modular Wall Unit

Mitered cases combine with a unique hanging system for versatile storage

BY ANISSA KAPSALES

56 Indigo Tray Table

A removable parquetry tray transforms a simple, three-legged table

BY HEIDE MARTIN

42 The Fundamentals of Milling

Key machines and smart strategy for making boards foursquare

BY BOB VAN DYKE

66 Strong and Stylish Dovetailed Dividers

Three options for these classic components of casework

BY WILL NEPTUNE

50 Dead-on Double Tenons with a Router

Simple template offers accuracy and repeatability

BY MIKE KORSAK



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departments

6 On the Web

8 Contributors

10 Letters

12 Workshop Tips

- Tablesaw outriggers let you use a smaller sled
- Use a pencil sharpener to make tight plugs

16 Tools & Materials

- Hybrid saw packed with features
- Cyclone for a shop vacuum

20 Finish Line

Indigo dye on wood

26 Handwork

Winding sticks guarantee accuracy

74 Gallery

78 Master Class

Dovetailed dividers with a built-in bead

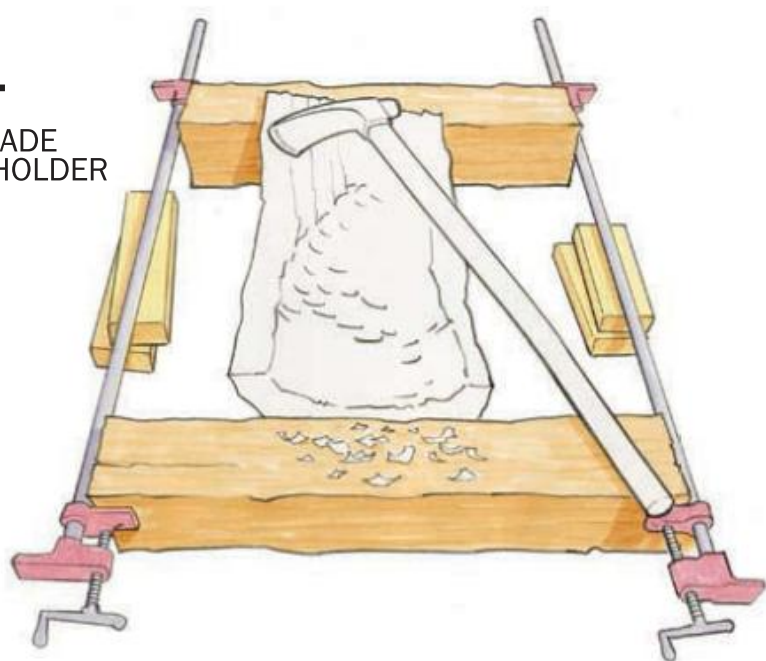
Back Cover

A fusion of pattern and form



14

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For members

VIDEO

Perfect paring

Will Neptune uses an angled paring block to create a perfect dovetail on his dividers (p. 66). In this video, Matt Wajda demonstrates Neptune's technique.



VIDEO

Scrolling with Tim Coleman

Tim Coleman's creative use of decoration in his furniture is legendary. In this video, you'll see how he creates some of his dazzling details using the humble scrollsaw.

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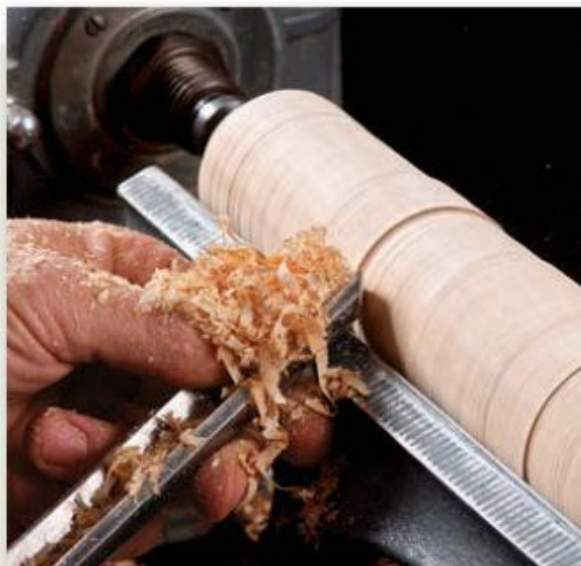
Unlimited includes two digital book collections: *The Complete Illustrated Guide to Woodworking* and *Methods of Work*.

VIDEO WORKSHOP

Learning Curve: Turning

Join two woodworkers—Anissa Kapsales and Ben Strano—right from the start as they learn to turn under the watchful eye of an expert, Windsor chair maker David Douyard. In this series, you'll learn the basics of turning, including:

- Initial shaping with a roughing gouge
- Creating V-cuts and beads with a skew chisel
- Accurately sizing tenons with a parting tool



Online extras

Free content at finewoodworking.com/276



VIDEO

Straighten boards at warp speed

A board that's severely twisted is nearly impossible to straighten using conventional methods. In this video, Bob Van Dyke (p. 42) comes to the rescue with his fast method of flattening a board that many would consider too warped to use.



VIDEO

Recipe for natural dye

Indigo dye (p. 20) isn't the only way to color wood naturally. You can extract natural dye from many items found in your grocery store's produce section or even in your yard. We'll show you a few.

VIDEO

Get to know Bill Pavlak

Bill Pavlak (p. 26) chats about his favorite makers, his favorite furniture, and how working at Colonial Williamsburg has affected his woodworking. Plus, you'll discover the one power tool he wishes he could use.

SHOP TALK LIVE

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Tune in to our biweekly podcast for lively conversations about the craft with our staff and other experts. Listen on iTunes, or watch it on YouTube or at FineWoodworking.com/shop-talk-live.

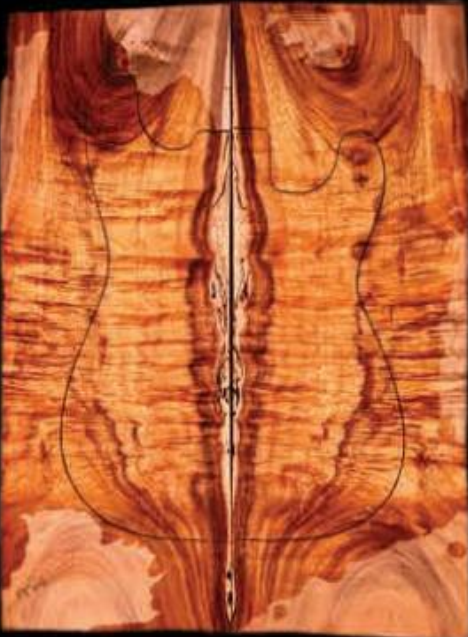
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contributors

A childhood watching her patient and meticulous father making things from wood, the purchase of a massive fixer-upper home when she was 21, an apprenticeship with woodworker Eric Keil, and a decision to study at College of the Redwoods (now The Krenov School)—these things and more led **Anissa Kapsales** (“Modular Wall Unit”) to her career as a *Fine Woodworking* associate editor. The job’s blend of people and woodworking appeals to this mother of two: “I get to meet authors, watch them work, peek into their lives, learn tons of fascinating things from them,” she says. “Wood is an amazing material, predictable and wild at the same time. I love the way it smells when it’s being cut, the way it looks, the way it feels to work with it. And there is nothing better than being in that zone in the shop, when everything is working the way it should and feels right, and you just don’t want to stop.”



Will Neptune (“Dovetailed Case Dividers”) is a celebrated teacher and furniture maker based in the Boston area. He graduated from North Bennet Street School in 1981 and taught there from 1985 to 2000. During his tenure at the school, he created much of the curriculum that’s still in use there today. In 2013, he received the Cartouche Award for excellence in period furniture making.



Heide Martin (“Indigo Tray Table”) has degrees in landscape architecture and urban design, but after some years working in landscape architecture in Seattle she left to study woodworking at the Center for Furniture Craftsmanship in Maine. She now works with her husband and business partner, Patrick Coughlin, a carpenter and craftsman, designing and building home furnishings in Mid-Coast Maine. Martin loves the design process because it’s “a period full of extreme highs and lows. I am consumed by my designs as I work on them.”

Mike Korsak (“Dead-On Double Tenons with a Router”) can usually be found building custom furniture in his snug Pittsburgh shop. But this spring he left it behind and traveled with his wife to Croatia and to Bosnia and Herzegovina. In Dubrovnik, Croatia, they “walked the magnificent medieval stone walls that once protected the city from attacks.” And then, as it happened, “we stumbled upon an exhibit featuring 25 chests of drawers from the 17th to 19th centuries—proving that furniture really does make the world go ‘round.”



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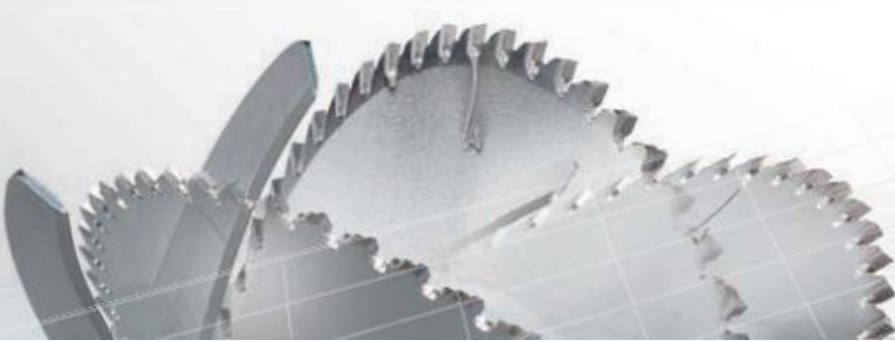
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From the Editor



The healing power of woodworking

We each approach woodworking in a very personal way, and we get our satisfaction from it in personal ways. While appearing on our Shop Talk Live podcast (episode 189) at Fine Woodworking Live last April, furniture maker Nancy Hiller talked about the joy she gets from the work: “The brilliant thing about making something is that you get the satisfaction in three dimensions and sensually. It’s aesthetic in all senses; you get to touch the wood, and to smell the wood, and to feel the wood.”

Indeed, there is great satisfaction in completing a project. But woodworking is more than that. For many, the shop is an escape from the daily grind, a healing shelter from life’s stresses. When my oldest brother passed away suddenly in March, my woodworking helped me to refocus and to cope, providing welcome relief from the static noise that had enveloped the complicated processes of death and grieving.

I am not the only person who has found therapy in woodworking. It’s a story I hear quite often, especially from veterans who are trying to overcome the psychological and physical burdens of war. Their inspirational stories of how woodworking rescued them are the catalyst behind the Fine Woodworking Live Veterans Scholarship Program. We started the program in 2017, when we rebooted our annual conference at the Southbridge Hotel and Conference Center in Massachusetts. We offered three scholarships to active duty military and veterans, funded by Fine Woodworking, IBC, and the Southbridge Hotel. We also received some help from a private donor. That year the scholarships inspired a wave of charity. Soon we received calls from individuals who wanted to contribute independently from our generous sponsors.

We repeated the scholarships in 2018, but I wanted to get more people involved. So in 2019 we put on a silent auction of original artwork from the pages of *Fine*

Woodworking to benefit our fund. Attendees bid big and often, and in the end we raised more than \$4,000. I am forever grateful to those who donated.



By the way, if you are interested in helping our scholarship program, contact me at tmckenna@taunton.com. It’s an opportunity to make a significant difference in someone’s life.

—Tom McKenna, editorial director

Attention turning enthusiasts

I want to tell *FWW* readers about a great opportunity for total wood turning immersion. The annual symposium of the American Association of Woodturners (AAW) will be held at the Raleigh Convention Center in North Carolina, July 11–14, with lots of demonstrations, a huge trade show, thoughtful panel discussions, and more. Learn more at woodturner.org.

—JOSHUA FRIEND, editor, *American Woodturner*

Elegant math

I’m curious: how many times has *Fine Woodworking* published an issue that did not contain the word “elegant”? I’m guessing that, during the 30 or so years that I’ve been a reader, the number of times is small enough I could count them on my fingers.

—WAYNE KITSTEINER, Richmond, Va.

Editor replies: Busted. We’ve used it 626 times, which rounds out to 2.3 occurrences per issue.

Alternate tip for signing work

In the December 2018 Workshop Tips (*FWW* #271), Wayne Kuhn suggests using a branding iron to identify him as the maker of his projects. I use an electric engraver to sign my name on my projects. Engravers are much less expensive than custom branding irons.

—JOHN LINT, Little Compton, R.I.

Clarification in honing guide review

Regarding Chris Gochnour’s assessment of our Sharpening Sled honing guide in his recent review (*FWW* #274): Mr. Gochnour writes, “Working through stones of varying thicknesses, you’ll have to reset the blade to ensure the same angle.” It is true that if using stones of different thicknesses, the blade must be raised or lowered in relation to the height of the new stone. The bevel angle, however, never changes.

—TIMOTHY QUEENO, Alisam Engineering, Lima, N.Y.

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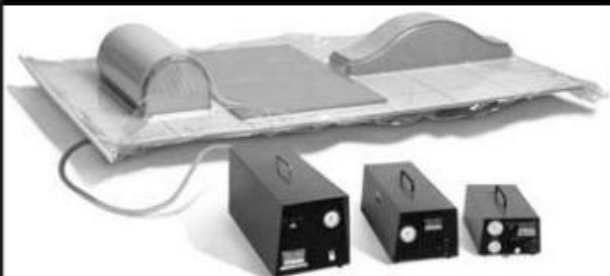
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Best Tip



Larry Schaller was introduced to woodworking in middle school, and he still uses the napkin holder he made in that industrial arts class. After getting married, he began making furniture and other small projects in his garage. His most recent project is a pair of folded-horn speakers, which fit a long speaker cone into a compact space.

Tablesaw outriggers let you use a smaller sled

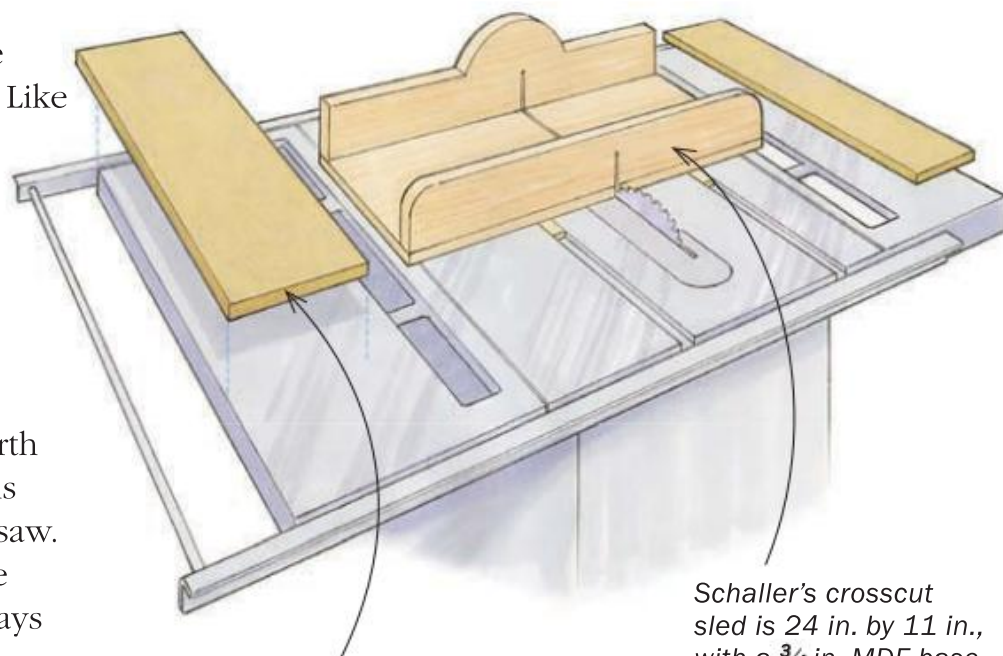
This is a simple tip but one that will save you a lot of hassle and a few backaches. Like many of you, I have trouble lugging around a large tablesaw sled and finding an accessible place to store it.

I realized that a little extra outboard support was the only thing stopping me from using my small 24-in. by 11-in. sled for 90% of crosscuts, including big, long workpieces. So I inset some rare-earth magnets into the back of two MDF panels and stuck them to the wings of my tablesaw. Unlike work-support stands, these simple outriggers set up in seconds and are always at the right height.

I positioned the powerful magnets along one edge of each outrigger so it can overhang the saw table and provide wider support. To use a stop on long workpieces, I just clamp a board to the sled's fence. When I'm done with the sled, it sits on a ledge mounted on the wall, with the magnetic outriggers stuck to a metal cabinet nearby. Your tablesaw's metal legs or cabinet will also work.

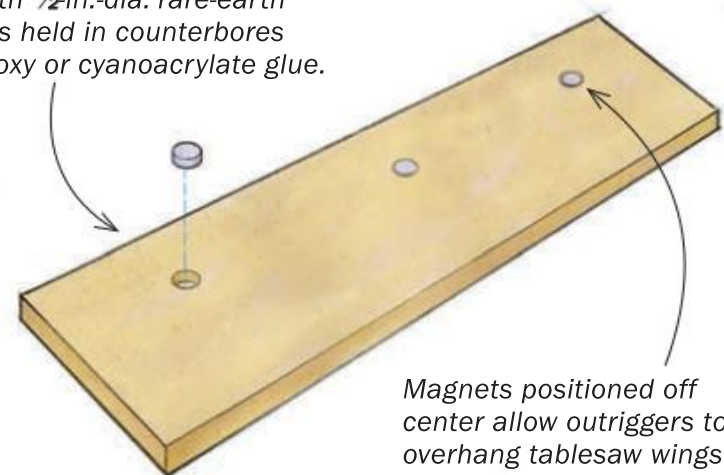
If you ever add a piece $\frac{1}{4}$ -in. MDF, for example, to the sled so you can renew the zero-clearance slot, just add the same to your outriggers. Also, if you already have a large sled, you still might want one outrigger to support cutoffs.

—LARRY SCHALLER, Edgerton, Wis.



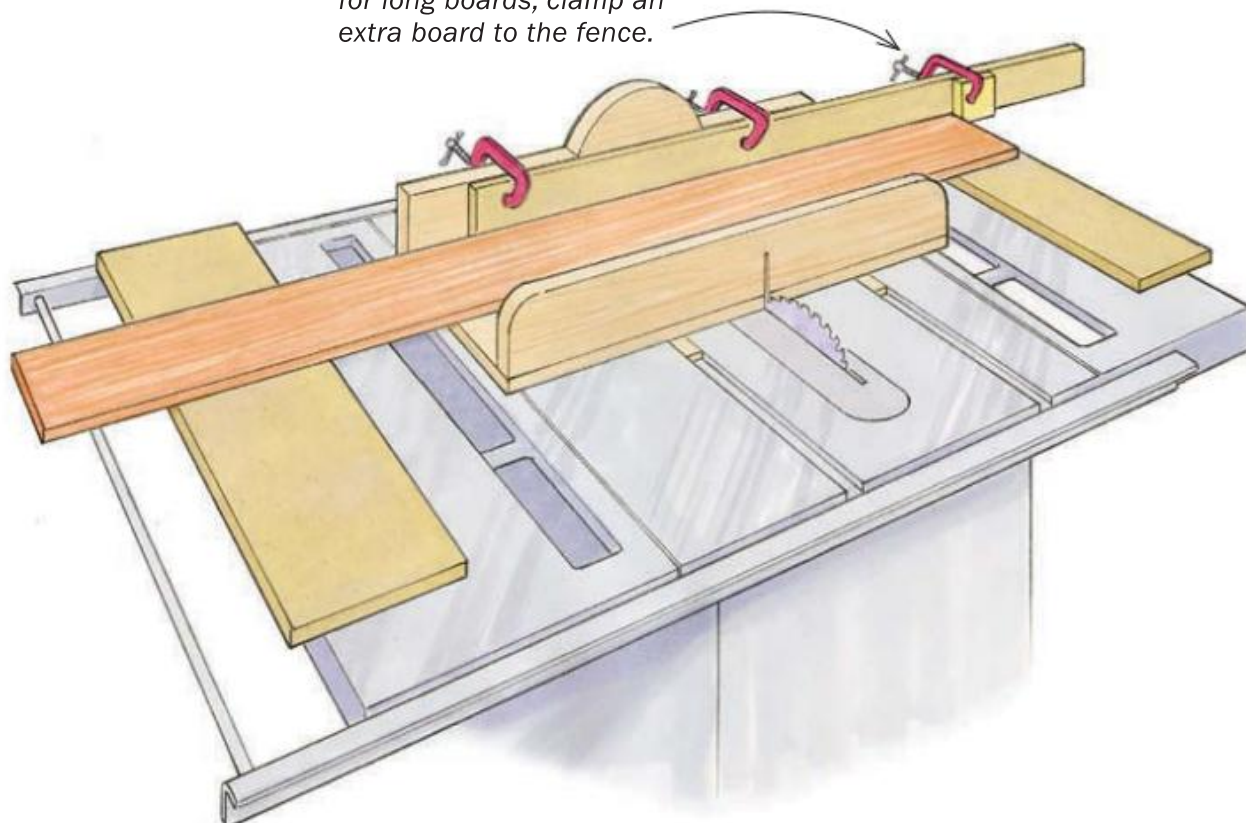
MDF outriggers attach to tablesaw wings with rare-earth magnets, letting a small sled handle longer boards.

Outrigger supports are also $\frac{3}{4}$ -in. MDF, with $\frac{1}{2}$ -in.-dia. rare-earth magnets held in counterbores with epoxy or cyanoacrylate glue.



Magnets positioned off center allow outriggers to overhang tablesaw wings for wider support.

To add a crosscut stop for long boards, clamp an extra board to the fence.

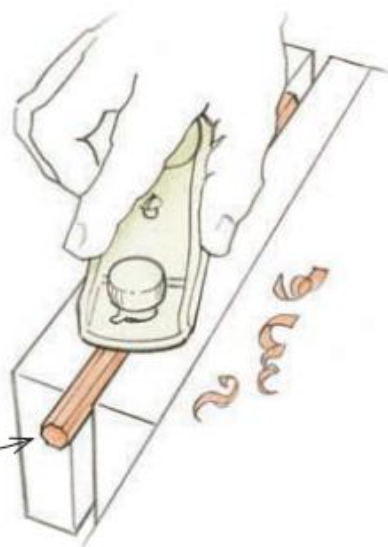


A Reward for the Best Tip

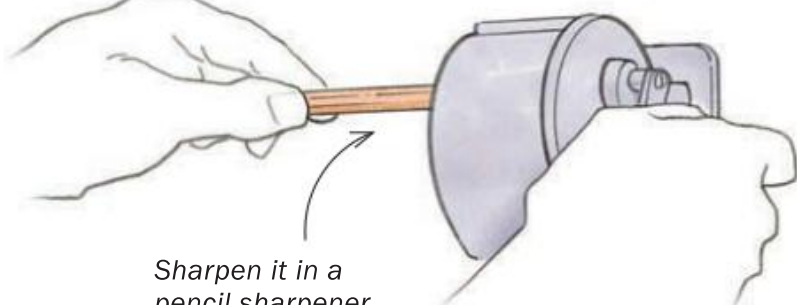
Send your original tips to fwtips@taunton.com. We pay \$100 for a published tip with illustration; \$50 for one without. The prize for this issue's best tip was a Senco FinishPro 21LXP pin nailer.

