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Vol. 48 / No. 283

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Inside This Issue:

- Build a Sleek Modern Workbench
- Get Ready for Spring; Elegant Garden Gate
- Short-Cut to a Perfect Patina

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from the editor

Sawdust

At the same time I was working on this issue, I was working on upgrading my home workshop. I added insulation and drywall to the rest of the garage. The timing was ideal as we were heading into winter. In the past, my small space heaters struggled to create a warm bubble of air. The change is dramatic. Now it feels snug, and I've been able to work in comfort out in the garage while the weather outside was frightful.

Over on the *Woodsmith YouTube* channel, I recently completed a four-part shop tour series. And I'm working on a couple of other projects there: a desk and an improved sawhorse. Every Thursday afternoon, we post a Shop Update video of upcoming *Woodsmith* projects that Marc, Dillon, and John are working on. Be sure to subscribe to check out all the other woodworking videos we post there. There's a lot of other woodworking information, inspiration, and instruction that we create ... for free.

The Woodsmith Shop season 19 is airing on public television stations across the country. Since each station sets its own schedule, I can't tell what day it's on in your area. This season has a lot of great projects, for all skill levels. Check out the episodes and get the plans over at *WoodsmithShop.com*.

Episodes of the *ShopNotes Podcast* come out every Friday. John, Logan, and I talk about what's going on behind the scenes at *Woodsmith* and *Popular Woodworking*. For the most part, though, we talk about what's happening in our own workshops and the projects that we're building. You can subscribe everywhere podcasts are available. You can check out the show notes pages at *Woodsmith.com/podcast*.

If you're on *Facebook* or *Instagram*, we post tips, videos, and updates on what we're up to. You can search for us on the app or click the links on the main *Woodsmith.com* web page.

If you have any questions, comments, or smart remarks about what we're doing here at *Woodsmith*, let me know: phuber@aimmedia.com.

contents

No. 283 • February/March 2026

Projects

Departments

Sander Fence

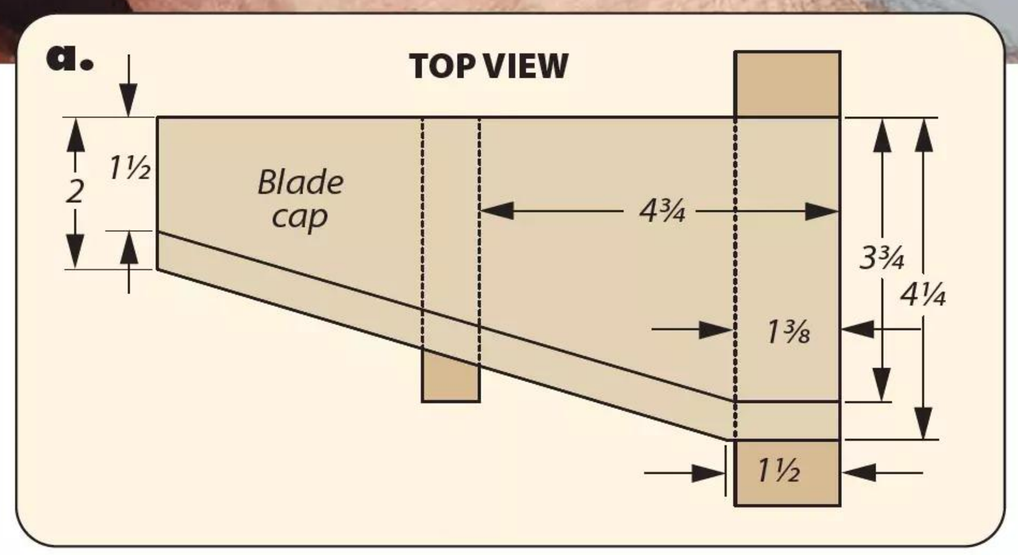
Most edge sanders feature a miter gauge slot so that you can support a workpiece while trimming its end. That never worked well for me. So I made a different solution, shown above.

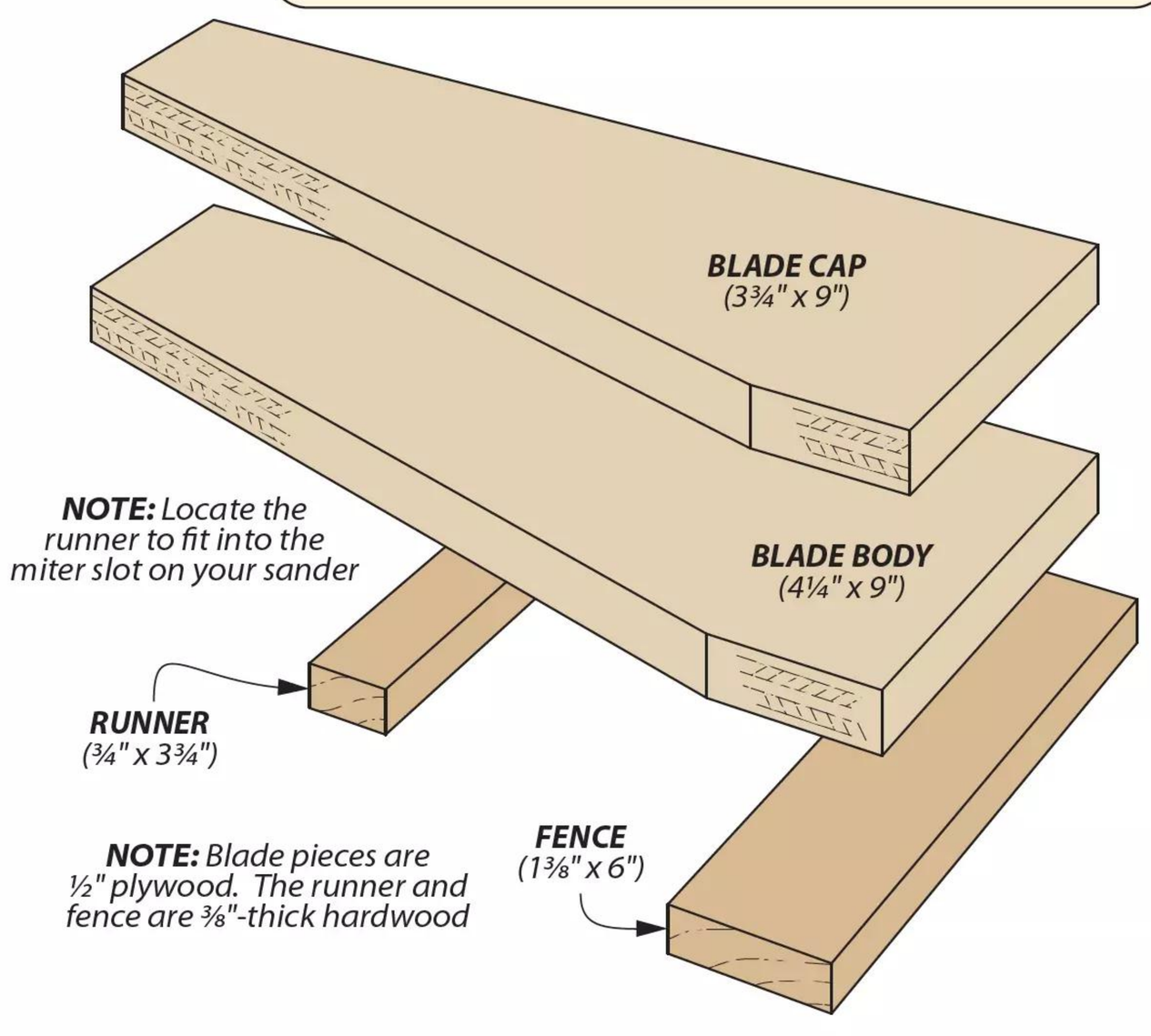
It's similar to a drafting T-square. I clamp it in place so that I can concentrate on the sanding and not holding a miter gauge in place.

A double-layer blade supports the edge of the workpiece. A runner registers in the miter gauge slot, and a fence along the outside keeps the blade square to the belt.

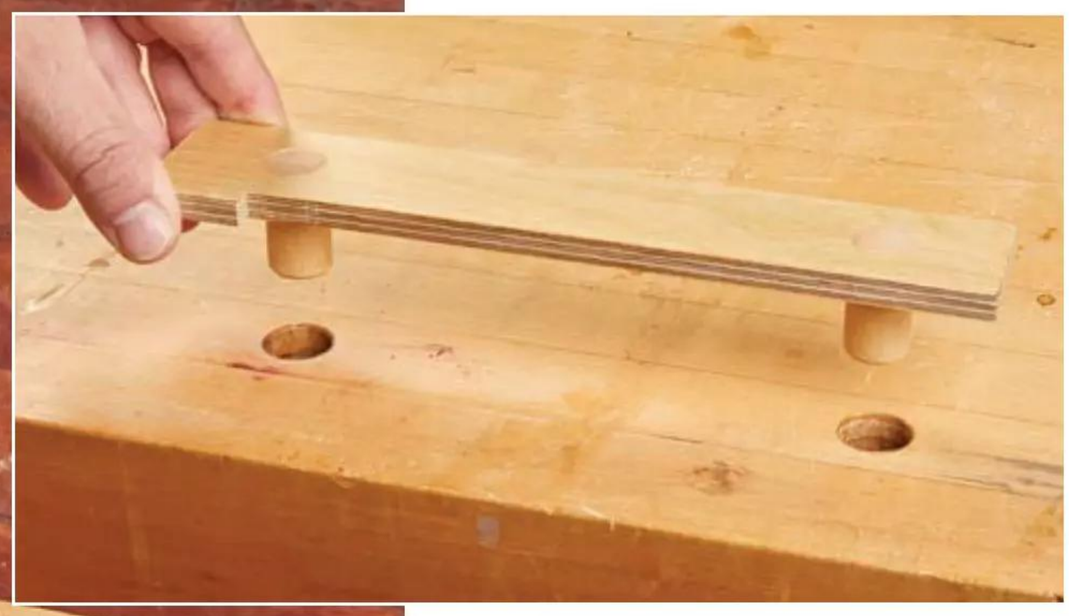
The blade is thick enough to provide support without getting in the way. It's tapered along the back and has a stepped profile for looks — a shop project needs style, too. One more thing: the dimensions shown match my sander. You'll need to adapt this to your own machine.

Phil Huber
Urbandale, Iowa





Compiled by: Phil Huber; Built by: John Doyle



▲ The stop anchors in two dog holes so that it won't rotate while in use. You could make it longer, too.

Hook Stop

Bench dog holes are often used with a vise to grip a workpiece. However, I use them more often for stops and supports. Here's one that might work for you.

It's made from a length of ½" plywood and features a short hook on the end. The hook catches the end of a workpiece, while the side of the stop supports the workpiece's edge.

As shown in the photos, this makes it ideal for securing small, narrow pieces near the front edge of my bench. I've also found it useful for holding parts while I cut slots with a biscuit joiner. For these I move the stop to a set of holes farther from the edge.

Nina Oslund
Cape Girardeau, Missouri

Illustrations: Becky Kralicek

Flatten Box Bottoms

I was making some canisters from tree branches and needed a way to flatten the bottom. My technique derives from metalworking.

I scribbled on a flat piece of plywood with a soft pencil. After rubbing the canister across the plywood a few times, I checked the bottom. Dark marks revealed the high spots. I planed them off with a block plane, bracing the canister in the open jaws of my face vise. Repeat the process until you get uniform marks across the bottom of the project.

By the way, this technique works just as well with turned items and conventional boxes.

Harold Ebbletrap
Potter, Wisconsin

QUICK TIP

Fancy Bit Cleaner. *John Doyle of Toledo, IA* bought an inexpensive, ultrasonic jewelry cleaner online. He filled it with *Simple Green* and loaded up gunky router bits. After a few minutes in the bubbling action, the bits could be wiped clean with a toothbrush and cloth.

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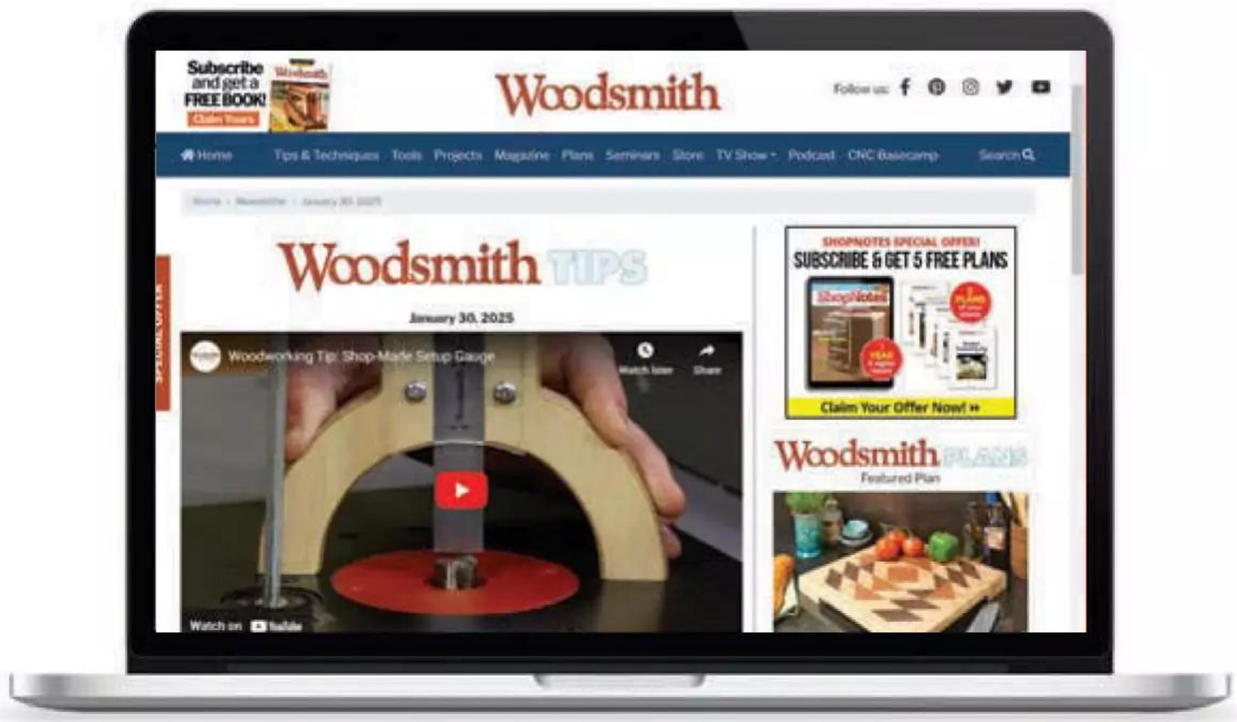


Clip-On Racks

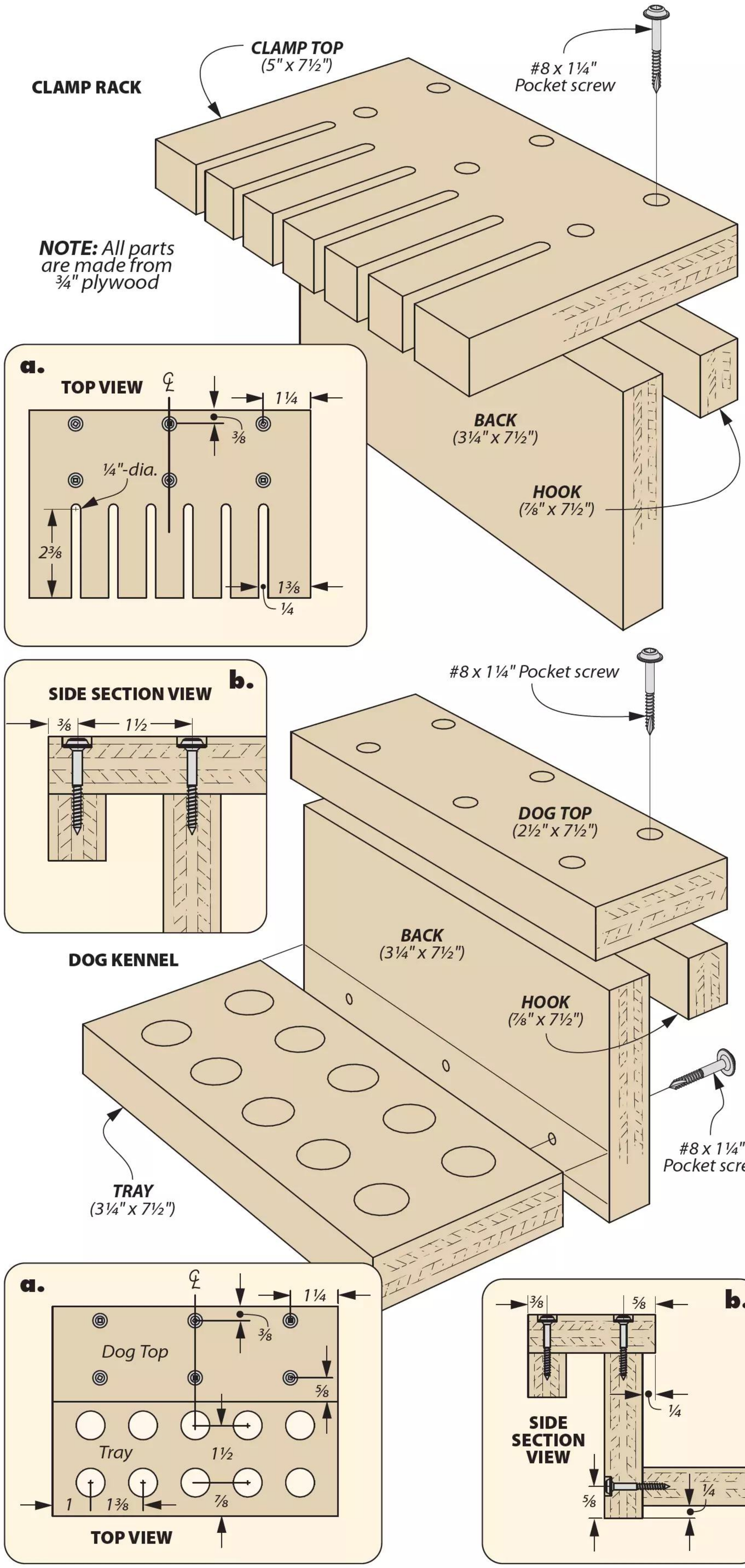
I made the *ShopNotes* Knock-Down Workbench from *Woodsmith Plans*. It's been a great workstation both in my shop and on a DIY worksite. To make using the bench even easier, I made a couple of racks to hold bench dog accessories and clamps. Both are super useful for the holes and slots in the benchtop. The racks clip to the stretcher below the top, as you can see in the upper photo.

The racks share a simple, plywood construction. Their primary feature is the hook on the back. The clamp rack (lower left photo) has an extended top with slots to accept the clamp bars. The dog "kennel" has a tray with a series of holes to accommodate various types of dogs and hold-downs. When I need to fold the bench up, I hook the racks on a cleat hanging in my shop.

Matt Smith
Petosky, Michigan

◀ These small racks keep workbench accessories close at hand, yet off the bench surface.

▲ The space between the hook and rack's back is slightly wider than the thickness of the apron on the workbench. This makes for easy placement.



Comments & Questions

TAMBOUR DOORS

Bearl Thomas called into our customer service wanting to know if the canvas we use as a backer for tambour doors (Tambour Door Tool Cabinet from *Woodsmith* issue 187) is the kind they paint on and is it strong enough?

Hi Bearl,

Thank you for your interest in the Tambour Door Tool Cabinet. I used this project as my hand tool cabinet in the Woodsmith production shop for many years. It is very striking and attractive.

When this project was built the canvas came from a local art store. Canvas comes in different weights but it is not necessary to use heavy sail canvas, as it will make for a stiff action when opening and closing the door so "art store" canvas is the right choice.

All the best,
Chris Fitch
Creative Director, Woodsmith

ROUTER TABLE DUST COLLECTION

It seems too simple to understand the dust-free router table tip. How does it work? Does it go around the router bit? Why drill the extra hole in the top of the router table? OK Phil, I know that you understand, but I don't. Please help me!

William Wilson

Hi William,

There's some backstory going on here:

First, I don't like having a dust port hanging off the back of a router table fence. I feel that the weight can make adjusting the fence challenging. Add to that, the vac hose often snags on the edge of the table, causing other problems, and under-the-breath mutterings.

Second, the router table fence has an open area behind the bit that aligns with the "extra" hole in the router tabletop. This combination allows the port at the back of the table to collect dust and chips generated when I cut rabbets, form profiles, or work with a slot cutter.

Third, as you back the fence away from the bit (for example, dadoes, grooves, flutes, stopped slots, etc) the fence no longer contributes to the dust collection situation. And with a workpiece covering the bit, the dust and chips are expelled below the tabletop. In these instances, the narrow nozzle at the front end the dust port shown in the tip is what gathers the debris generated during these operations.

I made this dust port as a prototype and have been happy with its performance in my shop so far. Please let me know if this tracks with what you're asking.

Stay well,
Phil Huber
Executive Editor/Woodsmith & ShopNotes

SHOP TOUR

Good evening, Phil. I wanted to thank you and the *Woodsmith* team for allowing me to visit today. After being a subscriber to *Woodsmith* for over 20 years and watching many episodes of the *Woodsmith Shop*, it was surreal to be there. As I mentioned earlier, nearly all of my woodworking projects have been made

using plans found in *Woodsmith*, which I've found to be inspirational, well illustrated, and accurate. Thank you for allowing hobbyist woodworkers like myself to visit your location, see where the magic happens, and geek out in your presence. It was a once-in-a-lifetime experience; although, I do hope to see you at Woodworking in America 2026. Thanks again!

Jeremy Gates

Hi Jeremy,

It's a delight to have folk come for a tour. One characteristic of Woodsmith is that we do everything in-house: design, build, write, illustrate, photograph, and video. I get to see this in action everyday and I want readers and viewers to have that chance, too.

If you're in the Des Moines, Iowa area, feel free to come in for a tour. While several folk work from home, a handful are in the office most days. Please send me an email to phuber@aimmedia.com to let us know when you plan to visit and how many to expect. We welcome both individual tours and group visits.

For those who can't make it here, we do a Shop Update video on YouTube most Thursday afternoons. In these, you can see the progress on upcoming Woodsmith projects and hear what Dillon, John, and Marc are up to.

Stay well,
Phil Huber
Executive Editor Woodsmith

BENDABLE PLYWOOD SOURCE

I want to build the jewelry case from October 2011, issue 197. In the article you said that the source for the bendable plywood was *Lee Valley* but when checking with them it looks like they no longer carry it.

Do you another source for plywood? The best I could find was 3mm. Any help would be appreciated.

Thanks, Joe Serr

Hi Joe,

Yes, Lee Valley carried thin Birch plywood for a few years and then dropped it. Fortunately, with the advent of the "makers movement" there are now online suppliers of all sorts of interesting materials. Here is a link to Makerstock:

https://makerstock.com/products/custom-cut-1-16-flexible-bendy-thin-stock-birch-plywood-copy

They do not appear to have the metric sized sheet (approx. 25" x 25") used in the plan so you may need to see what other sizes can be using efficiently. Hope this helps. Enjoy building the jewelry case!

All the best,
Chris Fitch
Creative Director/Woodsmith

CNC MADNESS

What is the estimated cost of the materials and software for building a CNC router system presented in the course?

Darren Curtis

Hi Darren,

Thank you for your interest in the CNC machine building video course.

(https://woodsmith.mykajabi.com/building-shopnotes-cnc-machine)

The cost of building the machine is going to be about $1700.00. Software costs will include a license for Mach3, the operating software, which is $175.00. CAD software to create designs and toolpaths is also required, and there are many choices. Fusion 360 is a popular choice as it is free to hobbyists. There are other free options. Alibre workshop and Vectric VCarve are examples of CAD programs for sale. Most offer free 30-day trial versions, so look around. If you have any other questions, I'll be glad to answer them.

All the best,
Chris Fitch
Creative Director/Woodsmith

COLORING WOOD

Woodworkers love the look of wood in its natural state: the colors, the grain, the figure. On the projects that we build, a lot of time is spent selecting and arranging boards for the best visual effect. Our finishing regimen reflects that passion. Yet there are times when a hit of color would be welcome.

Too often, commercial furniture uses stains, toners, and glazes to unify the color in different pieces of wood. More often than not, the result is muddy, obscured grain.

Let's look at three better approaches to add color. They offer options to customize a project while allowing the grain to show through to various degrees.

In the examples on these pages, I'm showing projects made with pine. I have a soft spot for softwoods. The different pine species have a reputation for being troublemakers when it comes to applying stain. Blotching caused by uneven grain density and absorption is the biggest culprit. However, the techniques and products that I'll share here work just as well with more mild-mannered hardwoods.

◀ Pre-mixed water-based dyes offer a wide range of wood tones as well as bold colors. The transparent finish allows the grain to shine through.

DYE

Coming from Wisconsin, I do love the look of eastern white pine. Over time, the color of the wood mellows from pale white to a warm, tannish brown. Depending on the tree, the wood can have dramatic grain and variations in color, with sap and mineral streaks. It's just lovely.

Sometimes I want the grain and the variations, plus color. The solution is a dye. The pigments in dyes are much smaller than in stain. Blotching is less of a concern. The transparent color allows the full grain pattern to show through. Since I don't use it often, I like the pre-mixed water-based dyes, as shown at left.

Written by: Phil Huber

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WIDE RANGE OF COLOR. Mention dye (or stain for that matter) and most woodworkers think of think of wood-tone colors. You know something in the brown/red family. However, dyes come in a full rainbow of hues.

I made a tool chest from white pine. I found a blue dye that gives the wood a worn denim color. Even better, the colors in the pine play with the blue dye creating interesting variations. You can see the effect in the photo below.

APPLICATION IS EASY. Dyes and stains are very different from each other. So it makes sense that the application technique varies, too. Water-based dye feels like brushing *Kool-Aid* on your project.

Applying the dye takes a foam brush. Work in small sections, as shown in the upper right photo. Brush on a wet coat, working quickly to avoid lap marks. A good soaking keeps the color consistent across the surface. If you see places that look pale, you can brush over it again to wet the wood with the dye.

On horizontal surfaces, I blot off any standing puddles. An old T-shirt or even disposable shop towels work well here.

Allow the dye to fully dry. I give it a day. The water tends to raise the grain of the wood. I buff the surface with 400-grit sandpaper, then apply a protective top coat. As much as I like water-based finishes, this isn't the place for them. The water can pull up the dye and dilute the color. A spray finish is ideal.

▲ Work quickly to apply water-based dye with a foam brush. Keep the brush soaked in order to avoid dry lap marks.

▼ The small particles of dye allow the color of the wood to blend with the dye for cool effects.

SHELLAC

As I said, pine ages to a tawny brown with time, sunshine, and use. It's possible to fast-forward the effect or even steer it toward a specific tone. This is helpful if you need to blend differently colored boards into a unified whole. The secret is shellac. This historic material is usually thought of as a finish. However, it works just as well as a method to add color.

PICK A COLOR. Due to its long use, it's possible to go deep down the shellac rabbit hole. Instead, I recommend staying with premixed, easy-to-find cans of shellac. *Zinsser* makes several varieties of shellac. *SealCoat* has the least color. When applied, it adds a light straw tone to wood.

Confusingly, the next one up the line is the "clear." The color is deeper and more concentrated than *SealCoat*. The "amber" color gives light-colored wood like pine a rich "pumpkin" color.

THIN IT FIRST. Even though the shellac comes premixed, don't use it straight from the can. It's too syrupy to apply in smooth coats. Instead I like to thin it.

For the *SealCoat*, I mix it one-to-one with denatured alcohol. For the clear and amber colors, I find that two parts denatured alcohol to one part shellac gives me the right consistency for streak-free application.

▲ Premixed shellac is convenient. However, thin it with denatured alcohol to get smooth results.

▲ A test board is always a good idea. Not only does it let you compare colors, but you can also dial in your brushing or rolling technique. Thin coats brushed in well provide an even color while still letting the grain show up in the final result.

▲ Thin coats of paint allow the texture of the grain to show. This enhances the look of the project, emphasizing that it's made from real wood.

On large surfaces, I like to use a natural-bristle brush. For small projects, a tightly formed ball of cotton cloth works well.

The shellac dries fast. The first coat is ready for a second coat in under 30 minutes. I apply at least two coats to get a uniform color across the project. Once the shellac is completely dry (I give it a couple hours, at least), then you can apply the topcoat of your choice.

PAINT

Perhaps it goes without saying that a quick and easy way to add color to pine (or any wood) is to simply paint it. That's what we did on the Nordic wall shelf on page 36. The shelf was made with southern yellow pine. This has a distinct grain pattern. We wanted that to show through even after the paint was applied.

To do that, we thinned the paint with some water. For application, a small foam roller works best on large, flat surfaces. A small brush is needed to cut along the corners. In the cutouts, a flat artist's brush works well. Thinned paint applied in light coats yields a look where you can see the grain through as a subtle texture. Just be warned that the first coat may not look the best. There will be uneven areas and perhaps some lap marks. The second coat usually does the trick. W

Getting Clean Cuts in Plywood

Plywood is an awesome product for building furniture: it's flat, stable and available with common to exotic face veneers. However, working with plywood can be tricky. We've all had the experience of making a cut in plywood that left a ragged mess. There are just no good options to fix a shattered plywood edge. Paper-thin face veneers do not have enough thickness to sand and using filler is not a proud moment for any craftsman.

Why does plywood require such care in machining it? Plywood is an engineered panel built from thin veneers glued at alternating 90° grain directions. That cross-laminated structure gives it stability and strength — but it also means a saw blade tooth or router bit cutting edge is always working with the grain on one layer and against it on the next. Add micro-thin face veneers and tough glue lines, and you've got a material that chips the moment tooling or technique isn't dialed in.

Fortunately, there is no mystery to getting professional-grade results with a table saw or router in plywood, it just requires the right blades, bits, and techniques.

SAW BLADES

Thin, brittle veneer needs to be sliced, not chiseled. To accomplish this a table saw blade has to have the right type of grind and the right grind angles. ATB (alternate top bevel) tooth design is the standard for crosscut blades for general work, including plywood. For premium-grade work in plywood an H-ATB (high alternate top bevel) is used. It has steeper than standard bevel angles to help score delicate, paper-thin veneers.

Below are the stats for the three critical angles of a H-ATB plywood blade versus an ATB general -purpose crosscut blade.

Angle	What it does	Typical range H-ATB	ATB
Hook (rake)	Aggressiveness of the cut	5° (negative) to 0°	5° to 15°
Top Bevel	Shears fibers for a cleaner edge	30° to 40°	10° to 20°
Clearance	Prevents tooth heel rubbing	10° to 15°	10° to 15°

Written by: Chris Fitch

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Paul and Pascale Edelman

While an H-ATB blade produces the best cut, there are a couple of things to keep in mind. Cut quality is the priority, cut efficiency comes second, so don't over-feed while cutting. H-ATB blades dull faster — use them for finish passes only. Also, remember the ATB grind will not produce a flat bottom in the kerf but will leave "bat ears."

And what about track saws? We want the same virtues in a track saw blade: many teeth, non-aggressive cut, and a grind that will score the delicate thin face veneer. So, look, for an H-ATB or an ATB grind for great results in plywood when using your track saw.

▼ A table overlay is an easy solution to create zero-clearance support around the blade.

DADO SETS FOR THE TABLE SAW

Most dado blades are designed for general work in solid wood and plywood, so while they will do a reasonable job cutting plywood, there is a better option. A plywood specific dado set should have outer blades designed like the best plywood sawblades. That means more teeth and an H-ATB grind. Also, the chippers should have more teeth, usually 4, for a smoother cut.

When using a dado set on the table saw, the cutting action is taking place on the bottom of the plywood, so supporting the plywood's bottom face is critical to achieving the best chip-free cut. To get a clean cut use a zero-clearance insert. The zero-clearance insert will support the plywood's face veneer layer and help prevent chipping as the teeth of the blade cut through the plies of the stock. Just remember that a new zero-clearance insert will give the best results as opposed to one that had been used several times and is not zero-clearance anymore.

If you don't have a tight fitting zero-clearance insert for your table saw an easy solution is to make a table overlay. Just cut a piece of smooth, flat sheet material such as plywood or hardboard the size of the cutting area on your table saw, after setting your fence and lowering the blade, attach it to your table saw with double-sided tape. Raise the saw blade or dado blade through the overlay for a perfect, custom zero-clearance fit. Smaller strips of plywood can be taped where additional support is needed.

CARE FOR CARBIDE TOOTH SAW BLADES

- **Handle carefully!** Carbide teeth are brittle and can be chipped or broken if dropped or allowed to contact other tooling — so be mindful when changing and handling saw or dado blades.
- **Give them a good home.** Make a safe storage space for these specialized tools where they won't have other blades stacked on top and the tips are protected.
- **Keep the blades clean.** The teeth on a saw blade undergo a tremendous amount of heat and stress during a cut. Gum and dirt will build up on the tooth surface. It's important to use a blade cleaner regularly to keep the blades at optimum performance.
- **You'll know it's time.** Sharpen the blade when you feel resistance feeding stock through the saw or when cut quality begins to suffer. Most of us wait far too long before sending our blades out to be sharpened.

▲ Use care when handling your plywood dado set or saw blade as the teeth are delicate. Safe storage is a must.

▲ Take care of your tooling by using blade cleaners and removing gum and dirt build up. Clean tooling cuts better and stays cooler.

▲ Plywood router bits are sized to fit the actual thickness of today's plywood for perfect-fitting joints.