Use a pencil sharpener to make tight plugs in any wood

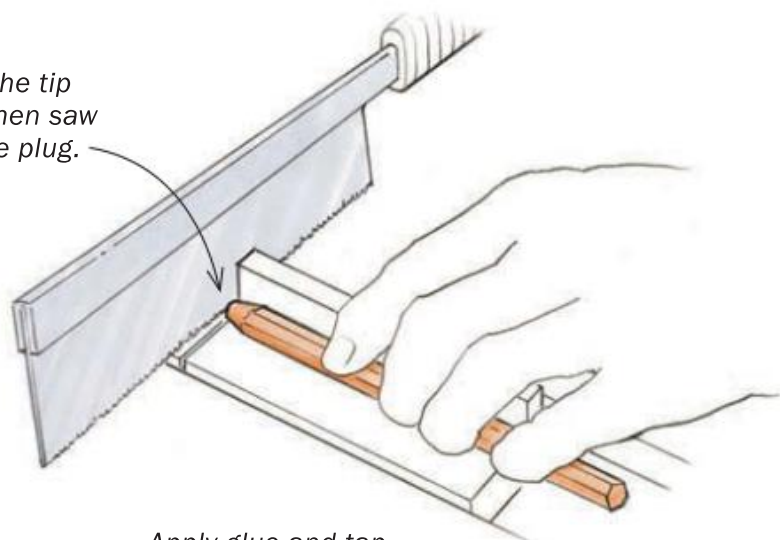
Cut a $\frac{3}{8}$ -in.-square stick on the bandsaw, and chamfer the corners to create an octagon.



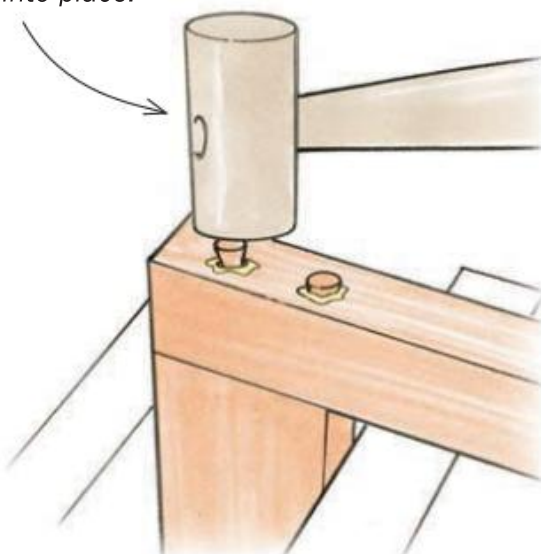
Sharpen it in a pencil sharpener.



Trim the tip and then saw off the plug.



Apply glue and tap it tightly into place.



While working in a high-end custom cabinet shop, I picked up this trick for making tight-fitting wood plugs. It requires only an old-school pencil sharpener and a few common woodworking tools. I use these plugs to hide screws, counterbored at least $\frac{3}{16}$ in. below the surface, and also to cover the hardware-store dowels I sometimes use to lock in tenons. The pencil-sharpener method lets me use whatever wood the cabinet is made from. I start with a $\frac{3}{8}$ -in.-square stick, cut on the bandsaw, and then chamfer the corners with a block plane or edge sander to create an octagon. At that point the blank will fit into the largest opening in the sharpener. To get a pile of perfect plugs, you just sharpen the stick, cut off a plug, and repeat. Because of the angle of the plug, one size fits most holes; you just have to trim the tip to get it to seat fully. I recommend dry-fitting your plugs to see how much to trim.

—JOHN CLAYSON, Bend, Ore.



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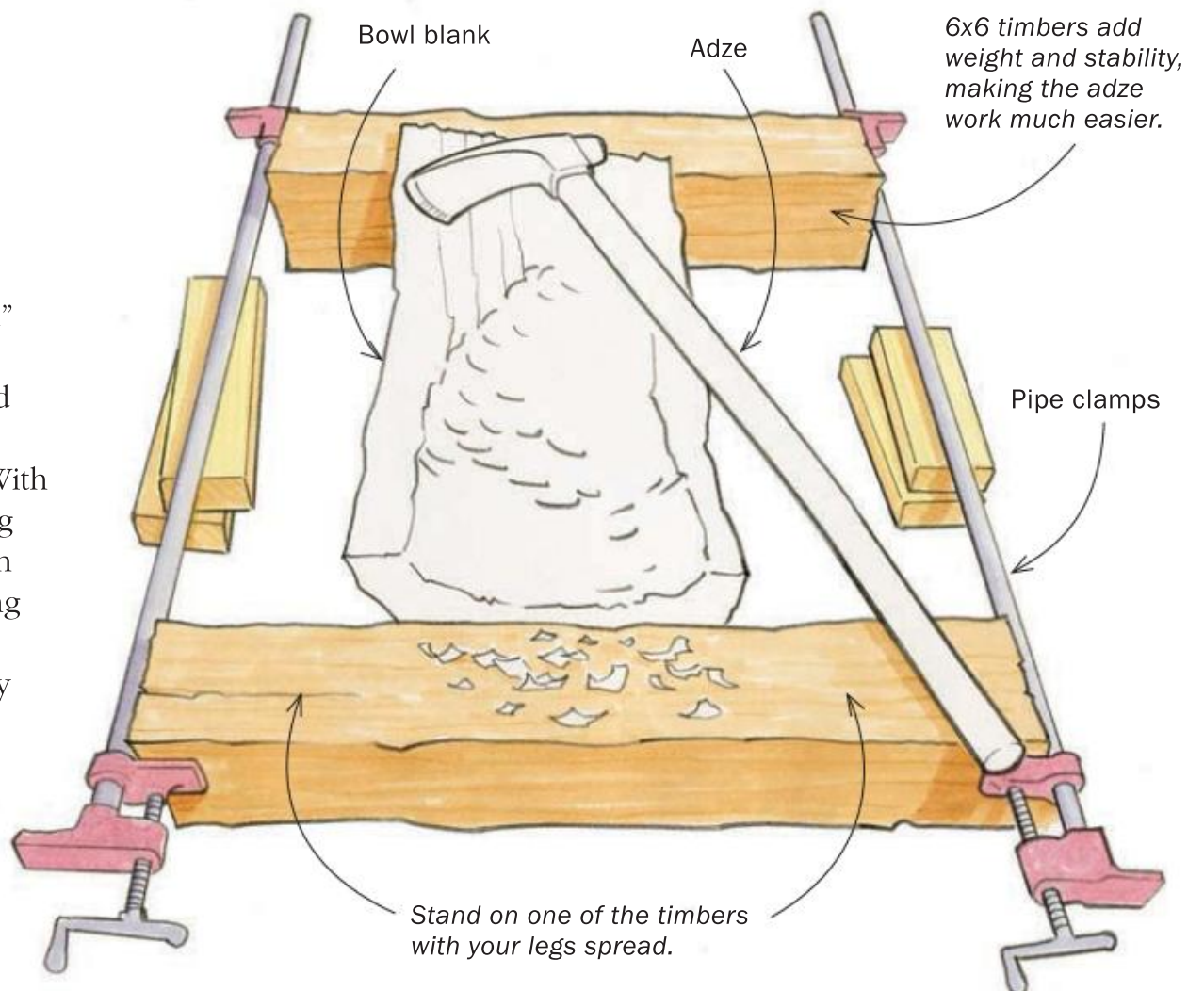
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Floor vise makes adze work safer and easier

As a hand-tool woodworker and a carver, I read David Fisher's article, "Carve a Greenwood Bowl" (*FWW* #263), with interest. For heavier cuts on a larger vessel I set the workpiece on the floor and went with a two-handed adze for the hollowing, instead of the one-handed version Fisher uses. With each swing, the adze's cutting edge went hurtling toward some part of my body. So I came up with this jig for securing a big bowl blank and keeping my legs out of harm's way. The jig is nothing more than two pipe clamps and two short, heavy timbers. You can stand on a timber at either end with your legs spread so the adze, if swung too far, would go between them. Your weight on the timber gives the jig plenty of inertia to cut against, making each blow very effective.

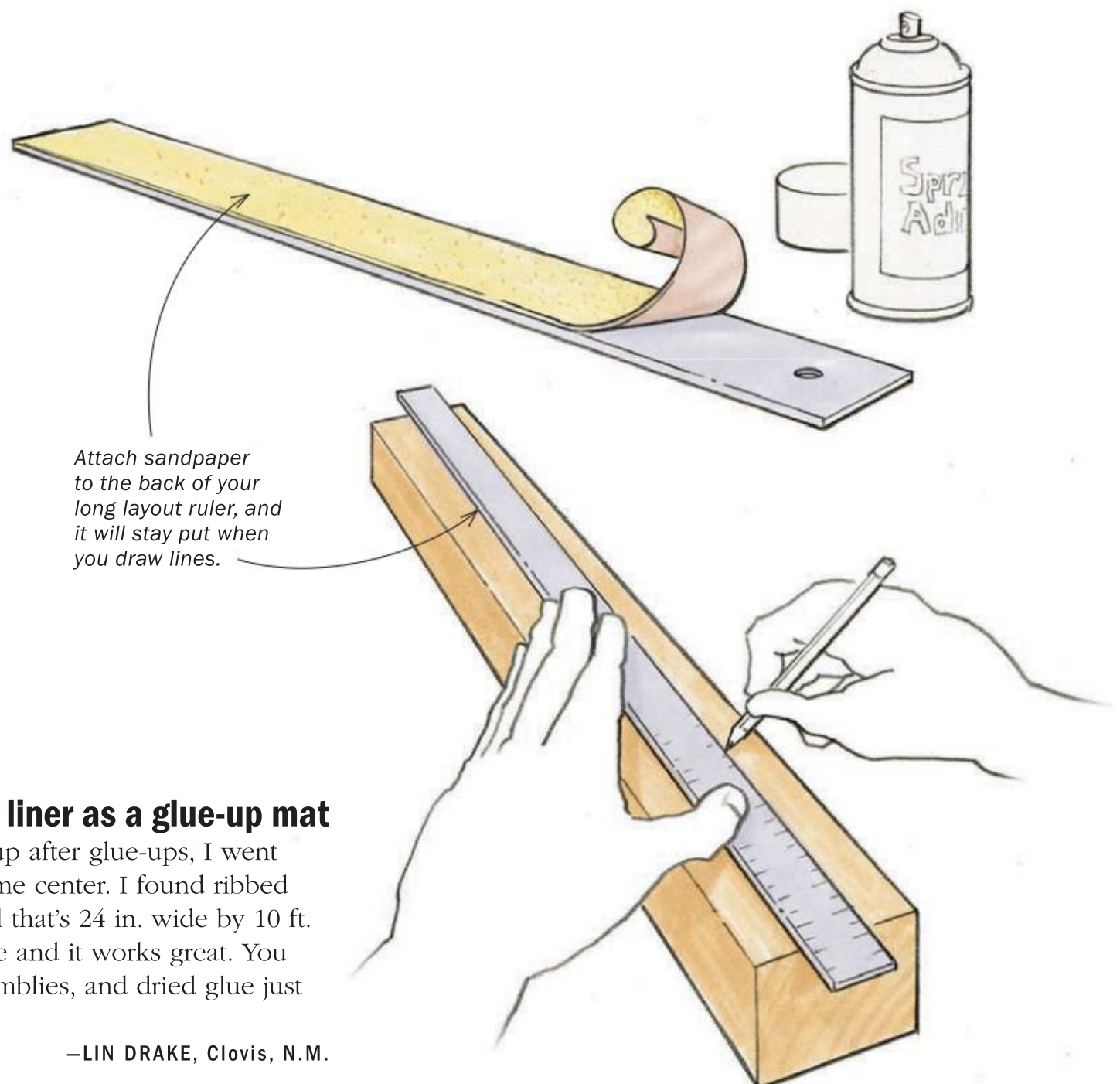
—BILL PIERCE, Arlington, Wash.



Lock down your layout tools with sandpaper

This tip is simple but stress-relieving. Use spray adhesive to attach 150-grit sandpaper to the back of your aluminum yardstick (you could use sticky sandpaper instead). Layout will be much easier without the straightedge shifting while you draw. This trick works wonders on all sorts of fences, straightedges, and other layout tools.

—PETE MICHELINIE,
South Pomfret, Vt.



Quick Tip Use plastic shelf liner as a glue-up mat

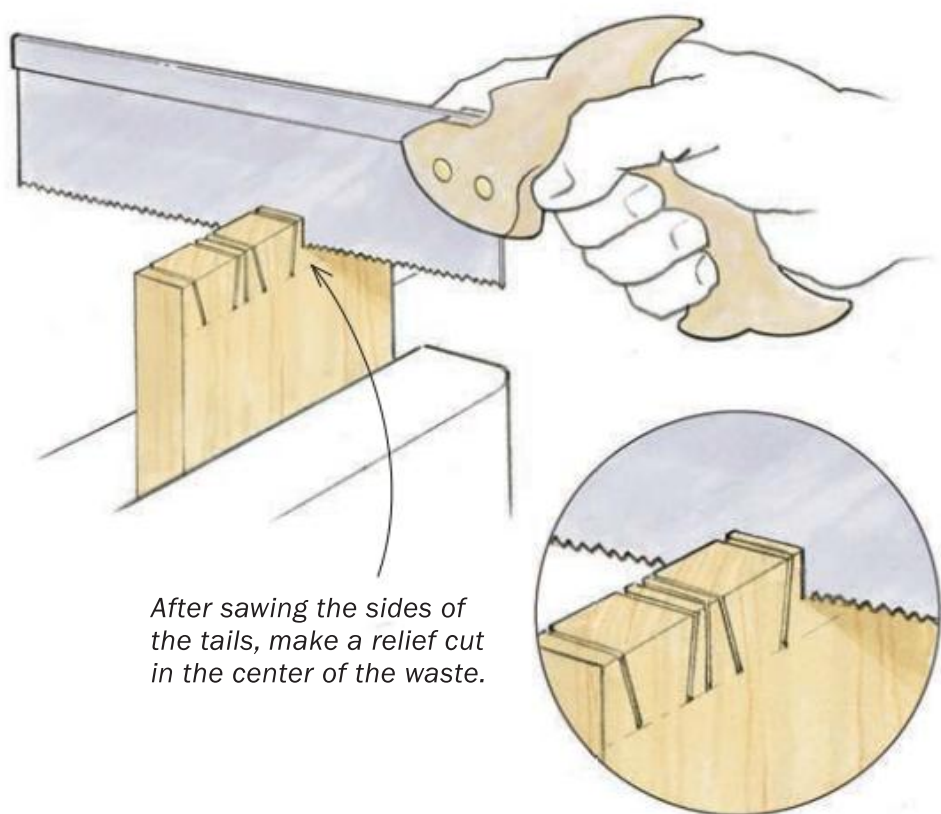
Tired of laying down paper or wiping up after glue-ups, I went searching for a solution in my local home center. I found ribbed plastic shelf liner, which comes in a roll that's 24 in. wide by 10 ft. long, for about \$8. I cut off a long piece and it works great. You can combine two pieces for wider assemblies, and dried glue just peels off.

—LIN DRAKE, Clovis, N.M.

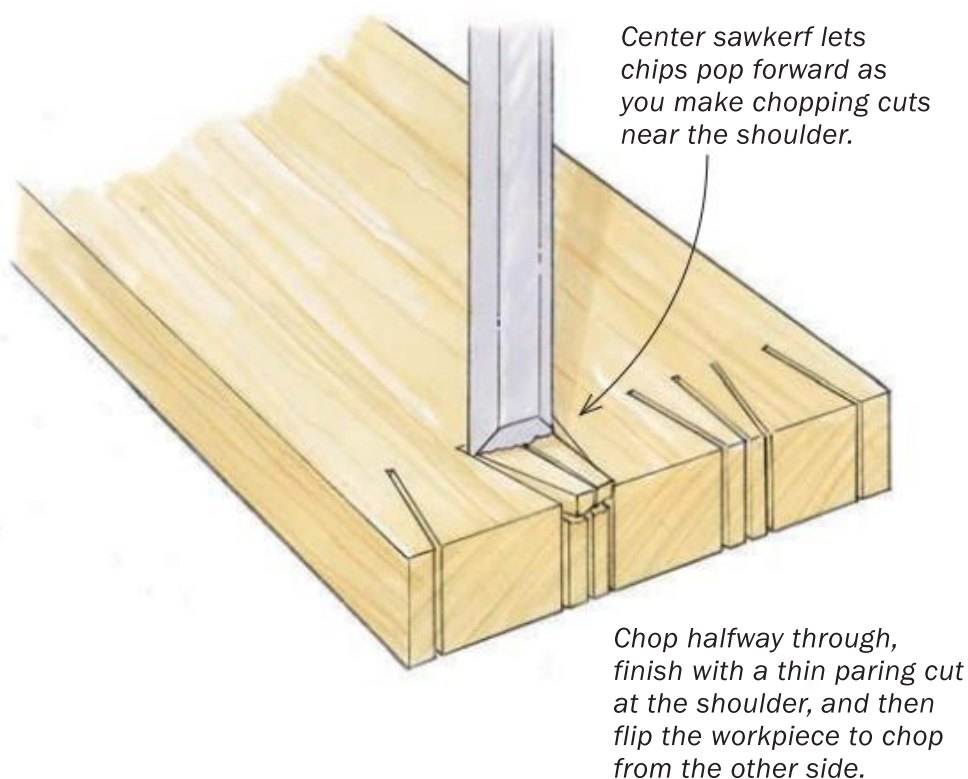
Relief cut makes it easy to chop out dovetail waste

When hand-cutting dovetails with narrow pins, it can be difficult to chop out the waste between the tails. It's much easier, however, if I first make a relief cut down the center of the waste. I use a Japanese pullsaw for my main cuts, but I make the relief cut with a Western-style push saw, which leaves a wider kerf. The extra space gives the waste material somewhere to go, letting me free big chips simply by chopping near the shoulder line. The chips pop out easily and the chisel doesn't want to dive toward the shoulder. Once I'm halfway through the thickness, I make a final chisel cut right at the shoulder, and then flip the workpiece and work from the other side.

—MICHAEL WINIARSKI, Bayside, N.Y.



After sawing the sides of the tails, make a relief cut in the center of the waste.



Center sawkerf lets chips pop forward as you make chopping cuts near the shoulder.

Chop halfway through, finish with a thin paring cut at the shoulder, and then flip the workpiece to chop from the other side.



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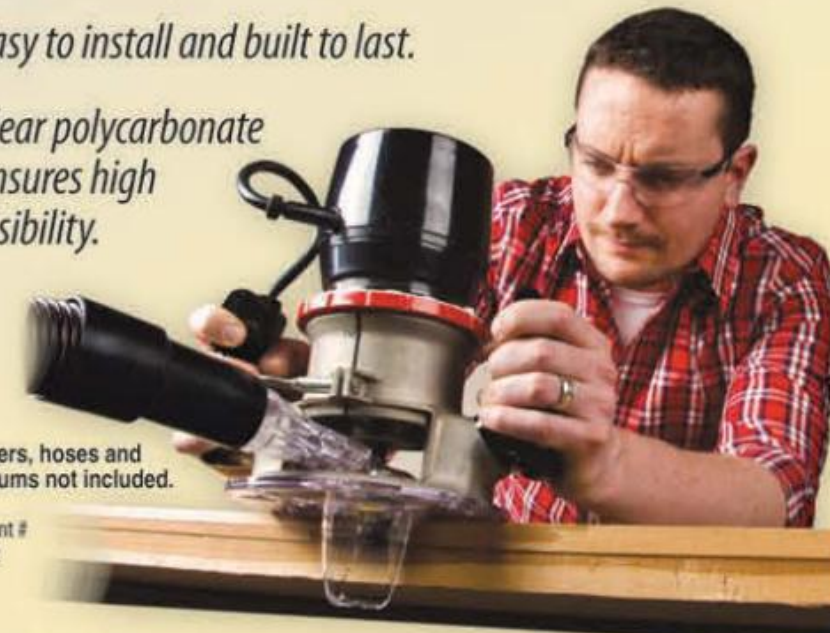
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■ MACHINES

Hybrid saw packed with features

THE JET JPS10-115 HYBRID tablesaw I tested is a gem. Like a contractor's saw, it's small, light, and runs on 110-volt outlets. And like a full-size cabinet saw, it comes well-tuned and with some nice features.

I tested the model with the 30-in. fence, which fits well in a small shop (for a 52-in. fence, add \$150). The 1¾-hp motor produces good ripping power, and the motor reset button is on the power switch rather than on the motor housing, making it convenient to reset the motor if an overload occurs. Assembling the saw was no problem, and the arbor assembly was parallel to the miter slots right out of the box. Cast-iron wings create a 44-in.-wide work surface and were easy to align flush with the table during assembly. Elevation and tilt mechanisms work smoothly, requiring little effort to tilt the blade to 45°. Storage for the fences, arbor wrench, and other accessories is provided on the saw cabinet.

Blade changes are painless, thanks to a user-friendly throat plate and arbor lock. A low-profile riving knife comes with the saw. It is easy to remove and, thanks to alignment pins,

easy to re-install. What's more, the riving-knife holder can be adjusted so you can set an accurate distance between the knife and blade. Speaking of safety, individual left- and right-side blade guards can be lifted independently and have detents that will hold them in their uppermost position—nice for working close to the fence.

Both the rip fence and the miter gauge are sturdy and accurate. The miter-gauge bar has expansion screws allowing a tight fit with the miter slot. The blade is enclosed in a housing that connects directly to a dust collector through a 4-in. port. The dust collection confines all the fine particles to the dust bin, but the heavier stuff falls to the floor beneath the saw.

I was impressed with the performance and quality of the Jet. It's a great entry-level tablesaw that offers a lot of performance for a small price without taking up a lot of room or requiring a 230-volt circuit, perfect for the smaller shop. It does come in 230-volt models, too.

—Roland Johnson, contributing editor



Tablesaw by Jet
Model JPS10-115
\$1,500

ADJUSTMENTS ARE EASY



Arbor lock frees up a hand. The saw has a stop that prevents the blade from rotating during blade changes, so you need only one wrench to loosen the arbor nut instead of two.



Slick throat plate. A recessed knob locks the plate in the table. Twist the knob for easy removal for blade changes. The design allows for shopmade plates, but there would be no lock.

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■ ACCESSORIES

Cyclone for a shop vacuum

I'M A BIT FRUGAL, so I tend to overfill the dust bags for my Festool dust extractor until they are bursting at the seams. I'm sure the extractor's performance isn't improved when the bags get bogged down with dust and chips, and it may even compromise the lifespan of the unit. Hence the appeal of Festool's new CT-VA-20 Cyclone Dust Collection Pre-Separator, which promises to cut down on the number of bags I have to buy and hopefully reduce the wear and tear on my extractor.

The unit resembles a typical Festool Systainer and mounts directly to the top of the dust extractor. Assembly was straightforward and only took minutes.

The operating principle is simple: Dust and wood chips are pulled through the Cyclone, where large and small particles are separated. The larger bits fall into a reusable clear plastic bag, and the finer dust is sent on to your dust extractor. Since the larger bits take up a lot of volume, the idea is that your extractor's expensive filter bags don't fill up so fast.

To test the CT-VA-20, I started with a brand new filter bag in my extractor and sanded some cherry to produce fine dust particles. I then switched to my router and hogged out a bunch of sliding dovetails, which produced a large volume of big chips. The results were impressive. The plastic pre-filter bag was loaded with wood chips and large particle dust, while the filter bag contained only the finest particles of sanding dust and had lots of room to spare.



Pre-separator
by Festool
Model CT-VA-20
\$375

Festool's product description states that the Cyclone is designed for use with its CT 26 E, 36 E, 48 E, and 36 AC extractors. I have a CT 22, and the Cyclone worked with it.

—Ray Finan, Vermont furniture maker

■ ACCESSORIES

Handy tool roll

WHEN I TRAVEL to teach wood carving, I always bring my favorite carving gouges with me. Carrying my precious cargo safely and securely is very important to me. After all, these are my babies.

Recently, I tried the Asabeing 14 Pocket Tool Roll when I flew to teach a wood-carving class. The roll technically has 16 pockets, but the company doesn't count the two where the rope is attached because they're rather small. Still, I found them useful. Ten of the pockets fit full-size carving gouges, and the six smaller pockets of various sizes can hold pencils, rulers, small rasps, or smaller-handled gouges. A 19-pocket version is available for \$5 more.

I placed my gouges into the pockets handle-first, and they fit tight enough so they did not fall out, and loose enough so I could remove them without much effort. I was also able to fit two gouges with smaller handles into one of the larger pockets.



14-pocket
tool roll by
Asabeing
\$65

The thick hemp canvas was strong but lightweight, and there were no cuts in the fabric from sharp gouges. The top of the pockets also have a hemmed edge that prevents this area from fraying. For carrying a set of 10 gouges and a few smaller odds and ends, I would highly recommend this tool roll. When I rolled up my tools and secured them with the double hemp rope tie, I was confident my babies were safe.

—Mary May, woodcarver and instructor

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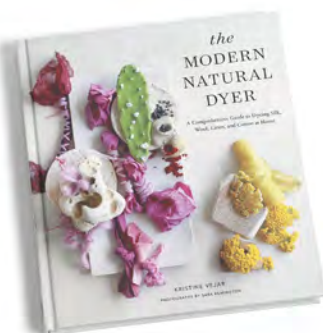
Indigo on wood

TRADITIONAL VAT-DYEING
YIELDS RICH AND
UNEXPECTED COLOR

BY HEIDE MARTIN

When I decided that I wanted to achieve a true indigo color for a table I was making (pp. 56–65), I quickly realized that aniline dyes would not give me the richness and tonal variety I was looking for. I decided to explore traditional indigo vat dyeing techniques, long used to give brilliant color to wool, silk, and linen. But I found precious little information on how to transfer these processes to wood.

Through trial and error, help from *The Modern Natural Dyer* by Kristine Vejar (Harry N. Abrams, 2015), emails with woodworkers who have tried similar experiments, and a lot of Internet research, I achieved a vat-dyed color with all the depth, vibrancy, and variety I had hoped for, all for around \$100 in supplies.



Select and prep the wood

Vat dyeing wood can be risky. It will raise the grain, may cause warping on thin pieces, and requires a vat large enough for immersion (in my case a 5-gal. bucket).

The pigment does not penetrate very deeply, so machining and sanding after dyeing can be difficult or off limits. Soft hardwoods, such as poplar and English sycamore, work best. Denser hardwoods, such as ash and maple, do not absorb the dye as readily.

Prepare your materials by sanding up to 220 grit. Then wet them to raise the grain and sand again with 220. Do this at least twice, removing the dust with a dry rag or compressed air.

Prepare the dye in two steps

To start an indigo vat, you first must create a highly concentrated indigo



What you need to get started

MATERIALS

NATURAL INDIGO EXTRACT

botanicalcolors.com

SODIUM HYDROXIDE (LYE)

Amazon.com
or local hardware store
(common lye drain cleaner)

SODIUM HYDROSULFITE & SODA ASH

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TOOLS

5-GAL. BUCKET

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SIPHON GUN

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WOODEN OR PLASTIC STIRRER (such as a dowel or long spoon)

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Create the mother

To start the dye process, mix the highly concentrated stock solution, called the mother, that you'll use to make the dye. Wear protective eyewear and clothing.



Indigo meets water. Start with $\frac{1}{4}$ cup of hot water in a mason jar and gently stir in 3 tablespoons of indigo extract.



Introduce lye to the indigo. Fill the mason jar with cool water, and then add 1 tablespoon of lye. Carefully stir until the lye is dissolved. Lye is used to raise the pH.



Sodium hydrosulfite joins the party. Add 1 tablespoon of sodium hydrosulfite and stir again until it's dissolved. Sodium hydrosulfite removes excess oxygen from the mixture by releasing hydrogen.



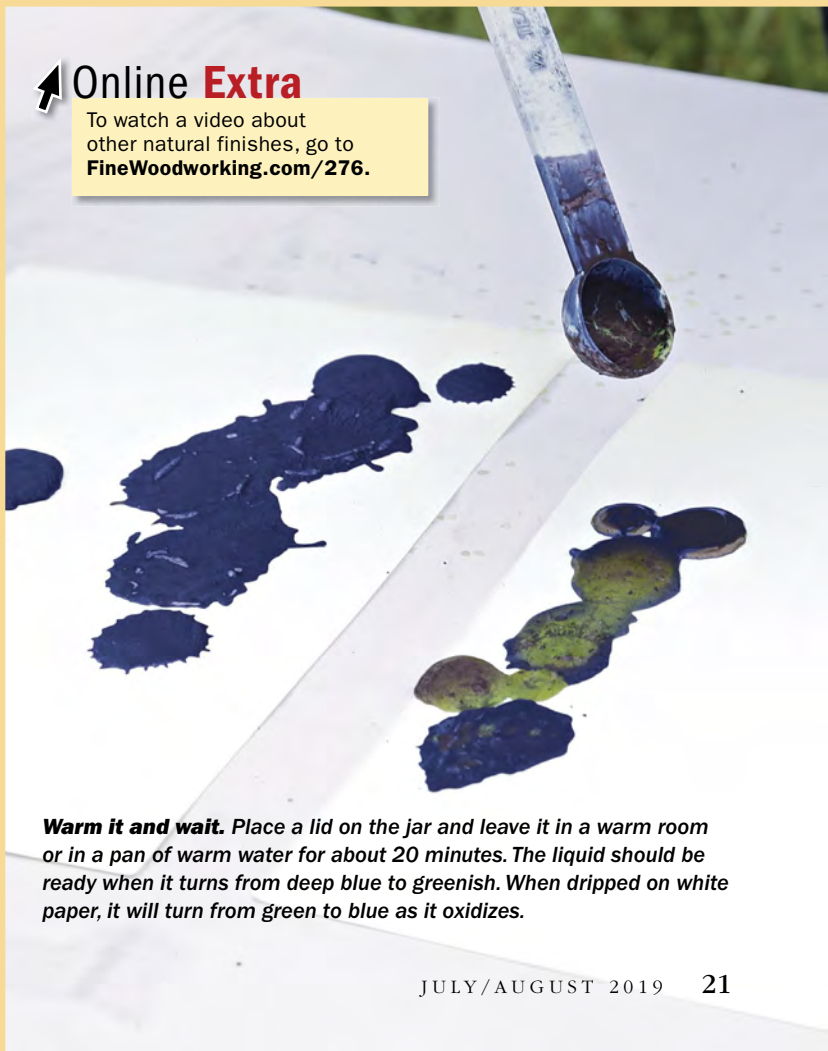
solution, known as the mother. Indigo is sensitive to oxygen and temperature, so avoid adding air to the mixture, and work in an environment that is around 65° to 75°F.

I'll give directions for a 5-gal. dye vat, the largest I've made. To make the concentrated solution, add $\frac{1}{4}$ cup of hot water to a quart-size, wide-mouth Mason jar. Add 3 tablespoons of natural indigo extract. Fill the jar with room-temperature water, stir, and then add 1 tablespoon of lye and stir again.

While you can pick up lye at any hardware store, be careful with it. Wear gloves and protective eyewear. Mixing lye and water together causes an exothermic reaction, where heat is given off. So always pour the lye into the water, and do it slowly. If you don't, you can create a volcano effect, in which

Online Extra

To watch a video about other natural finishes, go to FineWoodworking.com/276.



Warm it and wait. Place a lid on the jar and leave it in a warm room or in a pan of warm water for about 20 minutes. The liquid should be ready when it turns from deep blue to greenish. When dripped on white paper, it will turn from green to blue as it oxidizes.

Make a vat

With the mother mixed, it's time to fill a bucket and add some of the stock solution. While working with soda ash, protect yourself with goggles, a respiratory mask, a long-sleeved shirt, pants, and gloves.



Fill the vat and increase the pH. Use hot tap water, at 100 °F, to fill the container you're using for the vat. Add 8 $\frac{3}{8}$ teaspoons of soda ash (top)—wear protective eyewear and clothing. Stir the mix, and then test the pH (above). It should be just under 11.

a crust is formed over the solution, heat and pressure build up, and it erupts. Don't let this scare you; people all over the world use lye to make soap. Just take the proper precautions.

Now add 1 tablespoon of sodium hydrosulfite to remove excess oxygen. Stir again, then place a lid on the jar and set it aside in a warm room (or place it in a pan of warm water) for about 20 minutes. After it sits, it should turn from deep blue to clear greenish yellow.

To prepare the vat, fill a 5-gal. bucket with hot tap water (100°F). Add 8 $\frac{3}{8}$ teaspoons of soda ash and stir with a

wooden or plastic implement until it dissolves. Test the pH. It should be just under 11. If it is lower, add more soda ash. Carefully add $\frac{7}{8}$ cup of the mother solution to the vat. Add a scant $\frac{1}{4}$ teaspoon sodium hydrosulfite. Stir gently, then cover and let it rest for at least 15 minutes. The vat is ready when it is greenish-yellow with a coppery sheen on the surface.

Dyeing and drying

Carefully lower your workpieces into the vat. Try to avoid splashing, as this will add oxygen to the mixture. Leave the materials immersed for anywhere from one minute to 30 minutes. Deeper colors are achieved through multiple, shorter



Float the mother mixture into the vat. Rather than pour it in, introducing excess oxygen, float $\frac{7}{8}$ cup of the concentrated solution into the vat water (above). Gently stir. Add $\frac{1}{4}$ teaspoon of sodium hydrosulfite (below) to get rid of any oxygen you may have introduced, and let the vat rest for 15 minutes. When it turns greenish-yellow with a coppery sheen on the surface, it's ready.





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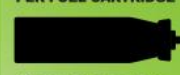
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Let the dyeing begin

Prepare your workpieces by raising the grain, and then you can start the fun of dyeing them.



Raise the grain. Immerse the workpieces in warm water, let them dry, sand them back with 220-grit paper, wipe away the dust, and repeat.



dips, rather than fewer, longer ones. You may need to hold the materials beneath the surface to ensure an even dye. Carefully remove your materials from the vat and hang them up.

This moment is fascinating: The wood will change from a greenish color to indigo before your eyes. After the green color has fully disappeared (this can take up to 30 minutes), the wood can be redipped repeatedly to achieve a darker shade. After your final dip and oxidation, rinse any dye residue off with water and allow the pieces to dry for at least 24 hours.

Coat the dyed surfaces

Once the wood is dry, I spray the dyed surfaces with a couple of coats of shellac before I start working with them. When the piece is complete, I apply a spray finish. I have had success with both Super Kemvar-M and Minwax Polyurethane. □

Heide Martin designs and builds home furnishings in Midcoast Maine.



Dunk and dry. Clamping the strips between pieces of plywood, Martin slowly dips them into the vat (left). Resting the shopmade armatures across the top of the vat allows her to dye more than one set of strips at a time. These holders do double duty as racks while the pieces oxidize and dry (right).



Rinse and seal. Once the pieces are the desired shade, rinse them to remove any residue. After they dry, Martin wipes them with a clean rag or white Scotch-Brite pad and seals them with a spray coat of dewaxed shellac (wiping on shellac will pull up some dye). Martin uses a siphon gun by Critter Spray Products, but a can of dewaxed shellac spray will also work. She is careful not to spray glue surfaces.



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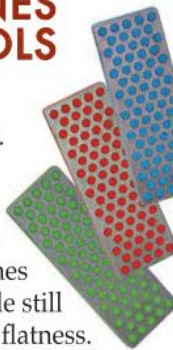
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BY BILL PAVLAK

Uses

LOOK FOR TWIST

Because they are typically longer than a workpiece is wide, winding sticks exaggerate any twist, making it easier to see if things are off-kilter.

KEEP ASSEMBLIES IN LINE

Whether he's making a chair, table, or case, Pavlak checks for twist during dry-fitting and glue-ups. Well-placed mallet blows, changes in clamping pressure, or additional clamps can bring things into alignment. If not, evaluate whether the twist can be planed out later or if you need to work individual joints.



SMALL STICKS FOR TENONS

With one stick placed across the end of a tenon cheek and the other just behind the shoulder, you can discern if there is any twist. Though the sticks are at different elevations, they work just as well.





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Contrasting inlay helps with sighting.
Adding two strips of inlay to one of the winding sticks causes the upper edges of the sticks to stand out from one another and the background.

Most woodworkers quickly grasp how vital squares and straightedges are in checking their work for accuracy. Yet neither of those essential tools indicates twist, just a bit of which can throw everything off-kilter.

That's where winding sticks come in. In essence a pair of narrow boards with parallel edges, winding sticks allow you to determine if a board, joint, or assembly is—or is not—free of twist (or wind, if you prefer to speak the old-timey way). How do they do this? Simple. Place one stick across one end of a board and the other at the opposite end and then, with one eye closed and level with the stick nearer to you, sight across the top edges of the two. If they are parallel, there is no twist. If they are not, then there's twist that you need to address. What's more, a single winding stick can double as a straightedge, letting you examine for cup and bow, too. From milling to assembly,

winding sticks are essential for fine work.

From milling ...

Winding sticks excel when you are flattening a board's face. Just first remove any cup, which causes the sticks to seesaw, resulting in a false reading. For the same reason, it's important to center your winding sticks on the stock, so I knife a vertical line at the middle of each stick as a handy visual guide.

Similarly, make sure the board's face and the bottom edge of each winding stick are clean. Just one shaving trapped between them can lead to inaccuracy.

If a board is twisted, generally the high points are on diagonally opposite corners. To bring them down, either plane on a diagonal path from one offending corner to the other or plane each corner individually. The approach I choose depends on how the grain is running and how much bow and twist there are. If the board still has some bow in it, I might hit each corner independently, feathering my strokes to avoid creating further irregularities.

CHECK FOR STRAIGHT

A single winding stick is essentially a straightedge, making it handy for examining if a board is cupped or bowed.



Make your own

Winding sticks are fundamental to successful furniture making, so while you can whip up a pair using any two pieces of wood with parallel edges, they're a lifetime tool that deserves a more careful approach. Fortunately, you can make a nice pair in an afternoon.

CAREFULLY MILL THE STOCK



True the bottom edges. This will be the reference surface, so act like you're creating a proper glue joint; in other words, make them dead straight. Make sure to dress a face perfectly square to this edge, too.



Let there be no light. Hold the bottom edges against one another to inspect for gaps. If you see any, plane them away. You're making the tool you'll use to check all of your future work, so don't skimp on this step.



Scribe and plane to width. Using a marking gauge, scribe a line across the top of each stick to mark the desired width (above). Plane the top edges down, but don't take the line. The remainder will get planed off when you make the inlay flush to the stick.



To treat smaller and less bowed boards, I sometimes plane from corner to corner.

... to assembly

While most discussions on the use of this simple tool begin and end with stock prep, there are plenty of other ways for twist to wind its way into your work. Essentially any surface that is supposed to be flat, no matter its size, can be twisted enough to throw everything off. Winding sticks are the tool to diagnose this.

When dry-fitting most structures and again during glue-ups, I will check for twist. For example, even though a table may have legs of equal length and sit on a level surface, it can still rock and wobble because of twist. To

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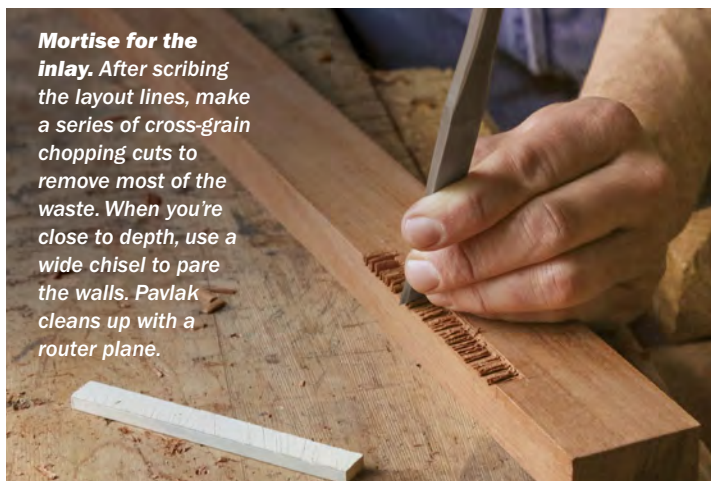


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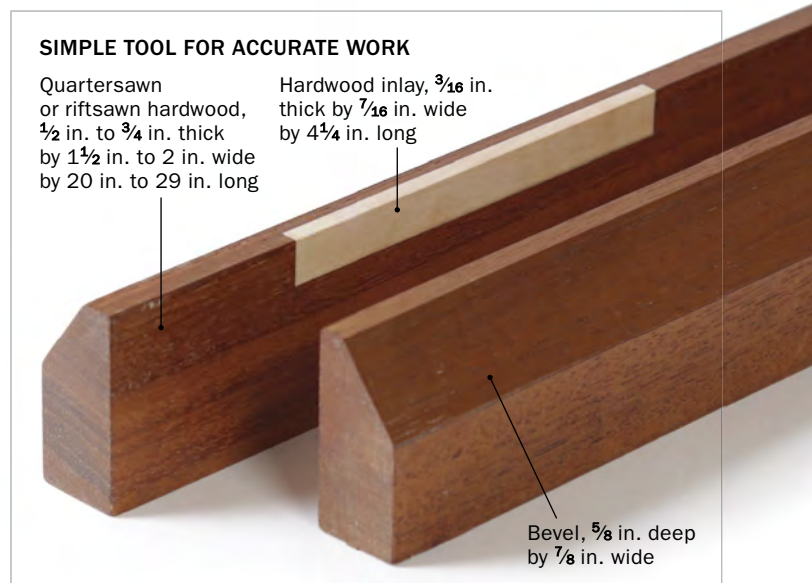
ADD CONTRASTING INLAY



Mortise for the inlay. After scribing the layout lines, make a series of cross-grain chopping cuts to remove most of the waste. When you're close to depth, use a wide chisel to pare the walls. Pavlak cleans up with a router plane.



Glue and clamp. Apply firm, even pressure. A caul on the other side of the stick protects it from being marred by the clamp's movable jaw.



SIMPLE TOOL FOR ACCURATE WORK

Quartersawn or riftsawn hardwood, $\frac{1}{2}$ in. to $\frac{3}{4}$ in. thick by $1\frac{1}{2}$ in. to 2 in. wide by 20 in. to 29 in. long

Hardwood inlay, $\frac{3}{16}$ in. thick by $\frac{7}{16}$ in. wide by $4\frac{1}{4}$ in. long

Bevel, $\frac{5}{8}$ in. deep by $\frac{7}{8}$ in. wide



Flush inlay to the surface. It's easier to leave the inlay proud of the surface at glue-up than to try to dial in the depth perfectly.

check, place winding sticks across the table frame, from apron to apron, and sight along them. If there is a little wind, try to find the cause. Sometimes it's uneven or excessive clamping pressure, while other times a joint might not be fully seated. If neither's the issue, and the twist is not extreme, perhaps you can simply plane out the twist after the glue dries. If that seems unlikely, disassemble everything to evaluate each joint. To be safe, I check for wind during dry-fitting and again at glue-up.

I also use small winding sticks to check the accuracy

of tenons, placing one at the end of the tenon's cheek and the other right behind the shoulder. Essentially any surface that is supposed to be flat, no matter its size, can be twisted enough to throw everything off course. Winding sticks are the tool to diagnose this. □

Bill Pavlak is the supervisor at the Anthony Hay Cabinet Shop at Colonial Williamsburg in Virginia.

Online Extra

Bill Pavlak answers our questions at FineWoodworking.com/276.

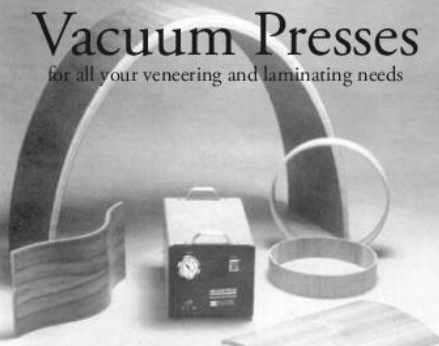
PLANE A BEVEL



Top edge gets a heavy bevel. On a winding stick, a wide bottom edge is good for stability while a narrow top edge creates a cleaner line for the eye, making precise readings easier.

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Modular Wall Unit





Mitered cases combine with a unique hanging system for versatile storage

BY ANISSA KAPSALES

Not long ago, I came across a modular shelving system in a Mid-Century Modern dealer's warehouse. Danish inventor/designer/manufacturer Poul Cadovius made a name for himself with these wall units, not to mention a ton of other things he designed. I was immediately taken by it aesthetically, but I was blown away by the unusual hanging technique. The pieces almost appear to float in midair, yet they lock in place with a clever system of angled dowels. You can change up the configuration of the pieces and the look of the whole ensemble by simply lifting the cases and moving them to different spots on the uprights.

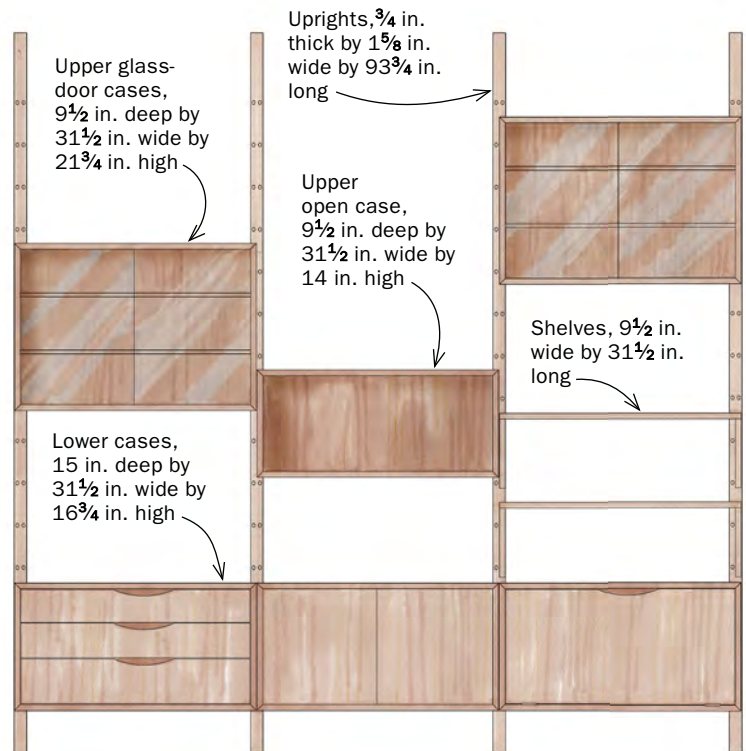
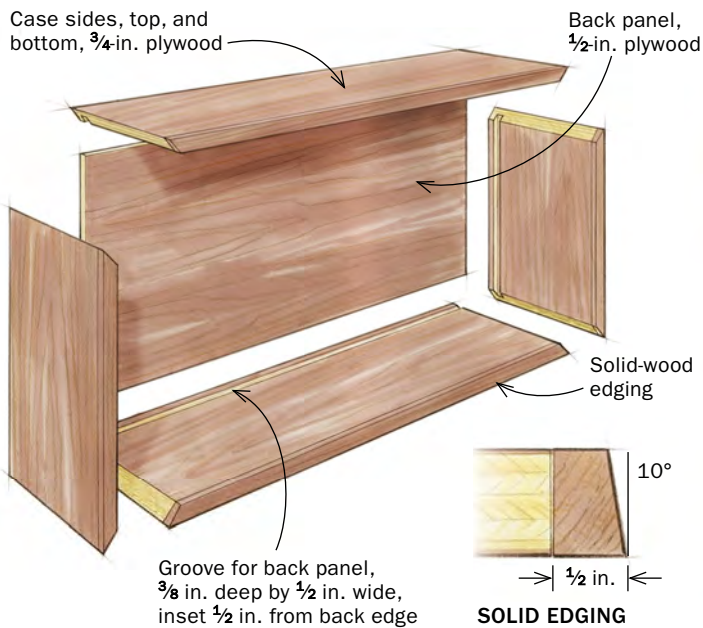
Cadovius's company lived on as dk3, but they no longer manufacture the original system I first saw. I got my hands on an old catalog and made my version of Cadovius's invention. I kept my design very simple and



Unusual but strong hanging system. Dowels fixed at a 45° angle in the back of all the cases lock into angled holes in uprights that are secured to the wall.