► Smaller sizes of plywood router bits use a spiral downcut grind for a silky-smooth cut but may require a slower feedrate for adequate chip ejection.

ROUTER BIT DADOES

Straight bits are the standard for most workshops and do a good job in all sorts of materials, including plywood. In use, the cutting edge of the bit contacts the veneers of the plywood at a perpendicular angle, not lifting or compressing the individual plies. If the bit is sharp, the result is a good cut with efficient chip ejection.

Router bits designed for plywood are skewed down, cutting the veneer in a slicing motion. The downward action of the cutter compresses the veneer plies preventing them from separating and results in a glassy-smooth cut. However, this downward cutting action does not clear the kerf as effectively as a straight bit and may mean having to take a lighter cut or reducing the feed rate.

Plywood is rarely the stated thickness. Plywood router bits match true material thicknesses for perfect fitting dados. As with saw blades and dado sets, treat these bits with care, protecting the brittle and expensive, carbide cutting edges (and keeping them clean).

With the right tooling and technique, you can dependably make silky-smooth cuts in all types of plywood. These professional-grade results will help you to unlock all of the efficiency, beauty, and potential that plywood offers. W

Improving Your Tables

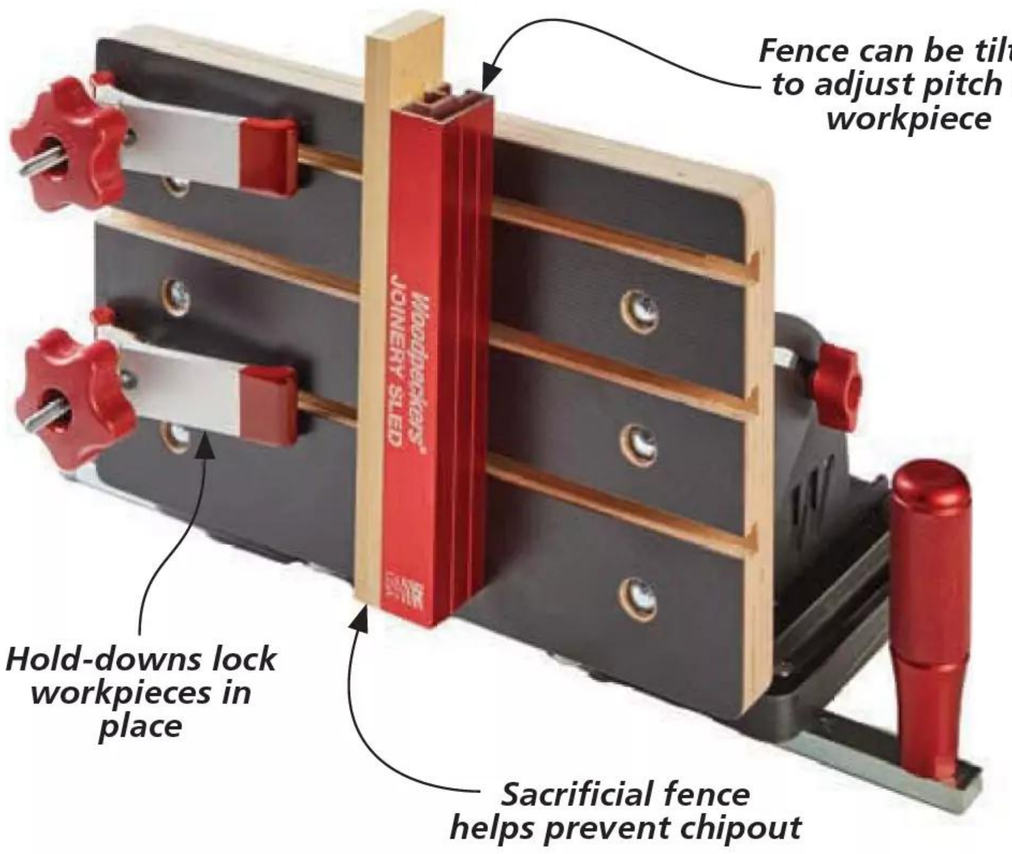
A table is an integral part of many woodworking tools. It provides a solid foundation for your cuts, and the time I spend at the table saw or router table accounts for a significant portion of my total shop hours. As such, it's important to put some thought into the function of your machine tables.

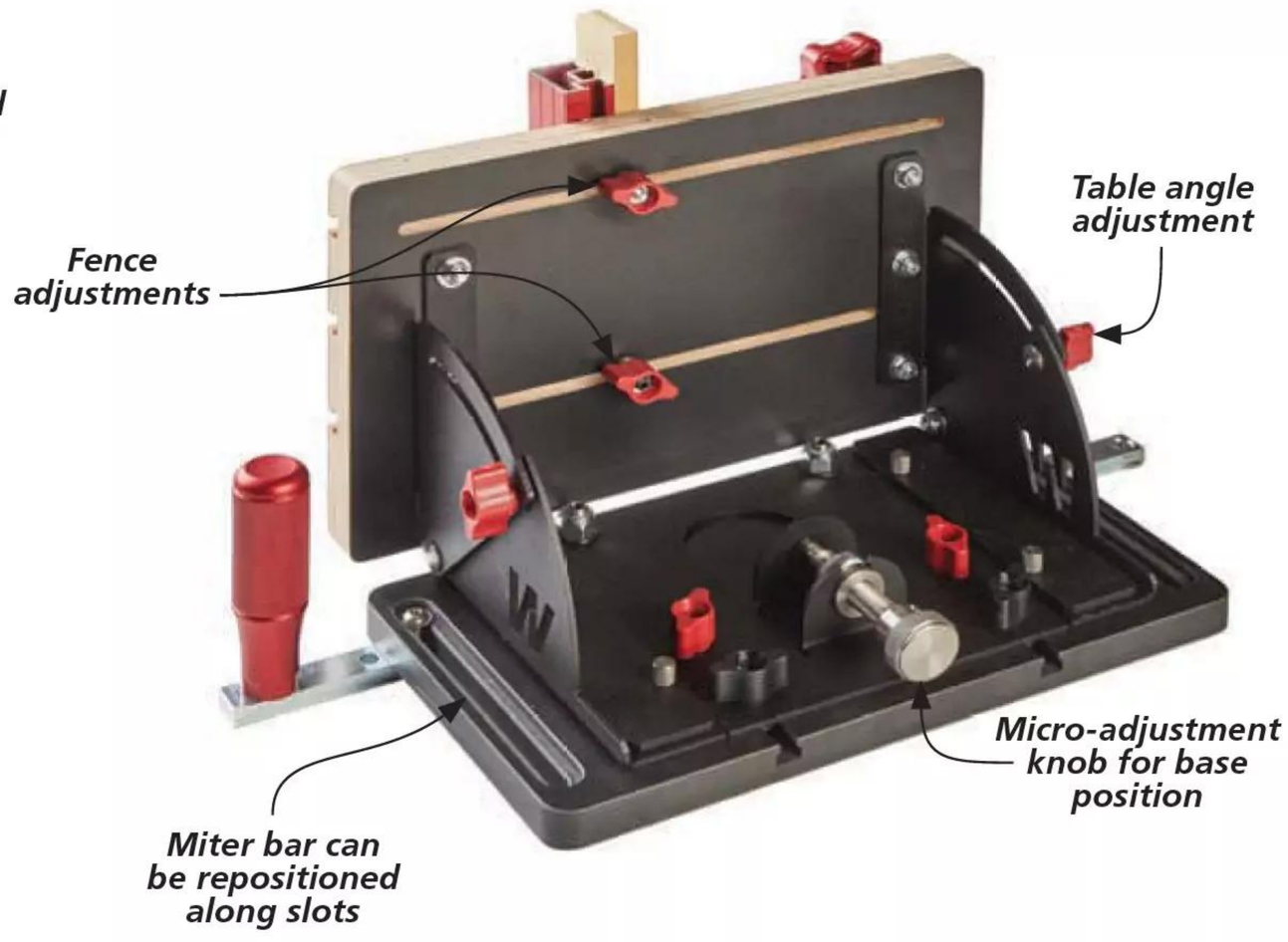
For this issue's Great Gear, we'll be looking at two items. First up is an accessory for any tool with a table and miter slot. Second is a series of products to keep your tables in tip-top shape.

WOODPECKERS JOINERY SLED

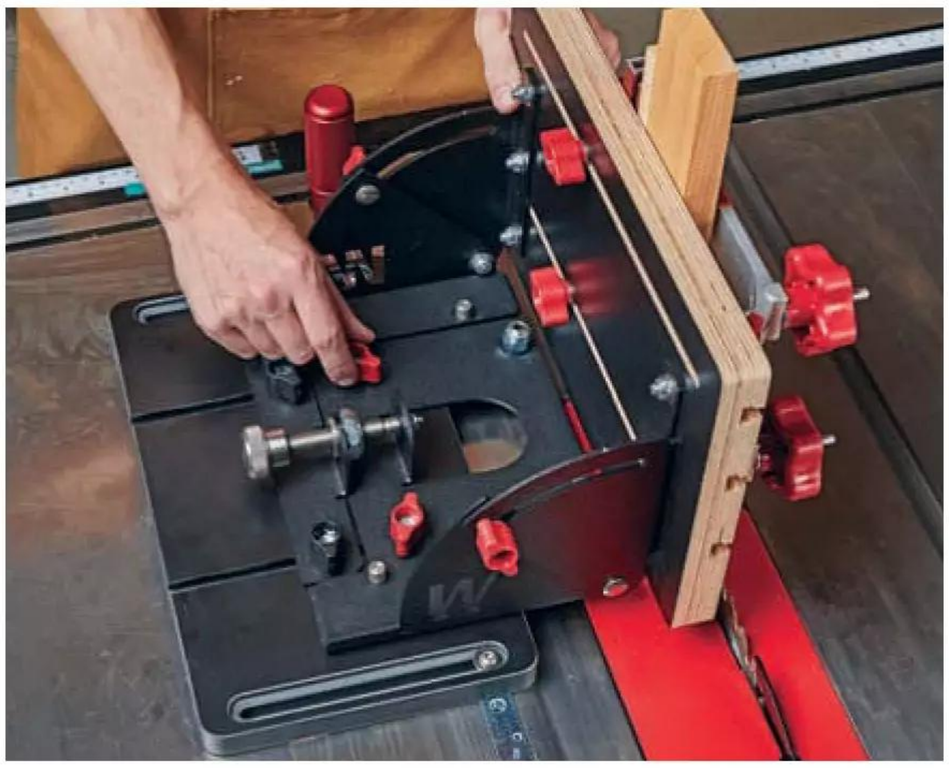
Woodpeckers makes some good products. Their bits and blades see a lot of use around our shop, but their jigs deserve attention as well. The one I'll discuss here is the sled shown on these pages.

A JIG REPLACER. *Woodpeckers'* Joinery Sled is intended to replace a variety of jigs you'd construct for your table saw or router table. It's guided by a miter bar and can be tilted anywhere between

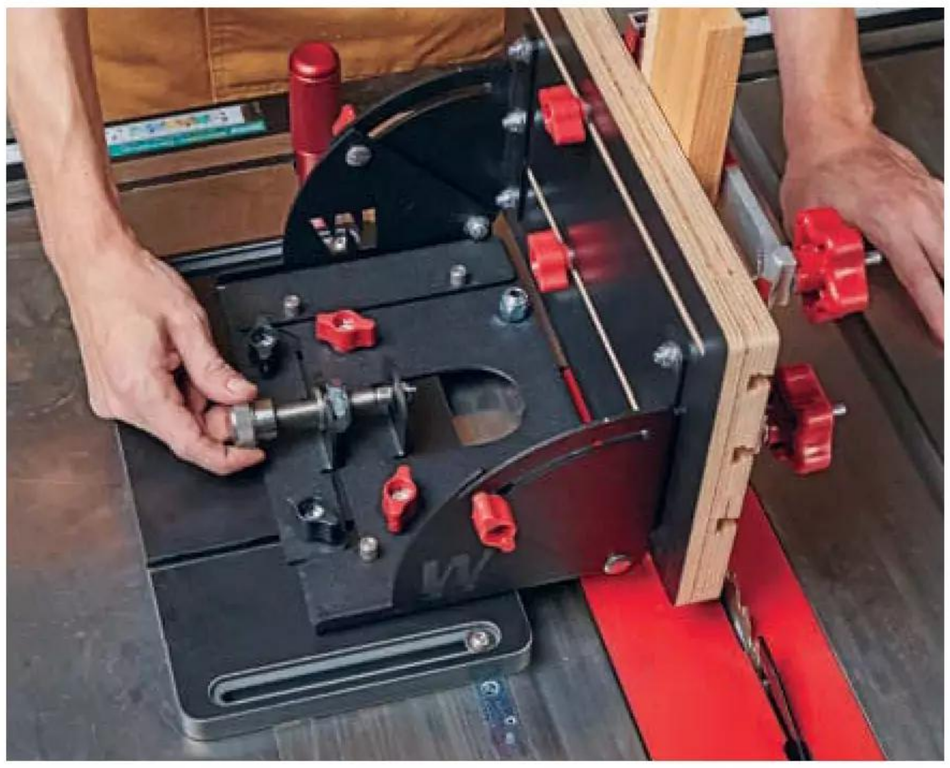




Written by: Rob Petrie



▲ The sled can be macro-adjusted by repositioning the miter bar or by loosening the four bolts on the sliding base and moving it by hand.



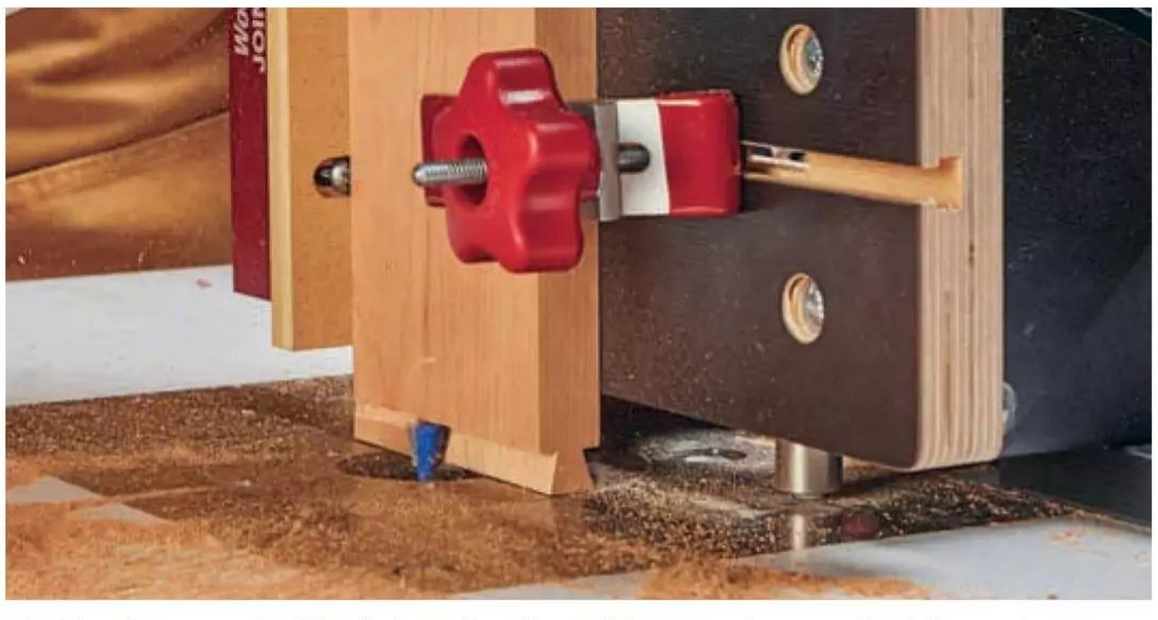
▲ For fine-tuning the setup, the back knobs can be tightened down to lock the rear of base, allowing you to use the micro-adjustment knob for final positioning.

44° and 91°. Additionally, the fence that backs the workpiece can be tilted, too, allowing for compound angle cuts.

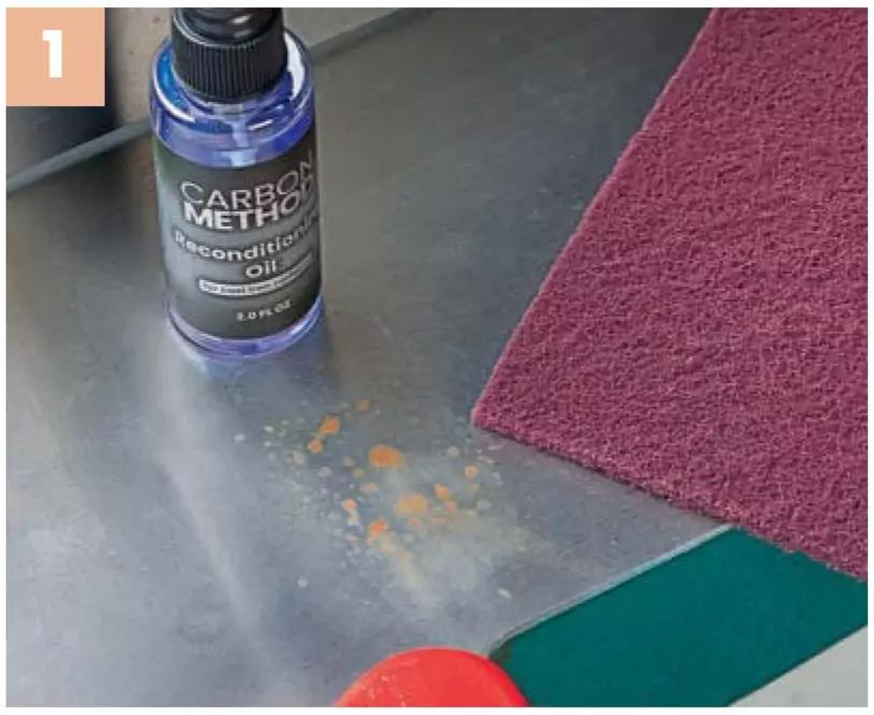
In practice, this replaces my tenoning jig, as well as two jigs I had for cutting at 45° in both directions. Compared to a shop-made jig, the micro-adjustment knob is nice for cutting joinery, and hold-downs are always good to have. While the ability to cut at any angle is a niche need, it does save you from having to construct a jig just for those parts when that need does arise.

WORTH THE BUY? Recommending a purchase always comes with the assumption that it'll be something you use. For me, there are a number of shop-made jigs for the table saw and router table that I make frequent use of, and this sled can take the place of many. Considering the time and material cost that goes into shop-made jigs — and the advantages of this version — I would consider the joinery sled worth the initial investment.

▲ The fence tilts to make angled cuts on ends, such as the groove for this splined miter joint, or to make compound cuts.



▲ The joinery sled isn't just for the table saw. Any tool with a miter gauge slot, like the router table, will work great with this accessory.



▲ The prep kit is a separate product to be used on rust or pitted spots on your tool's surface, removing them so the carbon coat can bond.

CARBON COATING

The second item on the Great Gear list for this issue is actually a series of products from the company *Carbon Method*. They provided me with two kits: the prep kit shown above and the carbon coating kit, which you can see on the next page.

PREP KIT. One of our jointers had acquired a spot of rust, which made an excellent example of these kits in action. I began with the prep kit, which is designed to remove rust, stains, and any pitting before moving on to the carbon coating itself. This kit comes with three sets of abrasive pads in varying grits (shown above) and a small bottle of their reconditioning oil.

The oil goes on first and acts as a lubricant for the abrasive pads. *Carbon Method* says only that this oil is their own "unique formula," but there is likely some reactive acid like you'd find in most rust removers. After applying it, you're instructed to let it sit for a few minutes to let it eat at the rust or stain.

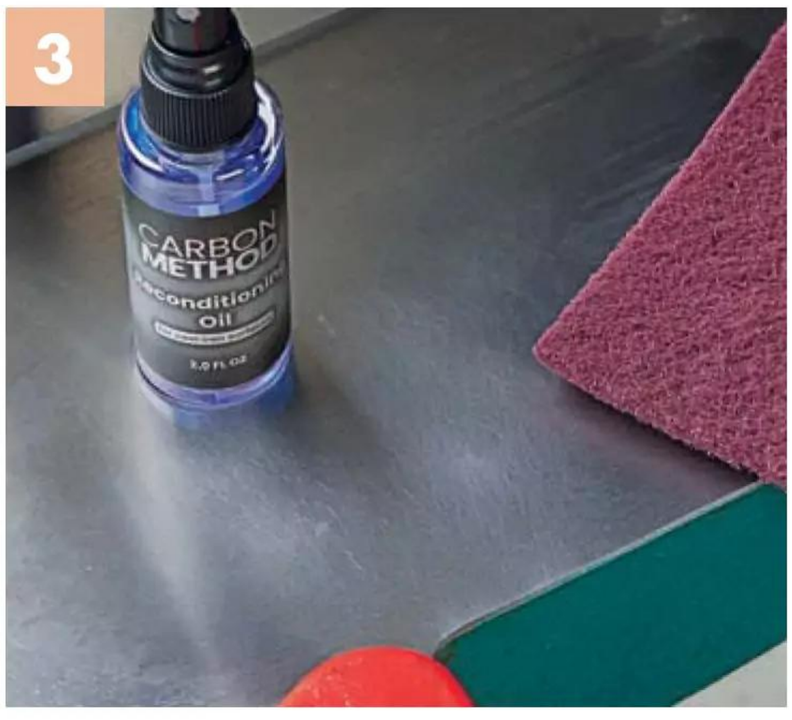
The spot of rust I had was shallow, so I removed it by hand (as you can see in Step 2 below). However, for deeper rust spots or pits, you can cut a section of the abrasive off and attach it to an orbital sander. The rust-removing portion of the oil seemed to work quickly, and it didn't take me too much elbow grease to clean the spot up.

The coarser grit I used for this left some surface marks (you can see them in Figure 3). These can be removed by finishing up with the finer pads, similar to following a basic sanding process.

CARBON CLEANSE. With the prep kit's work finished, the carbon cleanse came next. This is the first part of the coating kit, and I used white, disposable towels to wipe down the jointer as I sprayed it on (Step 4). This removes any gunk that might've built up on the surface of the tool.

The solvent worked well, removing resin left after sanding and polymerized machine oil. It also has a citrus scent — much less headache-inducing than a lot of gunk-removers.

▲ Apply the reconditioning oil to the trouble spot, and allow it to sit for a few minutes before abrading.



▲ Remove the problem area with the "fine" pads. Work over the surface with the other two sets of pads to remove the marks.

▲ After finishing with the prep kit, use the carbon cleanse solvent and a clean rag to clear the surface of any gunk.

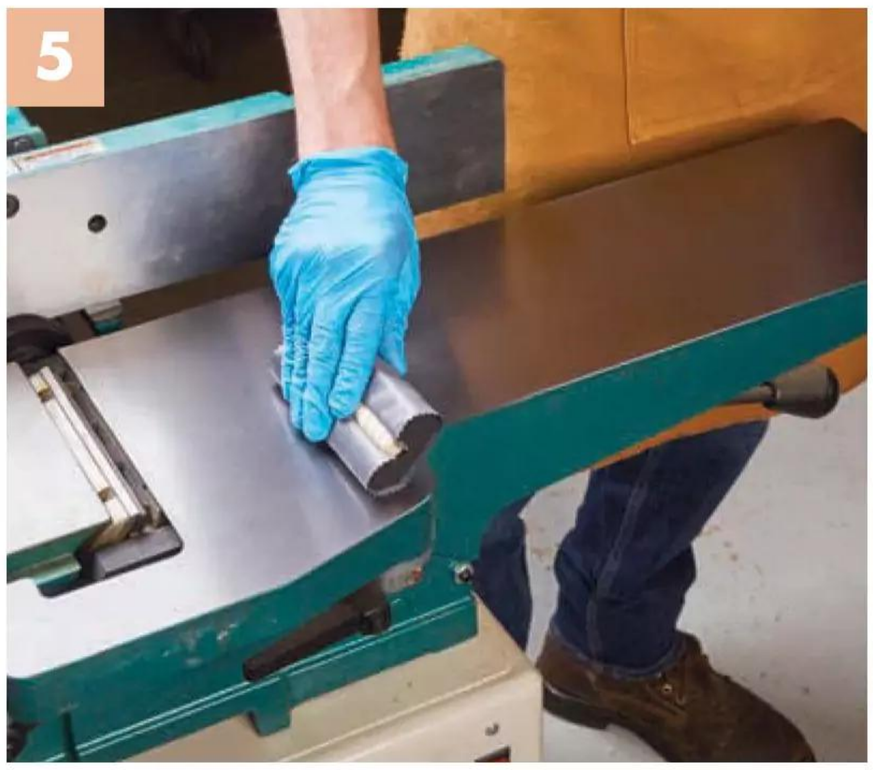
CARBON COATING. *Carbon Method* provides comprehensive instructions on how to apply their carbon coating. I won't get into the details, but you can see a few of the steps in the photos at right below. Basically, I applied the carbon coat using a foam applicator block (Figure 5). This is similar to a sanding block, providing a flat surface and even pressure as I wiped on the coating.

The coating's key ingredient is graphene. Graphene refers to the individual, hexagonal arrangement of carbon atoms — millions of which make up graphite when stacked. When graphene isn't stacked however (held together by a bonding agent, for example), it is a transparent, highly durable, and low-friction substance.

After applying the carbon coat, the last step was to buff it out (as in Figure 6). This is similar to buffing a wax coat, and it left the table feeling notably smoother than bare metal.

CARBON GLIDE. The final part of the carbon coating kit was the "Carbon Glide." This is a substance applied after the carbon coat cures. It has similar properties to wax, but without being temperature-sensitive. This simply gets sprayed on, left to dry for a minute, then wiped off.

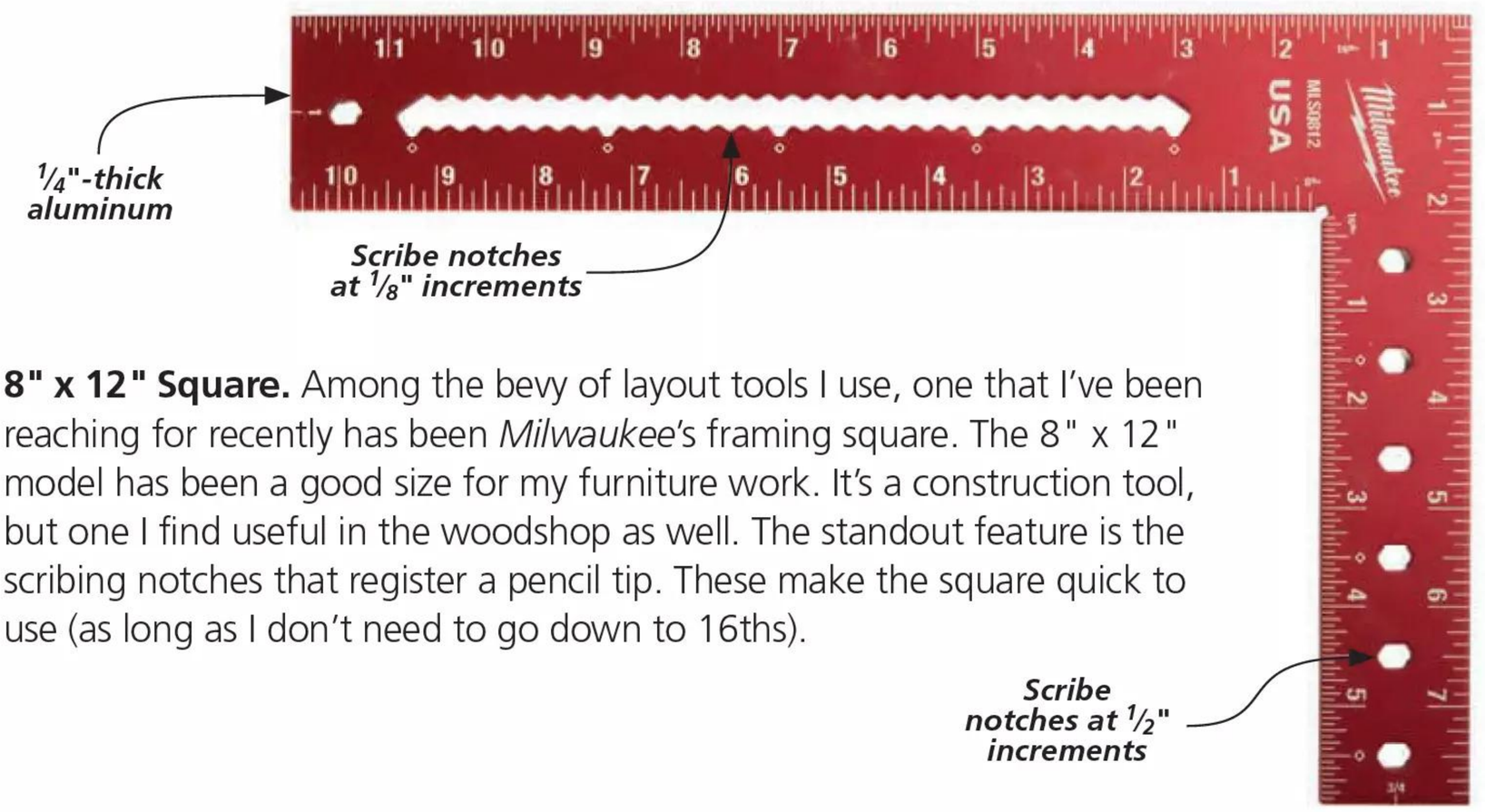
RESULTS. For the steps you see in these photos, I only worked on the infeed side initially. I left the outfeed untouched as a comparison, and there's definitely a difference. The finished surface feels smoother and slicker than the back end, even just to the finger. In terms of durability, time will ultimately tell. For now, the jointer is rust-free and operating smoothly. Though there are a number of steps, the application process isn't difficult, and I'm satisfied with the results. W



▲ A special applicator block is used to spread the coating over the surface. This consists of a fine cloth attached to a beveled foam block.

▲ The final step is to buff the carbon coating with the microfiber cloth, resulting in a smooth, low-friction surface.

MILWAUKEE FRAMING SQUARE



8" x 12" Square. Among the bevy of layout tools I use, one that I've been reaching for recently has been *Milwaukee*'s framing square. The 8" x 12" model has been a good size for my furniture work. It's a construction tool, but one I find useful in the woodshop as well. The standout feature is the scribing notches that register a pencil tip. These make the square quick to use (as long as I don't need to go down to 16ths).

Copper Patination

Patination is a process that occurs naturally when metal is exposed to air and humidity over time. A thin, oxide layer develops, producing a green or brown color (on copper).

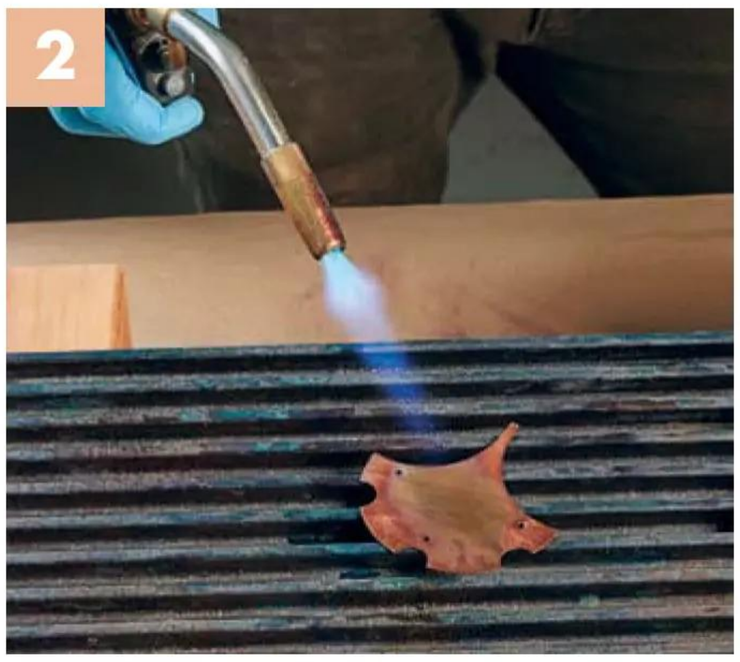
However, the process of patination using chemicals or heat to purposefully induce the formation of patina has been used by artisans for thousands of years. This is done not only to create a distinct aesthetic appeal, but to protect the metal from rust and contribute to its longevity.

The process used here is a combination of dye-oxide and heat. Dye-oxides are colorants that function as oxides, making them versatile in their application in that they can be blended or layered to achieve any color. These patinas are UV safe, non-reactive, and do not contain acids, which make them safe for handling and more than suitable for outdoor applications. To yield the best results, thorough surface preparation and use of the "right" products is paramount. Follow along for a more detailed procedure.

SURFACE PREP. The sucess of your end result is only as good as the

▼ *Sculpt Nouveau* offers a full range of patina and metal finishing products. Refer to pg. 66 for the select items used in this article.

▲ Scuff up the copper using 400-grit sandpaper. Remove any excess debris with a metal cleaner and degreaser.



▲ Heat the copper to 180-200°F using a propane torch. To ensure temperature accuracy, I used an infrared thermometer.

initial preparation. So, with that adage in mind, I began by sanding the surface of the copper to get a uniform appearance as well as remove any factory coatings. This was followed by a metal cleaner and degreaser, which removes contaminants and ensures proper coating adhesion.