A BASIC CASE

All the plywood cases in this wall unit are built the same way. The different treatments make them distinct from one another.

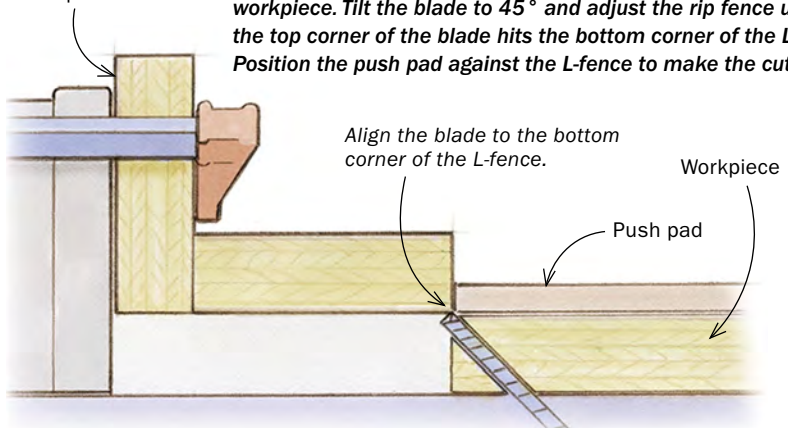


Push pad acts as a template for mitering. A cleat at the back and sandpaper on the bottom keeps it from slipping. To use the pad, first cut the case parts to final length, then align the pad flush with the end of the case part.



L-fence clamped to rip fence

The push pad rides along an L-fence. Clamp an L-fence to the table saw's rip fence. Set its height to the thickness of the workpiece. Tilt the blade to 45° and adjust the rip fence until the top corner of the blade hits the bottom corner of the L-fence. Position the push pad against the L-fence to make the cut.



GLUE, FOLD, AND TAPE

This mitered case is as low-stress a glue-up as you'll ever see.



Line it all up. Use a straightedge to register against. With the parts outside face up, line up the parts against the straightedge and each other, and stretch FrogTape tightly across the seams.

unadorned, but you can trick out the components in many creative ways.

With six cases to build, this is a big job, but the construction is straightforward. I built my cases with walnut-veneered $\frac{3}{4}$ -in. plywood, mitering the corners and applying solid walnut lipping to the front edges. Each case has a $\frac{1}{2}$ -in. walnut plywood back glued in, and I felt that this, along with the miters, provided ample strength and rigidity. I've built a number of plywood cases this way over the years, and none have failed. For extra security, you may choose to reinforce this joint with splines, biscuits, or L-tenons.

Start with the cases

I started by cutting down the plywood for the carcasses, leaving the pieces about 1 in. over width but cutting them to exact length.

My bottom cases will almost always be lined up together; therefore I cut the plywood so the grain runs across the top of them, which means the grain won't wrap around each box.

Once you cut the case parts, glue on $\frac{1}{2}$ -in.-thick solid edging. I milled the edging slightly over the thickness of the plywood and, after glue-up, I used a block plane to flush the edging to the plywood.

Once the edging was flush, I ripped all the parts to width with the edging against the fence. Then I tilted the blade to a 10° angle and, with the plywood edge on the fence,



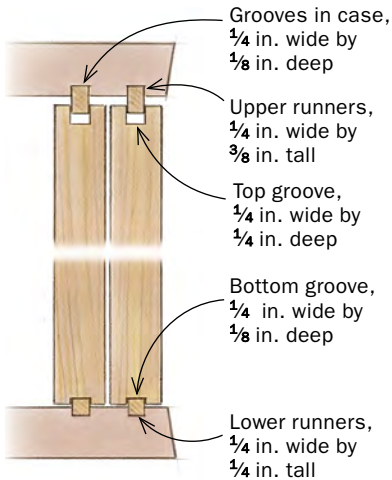
Flip it, glue it, and wrap it up. Carefully turn the whole assembly over, add glue to the miters, place the back in the groove, and fold it all up. Tightly tape the final corner. Before gluing, Kapsales prefinishes the insides of the cases and backs with shellac and wax.

OPTIONS FOR OUTFITTING THE CASES

Kapsales fitted different cases with sliding plywood doors, sliding glass doors, drawers, and a drop-down door. She left one case open.

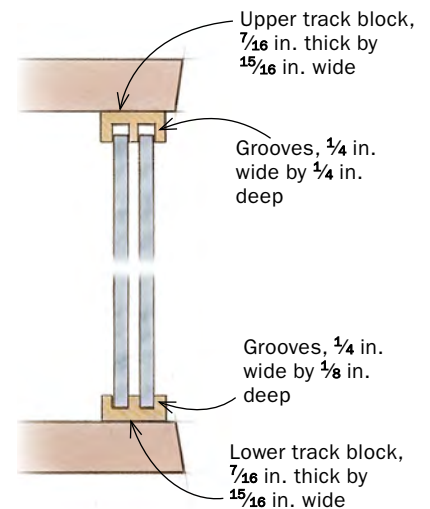
PLYWOOD SLIDING DOORS

Doors are edged with solid wood and slide on runners glued into the case. Wider edging on one side accommodates a recessed pull.



GLASS DOORS

The $\frac{1}{4}$ -in.-thick glass doors slide in tracks installed after the glue-up. They glide so easily that a little finger pressure is enough to move them back and forth, making pulls unnecessary and leaving the view uninterrupted.



ripped the angle in the solid-wood edge. Finally I tackled the miters. I used a crosscut sled to trim the edging to the length of the plywood, and then I used an L-fence and a push pad to cut the miters. While at the tablesaw, I cut the grooves for the back and cut any other grooves I needed on the interior of the boxes.

I glued up one box at a time. I lined up the parts in order, outside face up, on my bench. Using a straightedge across the front of all the parts I made sure everything was lined up perfectly, and then I taped across the seams. I carefully turned the assembly over, applied glue to the miters and in the grooves for the back,

and then folded up the parts with the back in place and taped the final corner closed, stretching the tape taut.

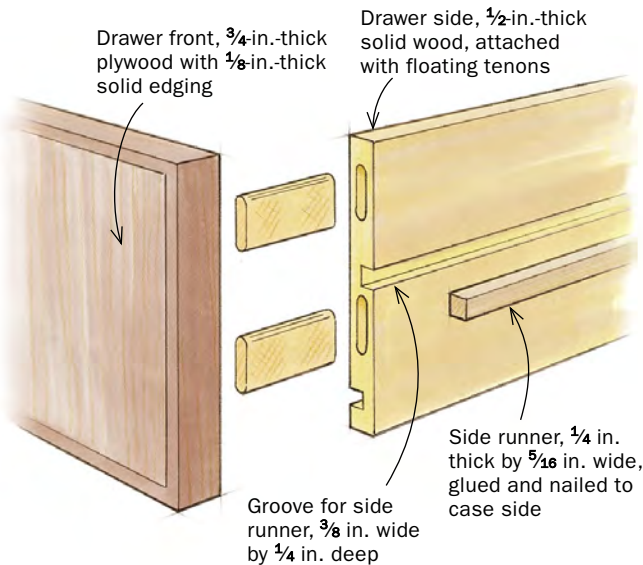
Different case treatments

There are five different types of boxes in my wall unit. Each one is handled a little differently.

One has sliding plywood doors edged on the sides with solid wood and grooved on the top and bottom to slide on runners that are let into the top and bottom of the box. I used wider edging on the outsides so that I could rout a slight recess for a pull.

VERTICAL GRAIN DRAWERS

Three drawers with vertical grain on their fronts slide on runners glued and pinned to the inside of the case. A crescent cutout serves as a simple pull. Because the drawer fronts are plywood, Kapsales uses Dominos to hold the drawer boxes together.



The case with drawers has wood runners glued to the case sides, and a groove in the side of the drawer that mates with the runners. The drawer sides and back are solid wood, but the fronts are plywood, which allowed me to run the grain vertically. I used a Festool Domino to join all the drawer parts.

I cut a crescent recess into the top of each drawer front. I edged the crescent with $\frac{1}{16}$ -in. veneer, and then edged the top of the drawer front over that, blending where the straight meets the curve with a block plane and sandpaper.

The third large case has a drop-down door that is also edged plywood with a crescent recess in the top.

The two upper cabinets with sliding glass doors have adjustable shelves, so they get $\frac{1}{4}$ -in. holes to hold shelf pins. The glass doors run in grooves cut into solid-wood runners that are glued into the carcase top and bottom.

Open shelving

In addition, there are two open shelves. Made of plywood and edged with solid wood, they lock onto shelf brackets with short dowels. The shelf brackets hang on angled dowels just as the cases do. The brackets are two solid-wood pieces that are mitered, reinforced with Dominos, and glued together.

Uprights hold it all up

Honestly, the four uprights are the most difficult part of the build. They are long pieces, each with two sets of angled holes every $5\frac{1}{2}$ in. down its length. The holes must be consistently spaced down the length of the upright and must line up with the holes on the other uprights.



DROP-FRONT CABINET

A hinged door with a cord stay drops down and gives access to a large space. The pull is the same crescent-shaped recess as was used on the drawers.

THE UPRIGHTS ARE THE CRUX

These uprights hold all the cases, and the pairs of 45° holes along their length make the whole unit modular—so the cases can be rearranged. Accurate and consistent holes are crucial. An angled drilling block and a drilling spacer are the keys to pulling it off.

DRILLING BLOCK NAILS THE ANGLE

The block lets you drill the angled holes in the uprights. A notched block glued to the drilling block provides clamping purchase.

Brass pipe nipple, $\frac{3}{8}$ in. I.D.

Clamping block, $1\frac{3}{8}$ in. square by 2 in. long

$\frac{13}{32}$ in.
 $\frac{13}{16}$ in.
 $\frac{9}{16}$ in.-dia. hole for brass insert

Drilling block, $1\frac{5}{8}$ in. square by $2\frac{3}{4}$ in. long

45°

Drill bit. The author used a $\frac{3}{8}$ -in.-dia. Kreg high-speed-steel step drill bit to drill the holes.

DRILLING SPACER ADDS CONSISTENCY

A plywood spacer straddles the upright, and has evenly spaced slots for the drilling block. When you build the spacer, use the drilling block as the guide to locate the spacer blocks.

Spacer block, $\frac{3}{4}$ in. thick by $1\frac{5}{8}$ in. wide by $3\frac{1}{4}$ in. long

End spacer, $\frac{3}{4}$ in. thick by $1\frac{5}{8}$ in. wide by 12 in. long

Sides, $\frac{3}{4}$ in. thick by 3 in. wide by $93\frac{3}{4}$ in. long

Drilling block

Spacer block

45°

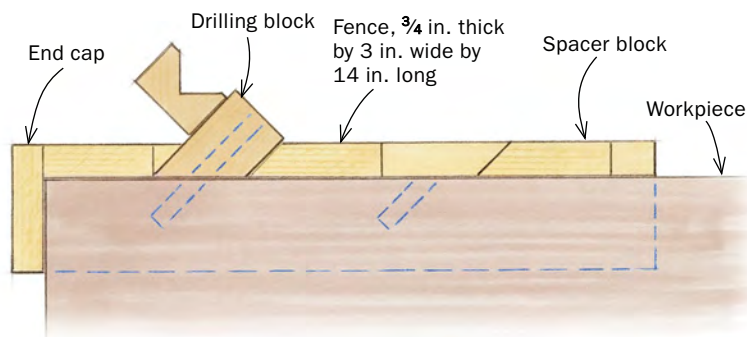
Workpiece



Drilling the holes. On a flat surface, making sure the work is elevated enough that you aren't drilling angled holes into the surface below, clamp the drilling spacer onto the upright. Be sure to precisely register the bottom of the upright to the top of the jig, and clamp the drilling block in the first slot on the spacer. Drill the holes, move the drilling block to the next slot, and then repeat all the way down.

ANGLED HOLES IN THE CASE SIDES

Each case has two single, evenly spaced dowels on each side. The dowels protrude at 45° to sink into the angled holes in the uprights. Use the same drilling block you used for the uprights but with different drilling spacers.



TWO DRILLING SPACERS PER CASE

Drilling spacers similar to the upright drilling spacer are clamped to the case. The two case spacers are mirror images of each other, and they register on the side of the case with a stop at the top.



Clamp and drill. Clamp the drilling spacer onto the case side, and then clamp the drilling block in place. Drill a single hole, using the metal sleeve closest to the outside of the case side. Move down to the next spacer and repeat that step. For the other side of the case, switch to the other drilling spacer and repeat the process.



I milled the uprights to final width, but I left them long and about $\frac{1}{16}$ in. thicker than their final dimension. I set them aside and made a modified doweling jig with metal sleeves (inspired by the Kreg pocket-hole jig). This drilling jig consists of two parts: an angled hardwood block with a pair of holes drilled in it, each lined with a 2-in. brass nipple with $\frac{3}{8}$ -in. inside diameter (found in the plumbing supply section of hardware stores), and a plywood spacer that straddles the upright and keeps it in place while registering the angled drilling block between a series of spacers along its length.

To make the angled block, I laid out the hole spacing on a hardwood blank, and used a $\frac{1}{4}$ -in. Forstner bit in the drill press to drill a pair of holes through it. Then I ripped a 45° angle along

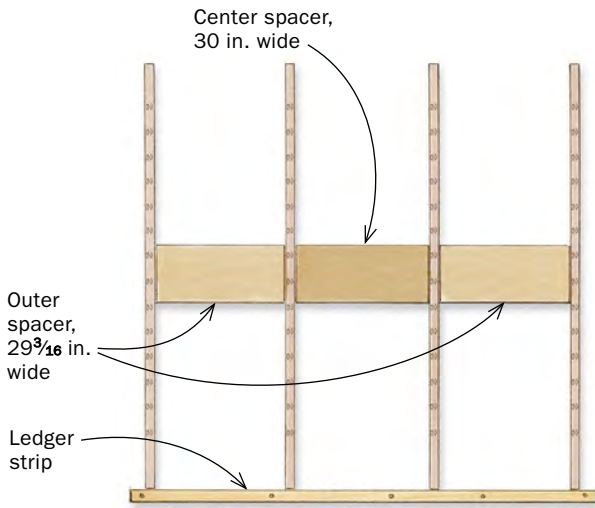
the length of the block and crosscut it to the same width as the upright. I knocked in the brass nipples, using a few drops of cyanoacrylate glue to lock them in place.

To make the drilling spacer, I started with two long pieces of plywood on edge and a bunch of short plywood spacer blocks with one end cut at 45°. The spacers were all the same length and were cut to the same width as the uprights.

To make sure the spacing between sets of holes was consistent and easily repeatable from upright to upright, I started assembling the spacer at the top, gluing and pin nailing the first spacer block in place. Then I set the drilling block against the first spacer, butted the next spacer against it, and glued and nailed the second spacer in place. I repeated and worked my way down the line.

INSTALL THE UPRIGHTS

This is a finicky installation. The uprights have to be plumb, all the holes have to align across the uprights, and the spacing between the uprights has to be perfect so the angled dowels in the cases slide right in.



Start with a ledger strip. Begin the installation by screwing in a temporary ledger for the bottoms of the uprights to sit on. It's vital that this ledger be straight and level.

Install the uprights. Working from left to right, install the first upright. Rest it on the ledger, and make sure it is perfectly plumb. Then use an MDF spacer to set the next upright in place, working from the bottom up. Have one of the finished cases to test the fit as you go. Work your way to the right.



You don't need holes very close to the ceiling or the floor, so they don't have to start all the way at the top or go to the very bottom.

Once the drilling spacer was finished, I clamped it over the upright, lining up the bottom of the upright exactly with the top of the drilling spacer. This is important because when you're installing them, all the uprights will rest on a leveled ledger strip, automatically lining up the holes with each other. Set the drilling block in the first slot, and with a hand drill and a Kreg pocket-hole drill bit, drill a pair of angled holes through the uprights. Move the drilling block to the next slot and repeat up the length of the upright. Once all the uprights are drilled, run them through the planer to skim off $\frac{1}{16}$ in. and clean up any tearout.

When it was time to drill holes in the boxes, I made two similar drilling spacers, mirror images of each other, to register the same drilling block on both sides of the case backs.

Make sure the uprights are anchored solidly

In second place for this project's difficulty prize is installing the uprights on the wall. Every home situation is different, so you'll probably use a combination of hitting studs, using wall anchors, or hitting the top plate. I made my uprights long enough so that I could hit the top plate on all four. On two of them I also hit studs, and on the other two I used wall anchors.

The boxes aren't too heavy, but once you load them with books and knickknacks they will be. If you aren't sure your installation will safely hold them you should hire a contractor to install the uprights for you.

In addition to securely anchoring the uprights on the wall, you have to place them precisely in relation to

each other to make sure that all the holes line up.

To make this as easy as I could, I did a few things. I cut MDF spacers to use between the uprights. I needed two because the distance between the outside upright to an inner upright is different from the distance between two inner uprights.

To start installing, I struck a level line close to the floor where I wanted my uprights to start. I screwed a long ledger along this line. Starting from the left, I registered my first upright on that ledger and screwed it in place, making sure it was plumb. I used the MDF spacer, a level, and one of the boxes with dowels glued in place to locate the next upright, making my way left to right. Then I arranged the boxes and shelves where I wanted them and loaded them up with stuff. The final product is large but amazingly light and airy at the same time. □

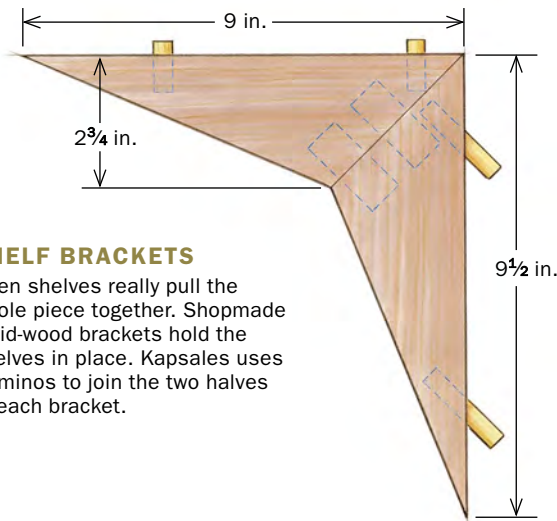
Anissa Kapsales is an associate editor.

HANG IT UP

Tolerances are tight on this whole project, and while the cases should go onto the uprights easily, you still have to line the dowels up with the holes.



The recessed back provides a good handhold. Start with the case held above the holes you want to engage and slowly slide down until you catch the holes and push the case into place.

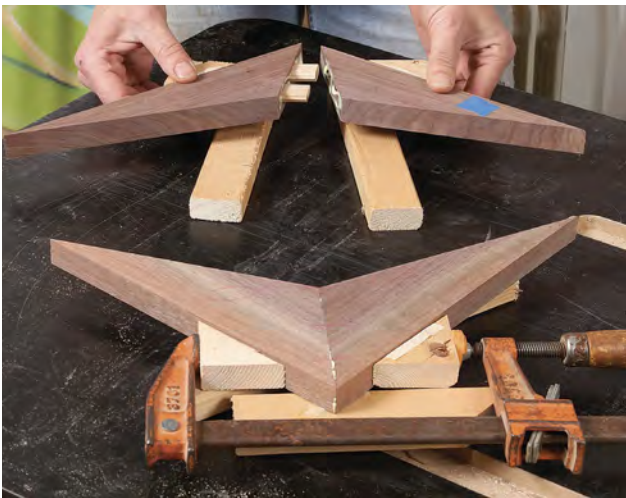


SHELF BRACKETS

Open shelves really pull the whole piece together. Shopmade solid-wood brackets hold the shelves in place. Kapsales uses Dominos to join the two halves of each bracket.



Install the shelves. Place the brackets on the uprights first. The short dowels on the top edge locate the shelf and keep it from slipping. To install the shelf, line up the holes in its underside with the stub dowels in the brackets.



Clamping blocks simplify the glue-up. The author uses double-stick tape to attach triangular blocks on each side of the joint. The blocks help direct clamping pressure for a gap-free fit.





1 Flatten a face



2 Plane the opposite face parallel

The Fundamentals of Milling

Key machines and smart strategy for making boards foursquare

So much in woodworking depends on starting with accurately milled stock—boards whose faces, edges, and ends are flat, straight, square, and parallel. But lumber doesn't come that way, and even if a board is that way today, it may not be tomorrow. This is why strategic milling is so crucial. With the right machines and the right approach, you can produce reliably foursquare boards—the foundation of successful furniture making.

BY BOB VAN DYKE

While you can use hand tools to mill a board, three machines—the jointer, the thickness planer, and the tablesaw—are an incredibly powerful, efficient, and accurate milling system when used correctly and in the right sequence. The process starts with the jointer, which flattens and smooths one face of the rough board. The planer is next. It makes the opposite face of the

board parallel to the face you just jointed while bringing the stock to thickness. Then it's back to the jointer to mill one edge of the board straight, smooth, and square to a face. Last is the tablesaw, which excels at straight cuts that reference off the rip fence, crosscut sled, or miter gauge.

Start with oversize lumber

Careful milling shouldn't be rushed. It begins with lumber selection. I always buy roughsawn boards that are considerably



Back to the Jointer

3

Square an edge



Online Extra

To watch Van Dyke flatten a board that many would consider too warped to use, go to FineWoodworking.com/276.

Tablesaw

4

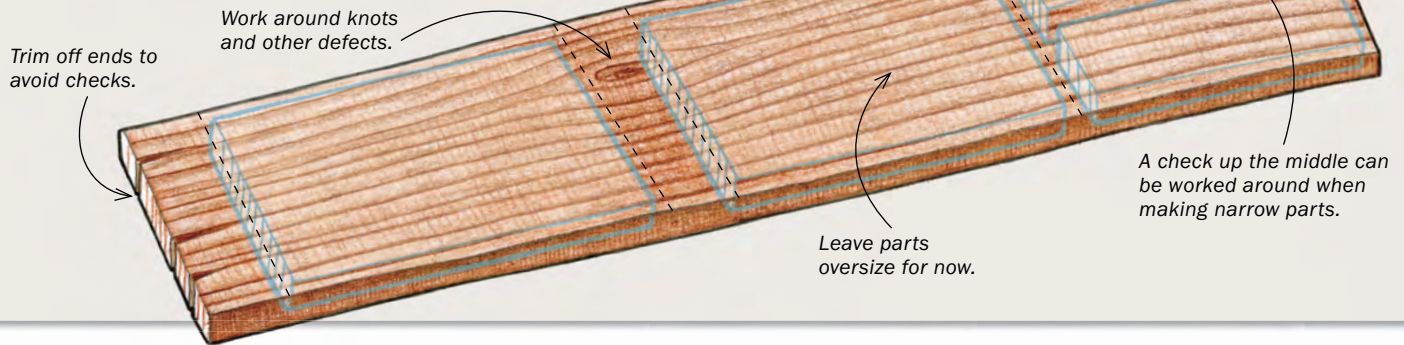
**Cut to width
and length**



Rough out the parts

Chalk out parts before bringing them down to a manageable size using the bandsaw and chopsaw.

BREAKING DOWN A BOARD



CLEAN THE ENDS



Cut off visible end checks. Splits from the end of a board weaken the stock significantly (right). Trim these off.



Retest for hidden checks. Take another inch or so and rap the offcut on the corner of a table (above). When a cutoff won't break, you're into good wood.

thicker than what I want to end up with. This extra bulk allows me to eliminate cup, bow, or twist without blowing past my target thickness. I also select stock as straight and square as I can find. Misshapen boards are usually that way because they contain internal tensions, and these stresses will continue to plague you as you mill the board. Either leave misshapen boards behind or accept the extra headache that comes with them.

Lastly, plan ahead. Bring the rough lumber into your shop weeks before milling it. This lets it acclimate to the environment there, stabilizing the stock before you work it.

Prep the boards

Next, chalk out your parts on the rough boards. But before committing to anything, inspect the ends of the boards for checks. Chop off at least 1 in. and test how strong the offcut is. If it breaks easily, you have an end check. Chop another inch off and test that. You might lose 5 in. or 6 in., but it is important to find that out before laying out the parts.

With the end checks out of the way, roughly lay out the parts on the boards. Chalk is best at this point because it is easy to erase as you change your mind—and you will change your mind.

Cut parts to rough size

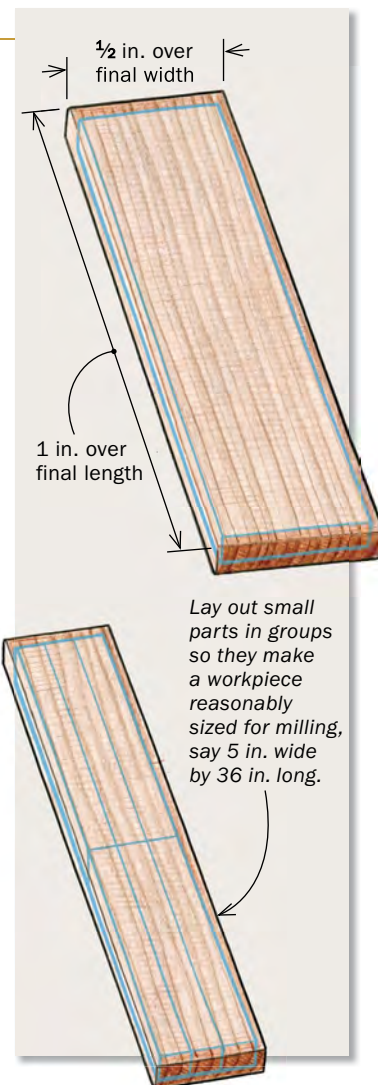
Strategic milling starts with sawing parts to appropriate size. This doesn't mean cutting parts to final dimension, but to a size that makes sense for the jointer and planer while avoiding waste. This involves trade-offs you need to consider. It frequently makes sense—for efficiency and safety—to mill smaller parts together in the board before crosscutting and ripping them out. But the longer and wider the plank, the more wood that must be removed to create a clean, flat face, and that could leave you with stock that's too thin.

To bring parts to rough size, I use the chopsaw and bandsaw. They are safer to use with roughsawn stock, which is likely to be warped in some way. Do not use the tablesaw here. An unmilled, crooked board going past a tablesaw blade can shift, causing the stock to contact the back of the blade and dangerously kick back toward you.

LEAVE PARTS BIG FOR NOW



Cut to rough length and width. Rough boards are unsteady, making the chopsaw and bandsaw the safer tools.



Label the ends. Cleaning the board's surfaces at the jointer and planer will remove your marks there; moving them to the ends lets you keep track of the parts.

Flatten the faces

The jointer and planer are the key machines here.



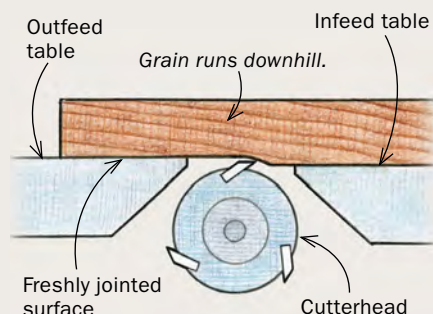
Pick the correct face to joint. Typically it's best to place the bowed face down, since it is more stable that way.



You don't need a finished surface. It's sufficient to joint enough wood so the stock will not shift as it goes through the planer.

THE JOINTER

When you push stock past its spinning cutterhead, the jointer smooths and flattens one face of the board. It won't make opposite faces parallel, however. That's the planer's job. The jointer's outfeed table is locked in place at the height of the cutterhead's apex. You adjust the infeed table to be lower than the apex by the amount of the intended cut.



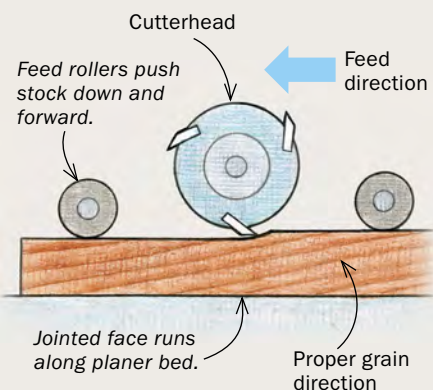
Plane the second face parallel to the jointed one. After planing until the second face is completely clean, begin flipping the board end for end between passes to take off an equal amount from each side. Leave the stock $\frac{1}{8}$ in. too thick.

Sticker and cover. Separate the freshly milled stock with $\frac{1}{2}$ -in.-square strips to equalize airflow. A plywood sheet on top makes sure no face is overexposed.



THE PLANER

The planer cuts the top face parallel to the bottom face. It can't flatten a board that's not jointed. Feed rollers push the stock firmly against the planer bed and propel it beneath the cutterhead, so the cut mirrors the downward face of the stock.



Flatten the wood, then let it rest

Wood is forever moving, and when you joint and plane it, you're exposing new fibers to the air, changing the internal tensions. To let the wood settle before you bring it to final dimension, mill in stages, spacing the milling sessions apart by days or even weeks, if possible.

Mill in two stages. However, if the rough stock is wide and more than $\frac{3}{8}$ in. too thick, mill it in three sessions, removing about $\frac{1}{8}$ in. each time.

Start by jointing a face. Next, use the planer to make the opposite face parallel to the jointed face. Once the second face is entirely surfaced, begin flipping the workpiece end for end between passes as you continue thicknessing. Take roughly equal amounts off each face to try to minimize inevitable wood movement. Do this until the stock is about $\frac{1}{8}$ in. over final thickness.

Last, sticker the wood. Jointing and planing exposes fresh fibers, which changes internal tensions, causing the board to warp. Sticker—stacking boards with spacers in between—lets the wood move freely by allowing air to circulate evenly around the parts. Stack the boards with long strips of wood about $\frac{1}{2}$ in. square—these are called stickers—between each layer. Remember to sticker a scrap board on the top layer, too, to cover it like the rest of the stock.

Final thickness

When the stock has stopped moving (or you are just out of time), go back to the jointer and planer.



Watch for cup. Every few days, check to see how much the boards have cupped. When the board stops cupping, the stock is done moving and is ready for final milling.



Joint a face. Place the cup down and maintain pressure on the outfeed table. Van Dyke marks the correct grain direction, helping him avoid tearout, which is particularly important during final milling.

Let the stack sit for a few days. Then, with a straightedge across the width, measure the cup on a sampling of the boards. Put the stack back together and check again the next day. More than likely the cup will have increased a little. Keep checking. When the cupping stops, the stock is done moving and is ready for final milling.

Bring parts to final thickness, width, and length

At this final stage, it is particularly important to pay attention to grain direction to avoid tearout. Normally you can read the grain by looking at the edge, but the jointer will tell you if you're right. After jointing a face without getting tearout, mark your feed direction.

Many people joint an edge right after they joint a face. I rarely do this because



Plane to thickness. Once the top face is completely planed, flip the board end for end between passes, trying to take off approximately the same amount from both faces.

Final width

After jointing an edge, it's time for the tablesaw, which excels at making straight cuts parallel to the rip fence.

JOINT THE EDGES



Square jointer fence means square jointed edge. Always check for square on the outfeed table a few inches past the blade. If the stock has a bowed edge, place it down for two points of contact.



RIP TO WIDTH



Rip to width. Keep the jointed edge against the rip fence; either face can be on the table.

GANG NARROW PARTS



Rip slightly overwide. Instead of ripping groups of identical narrow parts to final width, first cut them $\frac{1}{16}$ in. or so wide.



Rejoin the wide workpiece after each rip. This guarantees that each ripped part will have one jointed edge.



Edge-plane as a bundle. Placing their jointed edges down, grip the parts tight as they enter and exit the planer so they act as one board.

TIP

MARK YOUR SQUARE SURFACES



It's important to clearly mark square surfaces. They'll be references for milling and joinery.

it limits my options when it comes to feed direction. So the next step for me is the planer, where I mill the stock to final thickness, again flipping the board end for end between passes.

Now joint one edge straight and square to the face. If the stock is crooked, I usually joint the concave edge because it gives me two points of contact and results in taking off less stock overall. However, if there is sapwood, unattractive grain, or a knot by one edge, I joint the other edge and rip the sap or knot off at the tablesaw. After jointing an edge, mark it and the face you kept against the fence.

With two flat faces and one straight edge, you can finally safely and accurately rip

the board to width before cutting it to length.

When ripping a number of pieces to the same narrow width, say under 3 in., I frequently take a different route. Here, I will rip each piece a light $\frac{1}{16}$ in. over width, rejoining the wider board between rips. Then I will gang them together and edge-plane them to final width before cutting them to length. This ensures all of the parts are exactly the same width, which makes for much easier and more accurate joinery. It also gets rid of the machine marks from the tablesaw.

Once I have all the parts cut to width, I use a crosscut sled or miter gauge to square an end and cut the boards to length.

Stack without stickering

I frequently see people stickering finish-milled parts. I believe this is misguided, since stickering is a way to let the wood move—the last thing you want after you take the pieces to final size. Instead, you want to stop air from getting to them. For this, I stack like-size pieces directly on top of each other—again topping things off with a scrap board—or, when I'm really concerned about maintaining flatness, keep them in a plastic bag. I have a wide tabletop that's been stored in a garbage bag for more than three years, and it's still dead flat. □

Bob Van Dyke runs the Connecticut Valley School of Woodworking, where he is also a teacher.

Final length

Use a crosscut sled or miter gauge in the tablesaw's miter slots to produce square crosscuts.



Square an end.
Cut off at least $\frac{1}{4}$ in. Anything less can allow the blade to flutter, making an end that's not square. For improved accuracy, the jointed edge should be against the fence, with no crumbs of wood between them.

Cut to length.
For repeatability, attach a stop to the fence, referencing the just-cut square end against it.



Storage



No stickers. After final milling, Van Dyke stacks the boards and adds a plywood top. This eliminates airflow around the faces, discouraging wood movement.



Plastic bag keeps boards from moving. Van Dyke uses trash bags for especially wide boards and for longer-term storage.



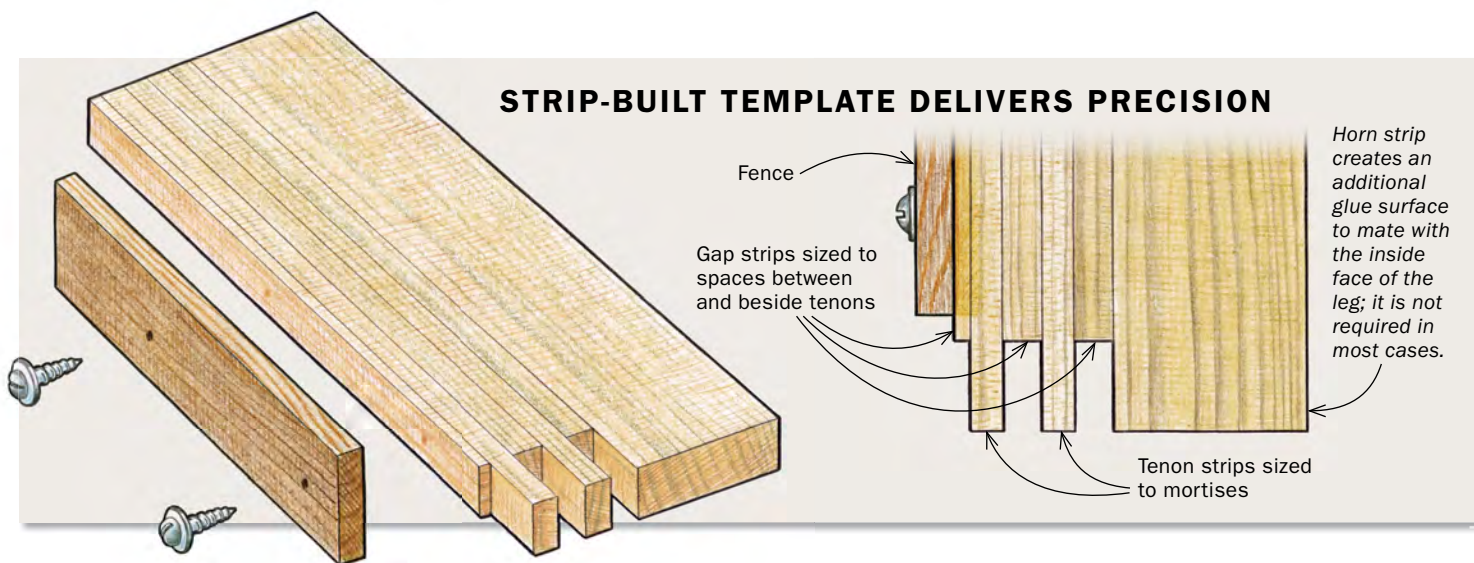
Dead-on Double Tenons with a Router

Simple template
offers accuracy and
repeatability

BY MIKE KORSAK

On a recent chest of drawers with very long drawer dividers, I used double tenons to join the dividers to the legs for extra strength. One of the challenges of cutting double tenons is dialing in the multiple setups. The tenons must not only fit their respective mortises snugly but also be spaced apart just the right amount. So the cuts that define the four wide tenon cheeks must be very precise. I could have cut the tenons on the tablesaw or bandsaw, but to guarantee uniformity and to simplify working with such long parts, I decided to cut them with a router and a special template. I made the router template by milling a

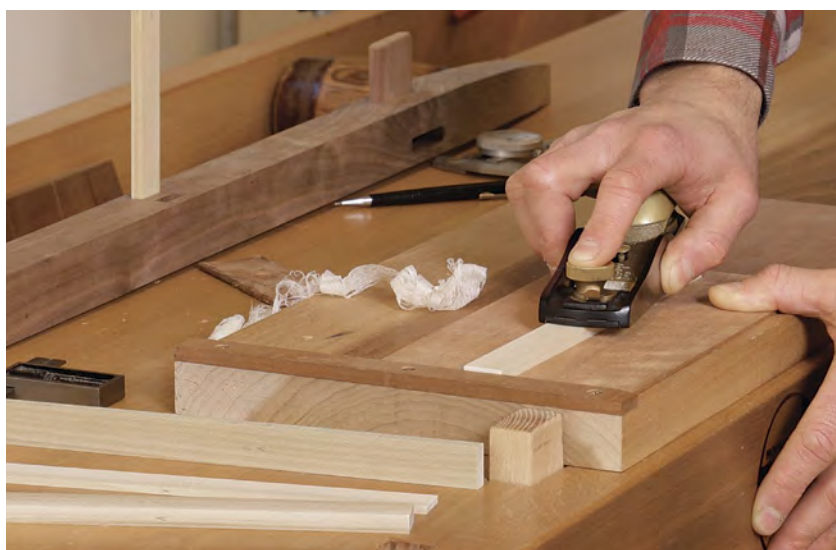




Sizing the strips



With double tenons, consistent mortise spacing is key. Korsak cuts one mortise of each pair, then shifts the mortiser's fence to cut all the second mortises.



Fit strips to the mortises. After machine milling the first two poplar strips slightly over thickness, Korsak fine-tunes their fit to the mortises with a block plane.

Fit a strip to the gap. With the two tenon strips fitted, plane a strip to slide snugly between them.

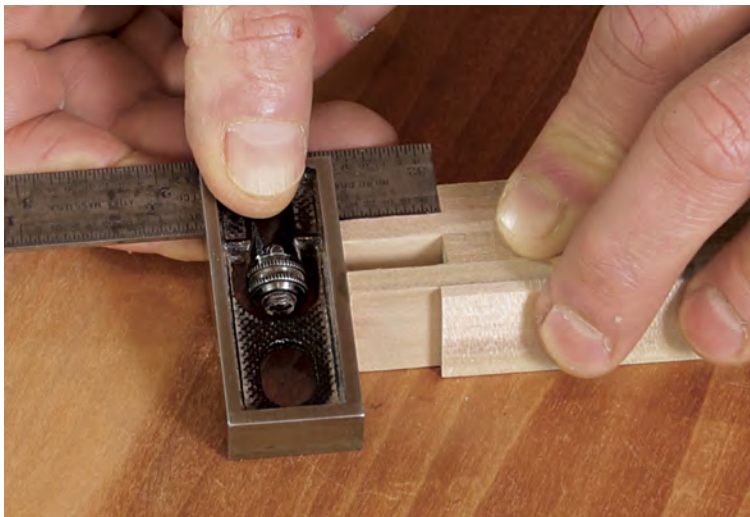


Size a strip to the inside edge. Using a flat scrap to extend the inside face of the leg, Korsak fits another strip to the gap.

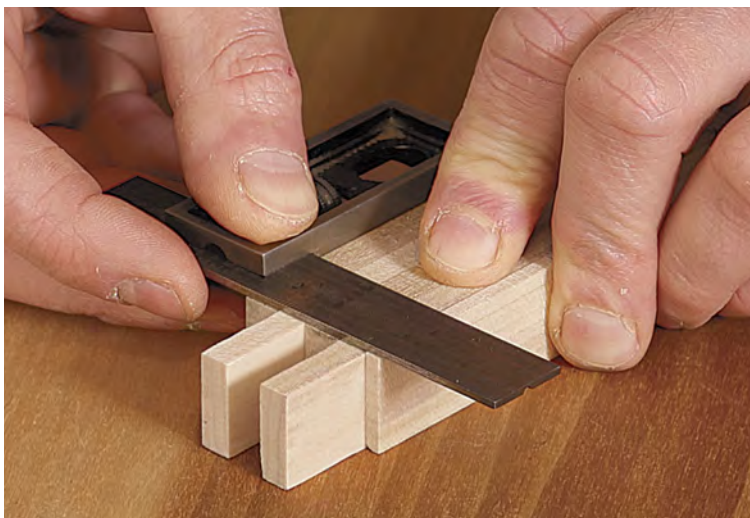


Glued-up strips make a smart template

Set the tenon length. Korsak uses an adjustable square to control the length of the tenons.



Square the shoulders. Next, the square ensures that the ends of the shoulder strips are aligned.



Square the end. Be sure the ends of the tenons are aligned as well. On his template Korsak adds a wide strip to the inside because his dividers wrap the inside face of the leg.



Strike a square line. A precise pencil line will allow Korsak to register the strips accurately during the glue-up.

series of strips to fit the mortises and the spaces between them, and then laminating the strips.

Cut the mortises first

I started by chopping the double mortises in the cabinet's legs using a hollow-chisel mortiser. The leg blanks were still square and the inside faces of each leg were my reference surfaces. Once the first mortises were cut on all four legs, I adjusted the mortiser's fence to cut the second mortise in each pair. This ensured that the spaces between the paired mortises would be the same for each set.

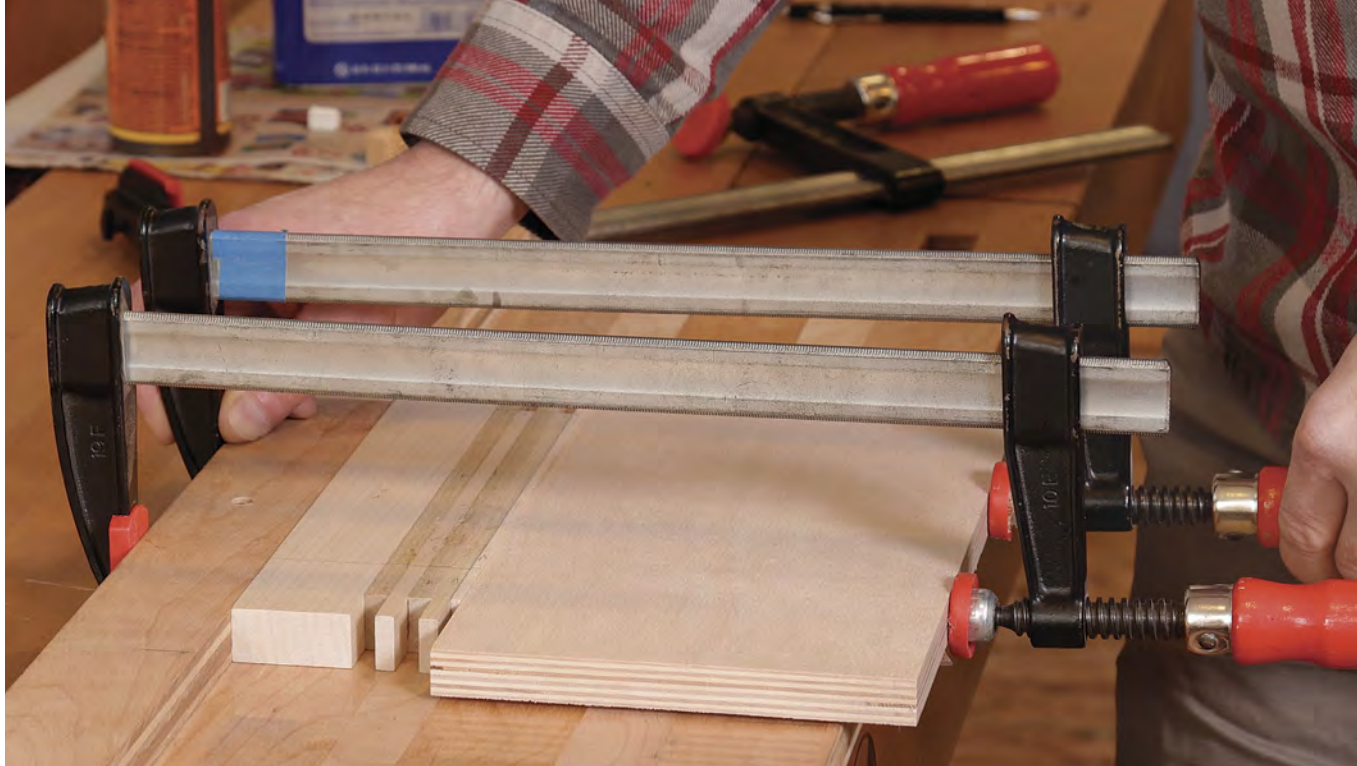
Glue up strips to make the template

With all the mortises cut, I began making the router template: a glued-up stack of strips, each strip milled to fit exactly in one of the mortises or else in the space between or beside the double mortises. I machine-milled each strip slightly thicker than the corresponding space it was to fill, then brought the strips to an exact fit with a handplane.