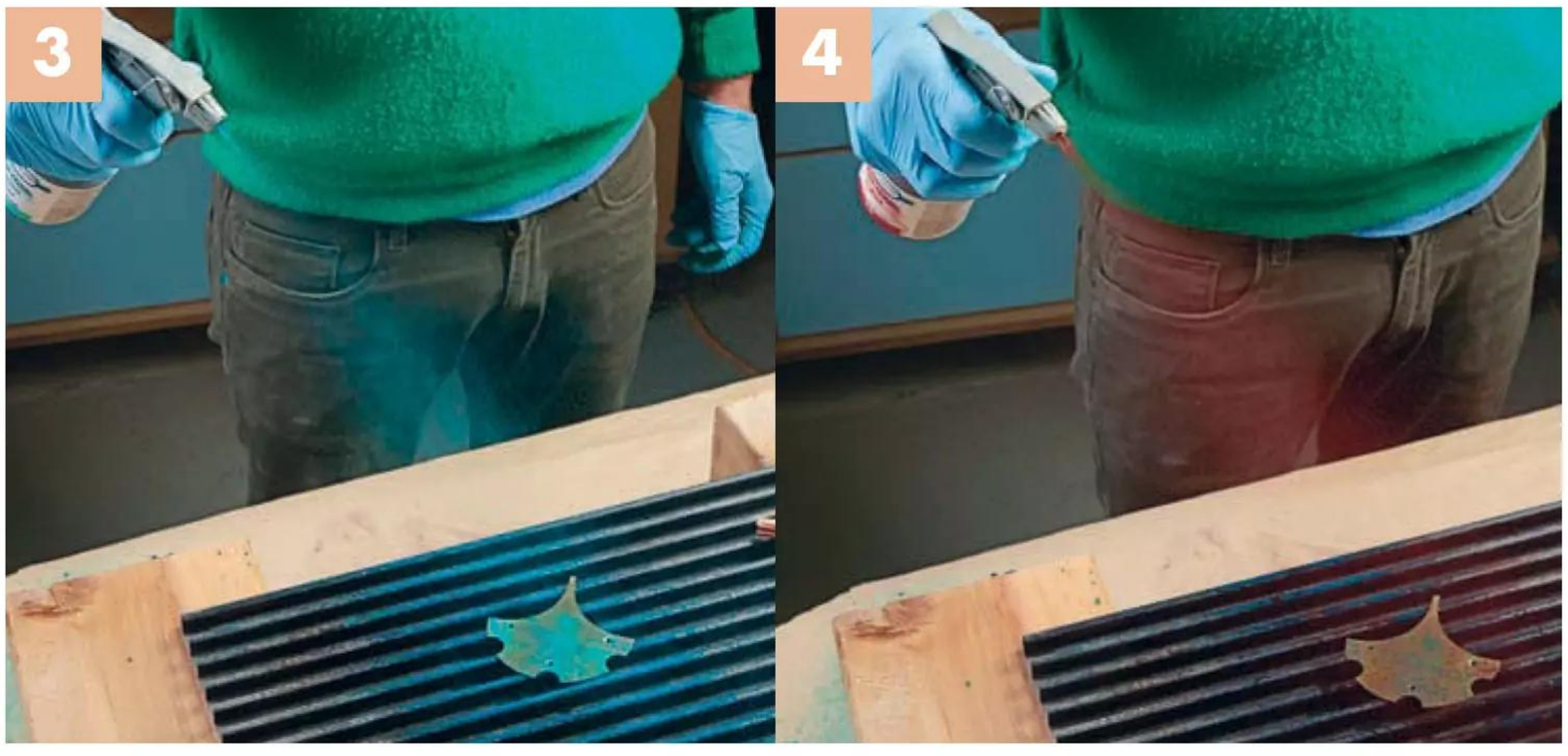
BRING ON THE HEAT. Dye-oxide adheres best when the metal is warmed. This is due to the increased surface tension and adhesion energy when subjected to higher temperatures. As the surface temperature rises, the oxide layer becomes more viscous and adherent. Here, a propane torch was used; however, a heat gun is also sufficient. Once the copper reaches the recommended temperature range, the dye-oxide can be applied. If using multiple colors, continue to flash the surface in between coats to maintain proper heat and dye adhesion.

LAYERING COLORS. As mentioned earlier, dye-oxides can be layered and blended. The best way to do this is by diluting select colors with distilled water. This allows base colors to emerge through additional layers. Furthermore, experimenting with the water to dye ratios is a great way to achieve desired visual results.

Depth and dimension can be further added during the layering process by using the texture of different materials (sponge, brush, cloth) as a blotting tool. These alternative materials function as applicators, but can also aid in blending color as well as creating texture or a pattern.

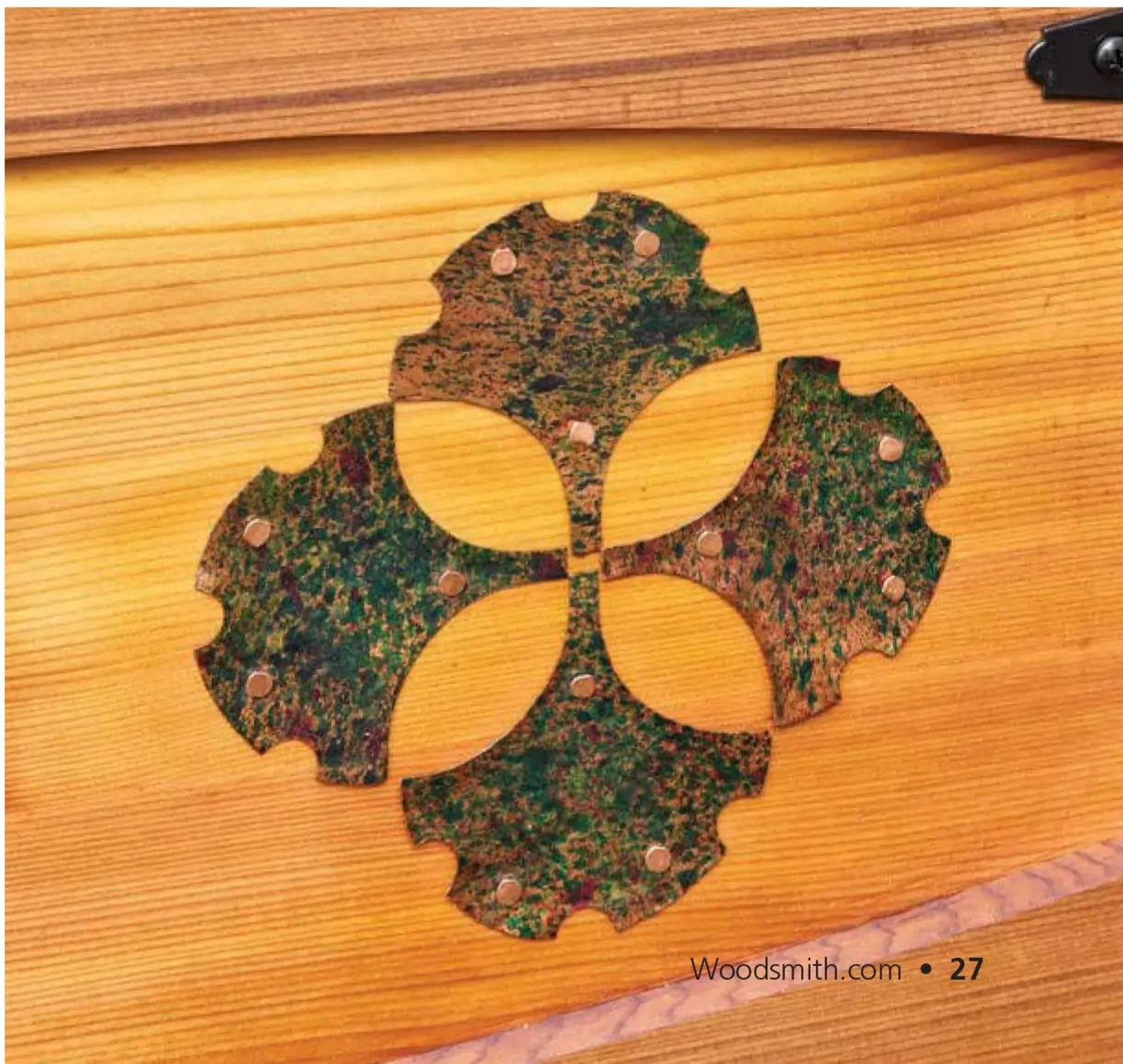
LOC & SEAL. Once you've completed the patination process, it's important to lock in or seal the color(s) created. For this process I used *Colorloc*, seen in Fig. 5. This is a clear, air-drying lacquer that has great adhesion to various types of metals. The purpose of this product is to protect the colors formed by torch, flame, or heat treatment on a variety of metals.

For further preservation of the patina, a two-part clear, low VOC polyurethane was applied over the *Colorloc*. This additional clear coat (*Ever Clear*) provides underfilm tarnish protection, as well as exceptional resistance to UV light, salt-air environments, and most chemicals. And since our gate will live outdoors, the added insurance was a welcomed addition. Overall, *Sculpt Nouveau* makes the patination process a breeze — even for a novice. W



▲ Dye-oxide patinas are a cross between solvent based dyes and a patina. The colors are all transparent and can be blended and layered together to achieve a variety of custom colors. Above, green-blue and red are used to imitate the seasonal transformation of the ginkgo leaf.

▲ *ColorLoc* is an air-drying lacquer used to seal in the patina. Once dried, an additional top coat of *Ever Clear* was applied to further protect the metal for life outside.



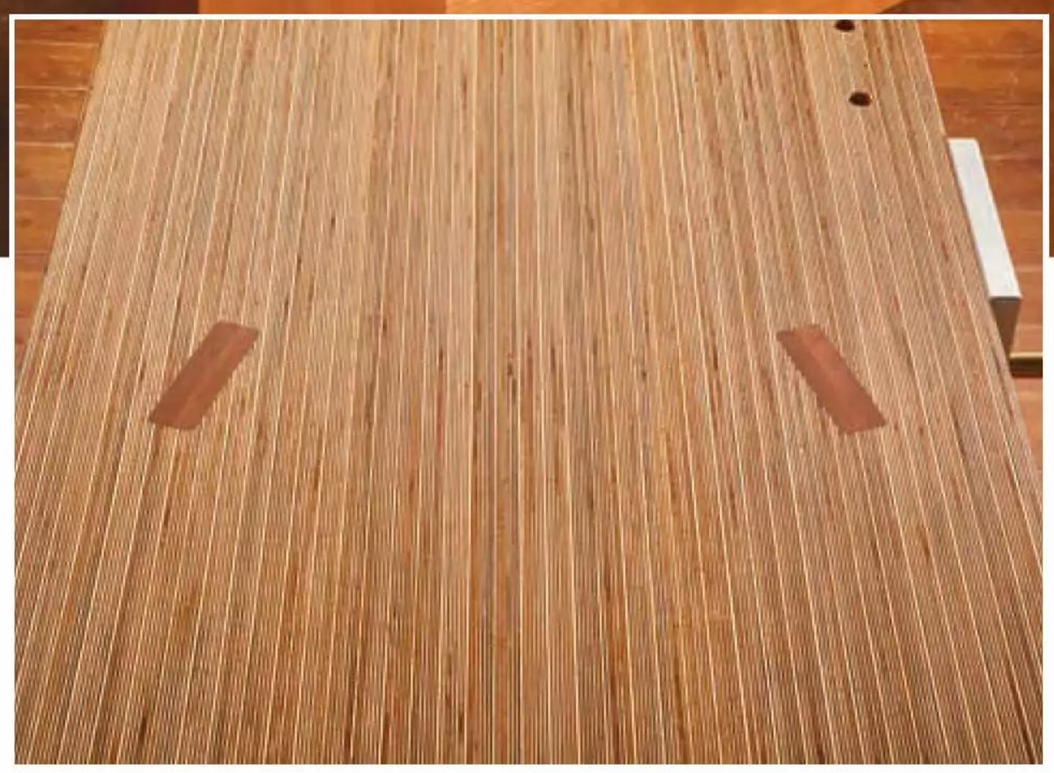
▼ The copper leaves are arranged in a fan motif to further illuminate the depth and complexity of the patination process.

ShopNotes
project

modern Baker Workbench

A workbench often is the most used tool in a shop. Not only is it a station for anything from gluing to sanding to hand tool work, but it's also a platform for planning — for scribing cut lines, laying out joinery, and poring over plans. It's the center that joins all work across the shop, and the base of operations for any woodworker. As such, it needs to be a strong, stable piece, but also one that you'll enjoy standing before and looking over. When our designer, Dillon Baker, was conceiving the new nexus for his own workspace in the shop at *Woodsmith*, the bench you see here was the result.

The first thing that catches the eye on this bench is the top, laminated from strips of Baltic birch plywood, held together and protected by epoxy. Equally strong are the cherry legs and stretchers below. A particular pair of vises, made by *HNT Gordon*, aren't like the ones you'd see on your grandfather's bench. Rather than being made of hardwood or cast iron, these are made from precise and stable machined aluminum. Finally, seated on the stretchers is a cabinet of Baltic birch and cherry. Altogether, this is a workbench of a truly modern mindset — not merely in its open aesthetic, but also in its construction. The bench makes the most of contemporary materials for both functionality and a fresh sense of style.

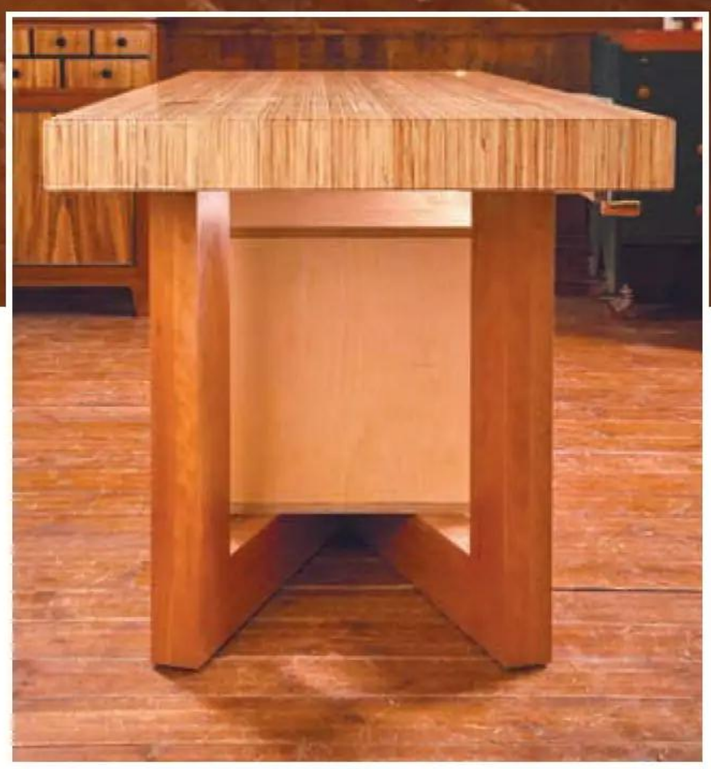


▲ ***Laminate Top.*** *The benchtop is laminated from strips of Baltic birch and connected by beefy through tenons.*

Written by: Rob Petrie, Project Design: Dillon Baker

▲ ***Face Vise.*** *A face vise made from machined aluminium provides a strong grip without marring the piece.*

▲ ***Tail Vise.*** *The knurled knob of this tail vise makes it easy to tighten and loosen pieces held in the dogholes.*

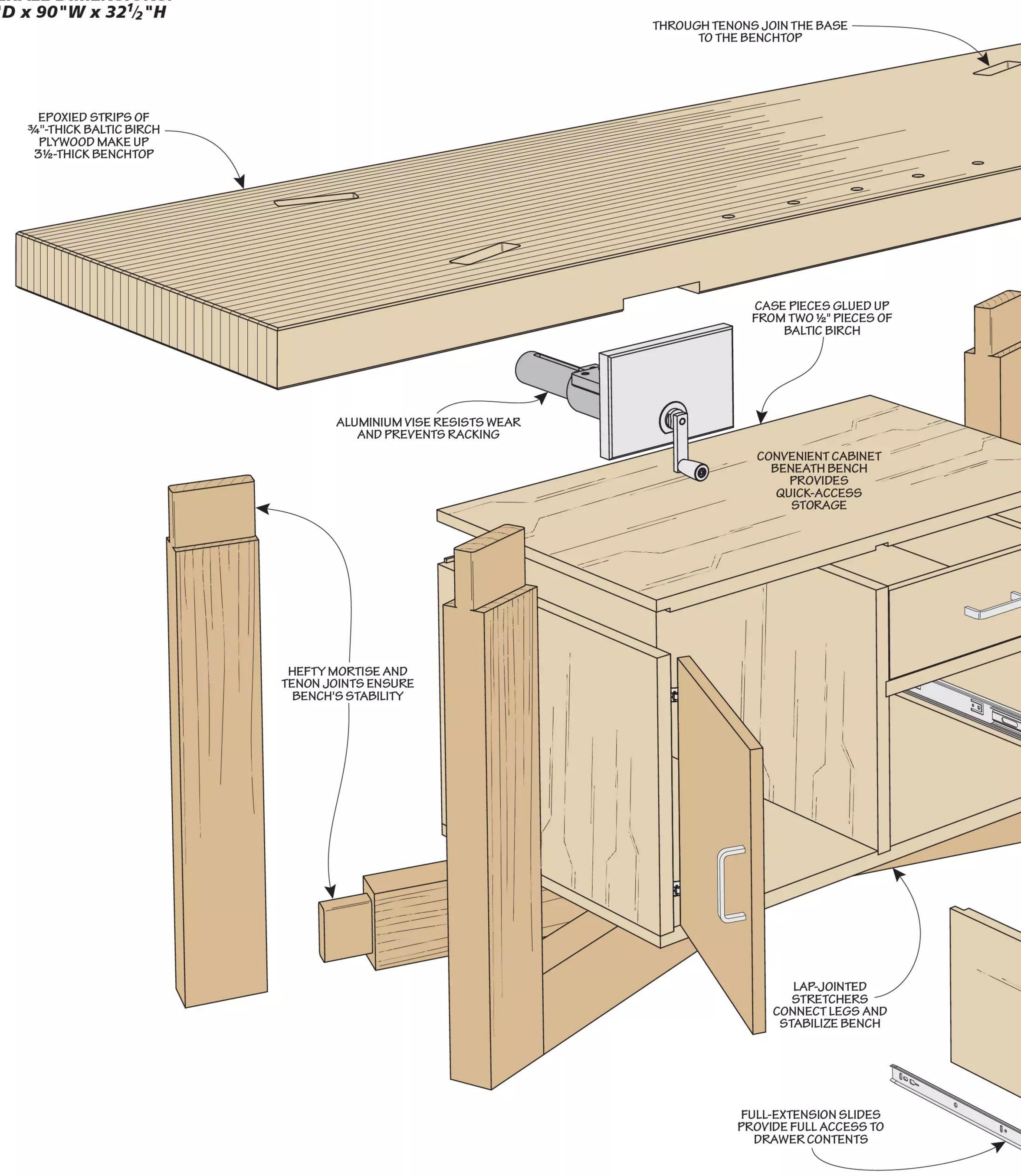


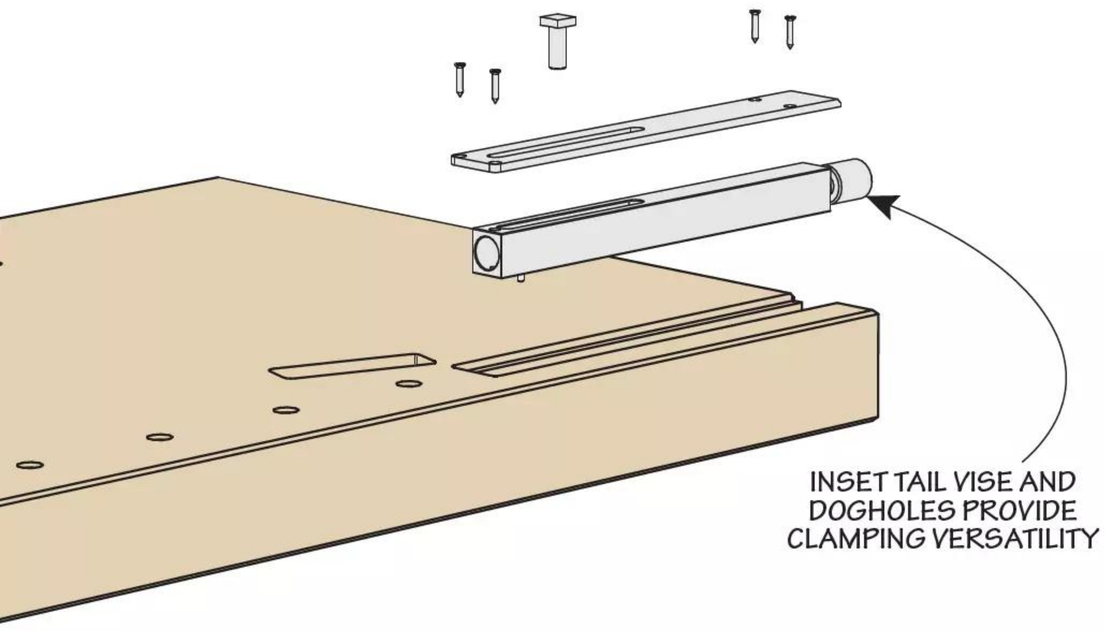
▲ ***Lapped Base.*** *The bench stands on 3"-thick cherry legs, held strong by lapped stretchers beneath.*

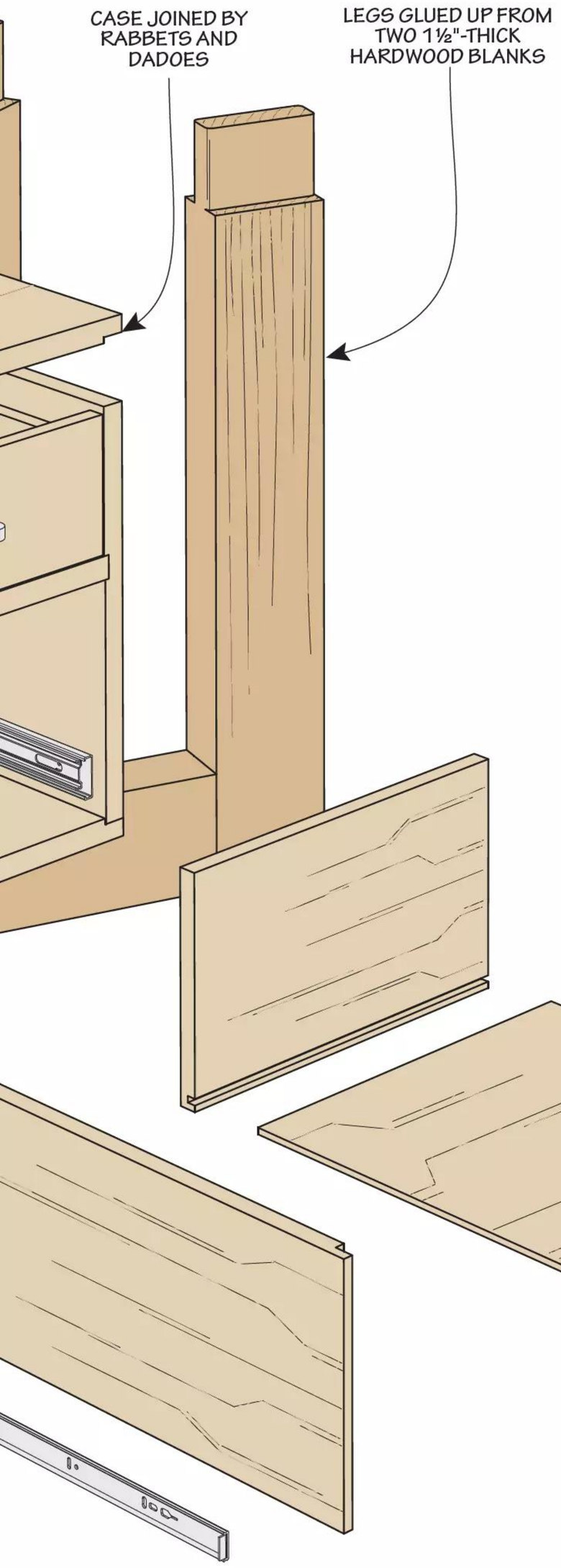
Illustrations: Dirk Ver Steeg

Exploded View Details

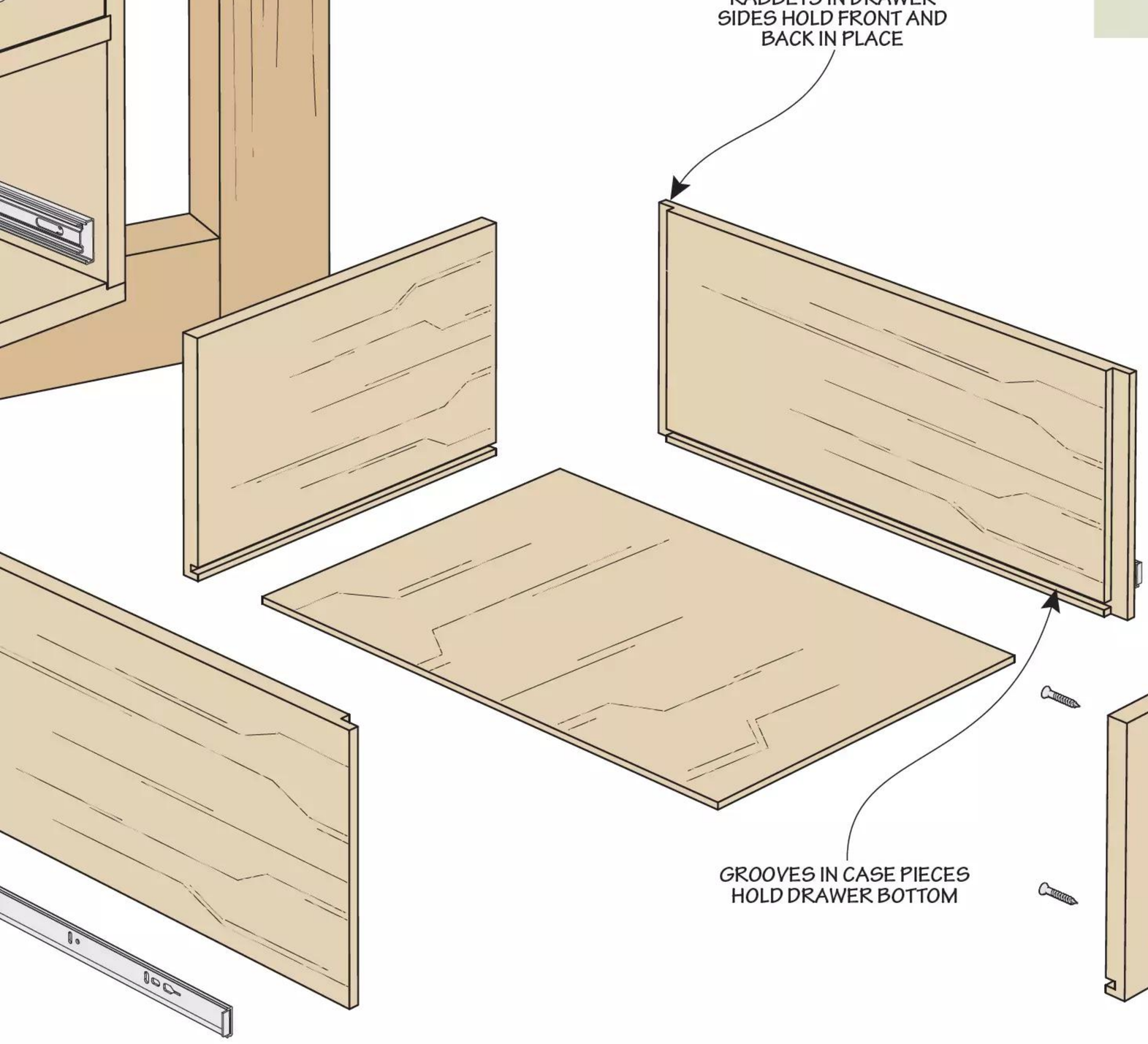
OVERALL DIMENSIONS:
30"D x 90"W x 32½"H

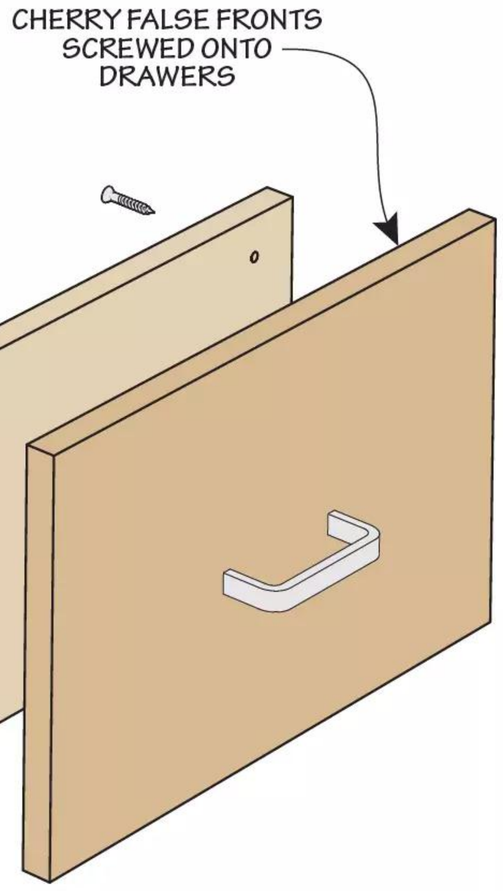






NOTE: SOURCES FOR VISES AND HARDWARE CAN BE FOUND ON PAGE 214



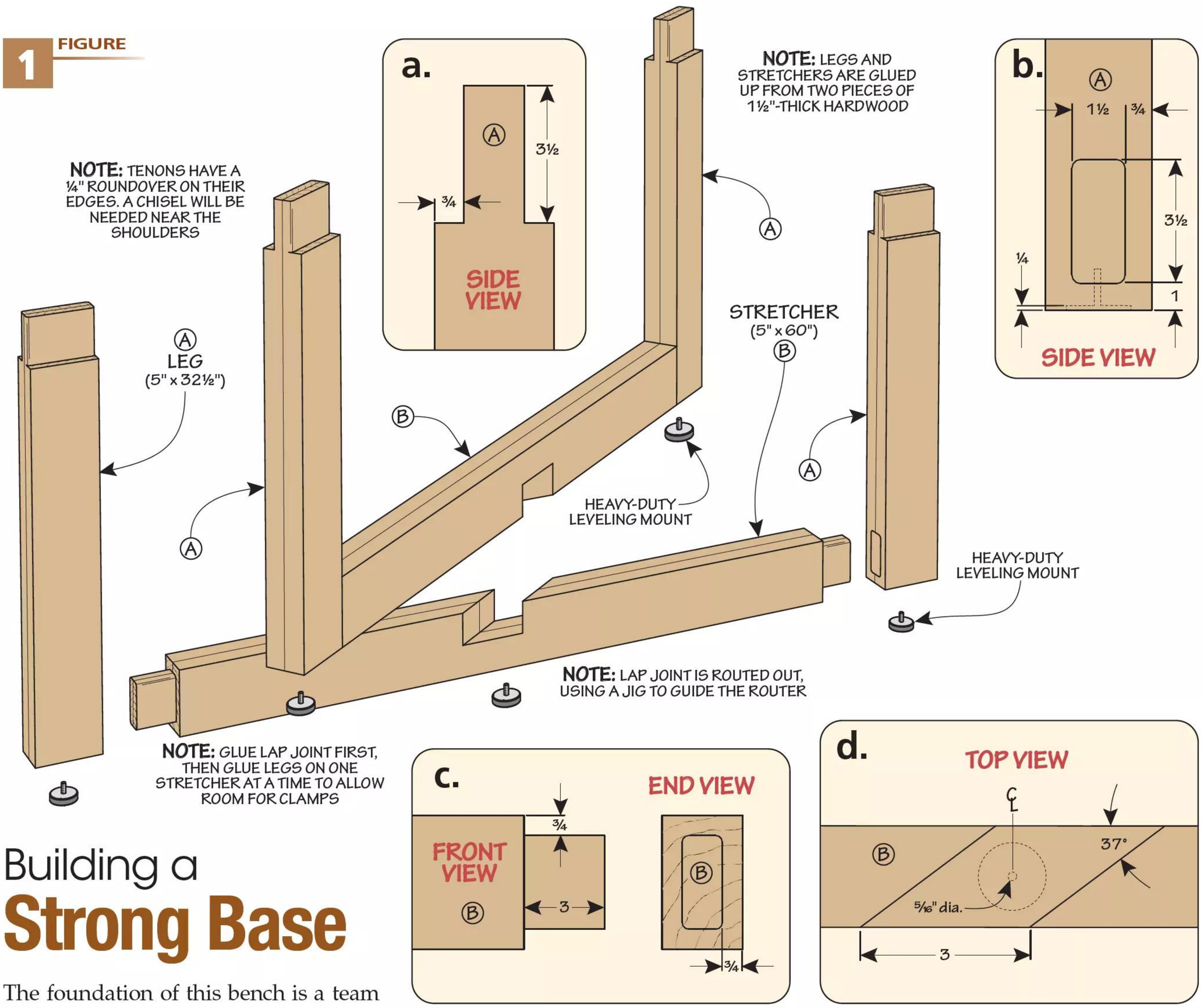


materials & hardware

BENCH		
A	Legs (4)	3 x 5 - 32½
B	Stretchers (2)	3 x 5 - 60
C	Top (1)	3½ x 30 - 90
CASE		
D	Case Top/Bottom (2)	1 Ply. - 24 x 36
E	Case Sides (2)	1 Ply. - 24 x 17½
F	Case Dividers (2)	1 Ply. - 23¾ x 17½
G	Case Back (1)	¼ Ply. -35 x 18
DOOR & DRAWERS		
H	Drawer Bottoms (2)	¼ Ply. - 15¼ x 21¾
I	Upper Drawer Front/Back (2)	¾ Ply. - 5 x 15¼
J	Upper Drawer Sides (2)	¾ Ply. - 5 x 22½
K	Upper Drawer False Front (1)	¾ x 5⅞ - 15⅞
L	Lower Drawer Front/Back (2)	¾ Ply. - 9 x 15¼
M	Lower Drawer Sides (2)	¾ Ply. - 9 x 22½
N	Lower Drawer False Front (1)	¾ x 9⅞ - 15⅞
O	Door (1)	¾ x 15⅞ - 16⅞

- (1 pr.) 110° Inset Euro Hinges
- (5) 2" Heavy-Duty Leveling Mounts
- (4) 22" Full-Extension Drawer Slides
- (3) 4" Stainless Steel Pull Handles
- (1) HNT Gordon Bench Vise
- (1) HNT Gordon Tail Vise
- (8) #8 x 1" Fh Woodscrews
- (4) #8 x 1¼" Fh Woodscrews
- (4) #8 x 1½" Fh Woodscrews

1 FIGURE



Building a **Strong Base**

The foundation of this bench is a team of four legs joined by a pair of stretchers. The strechers are connected by a lap joint, while the legs have mortises to accept the stretcher's tenons. The pieces are glued up from two 1½"-thick cherry boards and cut down to size. I cut the legs ⅛" extra-long here so the through tenons could be trimmed flush later.