First I fit the tenon strips. I worked them to final thickness one at a time with a block plane, using dial calipers to be sure I maintained consistent thickness along the length of the strip. I tested the strip's fit in its mortise as I worked.

Once I had both tenon strips fitted, I inserted them in their mortises and then planed a third strip to fit precisely between them. Then I planed two outside strips. A

Squeeze those strips. Korsak's simple plywood assembly station helps keep the strips in plane, and its fence acts as a clamping caul. Packing tape keeps the template from sticking to the plywood.



Test the fit. Once the glue cures, check to see that the template fits the mortises. All faces should contact but the fit should not be too tight.



Flatten with care. Plane both faces of the template, working carefully to be sure the template's faces remain square to its edges.



Affix a fence. Korsak screws on a registration fence so it's flush to one face of the template and overhangs the other face.

From template to twin tenons

Mark the gaps.

To prepare for roughing out the tenons, trace the template onto the workpiece.



Rough-sawn tenons.

At the bandsaw, cut out most of the waste between the tenons.



typical double tenon would require just these five strips; but I needed a sixth, because I had made these drawer dividers extrawide to include a horn that wraps inside of the leg and creates an additional glue surface there.

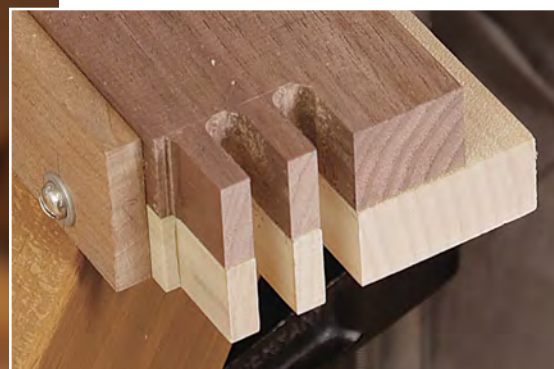
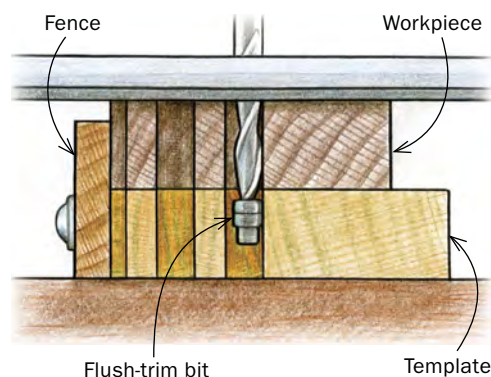
Assemble the template

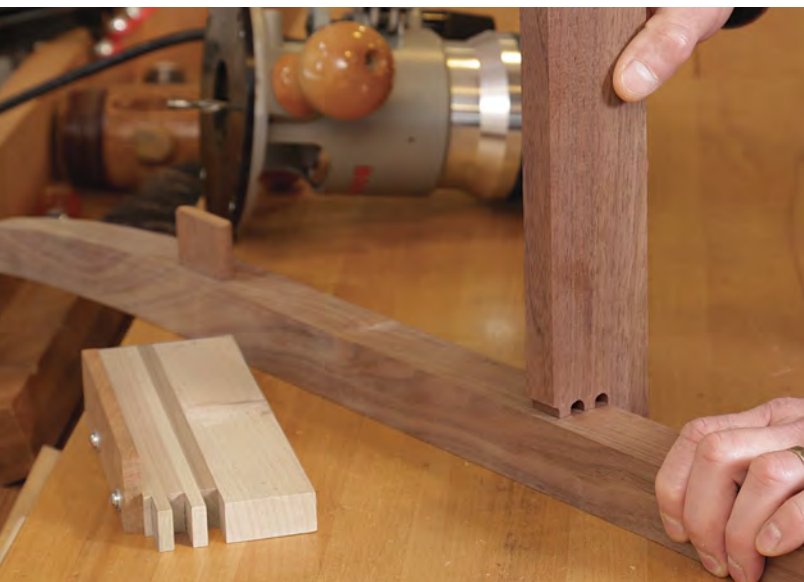
With the strips all made, I had established the thickness and the spacing of the tenons. To control the length of the tenons, I staggered the strips when I glued them up. Before applying glue, I established the tenon lengths with an adjustable square. Then I struck a square line across the pack of strips; this was my registration guide during assembly.

I glued up the template on a piece of plywood with a fence screwed to one edge. The fence acted as one caul and I used a second caul to distribute the clamping force. I applied packing tape to the piece of plywood to resist glue. I used polyurethane glue, since its longer open time meant I could adjust the strips before the glue started to set up.

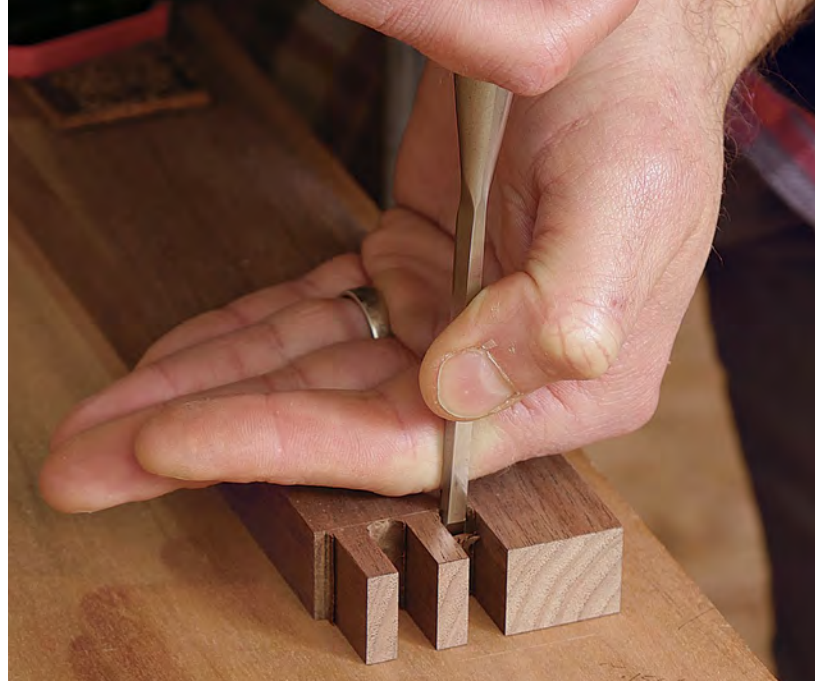
After the glue cured, I removed the clamps and tested the template's fit in each

Flush-trim to the template. Korsak clamps the workpiece to the template and the bench, then routs between the tenons with a $\frac{1}{4}$ -in.-dia. flush-trimming bit with a bottom bearing.





Test the real tenons. After routing, be sure the tenons and spaces all align nicely with the double mortises.



Last task. Square up the rounded corners of the router cuts, removing most of the waste before finishing with a last light paring pass right at the shoulder line.

set of mortises. I wanted the surfaces to be in contact, but I didn't want the fit to be too tight. Next, I planed the top and bottom faces of the template clean. The last step in making the template was to screw on a fence, which would register the template to the front edge of the workpiece.

The template in use

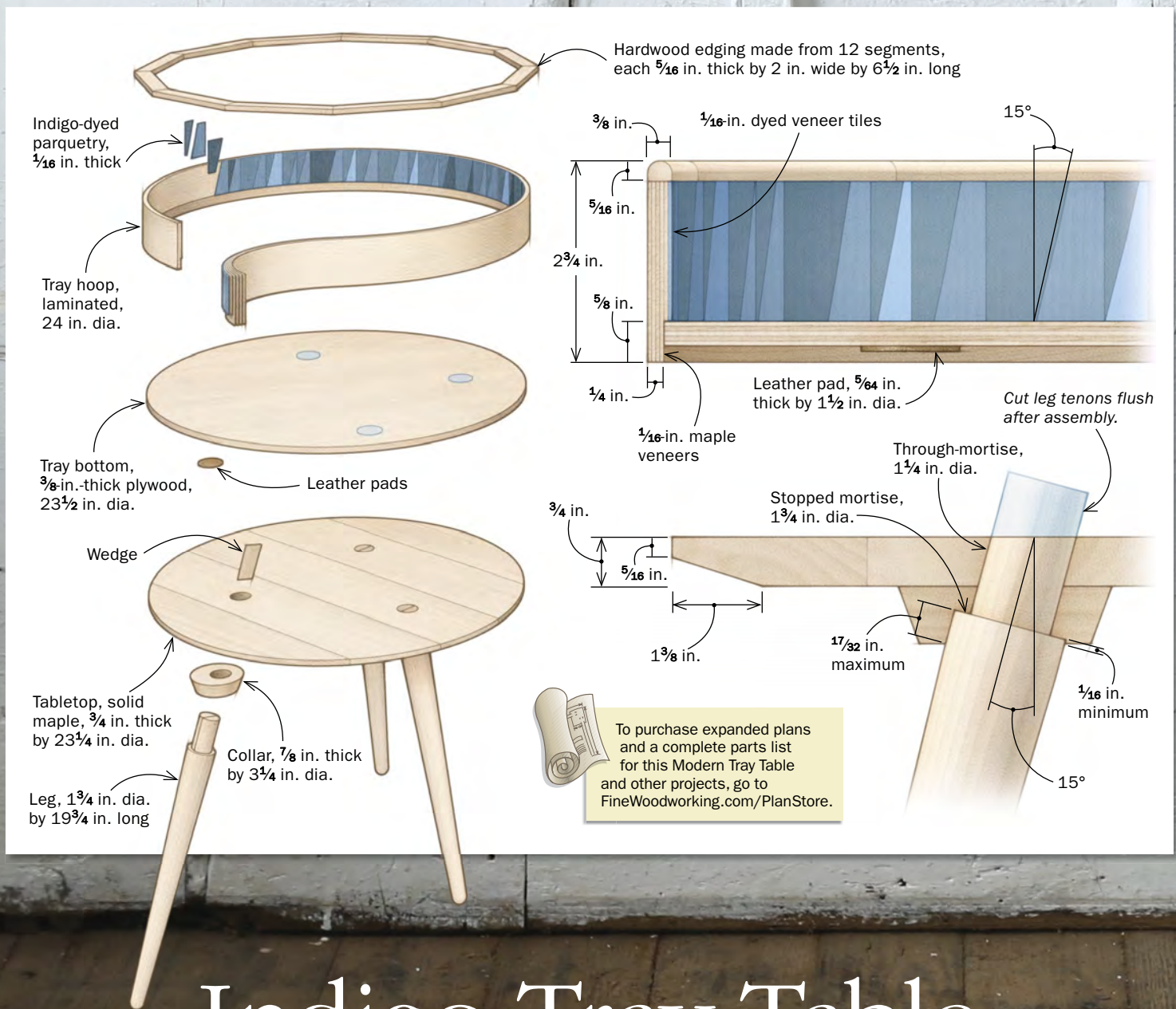
Before putting the template to use with the router, I used it to trace out the tenons on each workpiece. Then I took the parts to the bandsaw and sawed out most of the waste between the tenons, leaving just a bit of material to remove with the router.

To do the routing, I put the template on my bench and clamped the workpiece on top. I used a $\frac{1}{4}$ -in.-dia. spiral upcut flush-trimming bit with a bottom bearing (Whiteside RFT 2100: whitesiderouterbits.com) to follow the profile of the template. After routing, I used a chisel to clean up the small rounded corners left between the tenons on the workpiece. I finished the cleanup by placing the tip of a chisel in the shoulder lines and tapping the chisel with a mallet to remove the last bit of waste.

After test-fitting all eight divider-to-leg joints, I was extremely pleased with the results. All of the joints were nice and snug, but not too tight. And there was no need for fitting or fiddling with the joints—they were ready for glue-up. □

Mike Korsak makes custom furniture in Pittsburgh, Pa.





Indigo Tray Table

A removable parquetry tray transforms a simple, three-legged table

BY HEIDE MARTIN

This tray table was built at the Center for Furniture Craftsmanship in Maine during my Nine-month Comprehensive training, under the guidance of lead instructor Aled Lewis and co-instructor Bruce Beeken. While the table project as a whole is on the complex side, it can be built in stages or adjusted for

simplicity. You could build the table or tray as solo pieces, or adapt the tray design to feature undyed parquetry panels or no parquetry at all.

The table itself is stout and straightforward in its construction, but the removable tray gives the piece personality, utility, and complexity. The hoop of the tray is built

by laminating shopsawn veneers, and an applied edging conceals the seams of the lamination while also protecting the edge of the dyed parquetry.

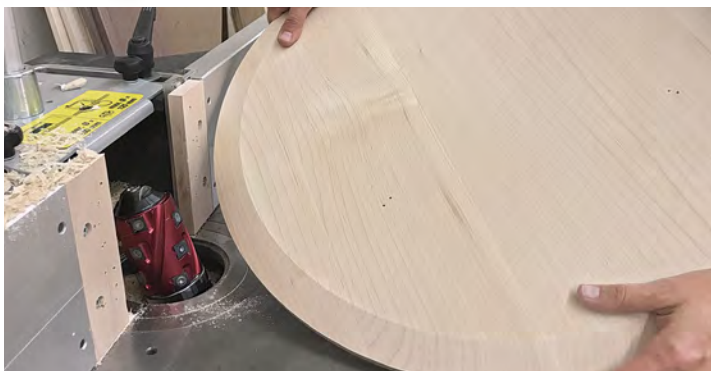
The tray's plywood bottom is glued in from below, fitted into a rabbet in the hoop. The rabbet overhangs the bottom and registers the tray on the tabletop.



The visual simplicity of the table allows the parquetry tray to take center stage. An underbevel lightens and adds visual interest to the table's profile. Turned and tapered splayed legs gain extra stability from applied collars and wedged through-tenons.

Make the top

Cut an underbevel. With access to a shaper, Martin cut the bevel by angling a straight cutter and using a high fence and a shopmade jig to hold the tabletop. Alternatively, you can use an Amana raised-panel bit with the circular top held on a router table using the same type of fixture.



Begin with the tabletop

To build the top, grain-match your boards and glue up an oversize panel. I used five boards for this top, making sure the leg through-tenons would land within the boards, not on the gluelines.

I cut the blank to a circle using a router method that gives clean, repeatable results. Start by making a circular template from

plywood or MDF. Using a jigsaw, rough-cut the circle on both the template and the maple top. Save the offcuts for the next step, beveling the tabletop. Use a pivot-point router jig to clean up the cut on your template. I got the idea for mine from a Methods of Work tip in *FWW* #99, "Router Circle-Cutting Jig" by James Guerami. Screw the template to the top, locating the screws

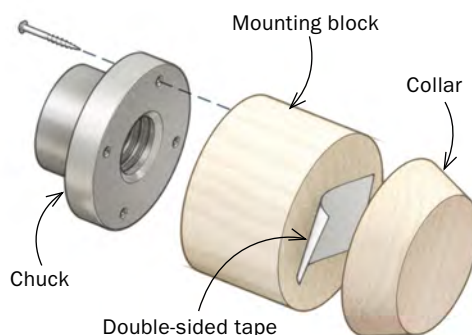
where the leg mortises will be, and then use a flush-trimming bit to cut out the top.

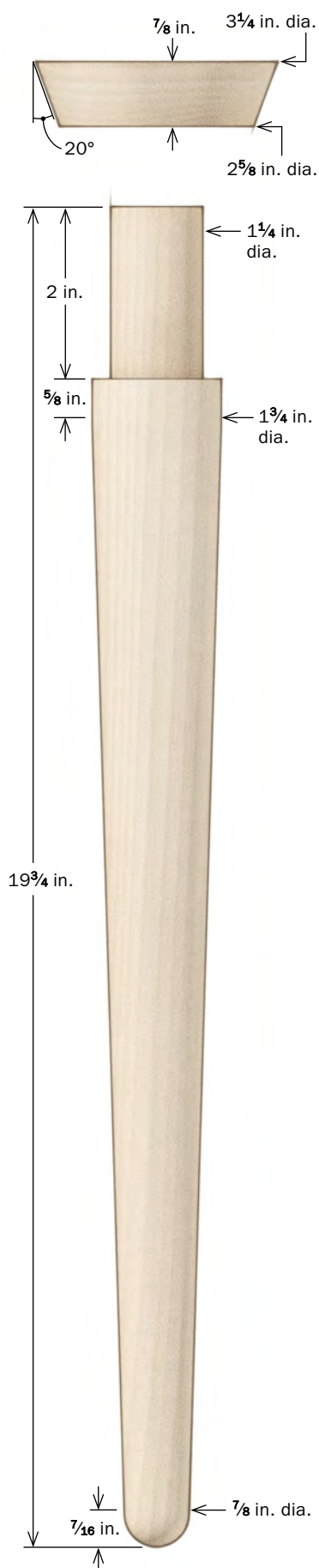
Next, cut an underbevel on the tabletop. I did this with two passes over the shaper, with a straight cutterhead set at an angle. The first pass takes off the bulk of the material. The second pass removes the last bit. I made a jig with the offcuts from the blank to support the circle as it rotates.

Cut the collars and legs



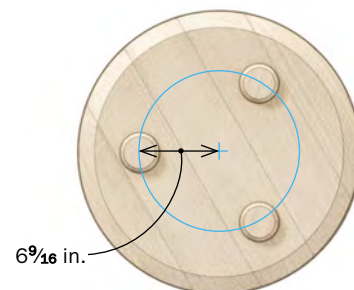
Collars first, then legs. Turn the tapered collars, then move on to turning the legs. To size the tenons, Martin uses a scrap drilled with both 1 1/4-in. and 1 3/4-in. test holes. First, turn the tenon. Because you will wedge it, don't worry about having a piston fit. Then, turn the top 5/8 in. of the leg to 1 3/4 in. dia., aiming to have a tight fit after sanding on the lathe. Finally, taper the rest of the leg.



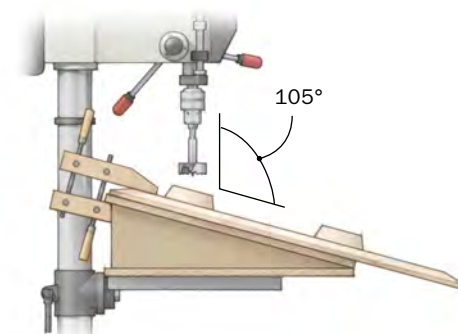


Assembly

Secure the collars. Before drilling the leg mortises, mark the collar locations. Attach the collars with double-sided tape and predrill for a screw in the center of each collar. Remove the tape, add glue to the collars, and screw them in place.



Drill mortises. Once the glue is dry, Martin removes the screws and drills stepped mortises, using a pair of Forstner bits and a fixture on the drill press that holds the workpiece at the correct angle.



Attach the legs. Keep the tabletop up on risers so the extralong tenons can come all the way through the collars and top. Martin uses yellow glue and wedges the tenons in place. Then she trims off the excess flush to the top.

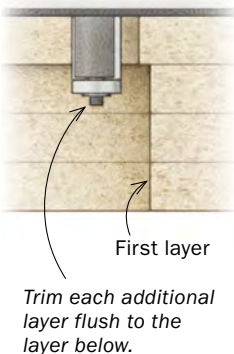


A removable Tray

Start with a form

The key to building the laminated hoop is putting effort into the form up front.

Layer by layer. Use a pivot-point router setup to make a circular cutout in a piece of $\frac{3}{4}$ -in. particleboard. Trace the circle onto a second layer and rough it out. Glue and screw it to the first, and then template-route. Repeat until all the layers are done.



Divide and locate. Carefully cut the form in half. To make sure that her form registers accurately while clamping, Martin uses a Festool Domino to make mortises on both halves of the jig, and glues Dominos into one side. Alternatively, you can use dowels or biscuits.



Turn the collars and legs

Now you are ready to turn the legs and the leg collars. I turn the collars first, then the tapered legs. Leave the first $\frac{5}{8}$ in. below the tenon shoulder untapered, since that is glued into the stepped mortise.

With the legs complete, move on to the mortises. Build a drill-press jig that will allow you to present the tabletop to the drill at a 105° angle. Back up the tabletop with a sheet of MDF to minimize blowout while drilling. First, drill the $1\frac{3}{4}$ -in.-dia. section, then drill the $1\frac{1}{4}$ -in.-dia. section right through the tabletop. Glue and wedge the legs into the stepped mortises.

Build the hoop for the tray

To create the bent-laminated hoop, I start by building a form from four 32-in.-square pieces of $\frac{3}{4}$ -in. particleboard. Use the pivot-point router jig to cut a 24-in. outside-diameter circle in the center of the first piece. Remove the interior circle and set it aside (you can use that later to build cauls for gluing on the parquetry). Place the first piece over a second, trace the circle, then cut it out with a jigsaw. Using glue and screws, attach the second piece to the first, then use a router and a flush-trimming bit to clean the cut. Repeat with the third and fourth pieces. Next cut the form in half cleanly on the bandsaw, making sure to mark and locate the mating edges.



Four steps to a hoop

Slice the veneers, dry-fit them, apply glue, and clamp them together.



1 Resawing tips. When sawing the veneers, use a featherboard for even pressure and a clean cut. Mill them $\frac{1}{16}$ in. to $\frac{1}{8}$ in. over final thickness, and joint the main stock after every slice.



2 Fitting tips. While math helps as a guide to proper length, dry-fitting is essential to get the butt joints exact. The most critical joints are in the inside and outside veneers.



3 Gluing tips. Martin uses Unibond for a longer open time and because it is a good color match to the maple. She rolls the glue on all the veneers at the same time.



4 Clamping tips. Be sure to line your form with packing tape or plastic, and work on a plastic surface. As you begin to tighten the clamps, keep an eye on the veneers to be sure they are not sliding up. Use a block and mallet to tap them flush. Let the hoop cure in the form for a day or two, to make sure that you do not have any major warping or cupping.



Add a parquetry pattern

Martin's subtle pattern combines wedge-shaped pieces of veneer in varying shades of indigo.



Trim by hand.

After sawing the tiles to a taper, Martin uses a plane and a shooting board to edge-joint them before gluing.

Work in small sections.

Martin glues the pieces into pairs, using a glue syringe. She uses yellow Frog tape because it stretches, adheres well, and removes cleanly. For each glue-up, stretch the tape over the seam on the back face, then flip the parquetry over and crack open the seam to apply the glue. Tape the seam closed from the front, then clamp or place a weight on the pair. Glue three pairs into a larger section.



Laminate the hoop

On the bandsaw, slice veneers from wood that has tight, straight grain. Be as accurate as you can when you take the veneers to final thickness (I used a drum sander) so the math will be simpler. Each veneer represents a layer of the final hoop, and the circumference of each one is affected by the thickness of all of the others. For my 24-in. hoop I used five $\frac{1}{16}$ -in.-thick veneers. The outside veneer was 24 in. dia. ($75\frac{13}{32}$ in. long), the next $23\frac{7}{8}$ in. dia. ($74\frac{39}{64}$ in. long), and so on. Even if your math is accurate, though, you'll need to do test fitting to get the butt joints perfect.