LEGS. My first task was to make the tenons on the legs (Figure 1a). As mentioned, I oversized these by an ⅛". I made them at the table saw, then I routed the roundovers. Stop routing just before the shoulders and finish out the roundovers with a chisel or rasp to prevent routing into the shoulders.

Then came the mortises. I started at the drill press, using a Forstner bit to bore out as much waste as possible. Next I made a template of the mortise (Figure 1b) to guide a pattern bit, then began routing out the remaining waste. To avoid taking too much at once, I free-hand routed the center, stepping down to the final depth. From there, a pass around the edges finished the mortise.

STRETCHERS. For the joinery on the stretchers, I started with the tenons. Despite the size, I cut these tenons on the table saw. With a support on the far end, I used a crosscut sled and a crosscut blade to establish each shoulder, then switched out for a dado blade to remove the rest of the waste.

Next came the lap joints. After laying out the joint, I used a simple jig to rout the lap. The jig straddles the stretcher and guides the router base. I made a series of cuts, plunging further down with each pass to reach full depth.

BASE GLUEUP. Now for some assembly. Begin with the lap joint, gluing and clamping the stretchers together first. Then glue the legs on one stretcher at a time so each pair has clamping room.

MOUNTS. The final step is to attach the leveling mounts. (Figure 1e). Flip the base upside down, use a Forstner bit for the recess and a twist bit for the pin hole, then screw in the levelers.

TOP

The top is laminated together from Baltic birch strips, each 3⅝" wide. I cut them extra long and epoxied the strips into

three (roughly) 10"-wide sections, epoxying and stacking the strips.

After the sections cured, I ran them through the planer to make sure they were flat and equally sized. From there, I epoxied the three sections to form the top, using cauls to keep it all flat. To cut a piece this thick to size, I made two cuts with a track saw, then cleaned the edges up with a router.

VISE RECESSES. The face vise and tail vise are two integral parts of the bench. The recesses for the face vise (Figure 2b) are easy — there's one for the body and another for the screw. As for the tail vise, there's one long recess with rabbeted edges (Figure 2c). For all of these recesses, I found a router with a few simple, hardboard templates to be the easiest method.

THROUGH MORTISES. A hardboard panel served as my template for routing the through mortises, as shown in Figure 2a below. I first flipped the top upside down and clamped the hardboard to one end. I centered the leg and stretcher assembly on top, then transferred the tenon locations onto the hardboard and cut these out to form the template.

I used a short ½" pattern bit along with the template to begin routing the mortise. Before routing however, I drilled into the waste to give myself a place to plunge in and begin routing.

As I routed deeper, I switched out to a longer bit. When I reached the full depth of my router and bit on the two mortises of one side, I attached the template to the opposite end and routed the others out as well. I cleaned these through mortises up with a flush-trim bit, then flipped the benchtop, drilled through to the existing mortise, and flush-trimmed the remaining waste out.

FINAL TOUCHES. A bit more router and drill work remains. I bored out the dogholes as below, then chamfered the edges of the dogholes and the bench.

ASSEMBLING THE BENCH. The top was now ready to be joined with the base. I flipped the top upside down on a set of blocks and applied epoxy to the leg tenons. I fit the tenons in the mortises, then clamped the assembly up. Once cured, I trimmed the tenons flush to the surface of the bench.

FIGURE 2

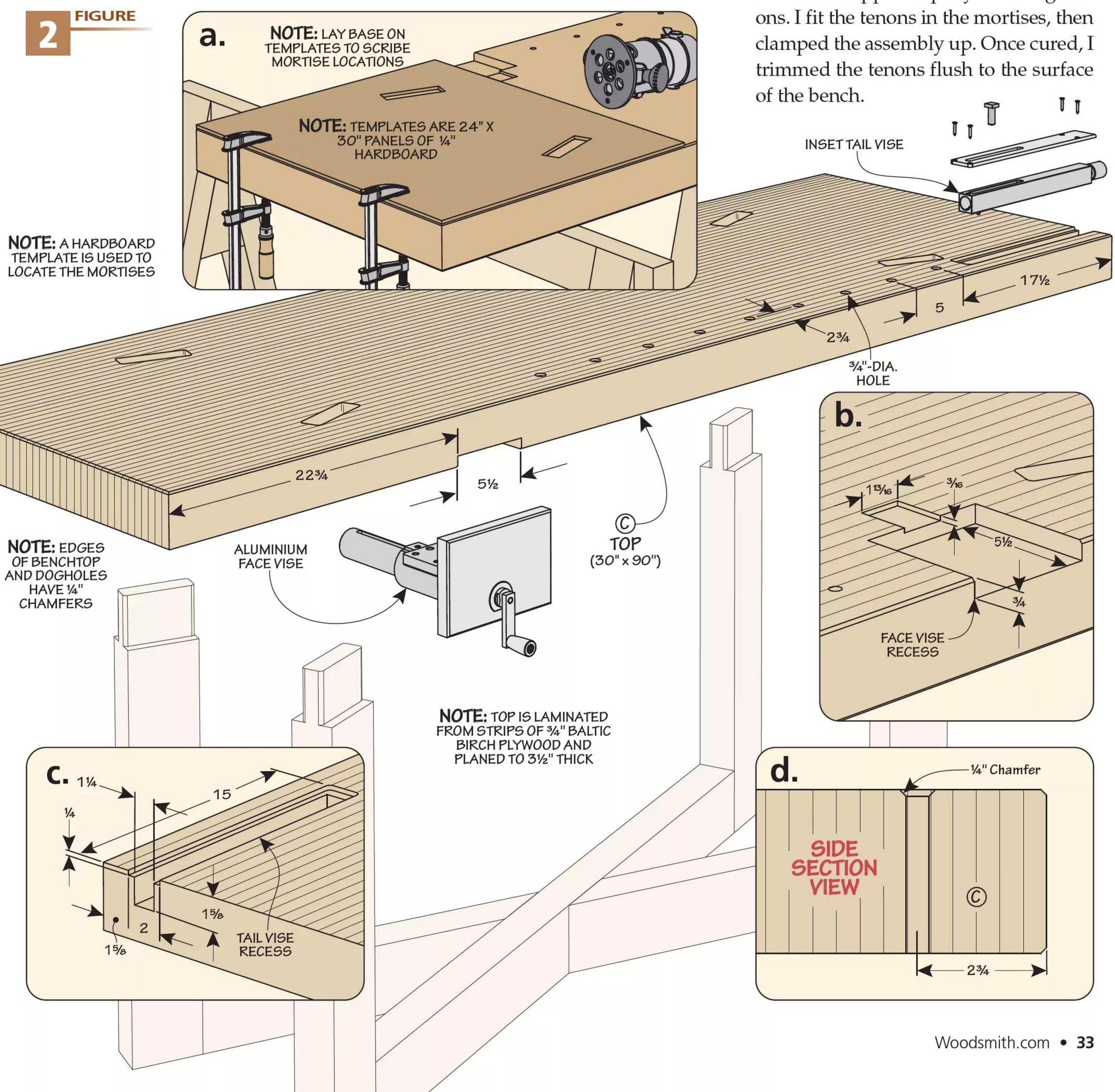
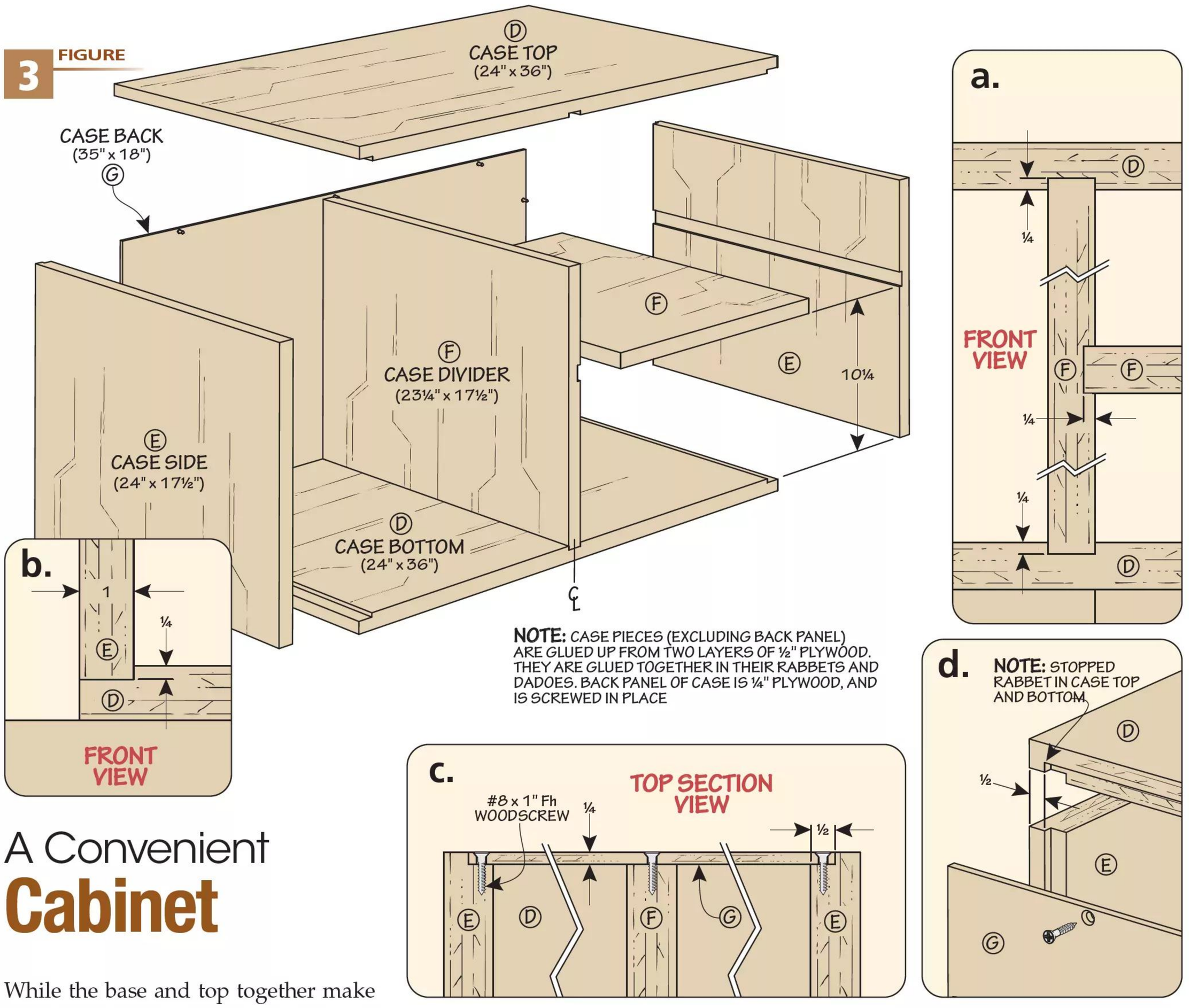


FIGURE 3



A Convenient Cabinet

While the base and top together make an adequate workbench, that's not the whole story to the modern Baker bench. A cabinet of Baltic birch lies beneath, equipped with two drawers and a doored cupboard, all made from glued-up ½"-thick pieces for a beefier look to go along with the bench.

CASE. I began by cutting the case pieces to size, as in Figure 3 above. These are simple pieces, and once finished you can move onto the joinery. Compared to the work on the base and benchtop, this cabinet is a cinch — all the joints can be made solely on the table saw.

DADOES. First up come the dadoes (Figure 3a). There's a dado in the top and bottom of the case to hold the vertical divider, as well as in the vertical divider and the right side piece to hold the horizontal divider. Each dado is sized to accept the piece that fits into it.

RABBETS. Next up are the rabbets. There are two different kinds of rabbets to work on here, and I began with the ones that would hold the sides (Figure 3b). These are the same size as the dadoes, only on the ends of the pieces.

Now for the rabbets to hold the back. On the sides, I used a dado stack buried in an auxiliary fence. For the stopped rabbets in the top and bottom however, I used a straight bit at the router table, then squared the ends up with a chisel.

ASSEMBLY. Now to put the pieces together. The sides, top, bottom, and both dividers can be glued and clamped up. After those pieces dried, I screwed the plywood back in place.

DOOR & DRAWERS

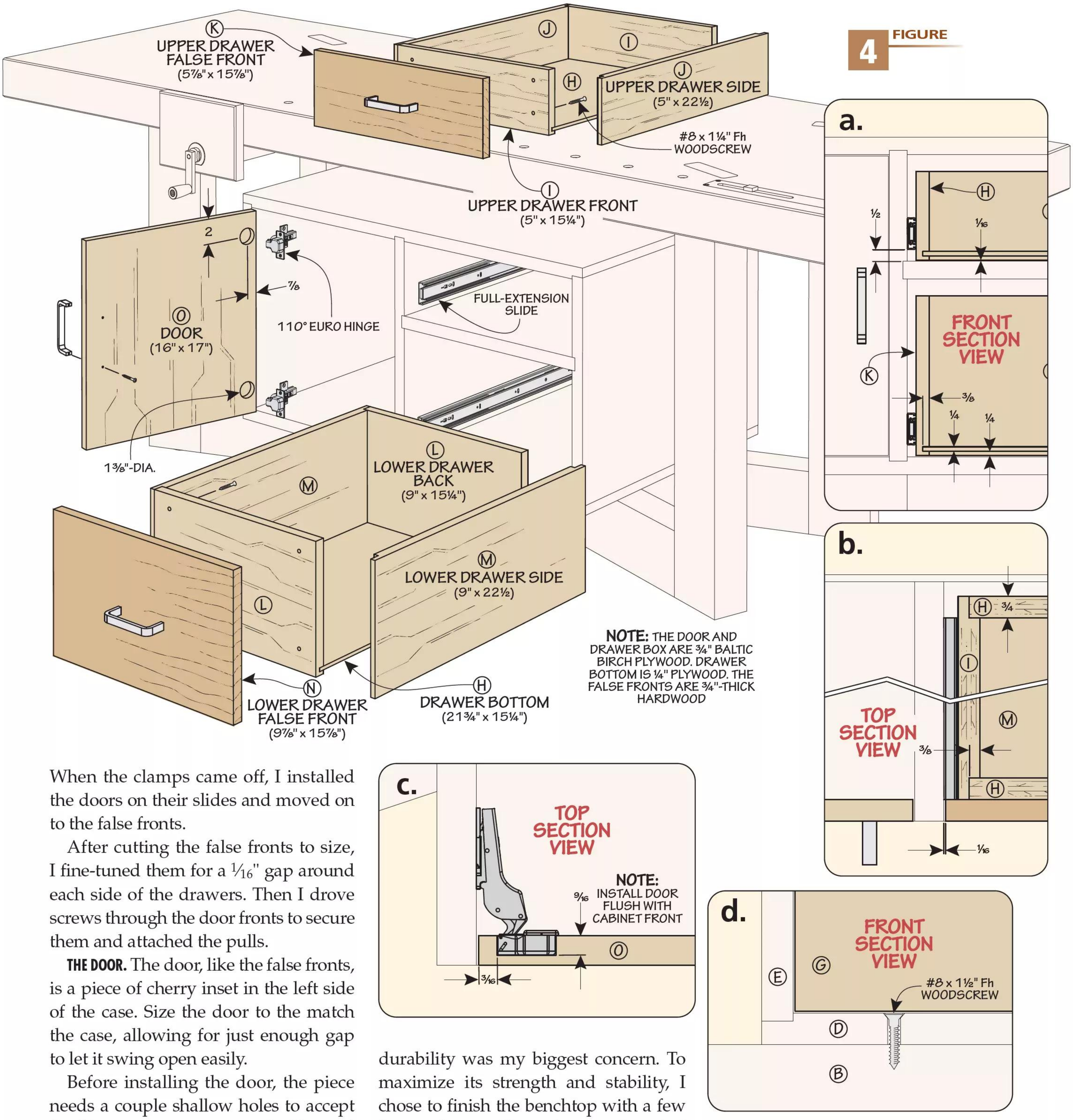
The final step in making the storage cabinet is to make and attach the door and drawers shown on the next page. While they can be done in any order, I began with the drawers.

DRAWERS. There are two drawers in the case: a shallower, upper drawer and a deeper, lower drawer. The drawers are primarily Baltic birch, with a thinner panel serving as the bottom. To provide some contrast on this cabinet however, each drawer has a cherry false front (matching the legs of the base).

After the initial sizing (hold off on the false fronts for now), I made the rabbets on the ends of the side pieces (Figure 3b). As with the rabbets on the case pieces, I buried the blade in an auxiliary fence, though this time I used a miter gauge to help me run the pieces through. Next I used a narrow dado stack to cut the grooves for the plywood bottom (Figure 4a on following page).

With the joinery cut, it was time to assemble the drawers. I glued up the front, back, and side pieces, with the bottom panel enclosed in its grooves.

FIGURE 4



When the clamps came off, I installed the doors on their slides and moved on to the false fronts.

After cutting the false fronts to size, I fine-tuned them for a 1/16" gap around each side of the drawers. Then I drove screws through the door fronts to secure them and attached the pulls.

THE DOOR. The door, like the false fronts, is a piece of cherry inset in the left side of the case. Size the door to the match the case, allowing for just enough gap to let it swing open easily.

Before installing the door, the piece needs a couple shallow holes to accept the hinges. As you can see in Figure 4 and Figure 4c above, these are sized to the door hinge, and they can be made easily enough with a Forstner bit at the drill press. Now the door can be hung in place and the pull can be screwed on.

FINISHING. From here, the easy route was to finish the parts of the bench before attaching them. A workbench is inevitably going to take a beating, so durability was my biggest concern. To maximize its strength and stability, I chose to finish the benchtop with a few layers of epoxy. First, of course, I sanded the top for a smooth look. After sanding, I took the time to apply three coats of epoxy to the benchtop, sanding in between each application as well.

Once the last layer of epoxy cured, it was time to give the whole thing a couple coats of spray lacquer. This provides sufficient protection for the rest of the bench, and a gorgeous, satin finish.

ATTACHING THE CABINET. Finally, it's time to attach the cabinet to the workbench. Remove the drawers, then center the case over the lap joint on the stretchers. Drive the screws through the case's corners to secure the cabinet, as in Figure 4d above. The result is a sleek-looking bench built from some of the sturdiest materials of the modern day.

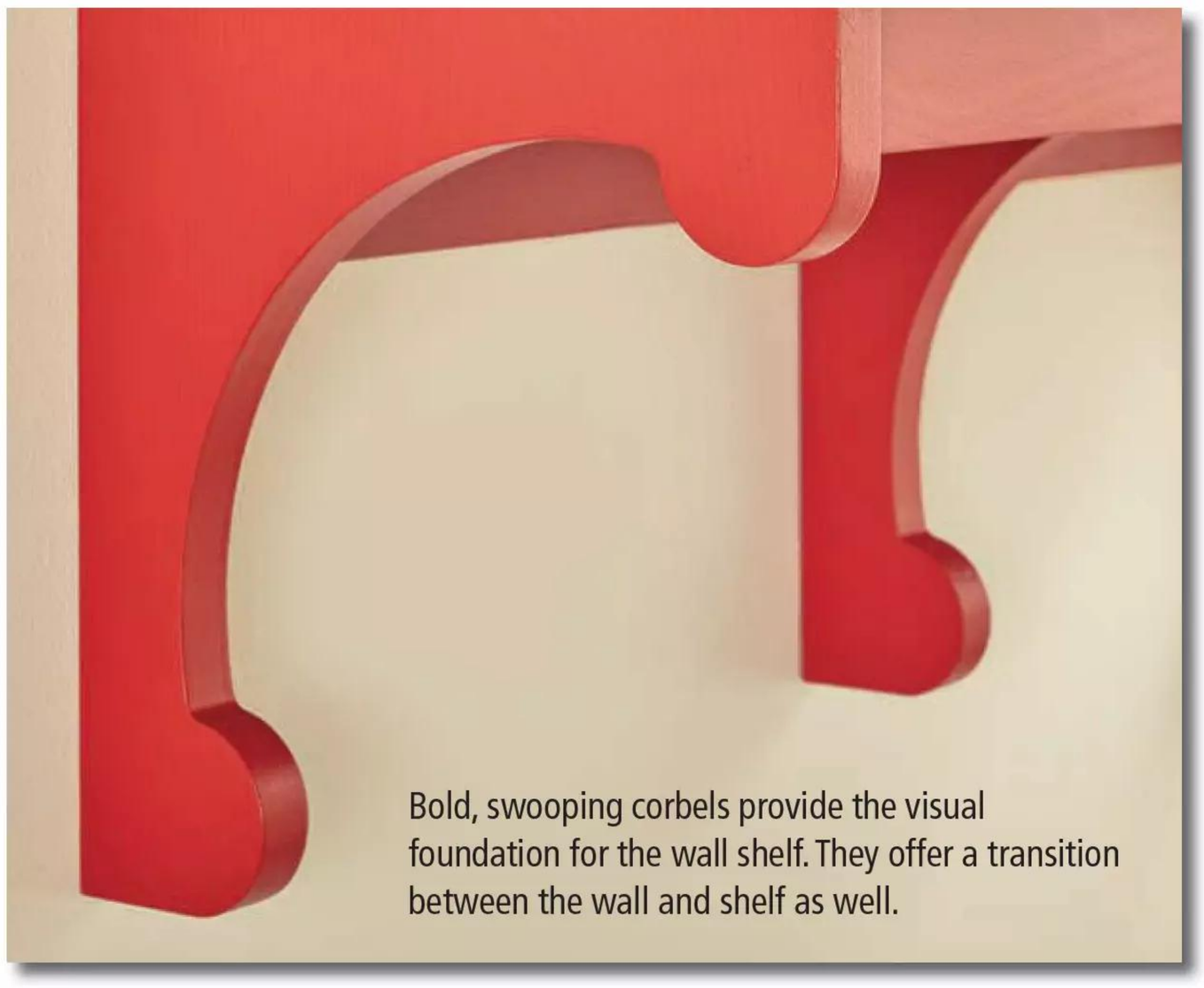
DESIGNER Project

Written by: Phil Huber; Project Design: John Doyle

▲ Diamond cutouts and a relief along the front edge are inspired by design details found in Scandinavian folk arts.

Nordic Wall Shelf

▲ In addition to its practical storage, the shelf is transformed by the two-tone paint scheme into a stage for showing off its contents.



Bold, swooping corbels provide the visual foundation for the wall shelf. They offer a transition between the wall and shelf as well.

Illustrations: Becky Kralicek

Easy-access storage is the purpose of this project. But that doesn't mean you can't have fun with the details.

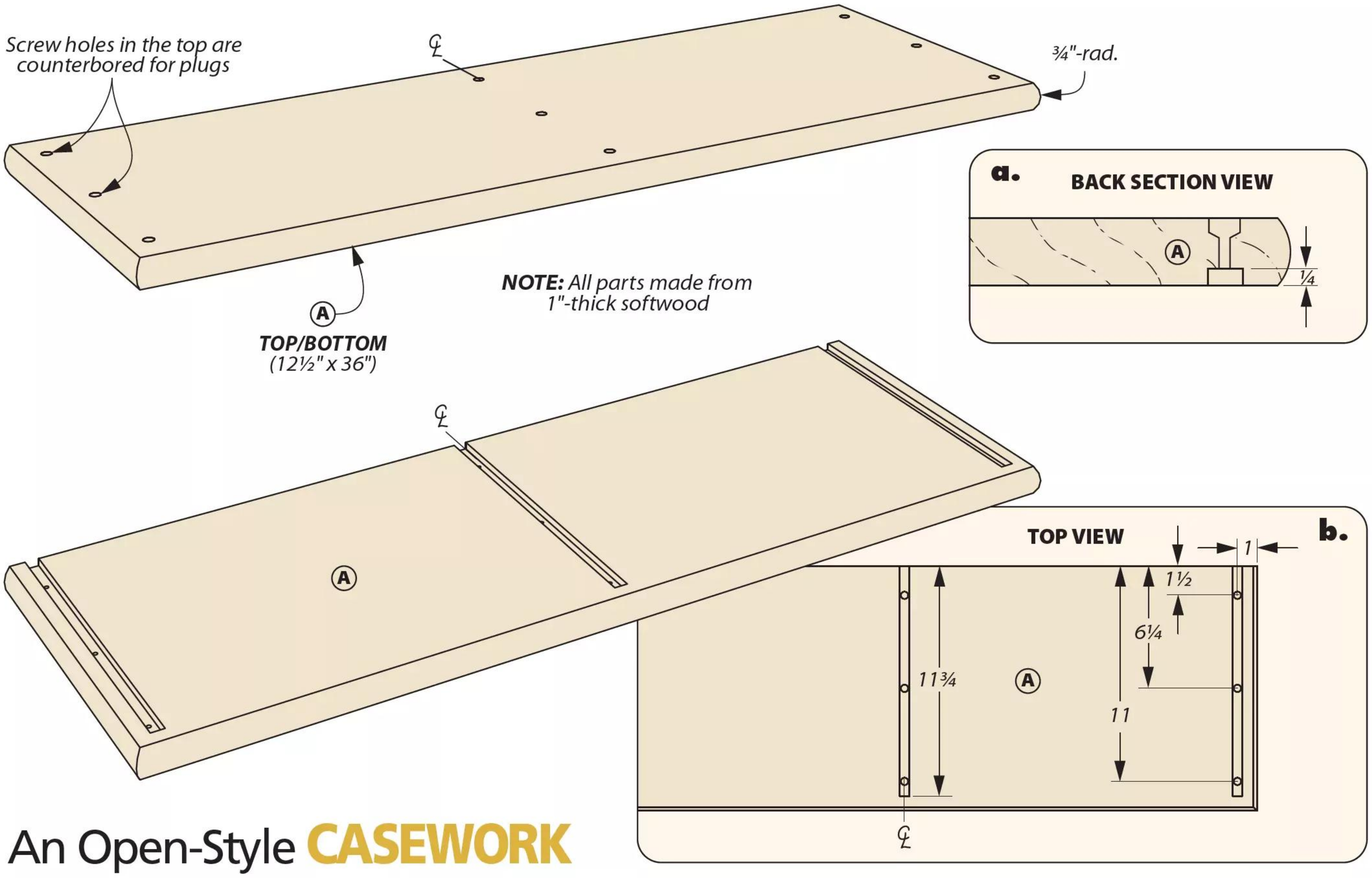
It's tempting on a woodworking project to go for a clean, spare appearance. The idea being to let the wood, its colors, grain, and figure, be the showpiece. On the other hand, you can emphasize certain characteristics of wood (its strength and ease of shaping) to create something with a totally different effect. The second path is the one designer John Doyle selected for this wall shelf.

The inspiration for it came from a photo in one of the other magazines in our corporate family, *Old House Journal*. The shelf hung in a kitchen and took design cues from Danish motifs and the Swedish artists Karin and Carl Larsson. The result is a shelf that packs in a lot of storage and a just-right level of eye candy.

A bold Scandinavian red for the case matches the relaxed style. The six cubbies formed by the inner shelves serve to both organize and display the items you keep there.

For our version, we used southern yellow pine we already had in the shop. Considering the design's origins, softwood is appropriate. The material is friendly and easy to shape. It forms a lightweight, yet strong project.

During the construction, you'll stick to the fundamentals for joinery: dadoes and rabbets. The details are created with the help of templates and some handwork.



An Open-Style CASEWORK

This project thrives on symmetry. So what you find on one part is often duplicated on its twin on the opposite side of the piece. As you work, ask yourself, "Where else do I need to do this step?" and you'll be in good shape.

TOP & BOTTOM. The top and bottom sandwich the components of this project, making a logical starting point. The drawing above points the way forward.

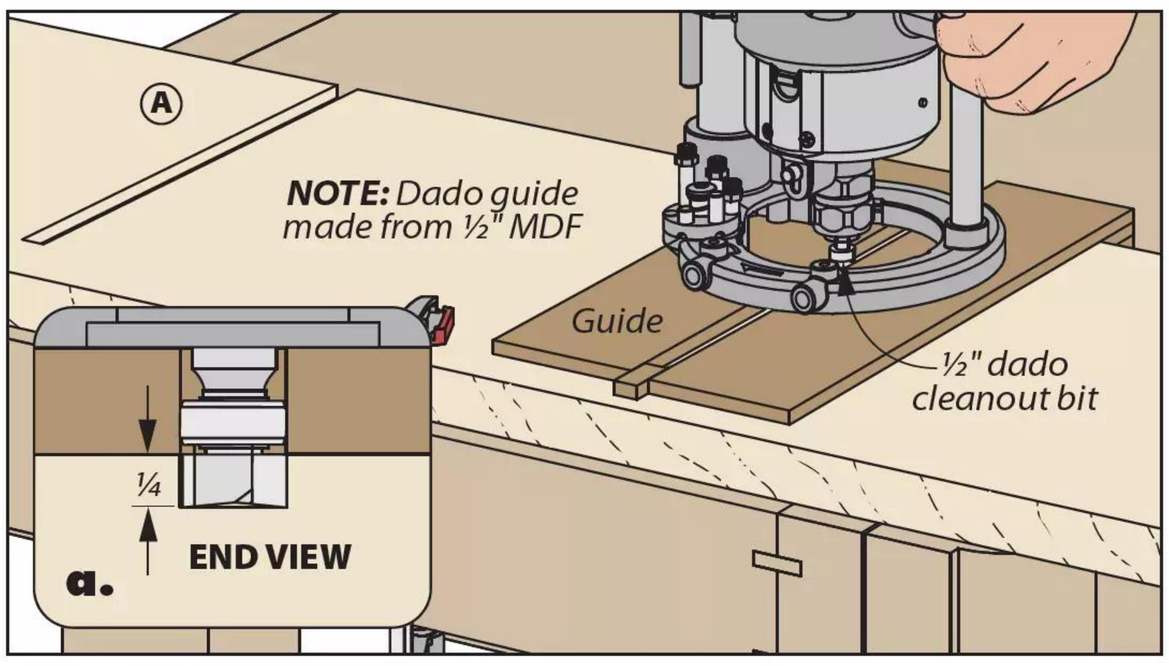
Depending on available material, your first steps may be to glue up panels to make many of the parts for this project. Cut the top and bottom to size and break out your router for some joinery.

SIMPLE ROUTER JIG. Stopped dadoes house three uprights. The locations for these are shown in detail 'b' above. Shop manager Marc Hopkins used a shop-made guide to rout the dadoes. This is shown in the box at right. Two pieces of MDF and a spacer support the router and form a path for the bit to follow.