For the glue-up I used Unibond for its color match to the maple and longer open time. I apply glue to all the hoop layers and use the form to bend them and apply pressure. Before applying any glue, place clamps over the form, loosely tightened. Once you apply the glue, start with the outside veneer and place each layer in the form, then tighten the clamps.

Build the parquetry

I made my parquetry from $\frac{1}{16}$ -in.-thick shopsawn veneers that I dyed with indigo (see *Finish Line*, pp. 20–24), cut into tapered tiles, and arranged in a pattern. I sealed the dyed veneer with shellac.

To apply parquetry to the inside of the hoop, work in stages for easier assembly. First lay out the entire pattern flat, then break it into short segments (8 in. or so) and edge-glue those. Once the segments cure, glue them into the hoop one at a time. Trim any overhanging parquetry.

Add edging to the top of the hoop

While not an essential step, adding hardwood edging conceals and protects the edge of the tray for a finished look. I built my edging by mitering 12 maple segments (see drawing, p. 56) to form an oversize ring. To create the ring, first mill all the pieces to width and thickness. Then cut the miters at 15° . With 11 pieces cut to length, fit them together to determine the exact length of the final piece, and cut it to fit. Glue the segments to each other end-to-end, and then to the top edge of the hoop. After glue-up, I trimmed the excess edging on the outside with a bandsaw, and

Parquetry meets hoop

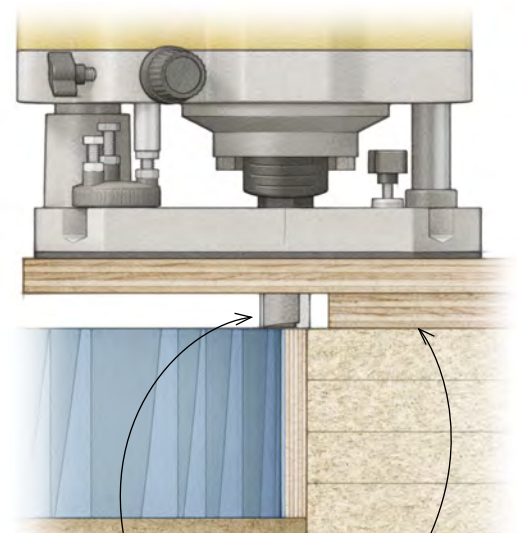
Martin does not try to glue all the parquetry into the hoop at the same time. Instead, she works in sections to make her way around the interior.



Assemble in segments. Three pairs glued together make a segment (above). Make a curved caul for clamping pressure (left) and use one half of the lamination form to hold the hoop vertical. Be sure to clean any squeeze-out at the edge of each segment, where the next one will meet it.



The final pair. Dry-fit the final two tiles individually (wedging them in place in opposition to one another). Trim a little at a time until you get perfect final joints. Martin blackens the edges with a Sharpie just in case there is even the tiniest gap, and then glues them in place.



Straight bit

Plywood router base rides on hoop form.

Trim overhanging parquetry. After using a bandsaw and coping saw to rough off the excess, Martin flush-trims with a router. The ring lamination form holds the hoop stable and provides a surface for the router's plywood base to ride on.

Finish off the top and bottom

A solid-wood edging on top will hide any gaps in the lamination and can be profiled for a more polished look. A plywood bottom sits in a rabbet on the bottom edge of the hoop.



Glue up the edging. Martin's edging is made of 12 maple segments mitered at 15° and glued into a ring. Stand the pieces up in a line on the long edge, glue the segments to each other, and use a band clamp to apply pressure while the glue dries.



trimmed the interior overhang with a coping saw. Then I trimmed them flush with a bearing bit on the router table, and gave the edging its roundover profile.

Final steps on the tray

The first time I built this piece I faced the tray's plywood bottom with shopsawn veneers to match the hoop. Plywood alone is a perfectly fine substitute. Use a pivot-point router jig to cut the plywood to size. On the router table, cut a rabbet into the bottom of the hoop for the bottom.

Finally, apply a finish to the tray and table. For a project using dyed veneer, a spray finish is preferable on the interior of the tray. I used Super Kemvar "M" topcoat, but any clear, protective finish will do. I finished the table with Osmo Polyx Oil. I also glued circular leather pads to the underside of the tray to protect the tabletop. To cut these, I sharpened one end of a piece of 1½-in.-dia. steel pipe and used this as a leather punch. Leather pads are also available at [amazon.com](https://www.amazon.com). □

Heide Martin is a designer and woodworker in Midcoast Maine.



Glue the edging to the hoop. Don't worry about the strength of the end grain miter joints. Once the edging is glued to the hoop, that won't matter. Martin glues the edging ring in place using circular clamping cauls.



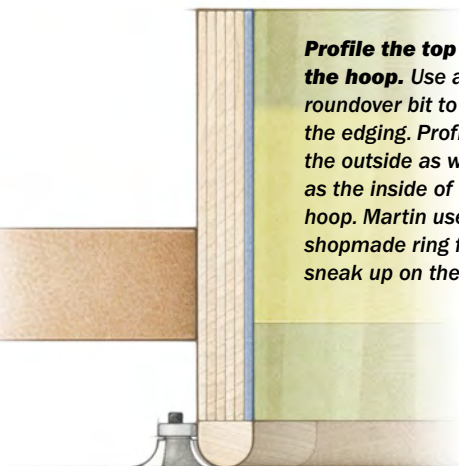
Trim the edging ring.

Rough-cut the excess on the outside with the bandsaw (above) and use a coping saw to carefully trim off the inside. Then use a bearing-guided bit, registering on the inside face of the hoop and then the outside face, to flush the lip to the hoop (right). Protect the parquetry by applying yellow Frog tape beforehand.



Profile the top of the hoop.

Use a $\frac{1}{4}$ -in. roundover bit to shape the edging. Profile the outside as well as the inside of the hoop. Martin uses a shopmade ring fence to sneak up on the cut.



Rabbet the bottom.

With a ring fence on the router table and a two-fluted straight bit, rout a rabbet in the bottom of the hoop for the bottom. The bottom will sit up inside the rabbet, leaving a small registration lip to seat the tray nicely on the tabletop. Final-sand the tray bottom and then glue it in, being careful to manage any squeeze-out immediately.



Strong and Stylish Dovetailed Dividers

Three options for these classic
components of casework

BY WILL NEPTUNE

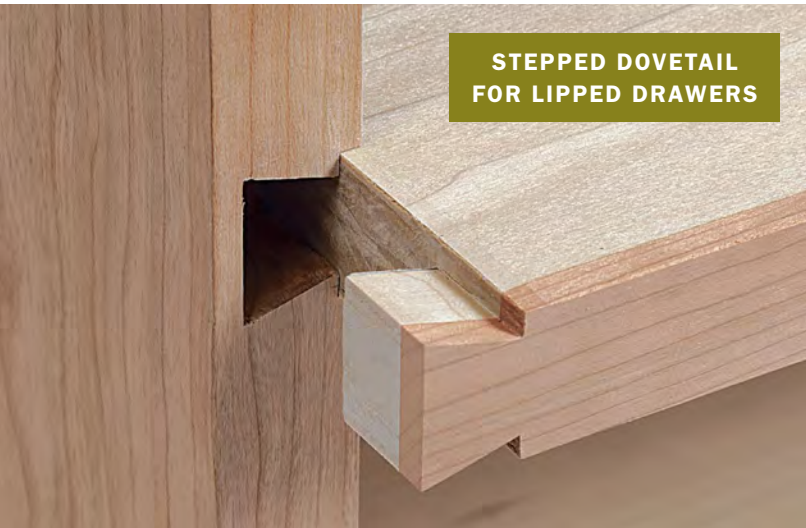


HALF DOVETAIL
FOR FAST WORK

When installing horizontal dividers in a case, I like to use a combination of dovetails at the front with dadoes across the case sides. A traditional solution, this method combines the ease and efficiency of dadoes with the strength of dovetails. But just because this joint is traditional doesn't mean it isn't equally useful today. Whether you cut them by hand or machine, dadoes are easy to cut, and the dovetails do a great job keeping case fronts from bowing or deforming because of wood movement or someone racking a drawer.

The key to cutting this joint efficiently is using simple wood paring blocks. Used to form the dovetail—and, in two varieties of the joint, the stub tenon that fits in the dado—these blocks simplify layout and allow for easily repeatable results.

I'll cover three variations of the joint here. The first, the half dovetail, is the simplest to cut but still plenty strong. The second, the stepped dovetail, pairs a dovetail housing—what some call a socket—with a wide dado that accepts the full thickness of the divider. These are great for lipped drawers. For inset drawers, I like the third option, the full dovetail, with its shoulder aligned



STEPPED DOVETAIL
FOR LIPPED DRAWERS



FULL DOVETAIL
FOR INSET DRAWERS

MASTER CLASS: DIVIDER WITH A BUILT-IN BEAD

Flip to the Master Class (p. 78) to see a fourth version of this joint, which is used for chests of drawers with mitered cockbeading. mirknig.su



Getting started

All three variations of the joint start with cutting dados in the case side and trimming the dividers to size.

DADO THE CASE

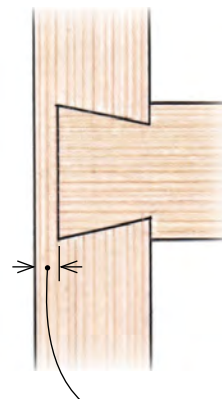


The dado size depends on which dovetail you pick. If you are making a stepped-dovetail divider and your dado stack's outside blades leave deeper scoring marks, level the bottom of the case dados with a router plane. Otherwise, the show face of the joint will have triangular gaps at the shoulder.

CUT THE DIVIDER TO LENGTH



Lay out the dovetail housing. Use a combination square to mark the length of the dovetail on each case side.



As a rule, make the lap $\frac{1}{8}$ in. to $\frac{3}{16}$ in. wide.

with the inside of the case. The steps used to cut each of these are similar. They all start with cutting dados in the case and trimming the dividers to length. Then, after making the dovetails (and, if necessary, tenons), you'll tap in the dividers and trace the tail onto the front edge of the case side. From there, it's a matter of using a saw, chisels, and a router plane to form the dovetail housing.

By the way, I typically install dovetailed dividers only in the front of a case. They're not as vital in the back, as the drawer opening back there is less critical. So unless a case is taller than 32 in., I don't worry about dovetailed dividers in the rear, and even then, a single one installed halfway up does the job.

You'll need dovetail paring blocks

While the flat paring blocks that I use to size the stub tenons are simply small blocks of wood—albeit carefully thickened—the dovetail paring blocks involve a bit more work. To start, it helps to have an idea of the dovetails' scale, so pencil the dovetail on the case or create a full-size drawing. Set a bevel gauge to the dovetail angle and tilt the blade on your tablesaw to it. The block should be about 2 in. wide and 8 in. long, with the ramped surface about $1\frac{1}{4}$ in. wide. The thin edge of the ramp should be the thickness of your divider stock. If you overshoot it, simply plane the front edge of the block. I cut a flat on each end of the block so I can clamp it to the bench.

Half dovetails are simple and strong

The half dovetail is the simplest divider joint to cut and offers most of the holding power of the other, more complex variations. The main advantage of this version is that it relies on a single reference face, so variations in divider thickness don't affect the fit of the joint. This can simplify milling. You'll need a ramped paring block



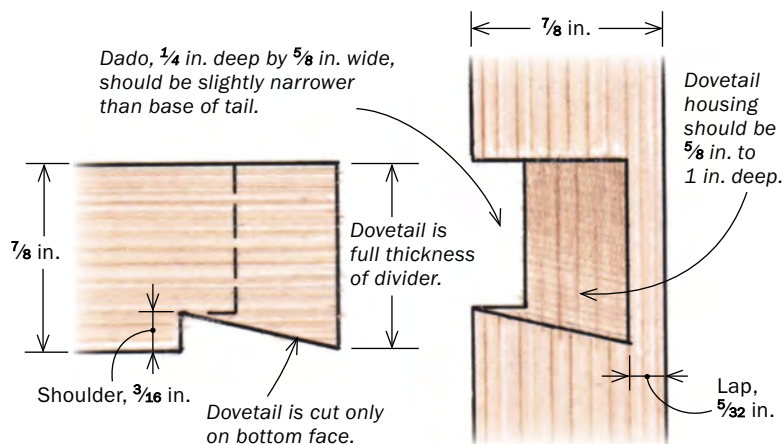
Mark and trim the divider. Lay the divider across the case to transfer the ends of the dovetails to the divider (left). Crosscut the divider at the tablesaw (below). If you're cutting more than one divider, set a stop.





Half dovetail

This is the simplest version to make. You'll need two paring blocks to cut the joint—one for the stub tenon and one for the dovetail.



1. LAYOUT



Scribe the shoulders. Set the divider in place and check that the dovetail shoulders align with the inside of the case (right).



for the dovetail and a flat one for the stub tenon. The flat one should fit snugly in the dado.

Use a marking gauge to scribe the dovetail shoulders on the top and edge of the dividers. Be sure the distance between them exactly equals the case's inside dimension. This is crucial because if the shoulders aren't spot on, the divider will either push the case sides apart or draw them in.

Next, lay out the stub tenons. They need to match the depth of the dados. After that, draw the width of the dovetail on the divider and inside the case.

To cut the stub tenons, first saw them to length, being sure not to trim off the dovetail as well. Lay the divider facedown on the bench and push the flat paring block against its end. Roughly chop the tenon's shoulder with a chisel and mallet and begin to split the waste



Determine stub tenon length. With the divider still in place, pencil the dado depth on the divider (above). This will be the length of the stub tenon. Use a combination square to carry the line across the divider (left).

2. STUB TENON



Mark the dovetail and housing. Use a depth gauge to mark the width of the dovetail both on the divider and the case side.



Trim the waste. Cut the stub tenon to length and the dovetail to width. Neptune uses a bandsaw and cleans to the line with a chisel.



Size the tenon paring block. Plane this block so it's a tight press-fit in the dado.



in from the end. Finish by paring the shoulder back to the scribed line and the tenon flush with the paring block. Keep the back of the chisel flat against the block. I recommend a wide chisel for more support on the block.

Next, cut the dovetail using the same process, but with a ramped paring block. Starting with the shoulder, rough out the joint before refining it, making sure the chisel is kept tight to the paring block for the final strokes. Pare the back face of the dovetail flat so it lies flush to the case during scribing.

With the divider done, you can transfer the dovetails to the case. Tap the divider into the dadoes until the tails meet the case front. Use a clamp across the case to hold the shoulders tight. With a sharp pencil, trace around the tail. Remove the divider and knife the laps with a marking gauge. Saw the housing a bit undersize and pare back to the lines, testing the fit as needed. The top wall of the dado can be used as a registration surface as you pare the top of the housing, making this

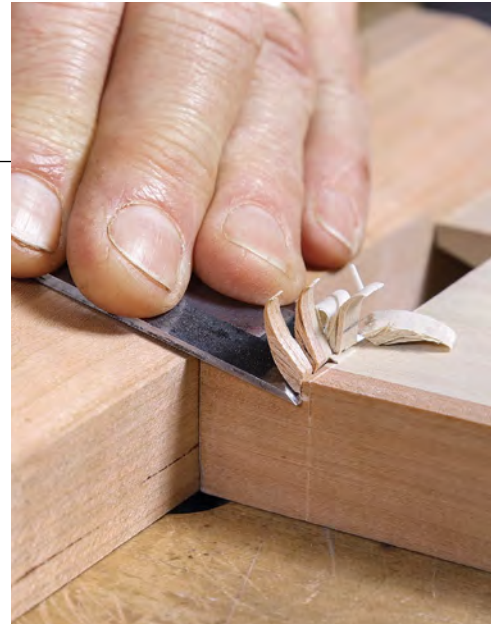
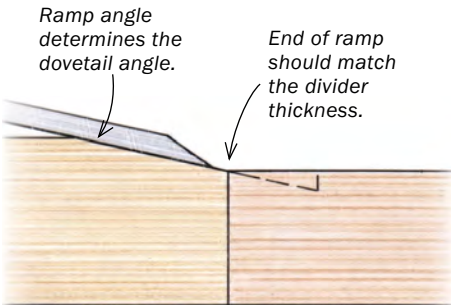


Flat block ensures consistent tenons. Establish the shoulder with heavy vertical cuts, staying inside the scribe line (above). Then follow with careful cuts to the line. Use the paring block (left) to cut the stub tenon to thickness. Start by roughing out the bulk of the waste. For the final cuts, keep the back of the chisel pressed firmly against the paring block and take narrow shavings.

Half dovetail continued

3. DOVETAIL

Angled paring block forms repeatable dovetails. Keep the divider square to the paring block. Remove most of the waste, then create the final surface with light paring cuts.



4. HOUSING



Trace the dovetail onto the case side. The stub tenon registers in the dado, ensuring the divider stays put. Trace around the tail with a pencil, then scribe the lap with a marking gauge.



Saw out the housing and chisel to your lines. To clean up the bottom of the housing, use a chisel (right) or a router plane.



Making a paring block for dovetails



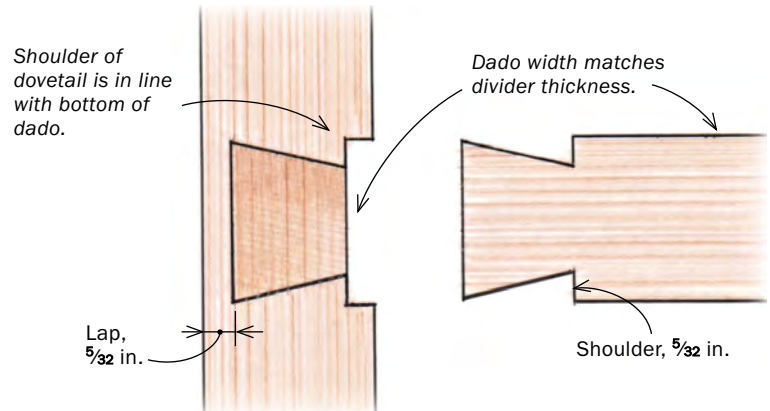
Transfer the dovetail angle. Set a bevel gauge to the angle of the tail. Tilt the tablesaw blade to match.



Rip the block. Saw the ramp, then smooth it with a handplane. Neptune bandsaws flats on each end of the paring block to create surfaces for clamping.

Stepped dovetail

The full thickness of the divider fits in a dado. This is a great option for lipped drawers, which cover the dovetail shoulder when closed.



part of the joint much easier to cut. I use a router plane to bring each housing to a consistent depth, helping with repeatability.

When installing the divider, tap it home bit by bit, covering the tails with a block. Be careful not to get the divider out of parallel to the case front or it will jam.

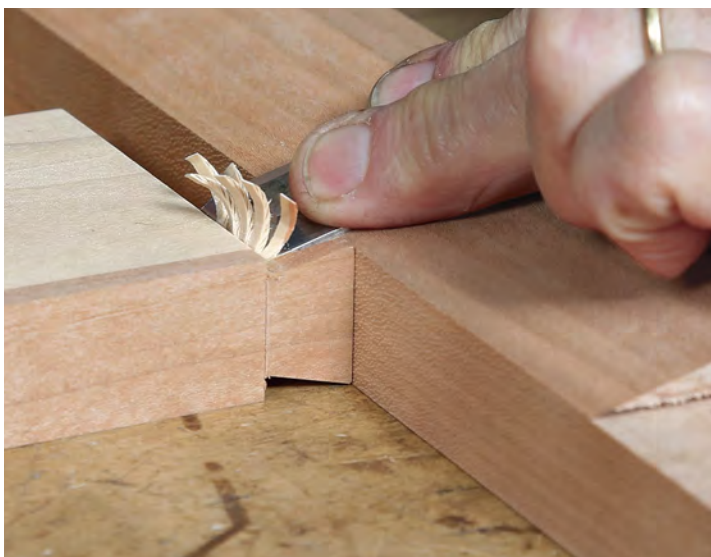
Stepped dovetails work well with lipped drawers

Stepped dovetails look good with lipped drawers, where the base of the tail aligns with the lip molding. This joint has no stub tenon. Instead the full thickness of the divider fits into the dado. This means that you need a paring block only for the dovetails.

Again, start by cutting the dados. Lay out the dovetail shoulders so they correspond exactly with the bottoms of the case dados. Saw off the waste behind the tail, then pare its angled cheeks. This time, you'll be paring full tails, so flip the stock to work from both



Mark the dovetail length. The shoulder of the tail should align with the bottom of the dado. Neptune sneaks up on this dimension with a marking gauge at the back edge of the divider to keep the show edge clean.



Pare the dovetail with angled paring block. Flip the board to pare both faces. Remove most of the waste before taking careful finishing cuts.

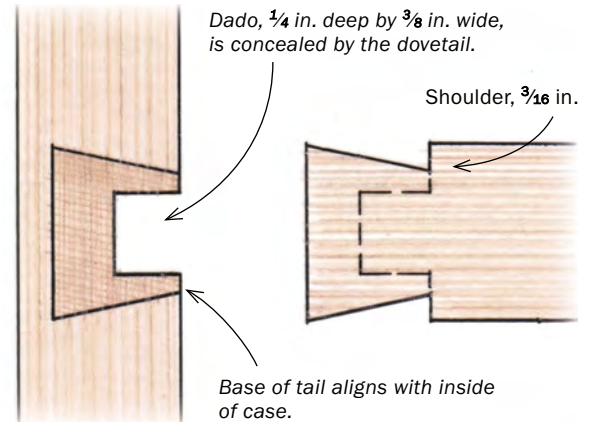


Trace the tail. Once the tail is pared, use it for layout. Then saw, chisel, and use a router plane to create the housing.



Full dovetail

The shoulder of the dovetail is in line with the inside of the case, letting this joint pair nicely with inset drawers.



1. STUB TENON

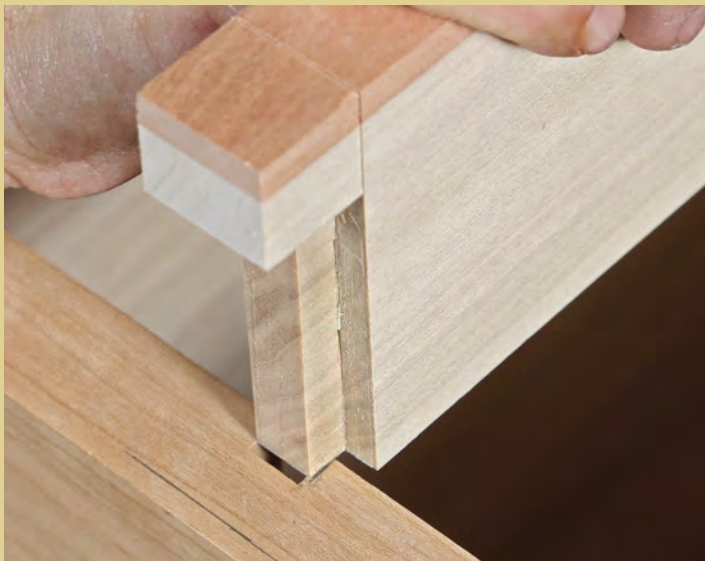
Start with an overthick tenon.

After sawing the stub tenon to length and chopping to the baseline (right), chisel it with a paring block that's intentionally too thick (far right). This leaves room to refine the block to get a perfect fit (below).