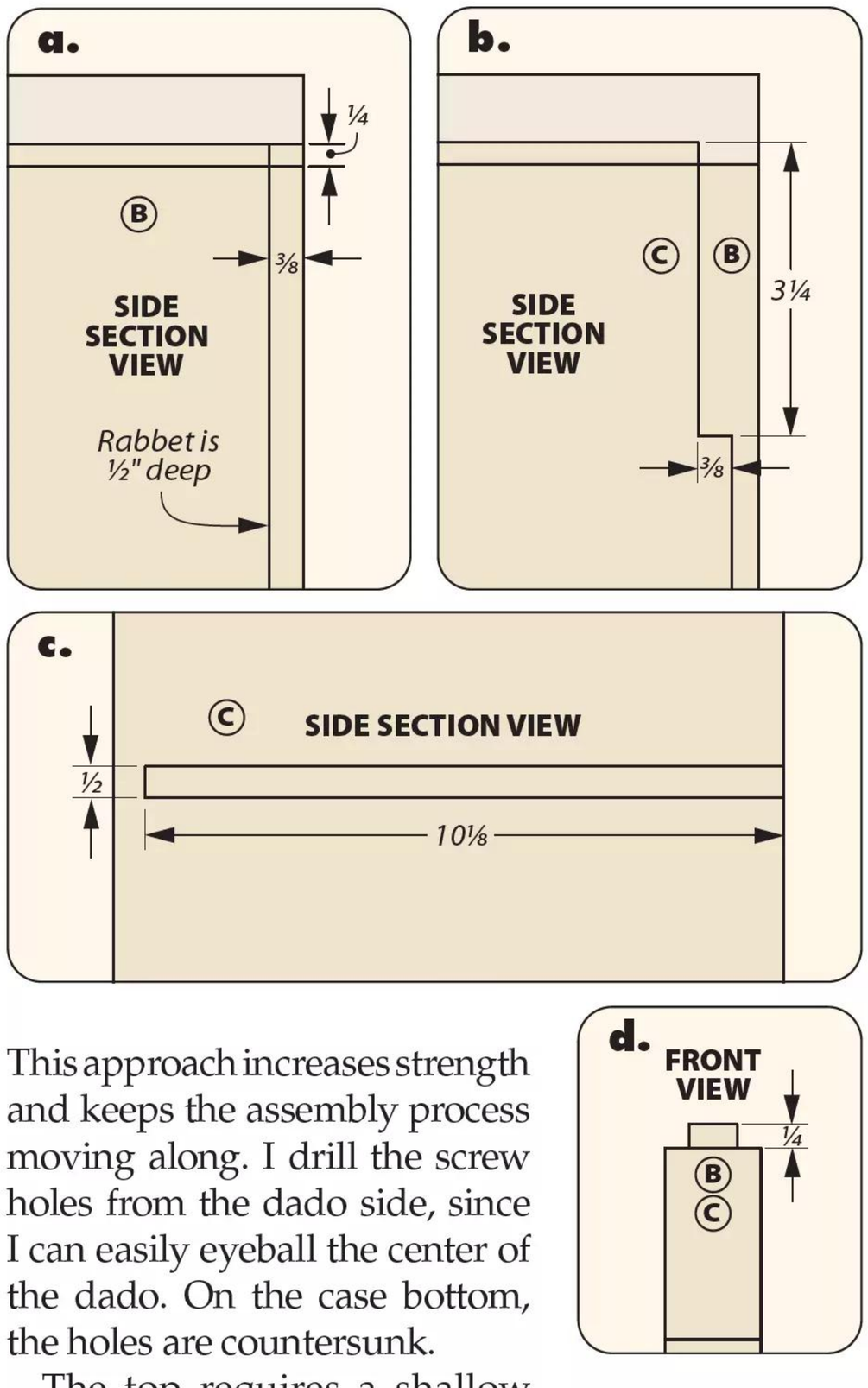
A fence on the back keeps the guide square to the rear edge of the workpiece. The bearing on a dado cleanout bit follows the guide. This means that the path can be lined up on your layout line, simplifying setup. The dadoes are shallow enough to rout in a single pass. Square up the ends of the dadoes.

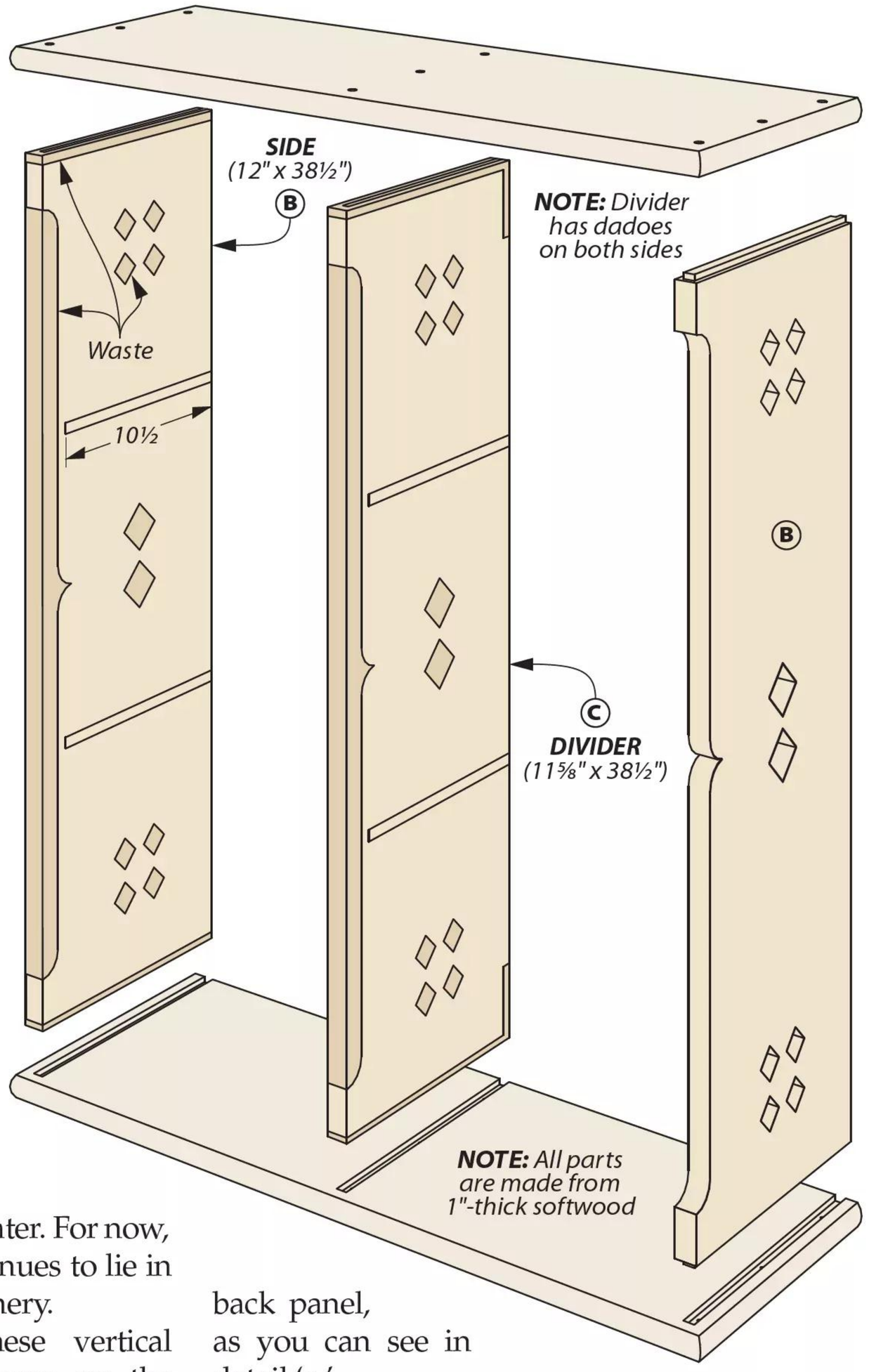
REINFORCEMENTS. The dado joints are backed up by woodscrews.

STOPPED DADOES



Double-Sided Guide. Similar to a T-square jig, this one features a fence and an arm to make 90° dadoes. The upgrade is to add a second arm that prevents the router from wandering off course. The space between the arms matches the router bearing.





This approach increases strength and keeps the assembly process moving along. I drill the screw holes from the dado side, since I can easily eyeball the center of the dado. On the case bottom, the holes are countersunk.

The top requires a shallow counterbore. This accommodates wood plugs for a flush surface. The top will most likely be used as another shelf, so a smooth surface provides a cleaner look.

A PROFILE. The ends and front edge of the parts feature a bullnose, as in shown in detail 'a' on the previous page. I formed this at the router table using a ¾" roundover bit. Raise the bit so that the top of the cutting edges align with the center of the workpiece.

SIDES & DIVIDER

From the top and bottom, the process turns to the bits that connect them. The upper right drawing shows the two sides and a center divider. At first glance, they appear identical. Don't be fooled. The divider is narrower to sit ahead of the case back. You can see the decorative details drawn in. We'll get to those later. For now, our attention continues to lie in the direction of joinery.

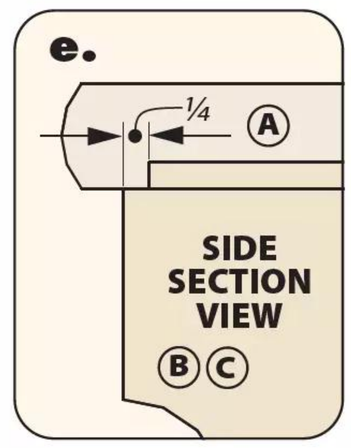
SHORT TENONS. These vertical pieces require tenons on the ends to fit the dadoes (details 'a' and 'd'). One option to form the tenons is to use a dado blade at the table saw. Cut a rabbet along each face of the workpiece to create the centered tenon.

Since long pieces are unwieldy, a second option is to bring the tool to the piece. A handheld router and a rabbeting bit perform the same operation.

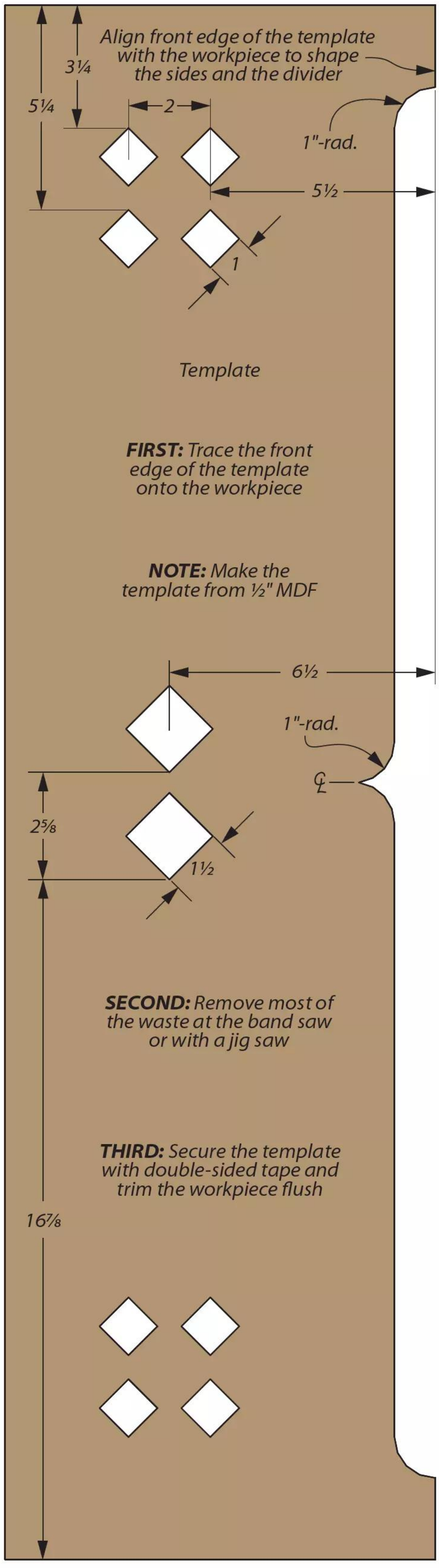
No matter which route you take, there's one more step: the tenon needs to be trimmed back at the front to fit the end of the dado (detail 'e'). A hand saw and a chisel handle this task well.

RABBETS & NOTCHES. Your tool of choice for tenon making stays in the game for the next step. The sides have a rabbet to house the back panel, as you can see in detail 'a.'

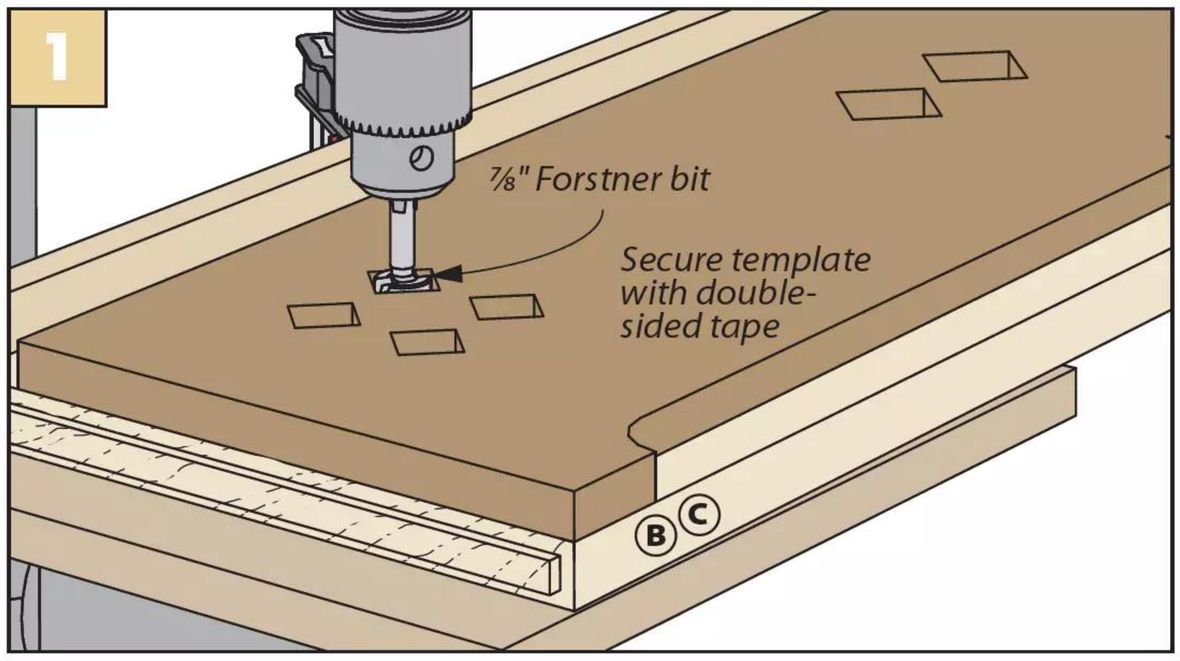
The divider doesn't need the rabbet. Instead, you cut a notch at the top and bottom, as in detail 'b.' This accepts hanging rails used to attach the shelf to the wall. Here again, I took the hand tool route. I cut the notch with a hand saw and cleaned up the cut with a chisel and file.



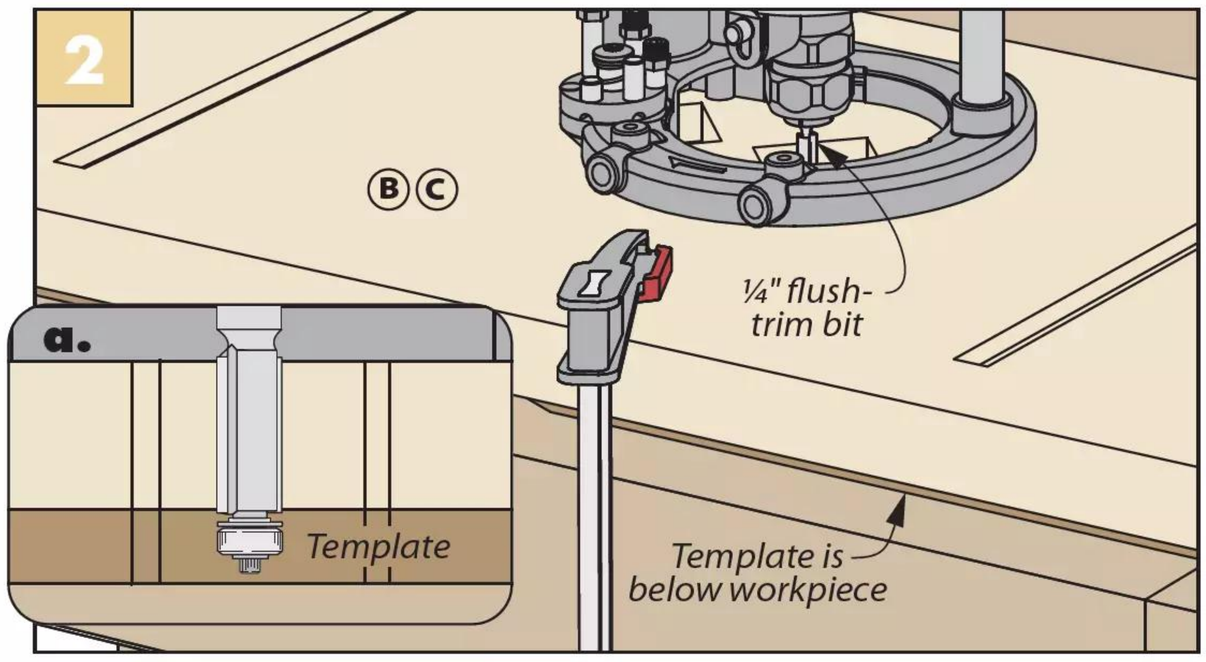
MORE DADOES. Grab the dado guide you used earlier. The last of the joinery details is to rout a pair of dadoes in the sides. Take note that the divider receives a set of dadoes on each face. Those dadoes aren't as long as detail 'c' shows. With a chisel and mallet, square up the ends of the dadoes. It's now time to get a little fancy.



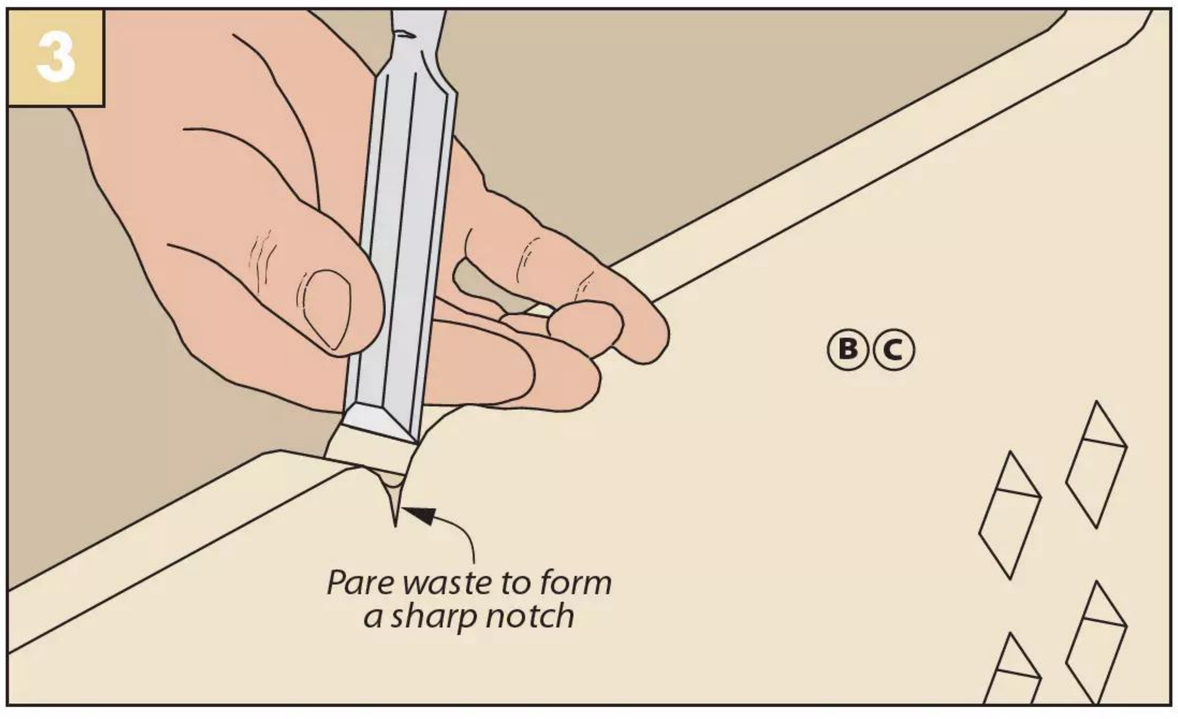
SHAPING WITH A TEMPLATE



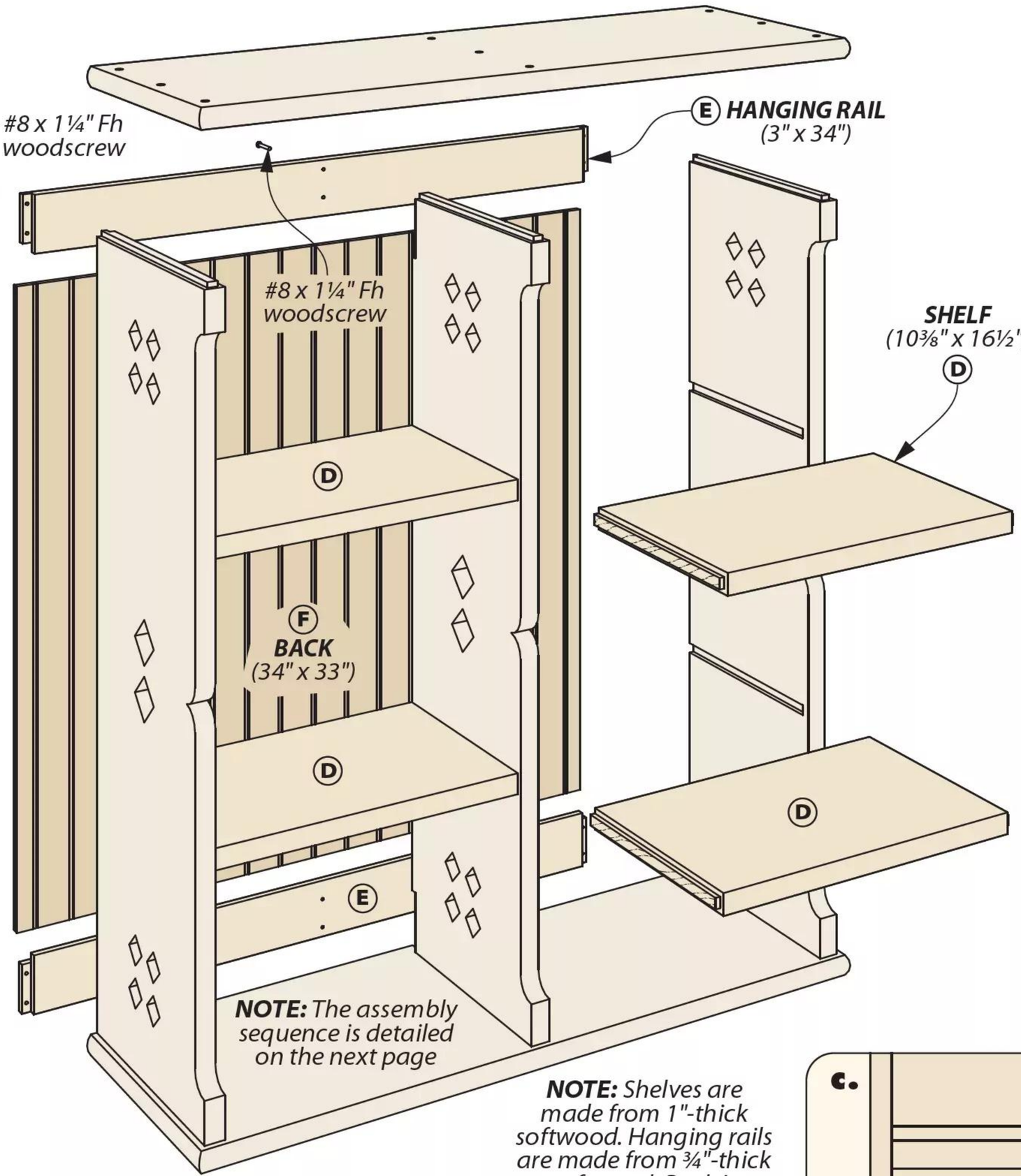
Drill Bits Save Time. At the drill press, remove most of the waste in the diamond cutouts with a Forstner bit. Set up a fence to help align the bit for each row of cuts. Use a 1⅜" bit to clear out the middle pair of diamonds.

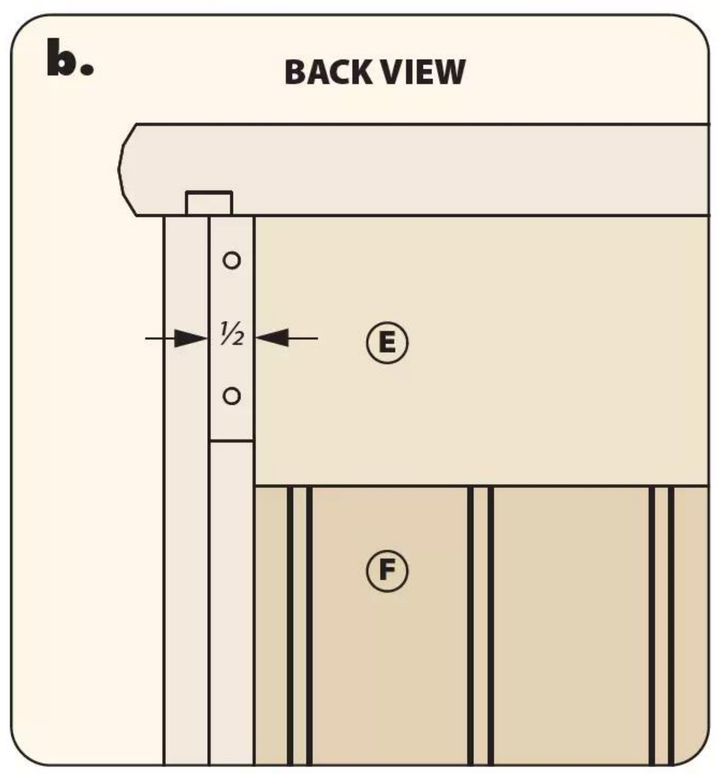


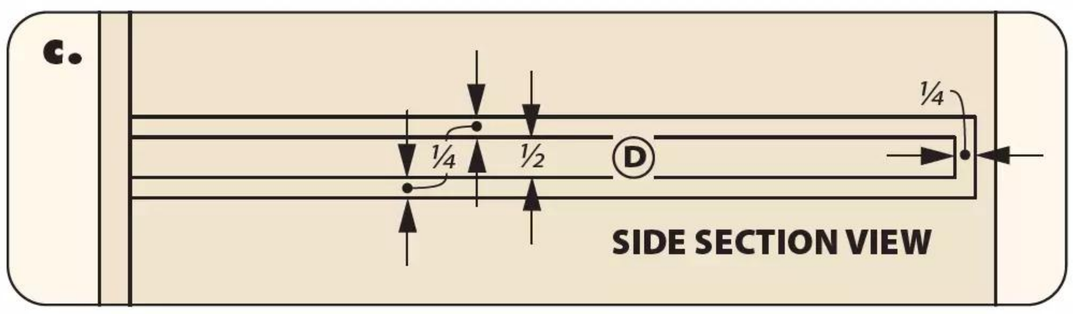
Fool The Eye. The diamonds appear to have sharp corners. Actually, the corners match the radius of a small-diameter flush-trim bit. Move the router clockwise around the inside of each cutout on the template.



A Sharp Notch. After trimming the cutout along the front edge of the sides and divider, the center notch requires some attention. Here I cut into the notch with a jig saw. Then pare into the notch with a chisel to form a crisp crease.







NOTE: *Shelves are made from 1"-thick softwood. Hanging rails are made from ¾"-thick softwood. Back is ⅜" beaded plywood*

Rout Some STYLE

The decorative elements of this shelf make it stand out, but they aren't difficult to create. The starting point is a full-size template. I like using ½" MDF for these. It's easy to shape and provides a considerable surface for a router bearing to follow.

CAREFUL LAYOUT. The drawing on the previous page gives you what you need to lay out the template. The care you take at this step pays off during the shaping steps that follow.

In general, using a template involves two steps: a rough, bulk removal of material followed by trimming the workpiece. Figure 1 on the previous page shows this with the diamond cutouts.

By contrast, the waste for the profile along the front edge is cut away at the band saw. The routing is done with a ¼" flush-trim bit (Figure 2). This smaller bit reaches farther into the corners of the diamonds. Figure 3 shows a cleanup step that requires a sharp chisel.

SHELVES & BACK

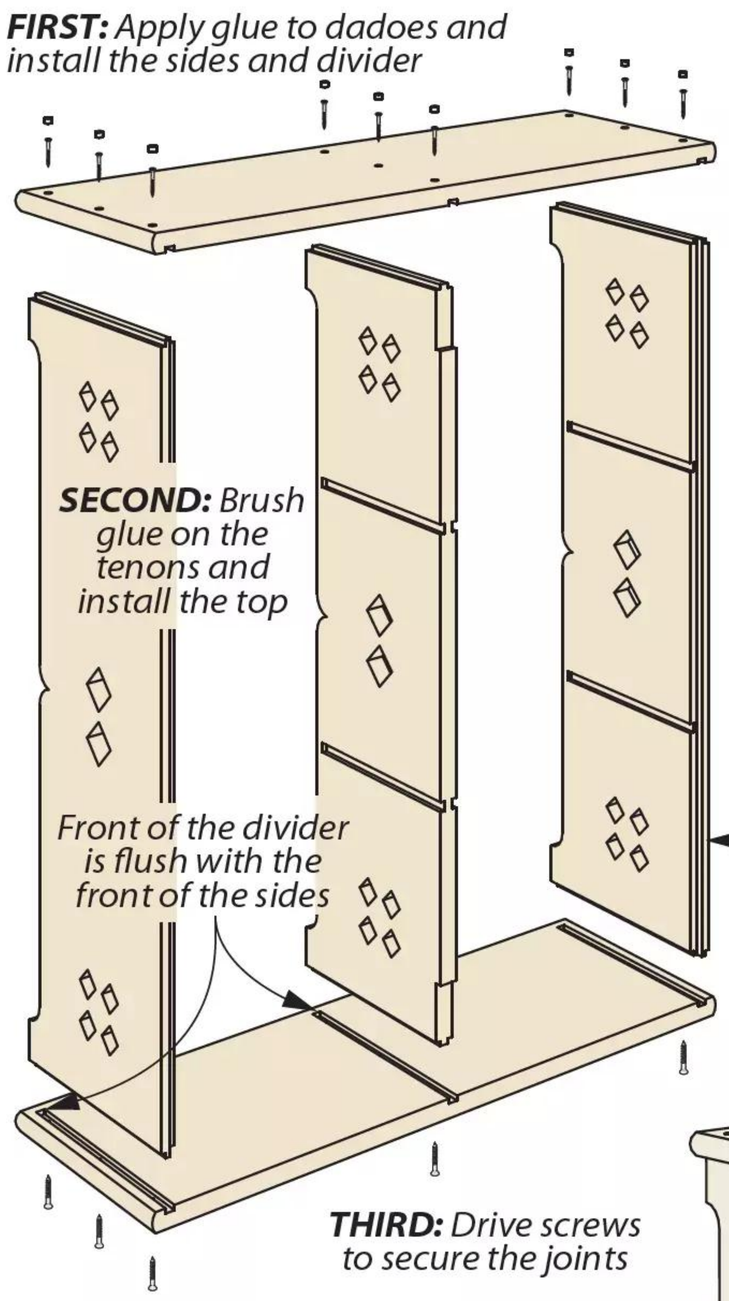
Several more parts wrap up the casework. In the drawing above, you see what's needed: a set of shelves, a back panel, and a pair of hanging rails. We'll concentrate on the construction now and address the assembly later.

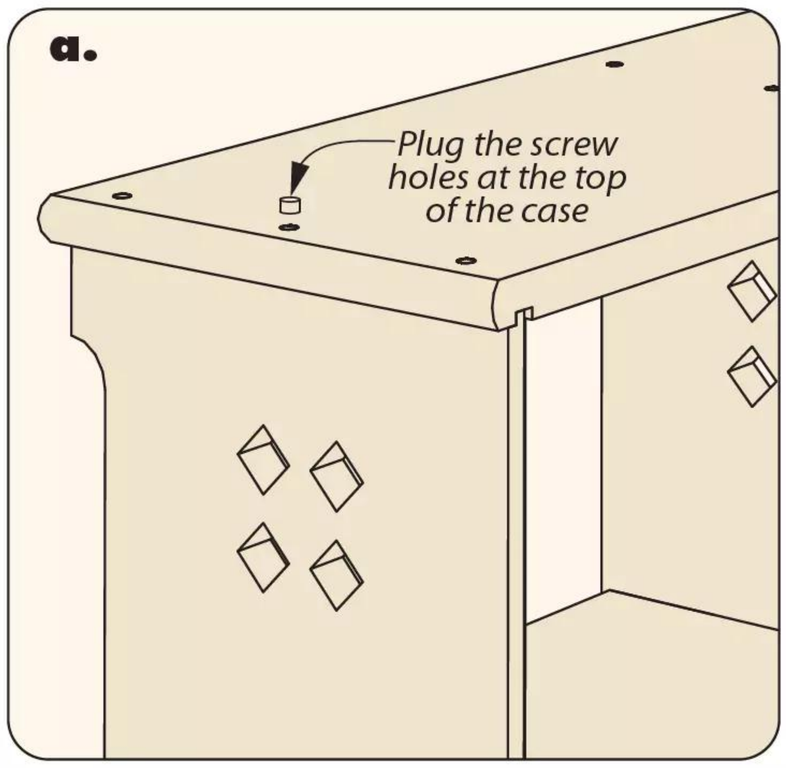
SHELVES. If you think of the shelves as small versions of the sides, you're on the right path. A tenon formed on each end fits the dadoes in the sides and divider. Don't forget to trim back the tenon. Take a look at detail 'c' to see what I mean.