Sneak up on the fit

With a tenon that's too thick, you can shave the paring block (far right) to adjust the tenon. Check the tenon after paring each face and adjust the paring block as necessary. This is much easier than trying to nail the paring block's size from the start.



2. DOVETAIL



Pare both sides of the dovetail using the angled paring block. Begin by rough-chopping the shoulder away from the line and splitting off the waste before taking narrow shavings with a sharp chisel.

faces. Because you're flipping the stock, all the dividers must be uniform in thickness. Tracing the dovetail and cutting the housing follows exactly the same steps as for the half-tail: Transfer the dovetail's shape before sawing and chiseling the waste.

Full dovetails are perfect for inset drawers

For inset drawers, I recommend using a full dovetail whose shoulders are in line with the inside of the case and drawer openings. This joint uses a stub tenon centered on the divider and requires a dado narrower than the base of the dovetail. Two paring blocks are needed: one for the dovetail and one for the tenon.

Because the tenon is centered, fitting this joint can get especially tricky, but there's a simple way to nail that thickness during fitting. You'll be referencing from both faces of the divider, so the tenon's paring block needs to be as thick as the shoulder and tenon combined. This dimension is crucial, since any difference is doubled in the actual tenon. Don't be intimidated, though. It's simple enough to sneak up on this dimension as you fit the first tenon.

After trimming the first tenon to length, start paring with a block that's intentionally too thick. Form the tenon, paring from both faces, and check it to see how much it's oversize. You need to remove half that much from the block—a fussy thing to figure out, so I just take a shaving or two with a handplane. Then I pare the tenon on both faces again and check once more, repeating this process until I have a press-fit. With the paring block now the perfect thickness, I can handle the other stub tenons in one go.

Press the finished divider into the case to trace the dovetailed ends. From there, simply saw and pare the housing to receive the tail. □

Will Neptune is a teacher and furniture maker near Boston.

3. HOUSING



Tap in the divider. Use a scrap block to protect the workpiece as you drive the divider into the case.



Housing for dovetail. Pencil around the tail, then use a saw, chisel, and router plane to form the housing.

Inspiration for our readers, from our readers

RICHARD WIENER

St. Anthony, Minn.

Time spent observing architecture in Japan influenced the design of this armoire, which has spacers between the case and the top and bottom that make it appear to float. The walnut veneer offered plenty of challenges. "The crotch was air-dried for three years and the veneers were cut by a homemade pit saw," Wiener said. "I experienced the entire process from harvest and curing to cutting and adhering."

WALNUT, 18D X 43W X 52H



JOSEPH MURPHY

Madison, Wis.

Murphy made this wall cabinet for a client who wanted something playful and original to house a collection of crystal figurines. While working on the design, he found a photo he'd taken of ice crystals on a windowpane. The geometric shapes of the crystals sparked the arrangement of boxes in the cabinet. "I'm happy that I took something I saw in nature and transformed it into a workable design for a cabinet," Murphy said. As to the little "staircase" he made for the upper cabinet, he said, "I didn't stew over that part ... I designed and made it on the fly, and sometimes that's the best way to go."

ASH WITH WHITE OAK ACCENTS, 8D X 25W X 44H



KELLY PARKER

Parkville, Mo.

There are no right angles to be found on this bench, which Parker designed to fit into an entry nook. It's made from walnut harvested on the property where the bench will live. Five nested, tapered curves that get successively shorter toward the front comprise the seat, which is itself a large, tapered curve.

WALNUT, 14D X 38W X 16H



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R. EVAN MILLER

Sequim, Wash.

Made for someone who loves the look of quartersawn grain in walnut, this table tested a wide range of Miller's skills—making molds, bent lamination, veneer work, and joinery with curved parts. The top has 64 pieces of walnut veneer slip-matched in a 45° chevron pattern. The veneered legs have a bending plywood substrate and are capped with solid wood on the top and bottom.

WALNUT AND WALNUT VENEER, POPLAR BENDING PLYWOOD
42W X 63L X 29H

Photo: Phil Tauran



JAMIE HERMAN

Rockland, Maine

This chest of drawers was Herman's student project at the Vermont Woodworking School. It was his first time trying compound-angle dovetails for a drawer. "I wasn't sure how they would run until the dovetails were all cut and glued together. Thankfully everything turned out well," he said. "There were lots of processes in this piece that didn't have much room for error, but the challenges made it all the more satisfying when it was finally done."

BUBINGA, ASH, AND WENGE, 18D X 14W X 62H

Photo: Lauren Mazzotta



JOHN BARFIELD

Toledo, Ohio

Barfield's caddy went through many iterations before it evolved into the design you see here. It started as a rectangular box with a handle, sized to hold silverware, correspondence, or other items. Each time Barfield made it, he added details—the scroll-cut handhold, the angled partitions, the tapered box sides. "It's hardest to design something simple and usable that hasn't already been done hundreds of times," he said.

MAPLE AND CHERRY, 10³/₄D X 15³/₄W X 9¹/₂H

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Dovetailed dividers with a built-in bead

BY WILL NEPTUNE

mirknig.su

My article in this issue, “Strong and Stylish Dovetailed Dividers” (pp. 66–73), covers three types of dovetails you can add to the ends of case dividers to keep drawer openings square, and all three options have something crucial in common: The dividers’ front edges are flush to the case. But the same techniques are just as viable if you want to add some cock beading—the small, half-round bead proud of the case’s surface that frames and highlights an inset drawer. You’ll just need a few extra steps and more paring blocks.

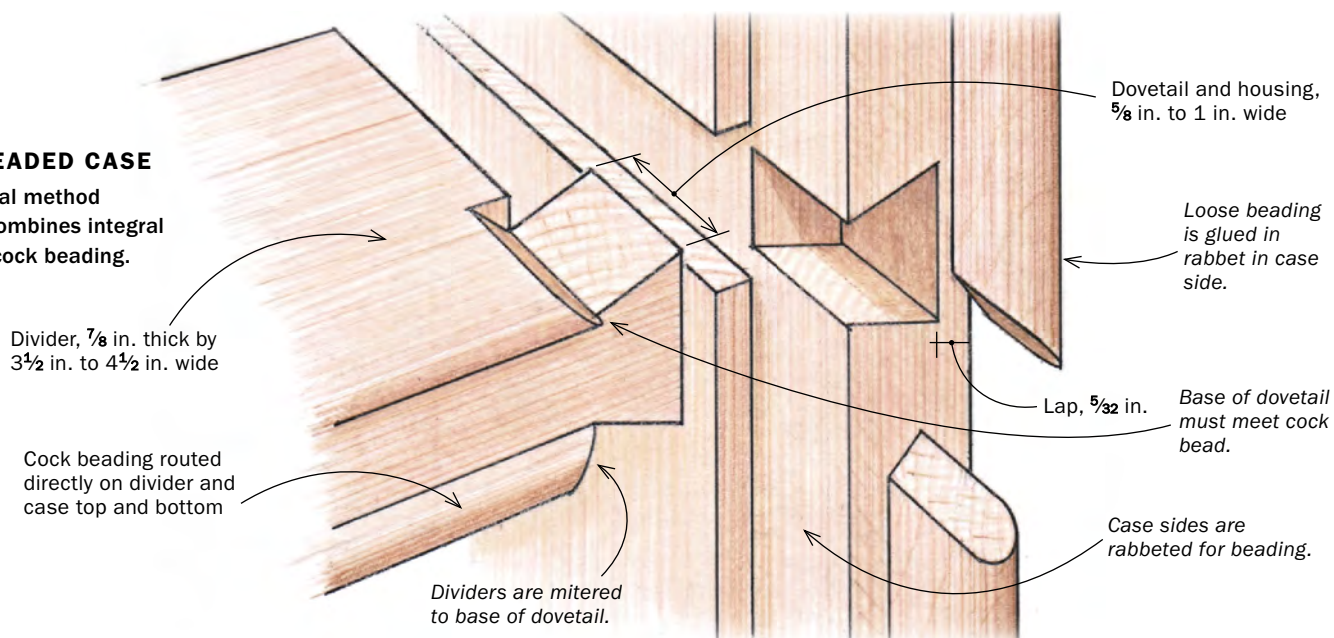
The approach I use combines integral beading cut on the dividers (and on the case top and bottom) with loose beading that gets glued to the case sides. By fitting the loose cock beading strips into rabbets—an ingenious 18th-century solution—this apparently complex joint becomes much less difficult and risky, especially when you use 45° paring blocks, as I do.

Start with the cock beading

The first step is to make the bead stock and cut the rabbets in the case sides. (When dovetailing the case, be sure to account for the rabbet to avoid gaps there.) The depth of the rabbet is determined by the thickness of your stock, which is determined by the size of your bead cutter. So after selecting the router bit—I like a $\frac{5}{32}$ -in. to $\frac{3}{16}$ -in. bead—

A COCK-BEADED CASE

This traditional method seamlessly combines integral and applied cock beading.





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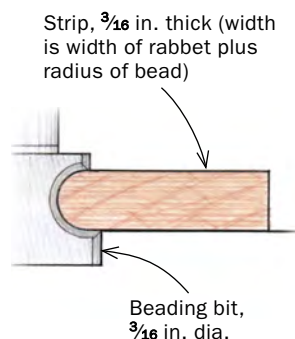
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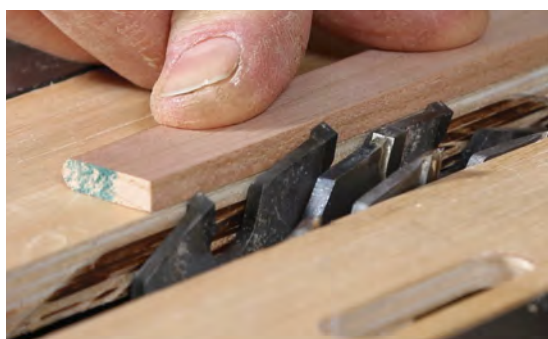
Rout the beads

Rout the profile on the loose bead. Mill the bead stock so its thickness matches your cutter's radius.



Bead the dividers. Using the same setting as for the loose bead stock, rout two beads into the front edge of the divider (left). To remove the waste between beads on the divider, reset the fence and use a straight bit (right).

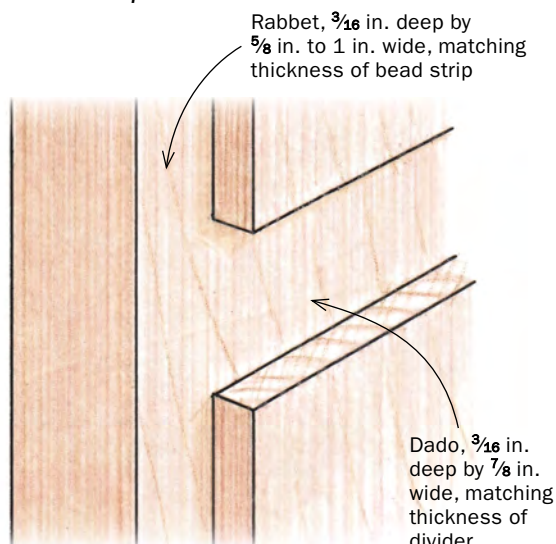
Rabbet and dado the case sides



Set the blade height to match the bead. If your dado stack leaves a less-than-perfect surface, lower the blade slightly and clean up the joint with a rabbet and router plane. Just make sure to plane the rabbet and dado to the same depth.



Dadoes first. Set the blade width to match the divider's thickness. When cutting the dadoes, register the end of the case side against the rip fence.



Rabbets second. Using an L-fence that extends above the blade to set the width of the rabbet (above), Neptune cuts to the same depth as the dado. The bead stock should extend beyond the front edge of the case the width of the bead radius (right).





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Dovetail the dividers

Scribe the baseline. Use a marking gauge to mark across both faces and the back edge of the divider (right). The marks on each end should align with the bottom of the rabbet and dado (far right).



Trim the dovetail to width. Keep the dovetail between $\frac{5}{8}$ in. and 1 in. wide (right). Anything more begins to weaken the case side. Neptune cuts close to his lines at the bandsaw (far right) before paring to them with a sharp chisel.



Angled block helps when paring dovetails. The ramped face of the block is the same angle as the desired dovetail. To work correctly, the block's thinner edge needs to match the thickness of the divider stock (right). Clean, controlled cuts with a chisel take care of the bead remnants at the corners of the tail (far right). Be mindful of the board's grain direction here to avoid gouging the stock.



mill the loose cock bead stock. For the best grain and color match, cut wood for these pieces from the same board as the case sides, ripping off a 1-in. strip adjacent to the front of the case side, and resawing it. The resulting long strips will give you several shots at a good miter.

With the strips thickened, rout the beads on them, on both edges of the divider, and on the case's top and bottom. Last, use a straight bit to remove the waste left between the beads on the divider and outside the beads on the case top and bottom.

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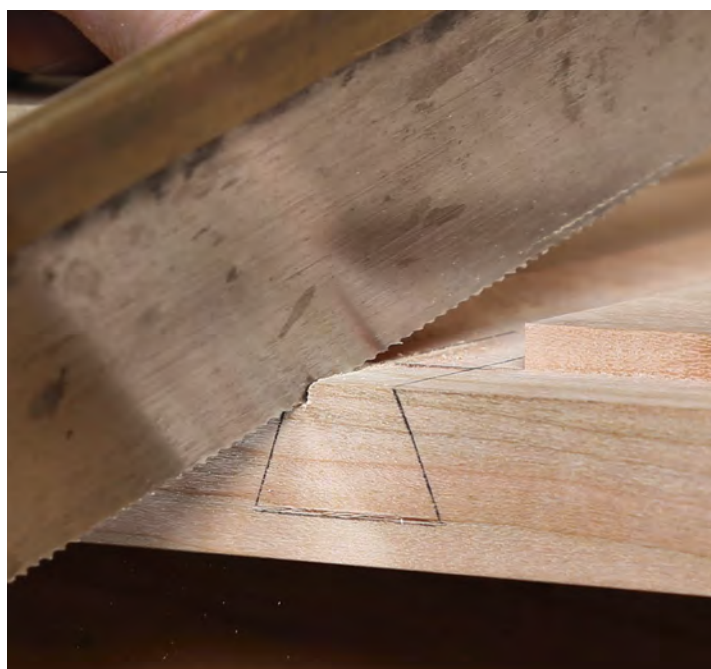
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			Woodpeckers	woodpeck.com	p. 17
			Woodpeckers	woodpeck.com	p. 29
			Woodpeckers	woodpeck.com	p. 75

Cut the housing



Transfer the dovetail to the case. With the divider in the dado, trace around the tail with a sharp pencil. Also, mark its width inside the case.



Saw the housing's walls. Saw close to the lines, but not up to them. Neptune still likes to keep the joint neat, but slight oversawing on the inside face is fine because the kerfs will be hidden in the dado.

Divider sits in a dado and dovetail housing

Only the front of the divider is dovetailed. The rest of its width sits in a dado, just like the stepped dovetail in the article on p. 66. The depth of the rabbets and dados equals the thickness of the bead stock. Plane the dividers to fit the dados and cut them to length.

When laying out the dovetails on the dividers, I want their shoulders to hit the bottoms of the rabbets. I use a router plane to clean up the bottoms of the housings, a big time-saver. Mark the width of the tail and cut away the inner waste.

To cut the dovetails, I rely on a paring block beveled to the same angle as the dovetails. There will be little rounded tabs at the corners from the bead. Pare these away.

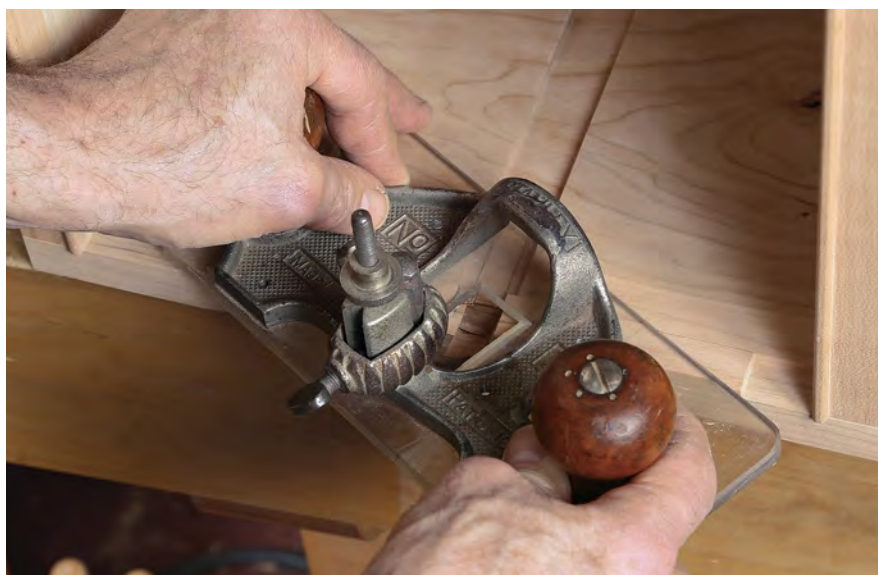
When the dovetails are done, tap the divider into the case dados and trace the tail onto the case. Saw, chop, and pare away the waste until the front of the dovetail lies flush with the front edge of the case side and the beads project from the case.

Miter the cock beading

Miter joints are simple things, but they can be awfully fussy. To help get my cock bead miters tight, I rely on 45° paring blocks, which, with careful layout, make this joint invisible. Start with the miters on the divider. To lay them out, dry-fit the divider in the case and lay a straightedge on the divider and against the inside of the case. Pencil across here. Don't use



Refine the housing with a chisel. Use a paring chisel to nail the perfect fit. A router plane can help level the bottom of the joint. Just add spare cock bead stock in the rabbet to stabilize the base of the router plane.



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Miter the dividers and case



Pencil the inside edge. With the divider dry-fitted in the case, push a straightedge against the case interior to locate the inside edge of the miter.



Pare the miters. This miter should end at the base of the dovetail. Using a 45° paring block, take light cuts. Score the front edge before mitering it to ensure a clean cut.



The case top and bottom get miters, too. Clamp an angled block to the case to guide the chisel. The miter should end at the inside corner of the case.

Miter the bead strips



Pare the first miter on the end. This paring block has a rabbet that fits the stock, allowing for easy and consistent registration.

a marking knife, as this will crumble the fibers at the miter, creating a gap. Set up a paring block to miter to this line with a sharp chisel. Use the same straightedge technique to lay out the miters for the cock beading on the case top and bottom.

Now turn to the applied cock beading. Miter one end. Then, with the dividers back in the case, mark the final length of each strip. Cut them a bit long so you can sneak up on a tight fit.

When these strips are properly cut and glued into place, the joint disappears. □



Mark and cut to length. Hold the loose cock bead so the tip of the first miter aligns with the tip of the case's miter. Pencil a line. This will be the outside edge of the loose bead's second miter. Cut the piece to length, then use the same rabbeted paring block. Work carefully for a gap-free fit (below).



Will Neptune is a teacher and woodworker near Boston.

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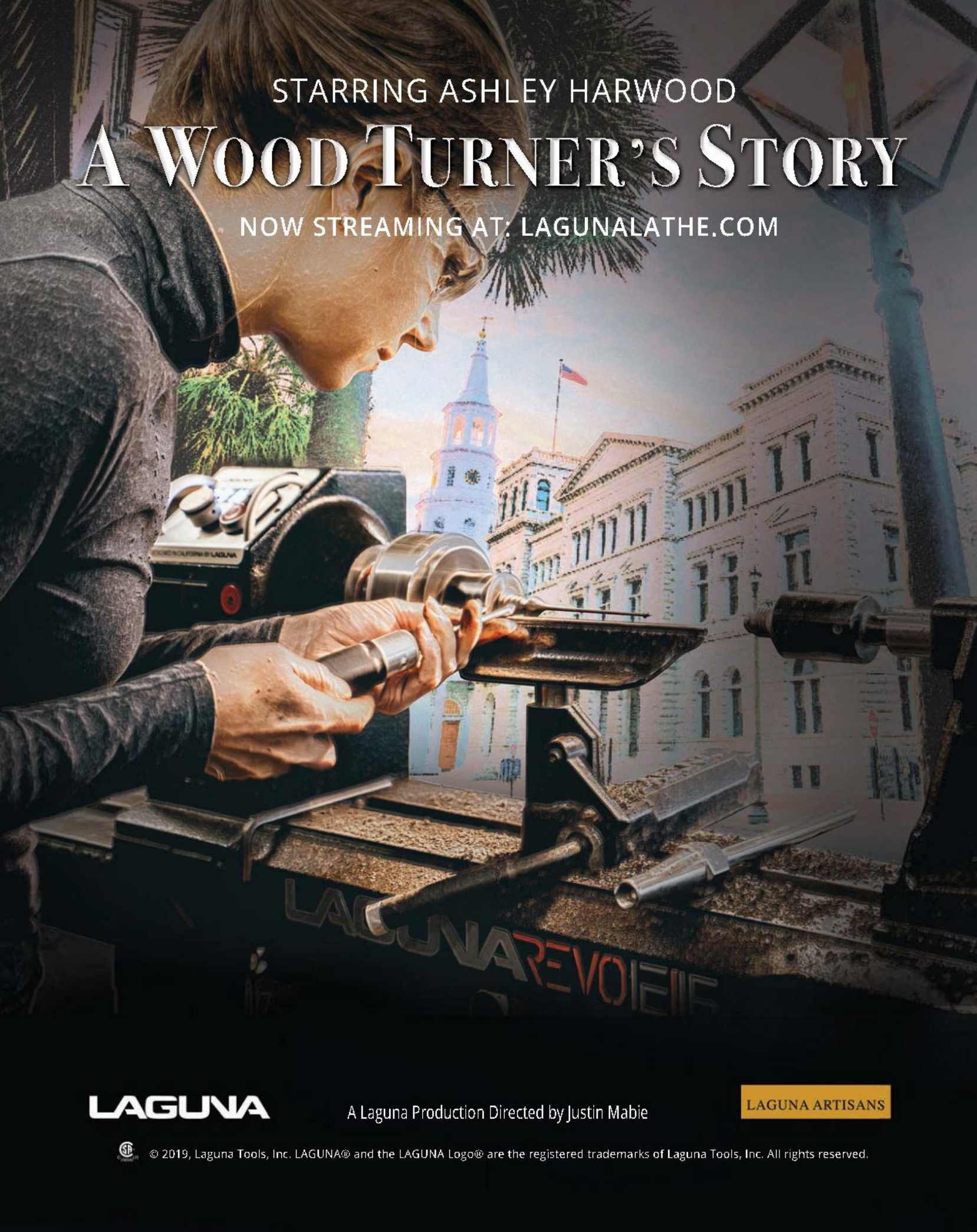
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A Fusion of Pattern and Form

Growing up, Ben Strear was enthralled by a book on the artist M.C. Escher and his interlocking, seemingly infinite patterns. Intricate patterns remain an obsession with Strear, and his carved and painted basswood pieces strive to fuse pattern with form.

Unlike Escher's playfully realistic artwork, Strear's pieces are more allusive



than literal; in both form and pattern they give the impression of something faintly remembered and full of meaning but not quite knowable: a fragmentary fossil, a weathered bone, an ancient writing tablet. Strear often starts his pieces on the lathe and uses an angle grinder, rasps, files, and sandpaper to complete the underlying

shape. He transfers his pattern design one square at a time from graph paper to a grid he draws on the workpiece, then carves the pattern with gouges and skewers. The carving, he says, is an endurance test, and can take hundreds of hours. It's not easy re-creating antiquity.

—Jonathan Binzen