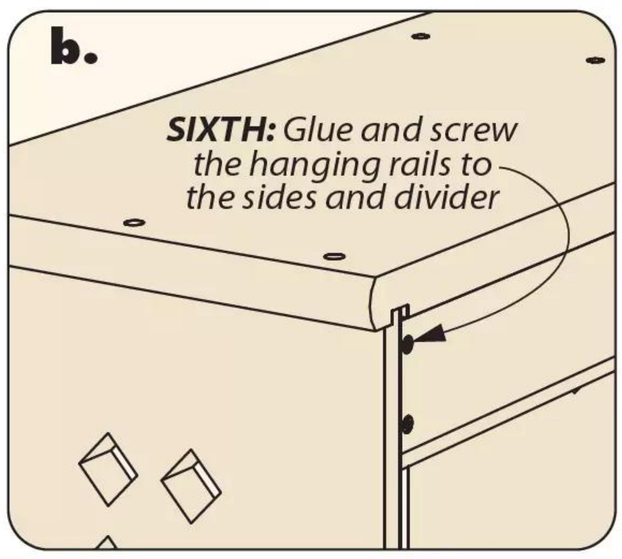
HANGING RAILS. Even with using pine, a cabinet plus contents gets heavy quickly. You need a strong, reassuring method to attach it to the wall. A pair of hanging rails serves this purpose. The rails have a rabbet along the inner edge that accepts the back panel, as in detail 'a.' Form a tenon on each end to nestle into the rabbet in the sides, as in detail 'b.'

The final step is to drill a pair of countersunk screw holes in each tenon. This reinforces the glue joint.

BACK. Perhaps the simplest part of the project is the beaded back. Take the time to size the back to center the beads in the opening.

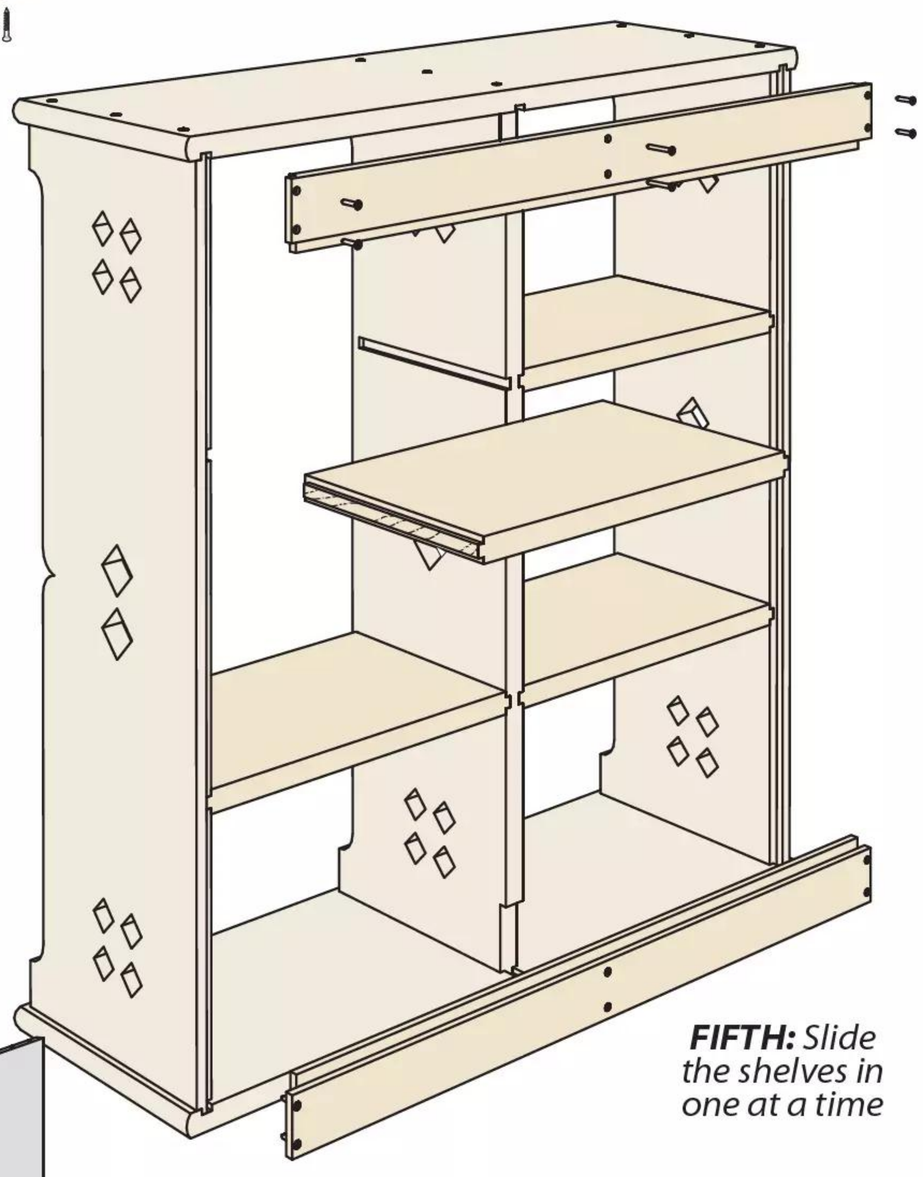






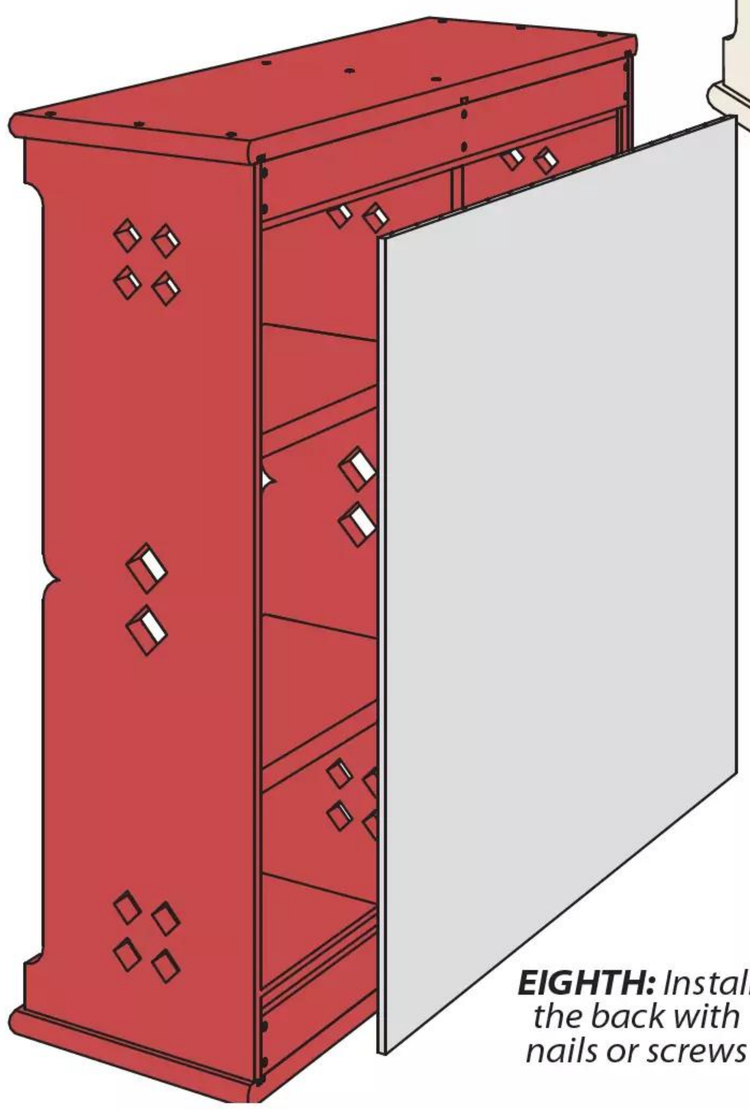
Sides are flush with the back edge of the top and bottom

FOURTH: Brush a small amount of glue into the dadoes

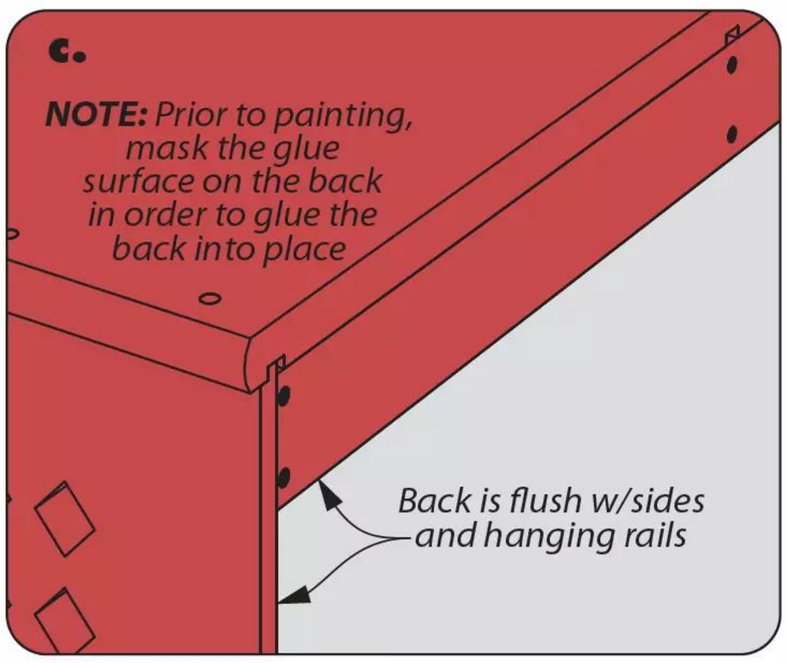


FIFTH: Slide the shelves in one at a time

SEVENTH: Paint the case and back



EIGHTH: Install the back with nails or screws



Cabinet parts, ASSEMBLE!

Excitement, anticipation, and impatience conspire to foil the clear-headed assembly of a project. There aren't that many parts on this project, so it seems like you can get the glue and clamps and have at it. The more you can calm yourself and plan, the better the process will go. The drawings to the left show the three stages of assembly.

OUTSIDE TO INSIDE. The outer case comes first. I assembled the top, bottom, divider, and sides with glue and woodscrews. A slow-setting glue is your friend. I like liquid hide glue.

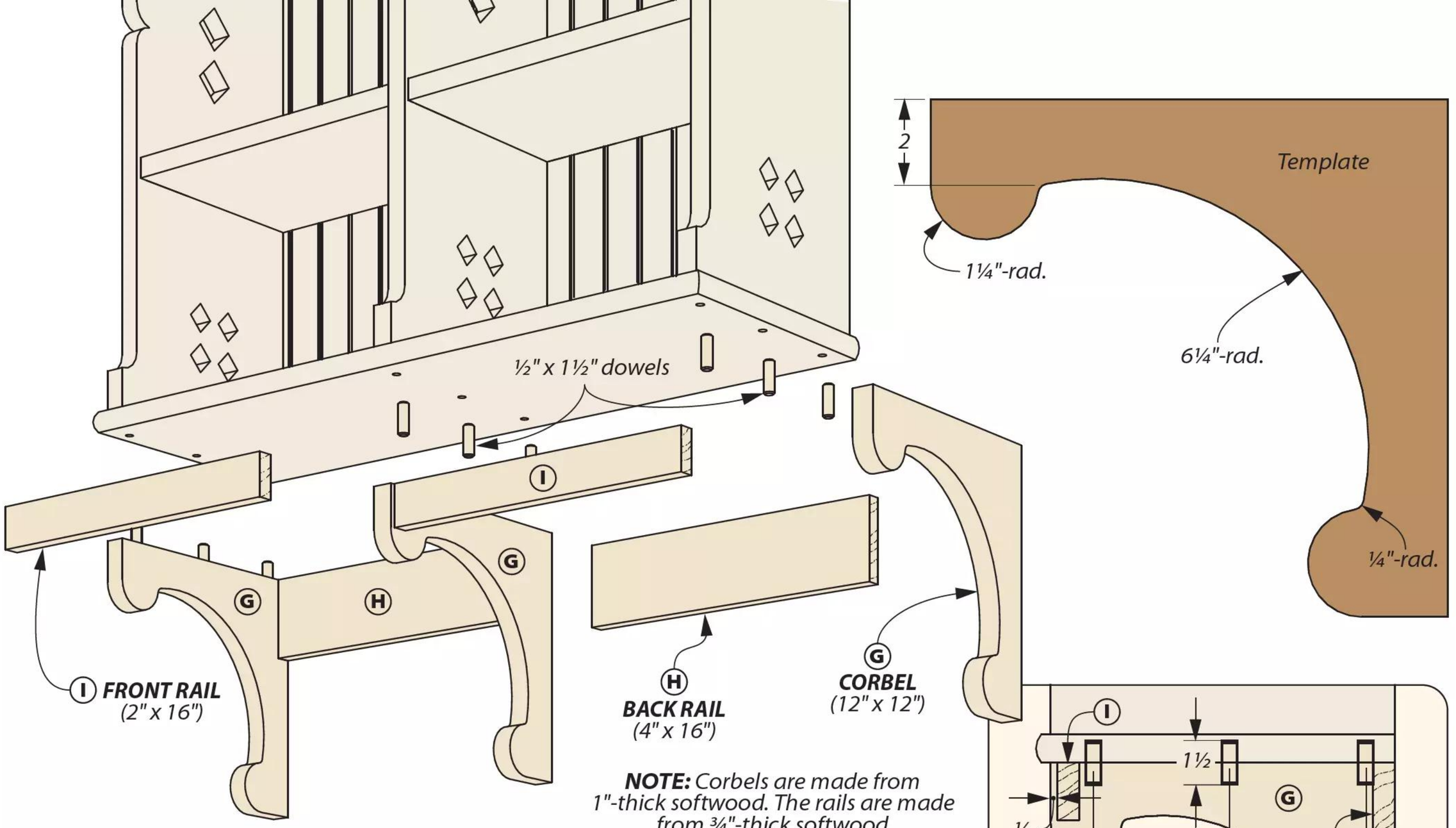
Even though screws secure the joints, I still use clamps to hold parts in place while I drill pilot holes and drive the screws. Wood plugs cover the screws in the top, as in detail 'a.' I use a hand saw, chisel, and sanding block to level the plugs. Watch out as the grain can split below the surface, causing you to use language you shouldn't.

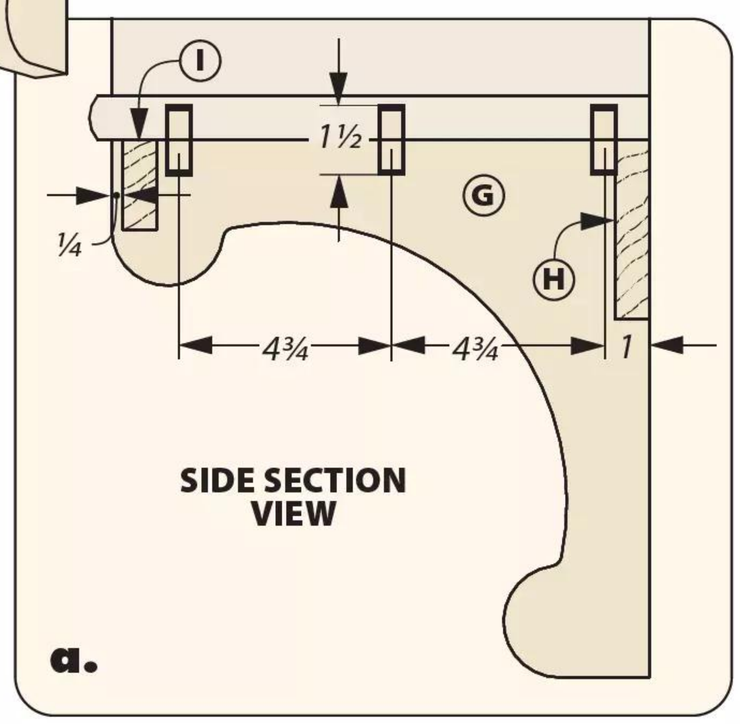
SHELVES & RAILS. From here, I installed the shelves. Slide these in from the back. Some woodworkers I know don't like sliding parts like this. I appreciate where they're coming from. However, in my view, this eliminates juggling multiple parts.

A small amount of glue applied to the back of the dado spreads along its length as you install the shelves. I find that liquid hide glue lubricates the parts, especially if the glue is warm.

The hanging rails are glued into the rabbets in the case sides (detail 'b'). I also run a bead of glue where the rail meets the top and bottom. Then drive the screws into the sides and divider.

PAINT & BACK. I hit pause on the assembly here for a finishing side quest. Our version has one





color of paint for the case and another for the back (refer to sources on page 66). So we painted the case prior to installing the back.

You have several options for installing the back. It can be glued in place and/or installed with woodscrews or nails. If you plan to add glue, be sure to mask off the glue surfaces before you paint the panel.

UNDERCARRIAGE

As it stands, the shelf can be put to use. However, a transitional element on the bottom gives it a more finished appearance, as you can see in the drawing above. Thick corbels and a set of rails act as a foundation, so to speak, even if they don't contribute to the support of the shelf on the wall.

CORBELS. The three corbels align with the sides and divider, as if they carry through the case bottom. They start as square blanks. In these, drill a set of dowel holes that will anchor them to the case bottom.

Just as before, the complex profile relies on a template. The upper right drawing provides the details to lay out the sweeping cove and lobes.

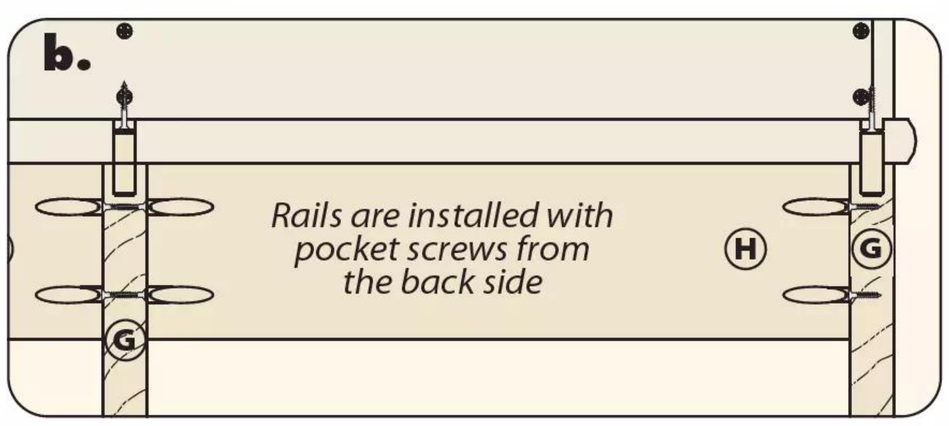
The grain direction on the blank is all over the place, which can lead to the router bit catching and causing tearout. You have two remedies. First, cut away as much of the waste as possible. I shoot for 1/16" and settle for anything less than 1/8".

The second answer is the router bit. Spiral-edged flush-trim bits possess a smoother cutting action that's less likely to grab unexpectedly. I like the bits that have a bearing on the tip as well as the shank end. As much as possible, rout with the grain direction running downhill. You may need to flip the part over and adjust the bit position.

RAILS. The remaining rails are cut to fit between the corbels. They're attached with pocket screws, as shown in detail 'b.'

I used dowel centers in the corbels to dimple the case bottom for the matching dowel holes. Then you can glue the corbel and rail assembly in place.

You built a sturdy project. Don't fumble the ball at the goal line. Be sure to secure it to wall studs with stout screws. W



Materials & Supplies

A	Top/Bottom (2)	1 x 12½ - 36
B	Sides (2)	1 x 12 - 38½
C	Divider (1)	1 x 11⅝ - 38½
D	Shelves (4)	1 x 10⅜ - 16½
E	Hanging Rails (2)	¾ x 3 - 34
F	Back (1)	⅜ beaded ply. - 34 x 33
G	Corbels (3)	1 x 12 - 12
H	Back Rails (2)	¾ x 4 - 16
I	Front Rails (2)	¾ x 2 - 16

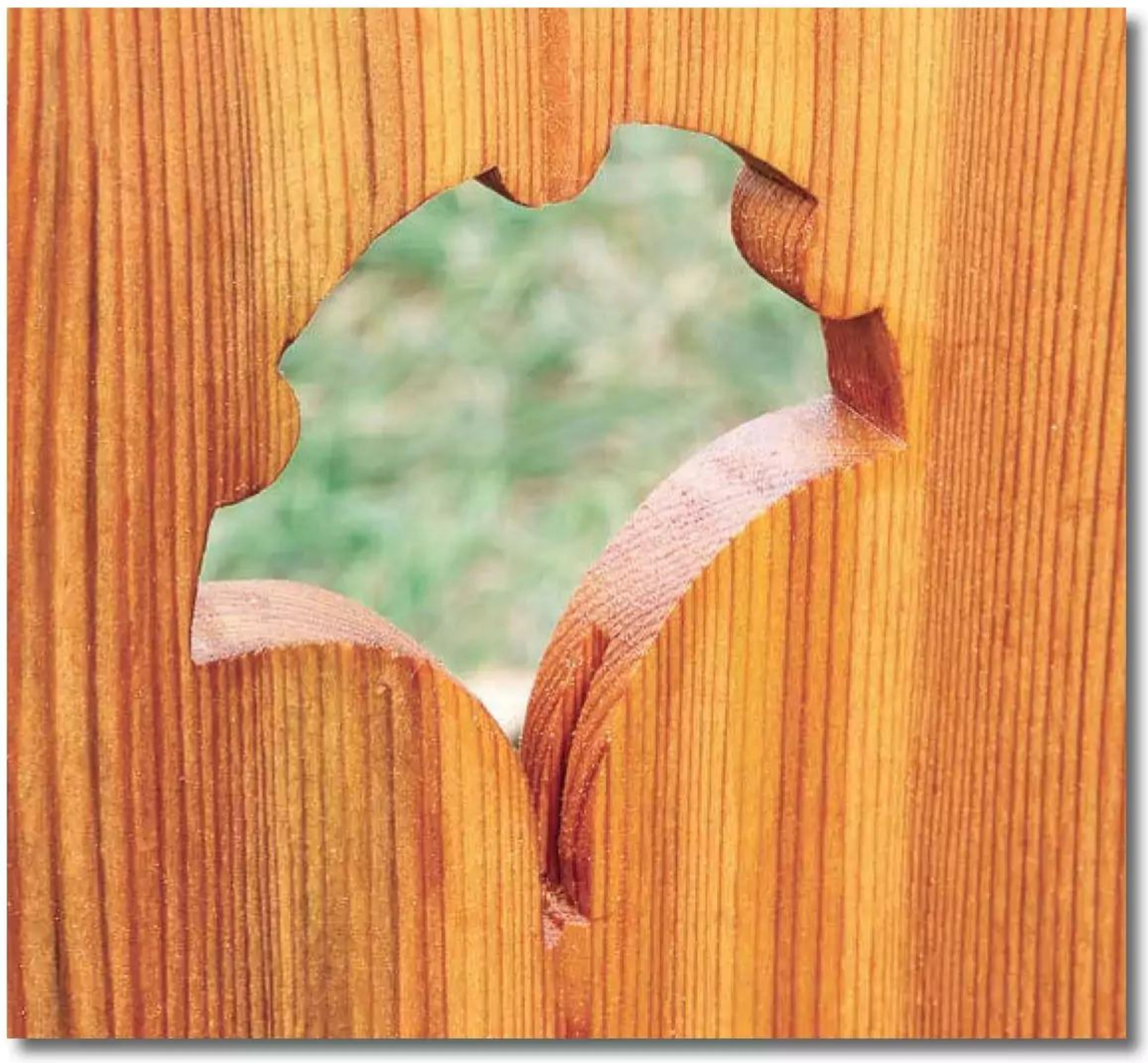
- (30) #8 x 1½" Fh Woodscrews
- (9) ⅜"-dia. x ½" Face-Grain Plugs
- (6) ½"-dia. x 1½" Dowels
- (12) #8 x 1¼" Pocket Screws

DESIGNER
Project

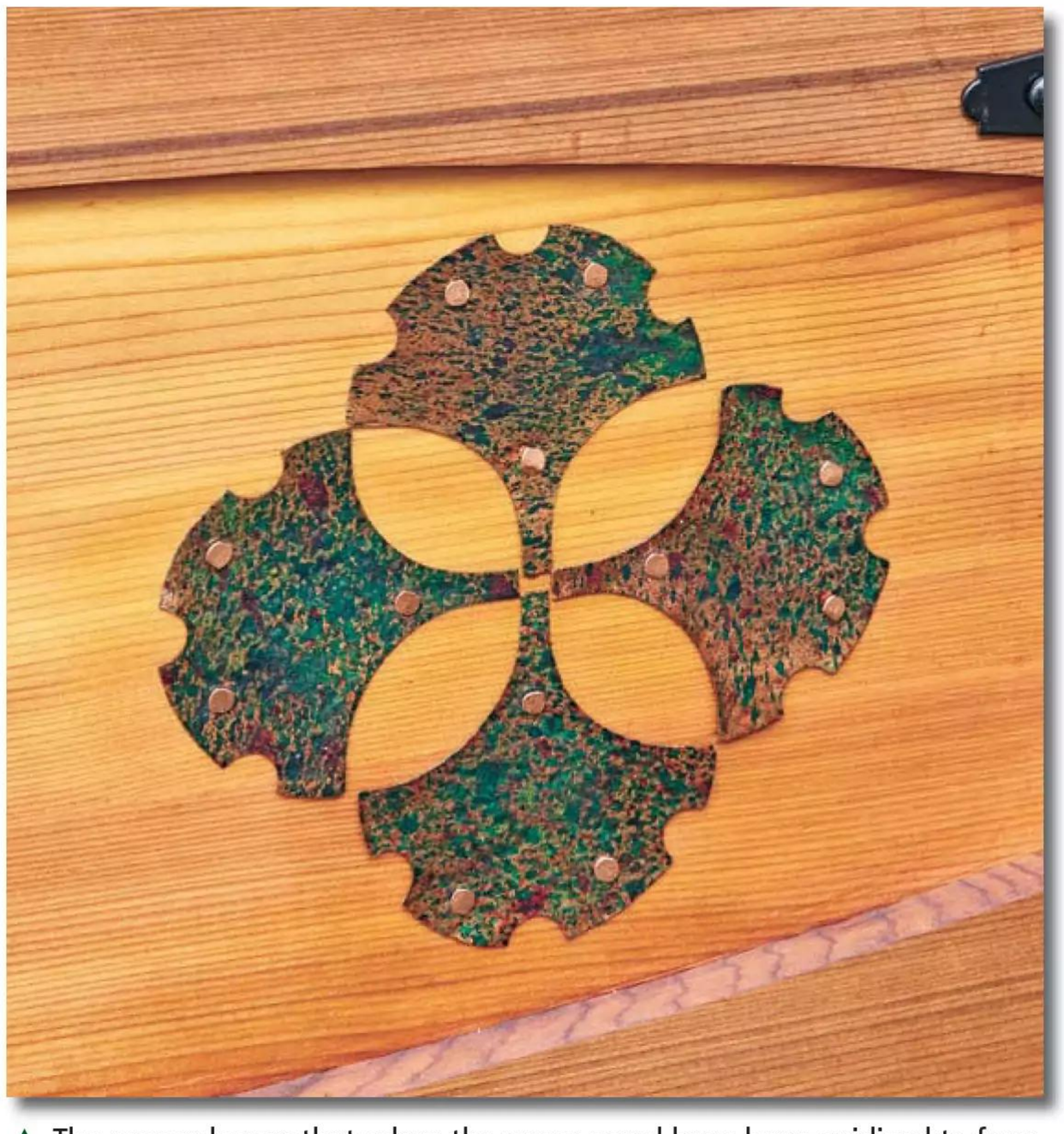
Written by: Rob Petrie; Project Design: Dillon Baker

Ginkgo Gate

Get ready for spring with this garden gate. Sturdy joinery and cedar wood combine to form a long-lasting and charmingly rustic piece.



▲ The stylized ginkgo leaf motif you see above is repeated in the cutouts on the lower slats, as well as the copper leaves on the upper panel.



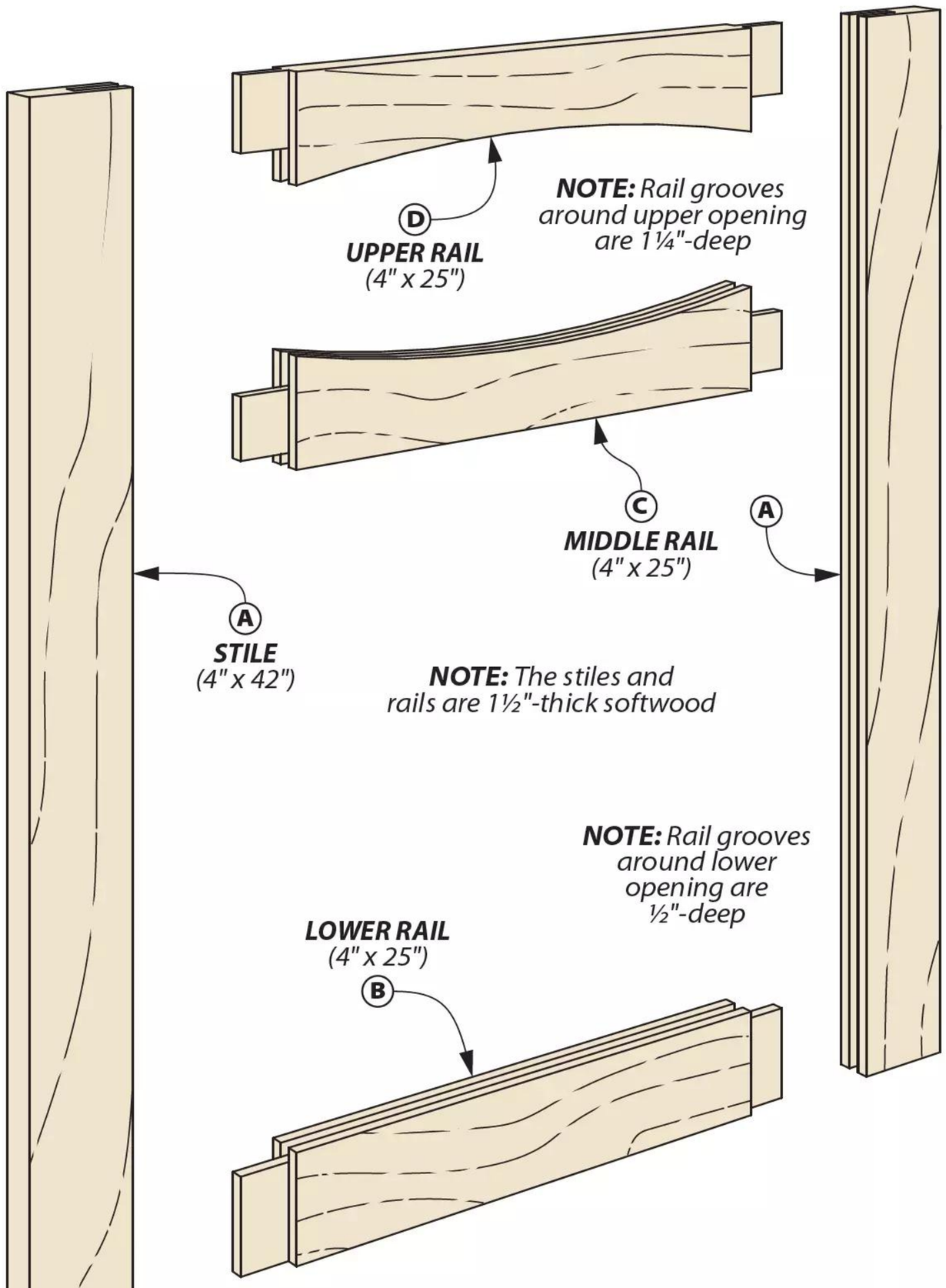
▲ The copper leaves that adorn the upper panel have been oxidized to form a patina. Take a look at the article on page 26 to learn the process.

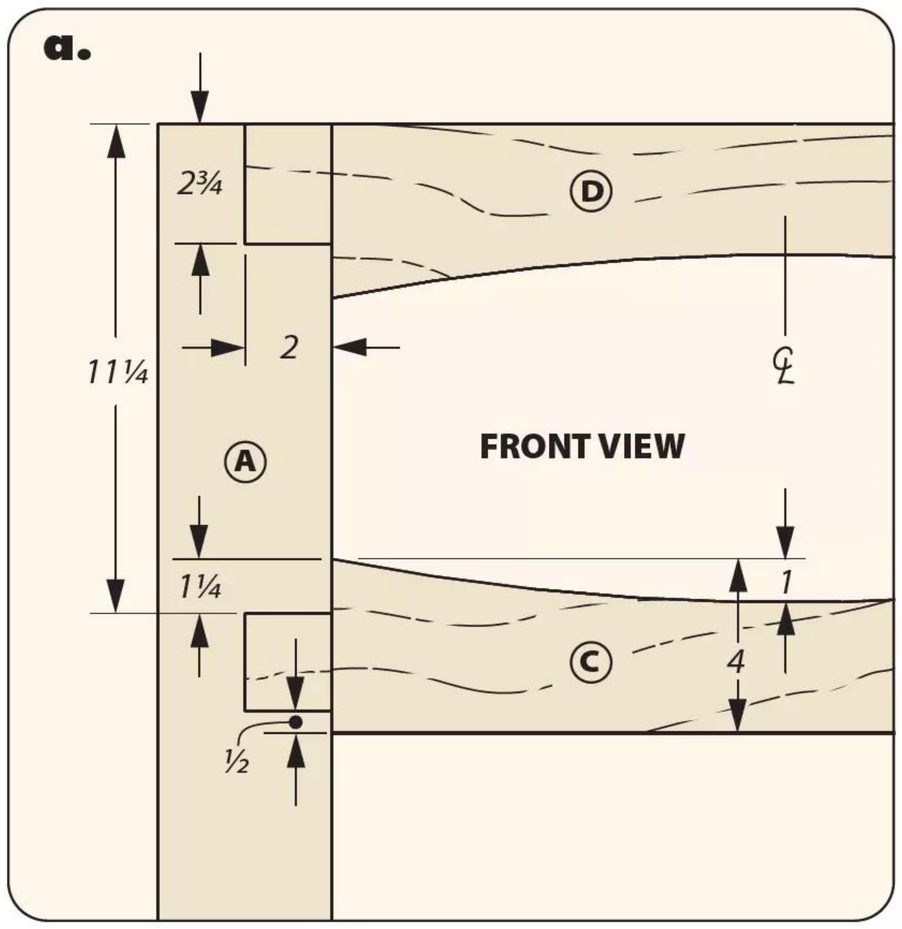
As winter sets in and the cold and the snow along with it, it becomes an excellent time to hunker down in the shop. There's no better way to take your mind off the bitter chill than preparing for spring, and to me, spring means gardens. Or, more accurately in this case, a garden gate.

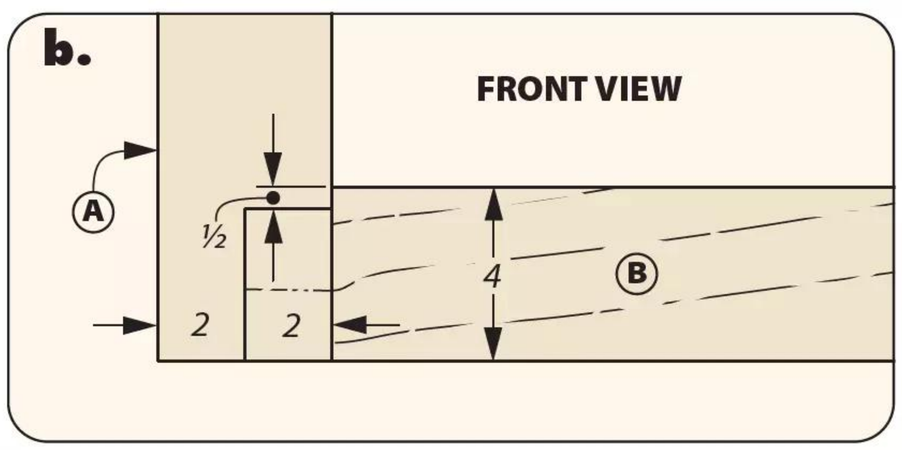
LEAF MOTIF. A gate isn't complex; after all, it's really just a door. But that doesn't mean it has to be boring either. A simple design used cleverly adds a unique sense of style. Our designer, Dillon Baker, was inspired by the ginkgo tree. Ginkgos are striking specimens if you're lucky enough to have them growing in your neck of the woods, especially in autumn. The leaves turn a distinct, bright yellow and fall all at once, littering yards and sidewalks in a plurality of little fans, holding their shapes until the snow falls over them. It was this scattered carpet that inspired the cutouts and copper leaves decorating the gate you see here.

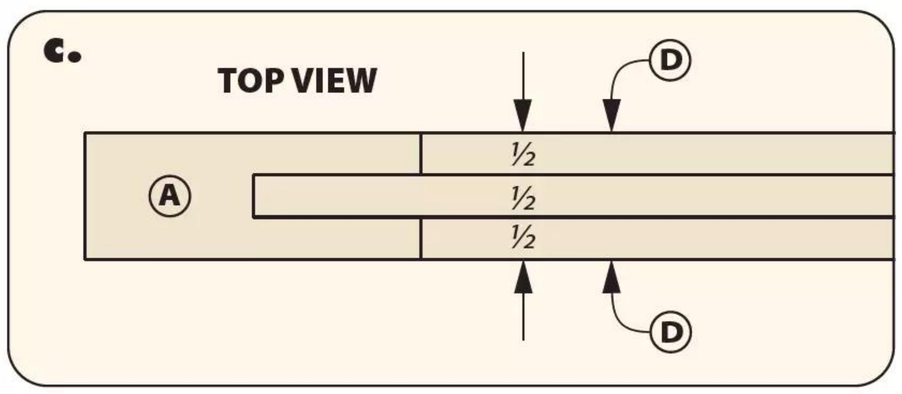
MATERIALS & JOINERY. Outdoor projects have certain requirements. The material needs to be resistant to the elements, and joints need to be sturdy enough to stand against wind and snow. Cedar is the wood of choice for its natural resilience, and tenons slot into grooves for a strong connection in the frame. Additionally, the tenons are reinforced with a draw bore, which uses dowels and offset holes to ensure those tenons are seated firmly. While copper will certainly change when left exposed, Dillon elected to lean into this, and added a patina (a process called patination) to the decorative leaves.

Illustrations: Becky Kralicek









Start with Stiles & RAILS

In its bones, this gate is a frame and panel door. I began by making the stiles and rails that constitute the frame of this pairing. These parts are joined by grooves in the stiles that accept tenons on the rails' ends. My preference is to work on the grooved portion of a joint first, so the stiles are where I started.

STILES. The stiles are the largest pieces on this project, yet they're relatively simple. I planed them down from 8/4 cedar first, then cut them to length and width.

With that done, the only thing they required was a groove along their interior edges (see details 'a' and 'b' above). I cut these at the table saw using a dado blade, as you can see in Figure 1 on the next page. This is a deep cut and fairly wide. However, cedar cuts easily, and I was able to do this in a few passes.

RAILS. Next come the rails. As you'll notice above, these parts are all the same size. However, the specifics of each one differ slightly. Each of these rails has the tenons I mentioned, along with a groove to accept either a panel (for the upper opening) or the slats (for the lower opening).

I cut the grooves first, again using a dado blade at the table saw. The tenons followed after that. You can see how I made the cut in Figure 2 on the next page. Your rip fence acts as a stop for cutting the shoulders, and an auxiliary miter gauge fence will

Materials & Supplies

A	Stiles (2)	1½ x 4 - 42
B	Lower Rail (1)	1½ x 4 - 25
C	Middle Rail (1)	1½ x 4 - 25
D	Upper Rail (1)	1½ x 4 - 25
E	Slats (4)	½ - 5¾ x 25
F	Upper Panel (1)	½ x 8½ - 22
G	Short Spacers (2)	½ x 1½ - 8½
H	Long Spacers (2)	½ x 1½ - 25

- (6) ⅜"-dia. x 1¼" Dowels
- (1) 24" x 24" 12-ga. Copper Sheet
- (24) #6 x ½" Copper Tacks
- (1 pr.) Strap Hinges
- (1) Pull Handle
- (1) Locking Gate Latch

help prevent tearout on the back end of the cuts.

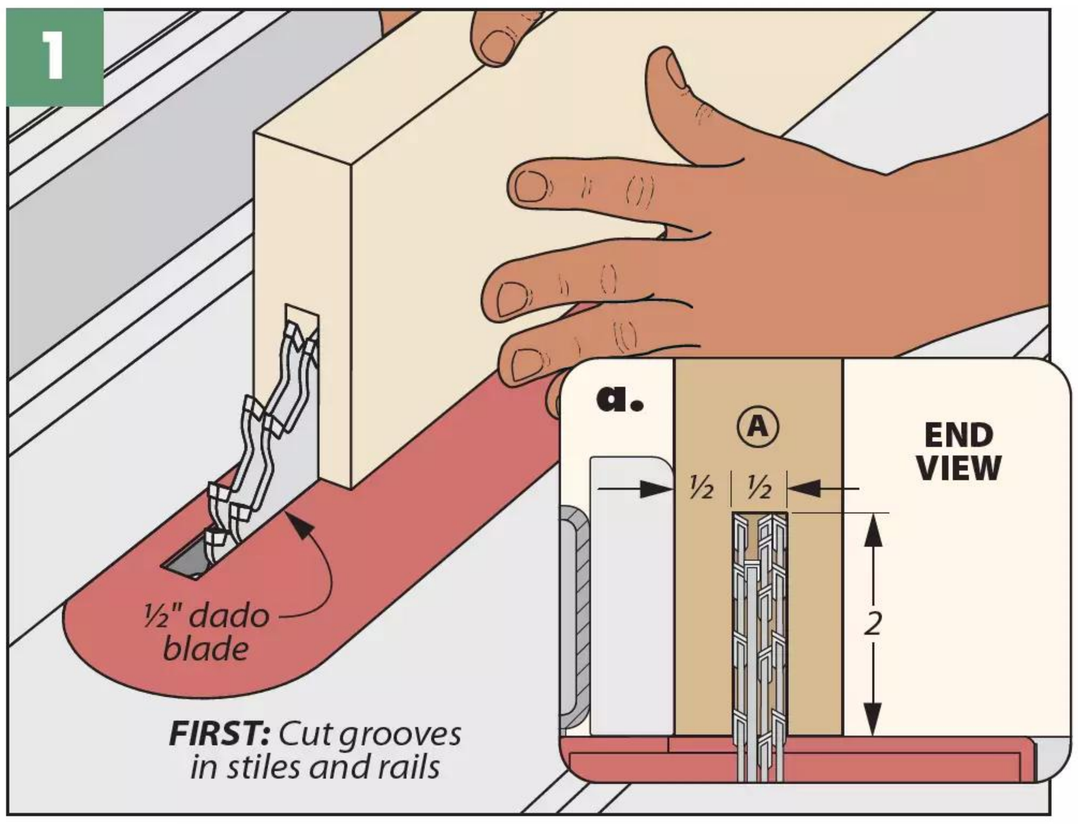
RAIL ARCHES. Last on these pieces are the arches along the grooves that surround the upper opening (meaning they'll be on the upper and middle rails — see detail 'a'). In order to cut these arches identically, begin by creating a template of the curve. A length of hardboard is a good material. The arc can be made by bending a yardstick (or a strip of hardboard) between two clamps to the distance of the radius. Strike that arc with a pencil and shape it using the band saw and spindle sander.

With the template in hand, attach it to one of the rails using double-sided tape. To remove most of the waste, cut along the template at the band saw, staying outside it, as in Figure 3 below.

To remove the blade marks and give the curve a finished edge, rout along the template with a flush-trim or pattern bit (Figure 4). With a workpiece of this size, I find the router table is ideal. Repeat the process on the other piece to complete the rails.

This concludes the "frame" half of the project. To finish, we'll make the "panel" half — or slats and panel to be more specific.

FRAME JOINERY & ARCHES



Get Groovy. The first piece of joinery to cut is the grooves. These are on the interior of the stiles, as well as the inner-facing edges of the three rails.

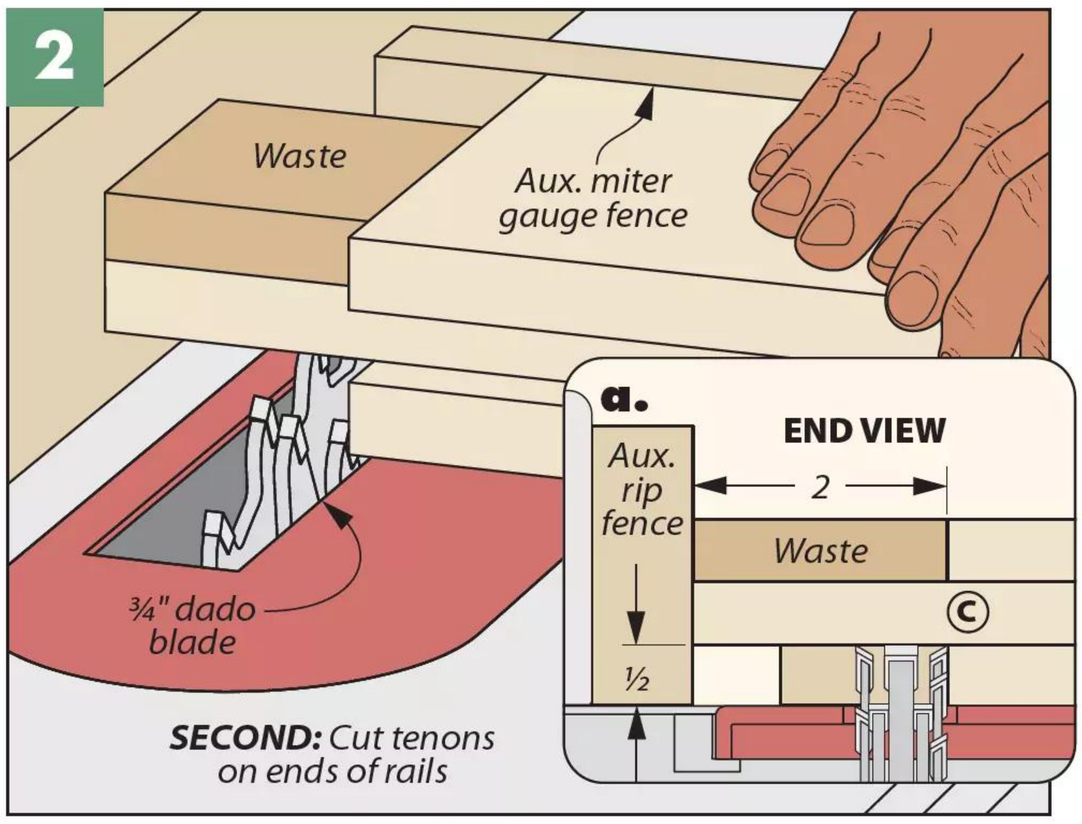
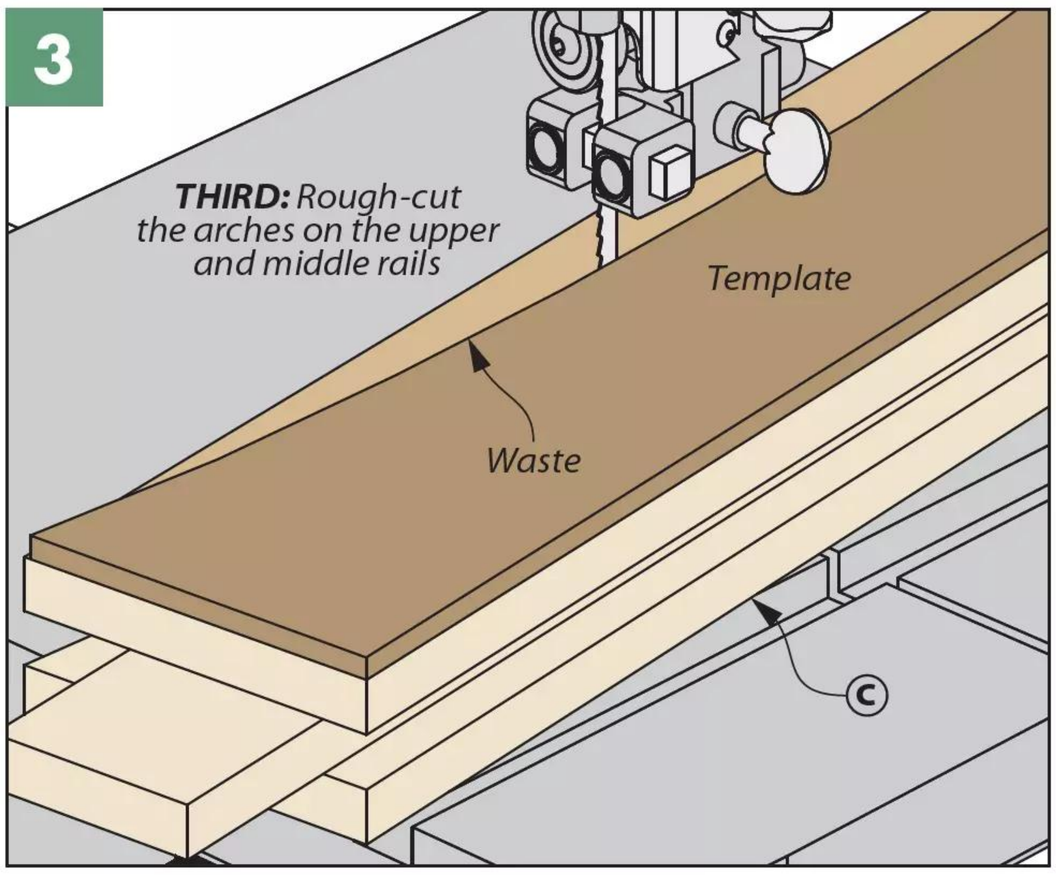
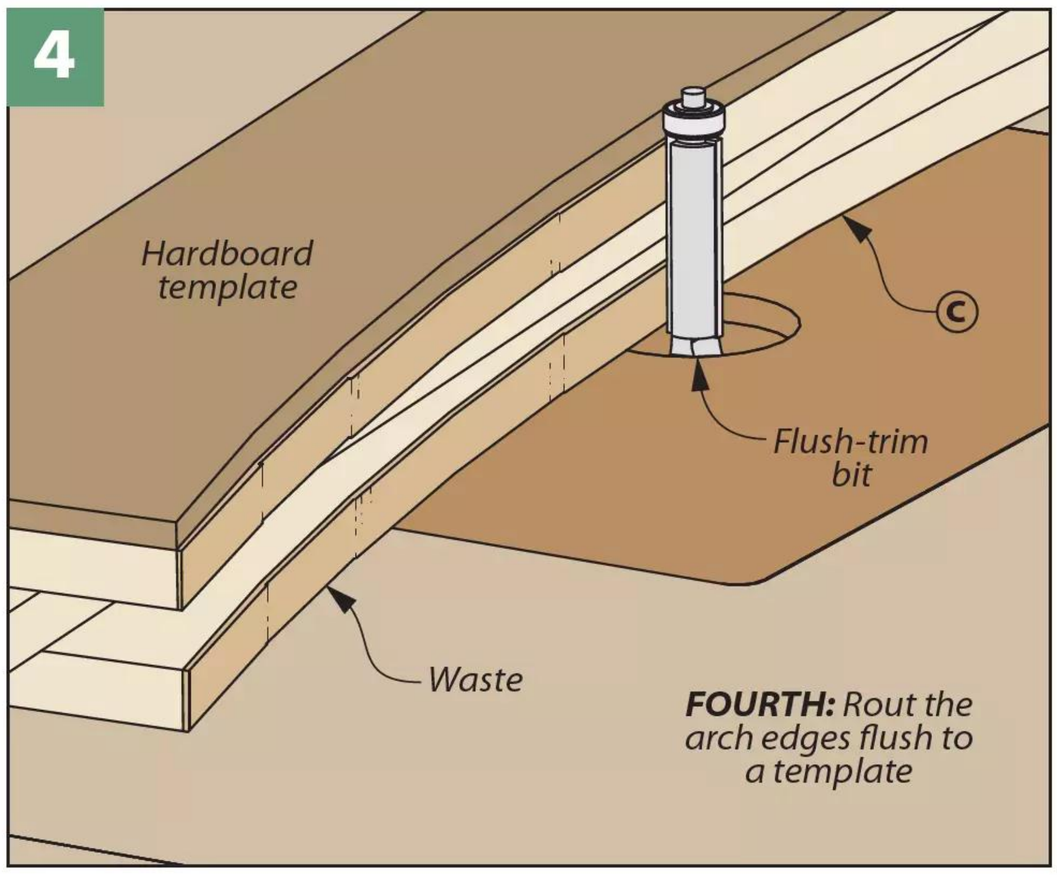


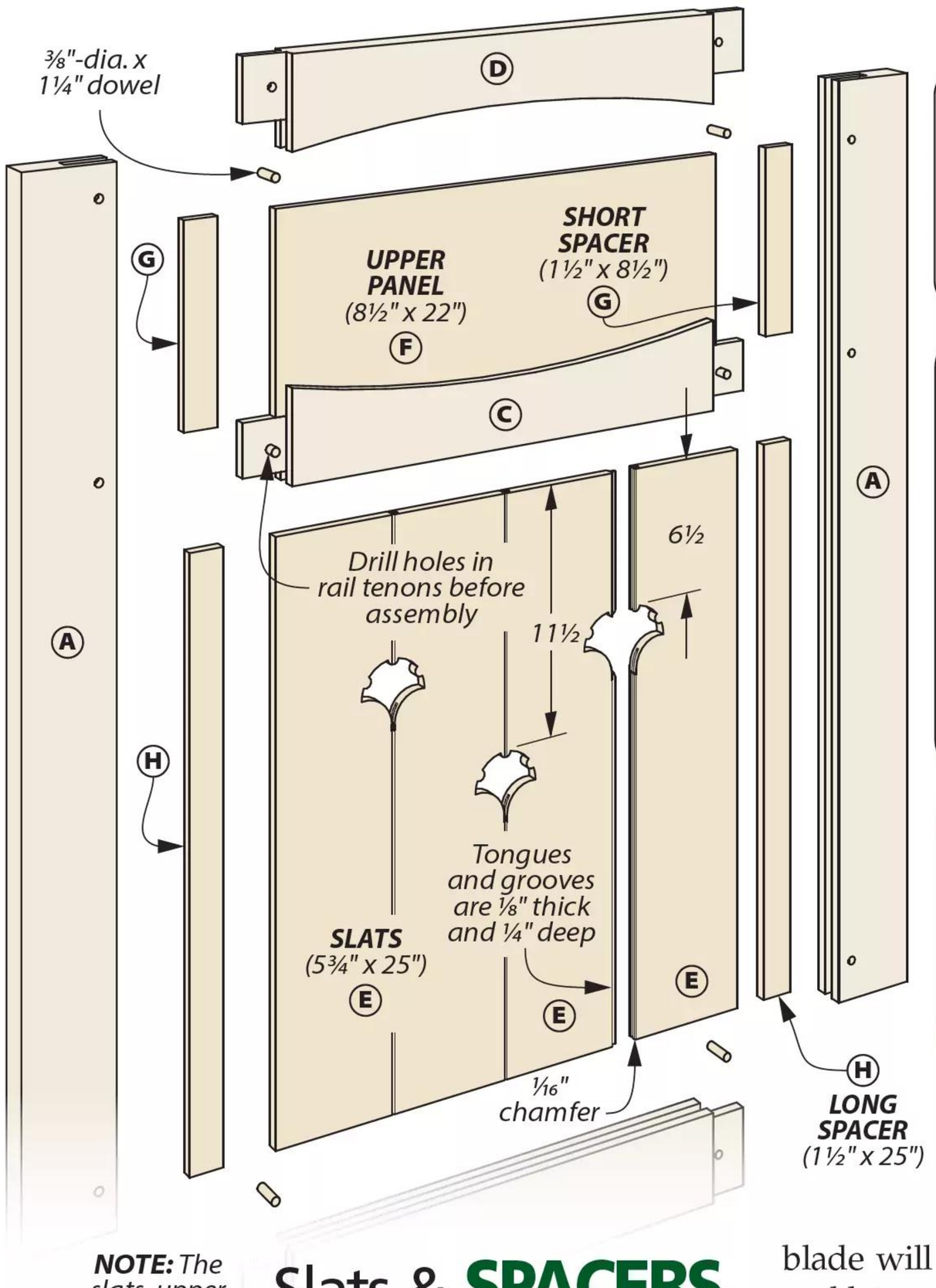
Table Saw Tenons. Use a dado blade at the table saw to cut the tenons on the rails. These tenons will fit into the grooves you just made in the stiles.



Rough Cutting. To cut the arches in the upper and middle rails, begin by taping down the template to one, then rough-cut most of the waste off at the band saw.



Flush-Trim Finish. Rout off the blade marks using a flush-trim bit for a smooth curve. The hardboard template will guide the bit's bearing as you make the cut.



NOTE: The slats, upper panel, and spacers are ½"-thick softwood

Slats & SPACERS

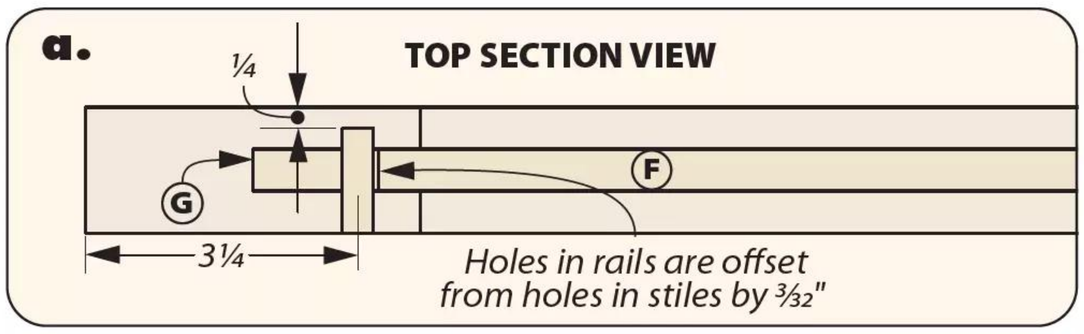
A set of slats and an upper panel fill in the rails and stiles. Along with these, we'll make some spacers to fill in the gaps in the stile grooves between the tenons.

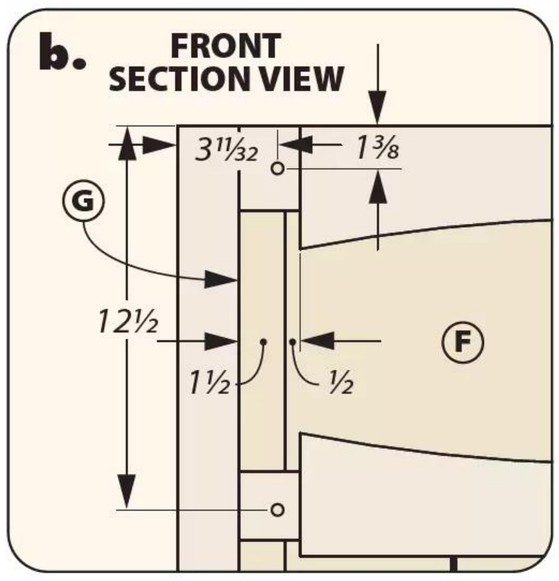
GROOVES & TONGUES. Although the slats are all the same dimensions, the joinery on them differs slightly on the outer pieces. When sizing the slats, cut them a little over-long. You'll see why.

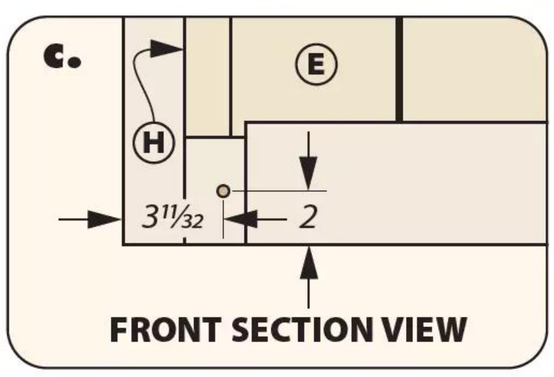
The right-most slat and the middle slats have grooves. These accept the tongues of the slats to their left. The tongues in the middle slats and left-most slat are made by cutting rabbets on either side of their edges. To do this, use a dado blade at the table saw, buried in an auxiliary fence.

GINKGO CUTOUTS. Cutouts in the slats establish the ginkgo leaf motif. The pattern on the next page provides a guide, and the box at right shows how to do the cutting with a jig saw. A high TPI (teeth per inch) blade will leave a cleaner edge and let you get closer to the pattern. Finish the slats by routing chamfers on the edges. Align the cutouts with each other and cut the slats to final length.

DRAW BORE TENONS. I want to take a moment for the rail tenons.



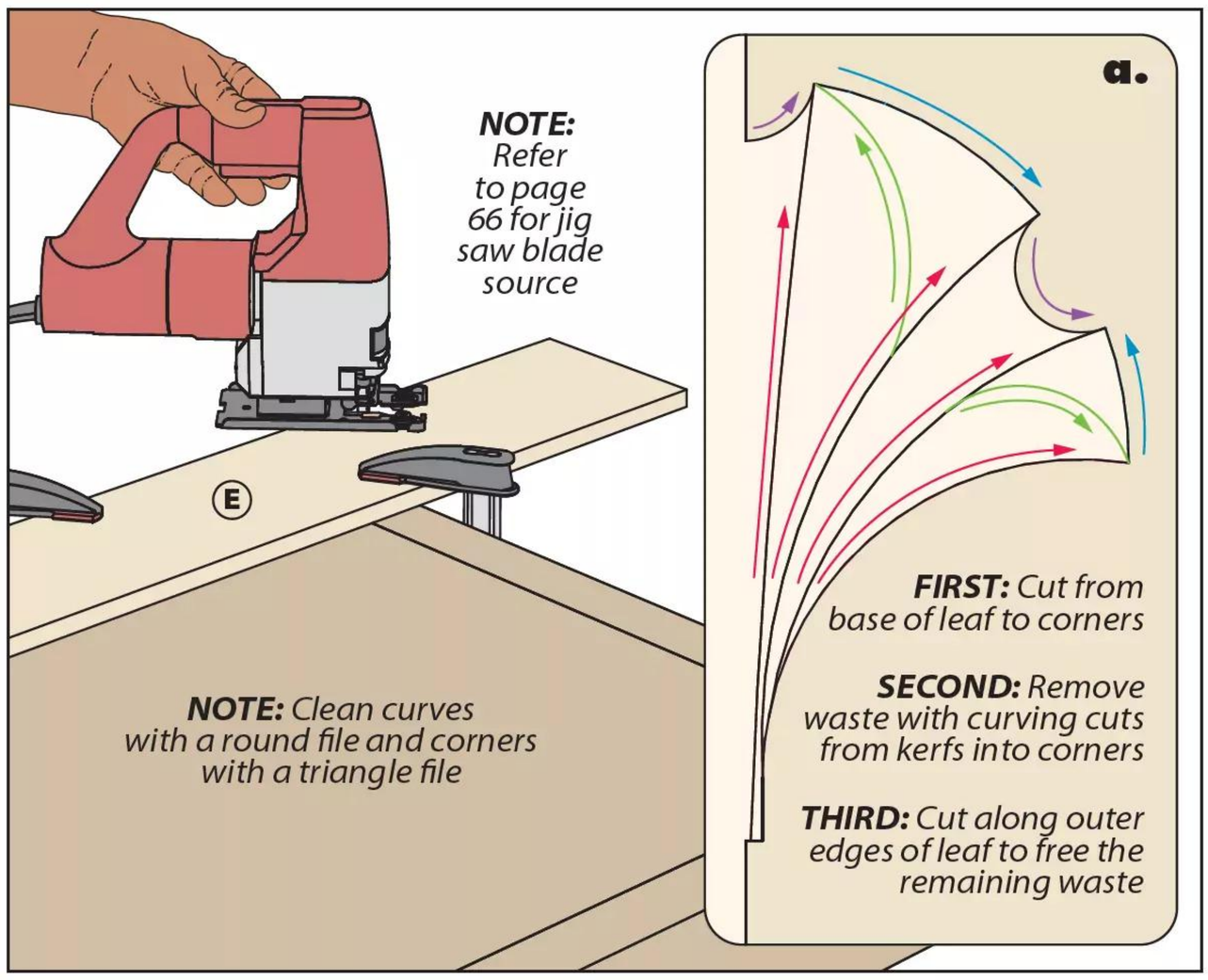




These have a draw bore, as you can see in the details. This is a dowel plug reinforcing the tenons; however, the hole in the tenon is set slightly in from the holes in the stile. This causes the dowel to pull it into place.

PANEL & SPACERS. Now for the upper panel and spacers. The panel provides stage for the leaves while the spacers play a backstage role, supporting the space between the tenons in the grooves. Cut these after drilling your draw bores so you can size them to fit between the rails. Then, it's time for assembly.

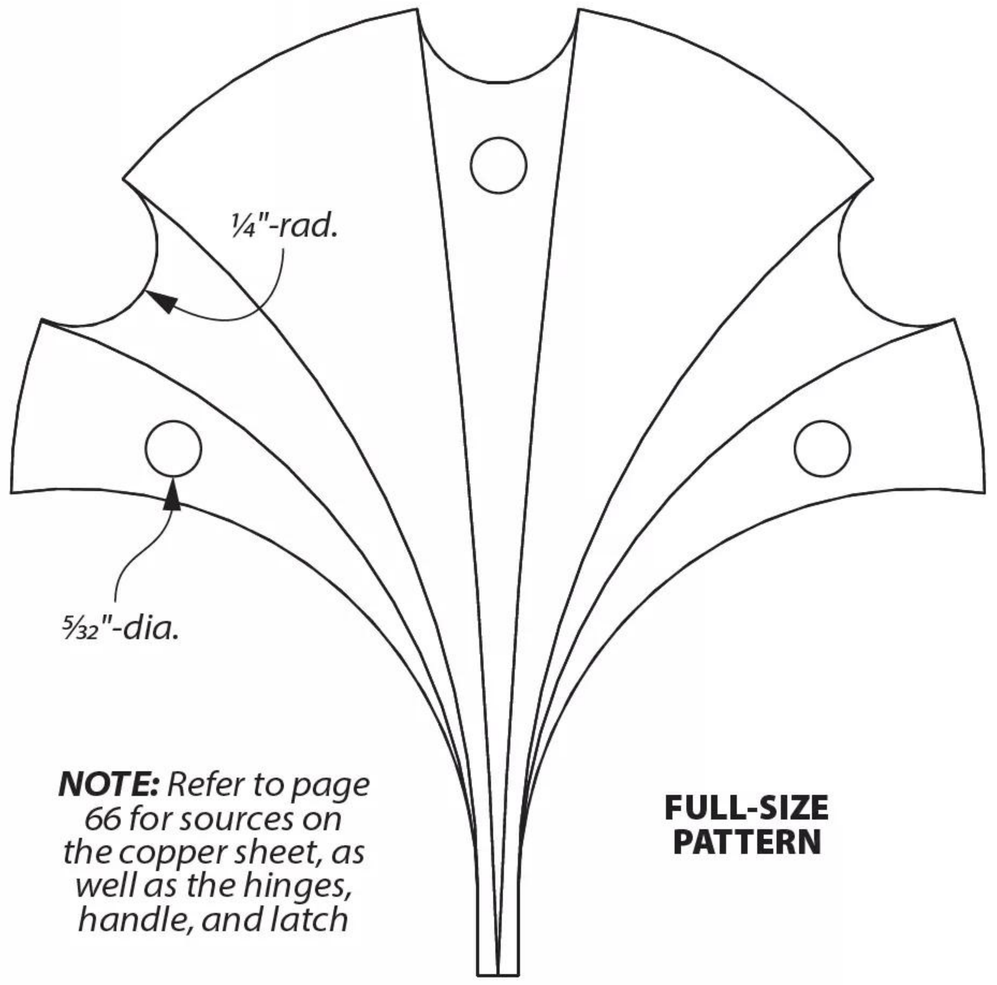
The opposite page shows how to make the copper ginkgo leaves. Once finished, attach them with a few copper tacks. Now, when spring rolls back around, all you'll need to do is mount your gate on its hinges, then add the handle and latch. W



CREATING GINKGO LEAVES

Copper Leaves. To shape the copper into ginkgo leaves, sandwich eight 3" x 3" pieces between two pieces of MDF with the pattern attached, then follow the steps below.

Establish Radii. Begin shaping the copper by drilling out the three large radii. Turn your drill press down to its lowest speed setting and drill the holes slowly.



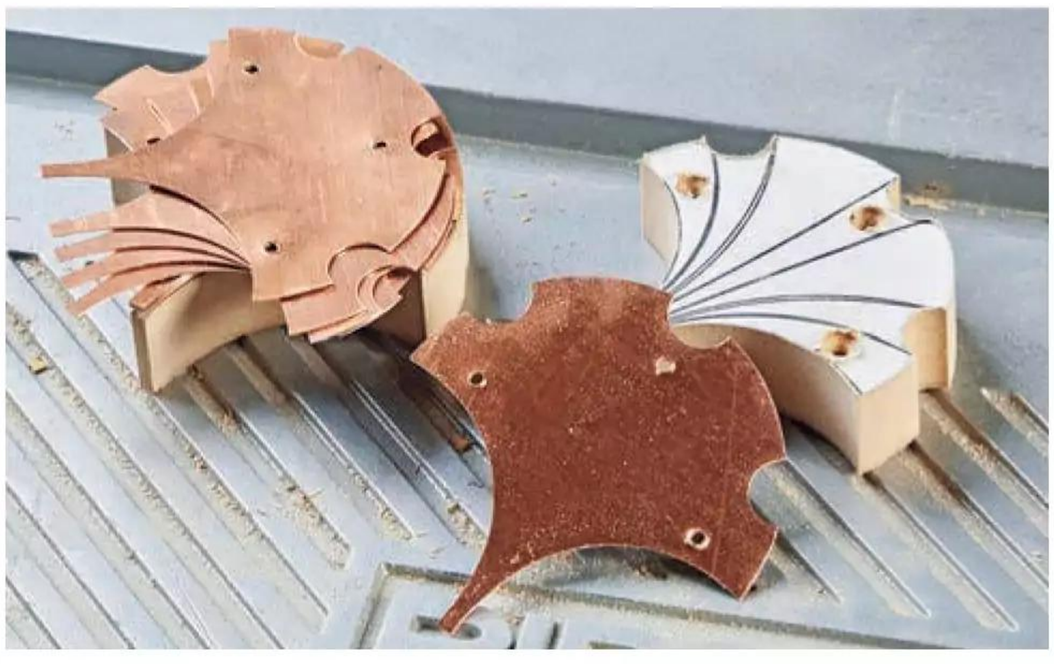
NOTE: *Refer to page 66 for sources on the copper sheet, as well as the hinges, handle, and latch*

FULL-SIZE PATTERN

Pilot Holes. Next, drill out the smaller holes for the tacks. For now, drive screws into them. This will keep the assembly secured after you remove the exterior.

Band Saw. Shape the perimeter of the leaves at the band saw. Make relief cuts as you go through to help get the excess waste out of your way.

Spindle Sanding. Sand off the blade marks at the spindle sander. As with the drill press, a lower speed works better when sanding a nonferrous metal like copper.



Complete the Motif. Remove the screws to free your copper leaves. If you wish to add a patina to the leaves as we did, then check out the article on page 26.

DESIGNER Project

Written by: Phil Huber; Project Design: Dillon Baker

▲ The ends conceal a pair of drawers. It's the perfect place to store a few games, or hosting supplies. They also come in handy for stashing clutter when company comes to visit.

Modern Coffee Table

Humble materials and common joinery techniques combine to create a handsome and handy living room essential.

Whenever I visit a museum, I end up admiring the display cases and stands almost as much as the pieces on exhibit. Some of these show off skilled work; others are meant to fade into the background.

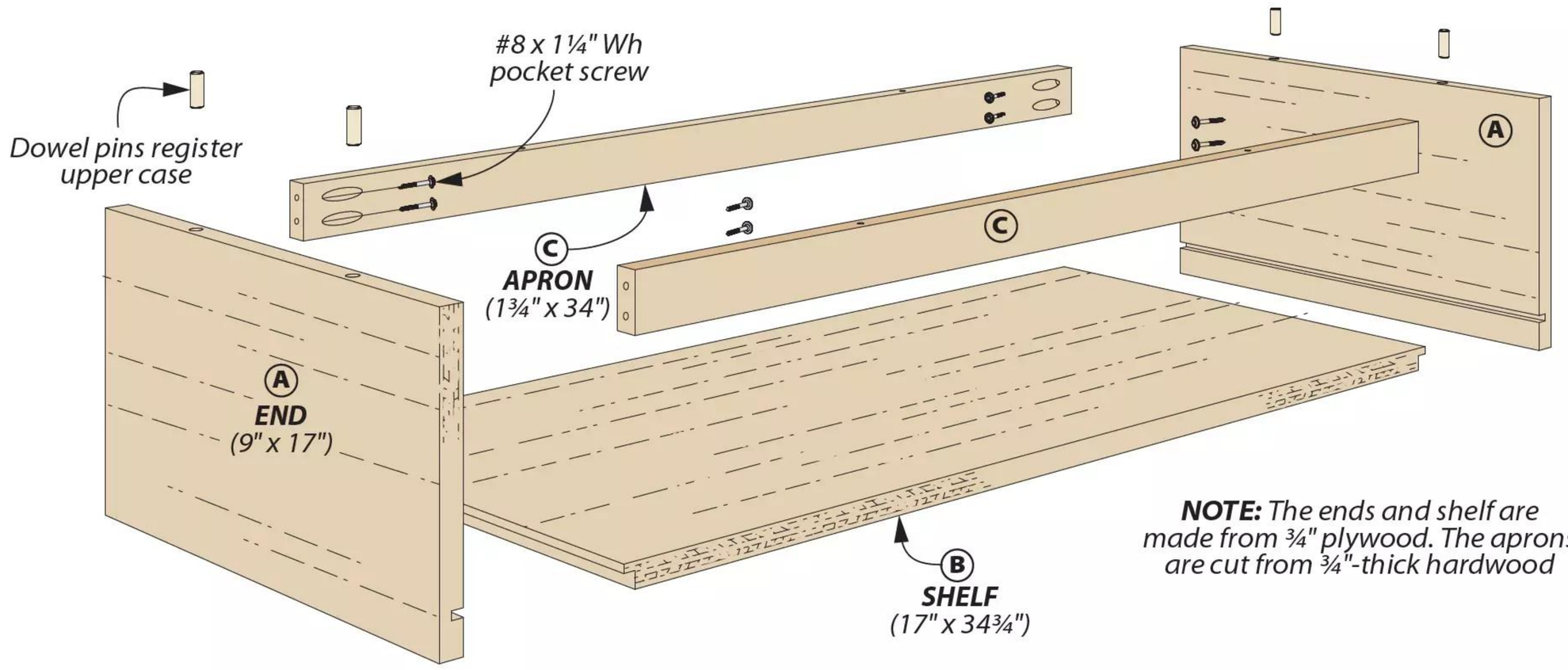
In many ways, a coffee table serves a similar role. Think of this version of a coffee table as a stage or platform for whatever is held on top: snacks, a game board, or favorite books. Function leads over flashy looks.

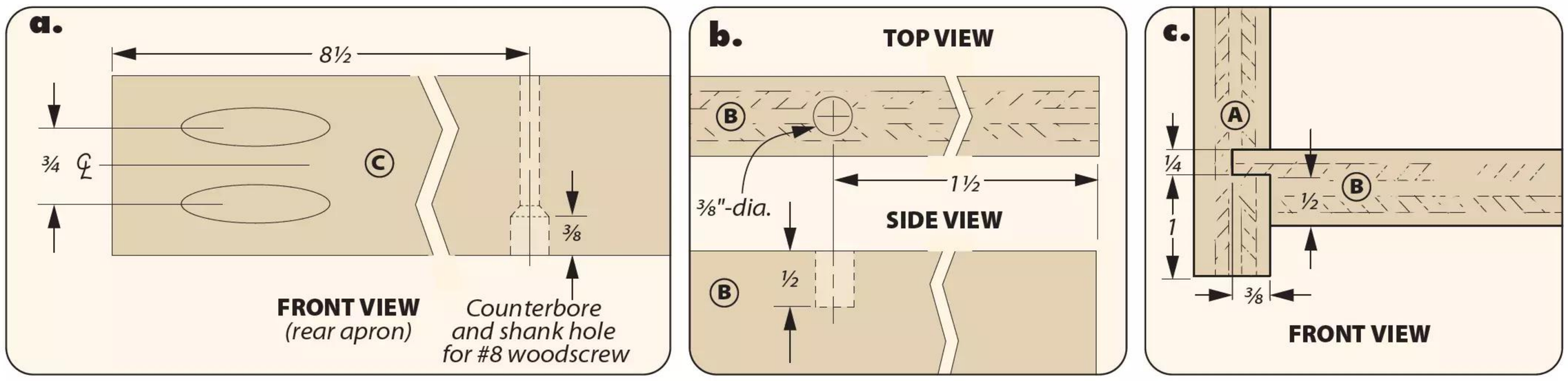
The glass top is the obvious focal point. However, a lower shelf draws your eye to other items. To cover storage needs, there's a drawer in each end. Deep and spacious, these compartments keep your living room gear close at hand, but out of sight.

CONSTRUCTION. Design editor Dillon Baker selected plywood for the casework. Grooves and dadoes hold it all together. A painted finish unifies and sets the stage.

◀ The recessed glass top serves as a frame for displaying photos, artwork, or memorabilia.

Illustrations: Harlan Clark





An open, sturdy **BASE**

The table breaks down into three main components: a base, a top, and the drawers. This allows you to focus on one aspect at a time. We'll start with the base, as shown in the drawing above.

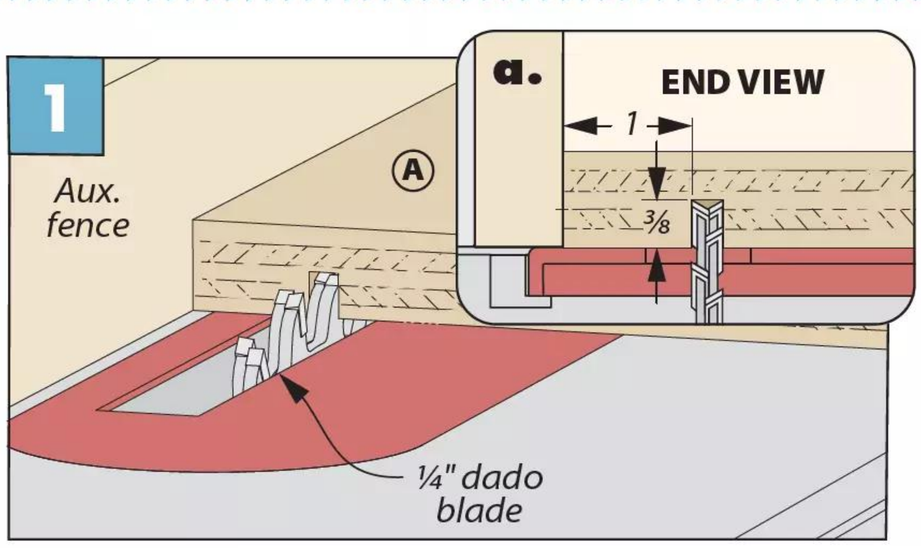
TONGUE & DADO. Cut the ends to size and then cut the shelf to match the length of the ends. These pieces are joined with tongue and dado joinery. The box below shows how to do this at the table saw. The dado cut in each end lifts the shelf off the floor, as in detail 'c.'

With your focus on the joinery, don't overlook the pair of index holes drilled in the top edge of each end. The hole locations are shown in detail 'b.' Later these house dowels that connect and register the top.

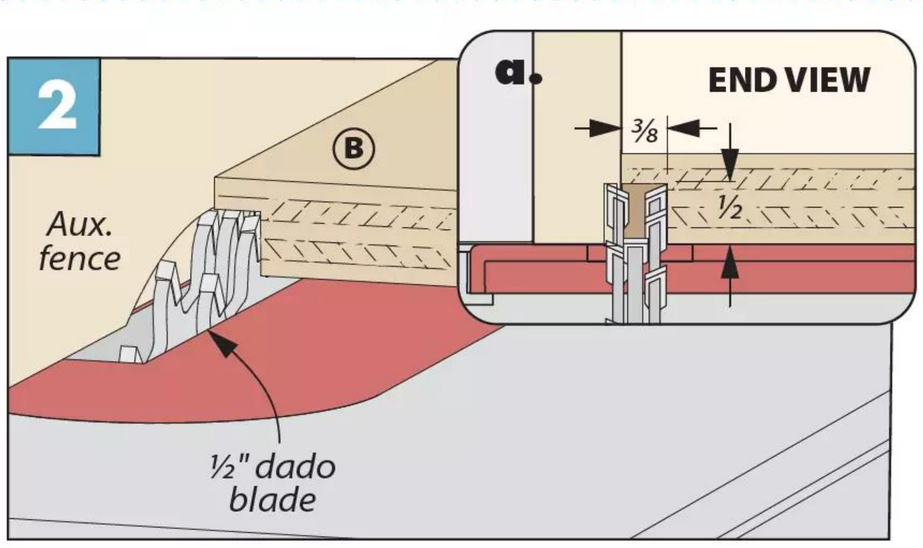
Back to the joinery. Take the shelf to the table saw and form a tongue on each end sized for a snug fit into the dadoes you made earlier (Figure 2 below).

APRONS & POCKETS. Two aprons wrap up the parts for the base. These are cut to match the

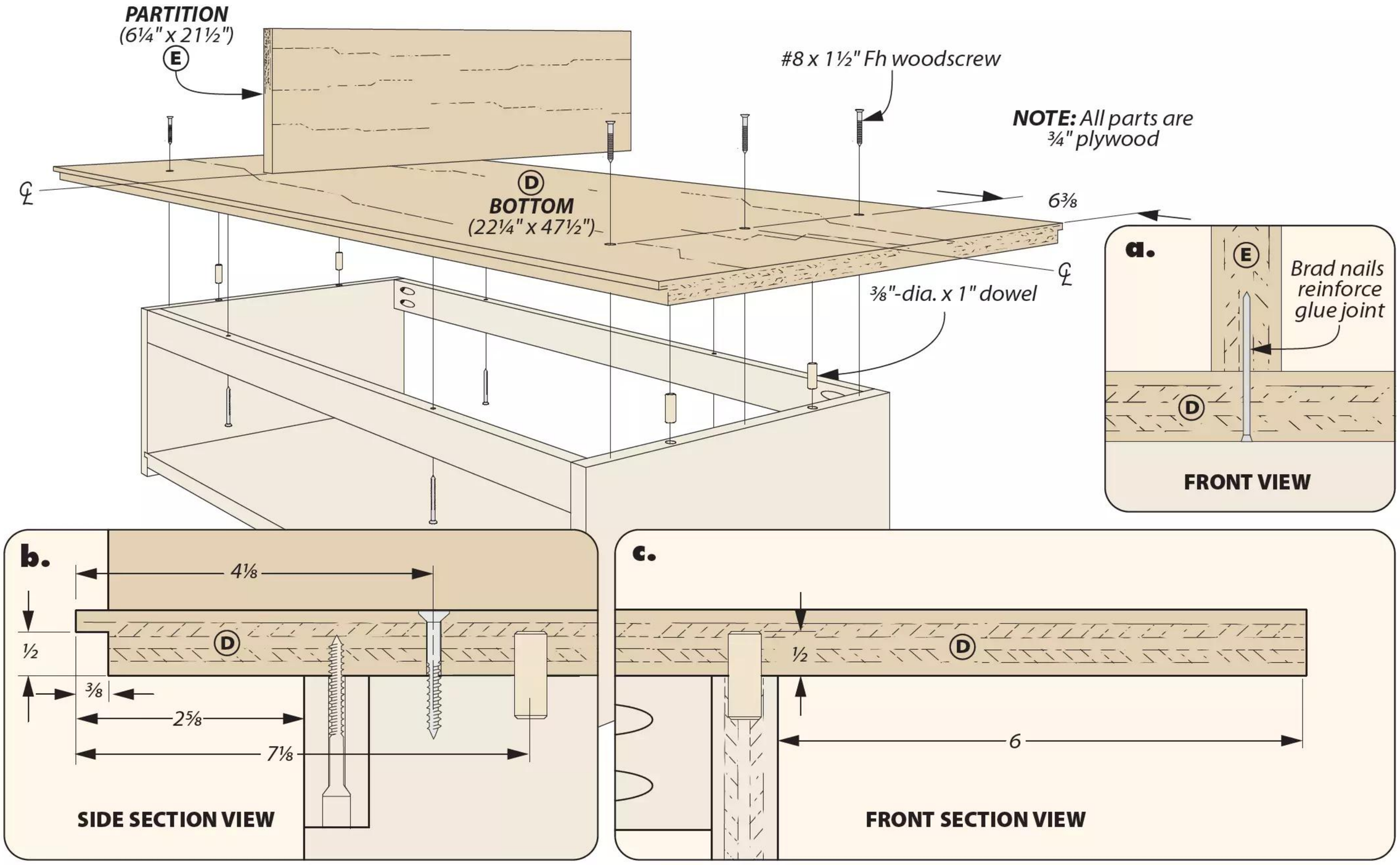
CUTTING ACCURATE JOINTS



Dado Comes First. A narrow dado blade cuts a channel in the end piece. This locates and registers the shelf correctly.



Rabbet Makes a Tongue. Set up a wider dado stack and recess it in an auxiliary rip fence. This allows you to form a consistent tongue.



shoulder to shoulder length on the shelf. Detail 'a' on the previous page shows the locations for countersunk screw holes that will fix the upper case in place.

Drill pocket holes in order to join the aprons to the ends. This brings us to assembly. Glue the shelf into the ends, keeping the edges aligned. Then drive in the pocket screws to secure the aprons. These are flush with the top edge and front and back edges of the ends.

UP TO THE BOTTOM

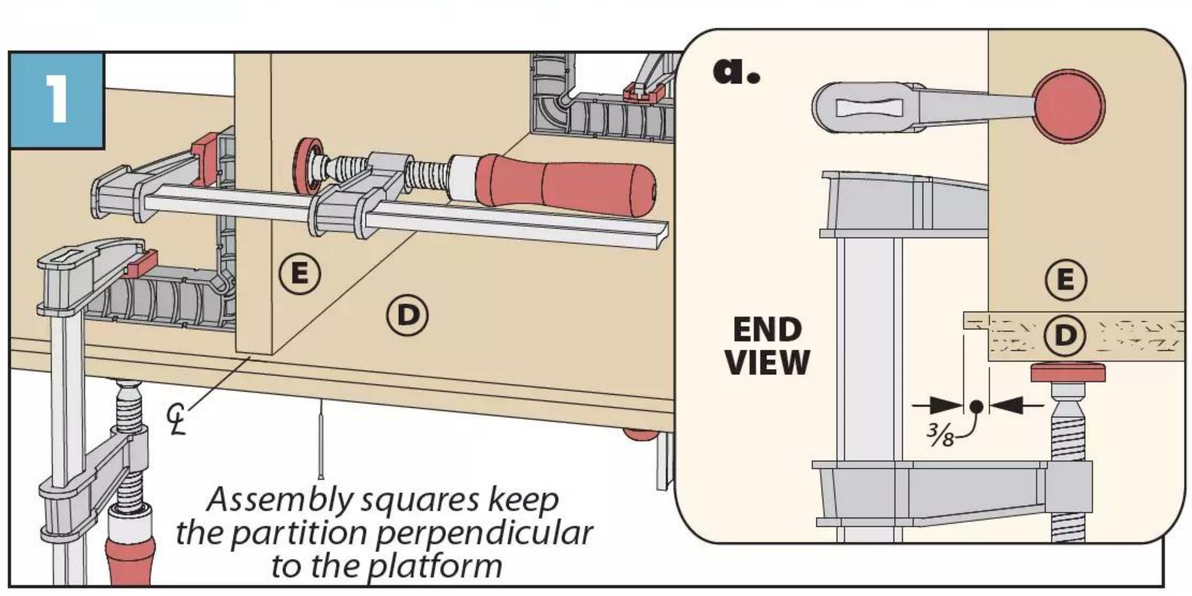
For the upper part of the table, I took a different construction approach. Instead of making a large box and attaching it to the base, I opted to build up the top section one piece at a time. The drawing above shows where we're headed.

THE BOTTOM. The first piece on the list to make is the bottom. (The case top is identical, so might as well cut two.) Using the table saw setup from the shelf, form a tongue along each long edge of the bottom, as you can see in detail 'b.'

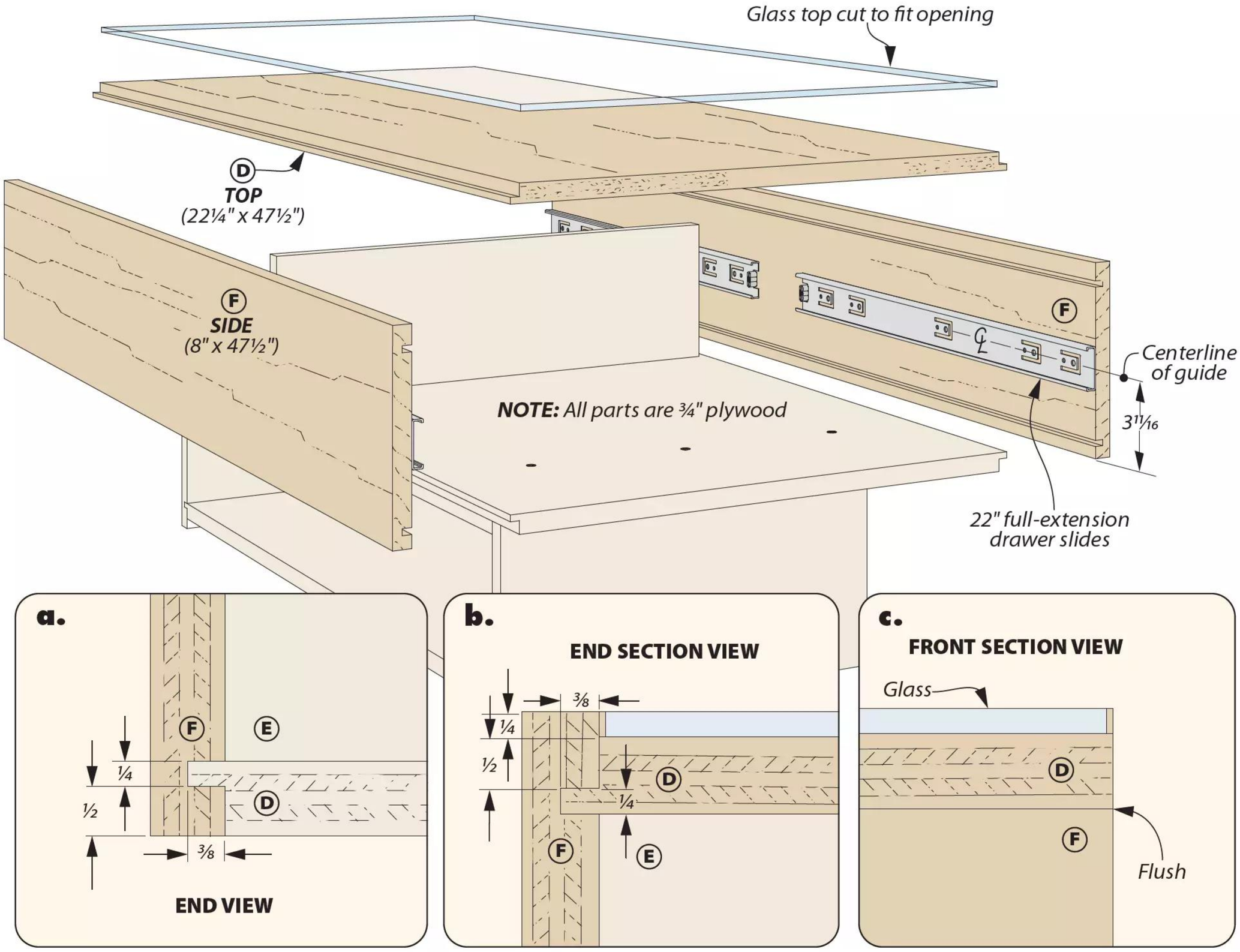
A partition comes next. Its length matches the shoulder-to-shoulder dimension of the bottom. It's centered, glued, and nailed to the bottom (detail 'a').

DOWELS & SCREWS. These two parts are screwed to the base. Remember the dowel holes in the ends? Now's the time to put them to work. I set dowel centers in the holes. Then I set the bottom in place and adjusted its position until it was centered. Once I was satisfied, I pressed down on the bottom. The dowel centers leave dimples to show where to drill matching holes, as in details 'b' and 'c.' With the bottom in position, I drove in woodscrews.

GETTING CENTERED & STRAIGHT



It's Hip To Be Square. Apply glue to the partition and use assembly squares to hold it in place while you drive nails.



Enclose the TOP

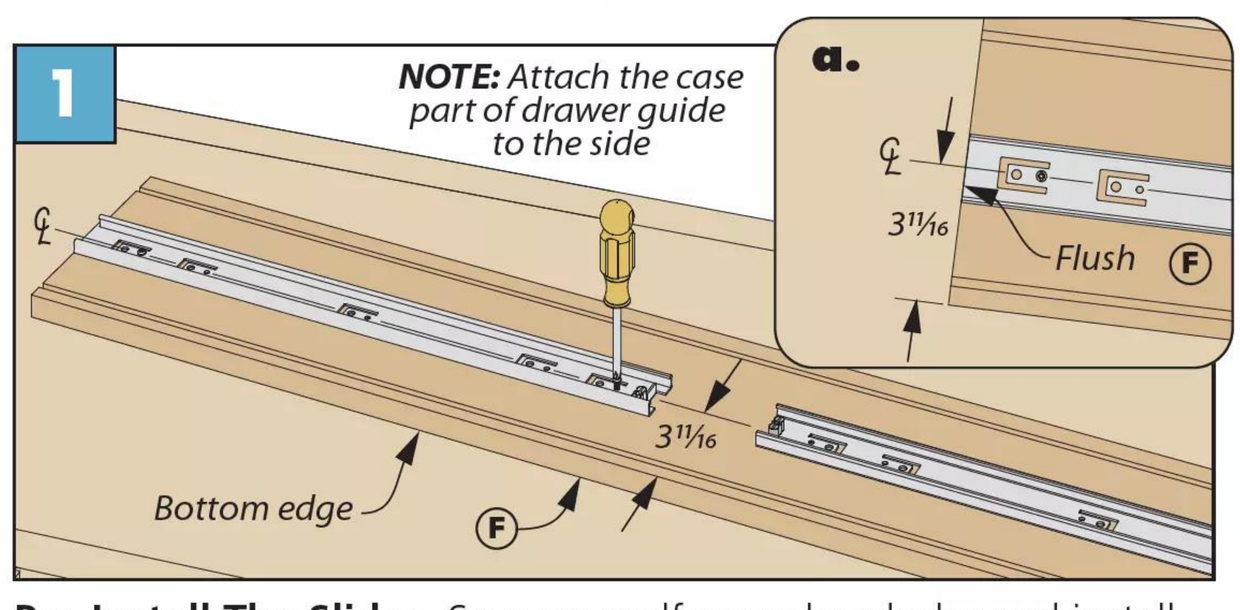
We started the project with tongue and dado joinery. We're keeping it going with a close cousin: tongue and groove joinery. If you haven't already, run the case top across the table saw to form the tongues on the edges, just as you did with the bottom.

BRING IN THE SIDES. The next two pieces to make are the sides. They're the same length as the top and bottom panels. For joinery, you need to reinstall the ¼" dado blade in the saw.

Take a look at details 'a' and 'b' to see the locations of the grooves you'll cut for the top and bottom. They aren't symmetrical. The groove for the bottom positions the sides flush with that piece. For the top, the groove is set lower. This creates a pocket in the top to hold the glass surface.

PLAN AHEAD. Hold back on assembly for a moment. It's a good time to pause and install the drawer slides to the inside face of the sides prior to assembly, as shown in the box below. Nobody likes reaching into a dark cave to install slides. Your future self will thank you for this bit of consideration. For bonus points, you could also paint the inside surfaces, too.

GUIDE FOR THE GUIDES

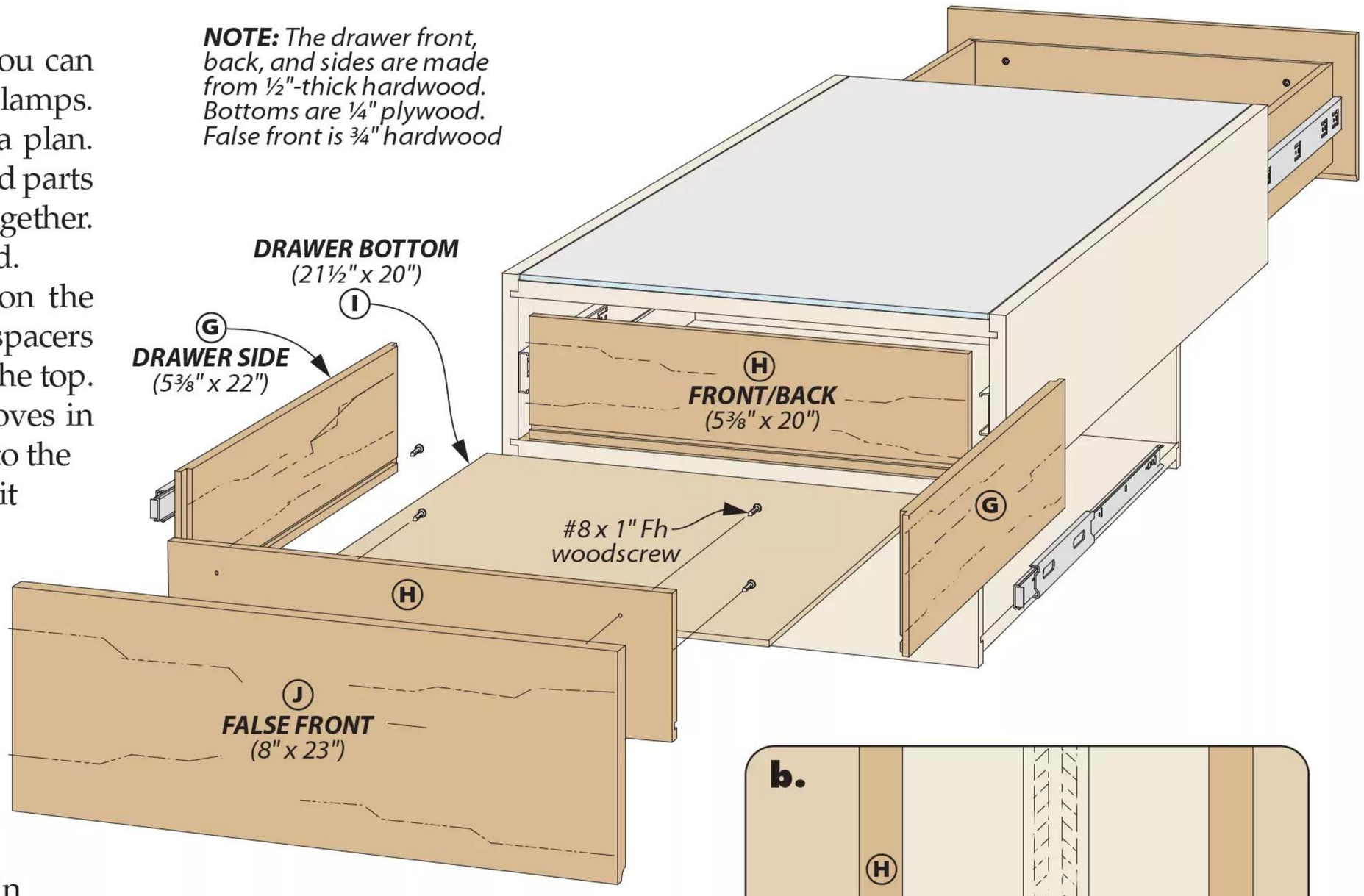


Pre-Install The Slides. Save yourself some headache and install the case portion of the slides prior to attaching the sides.

STAGED ASSEMBLY. At last you can gather up the glue and clamps. Then you need to have a plan. There are three good-sized parts that need to come together. Here's what I recommend.

Balance the case top on the partition. I cut a couple spacers to prop up either end of the top.

Apply glue to the grooves in one side and fit the side to the top and bottom. Clamp it in place for a few minutes so that glue starts to set. Then attach the opposite side in a similar fashion. Now leave the clamps in place for at least an hour or so.



DRAWERS TO END

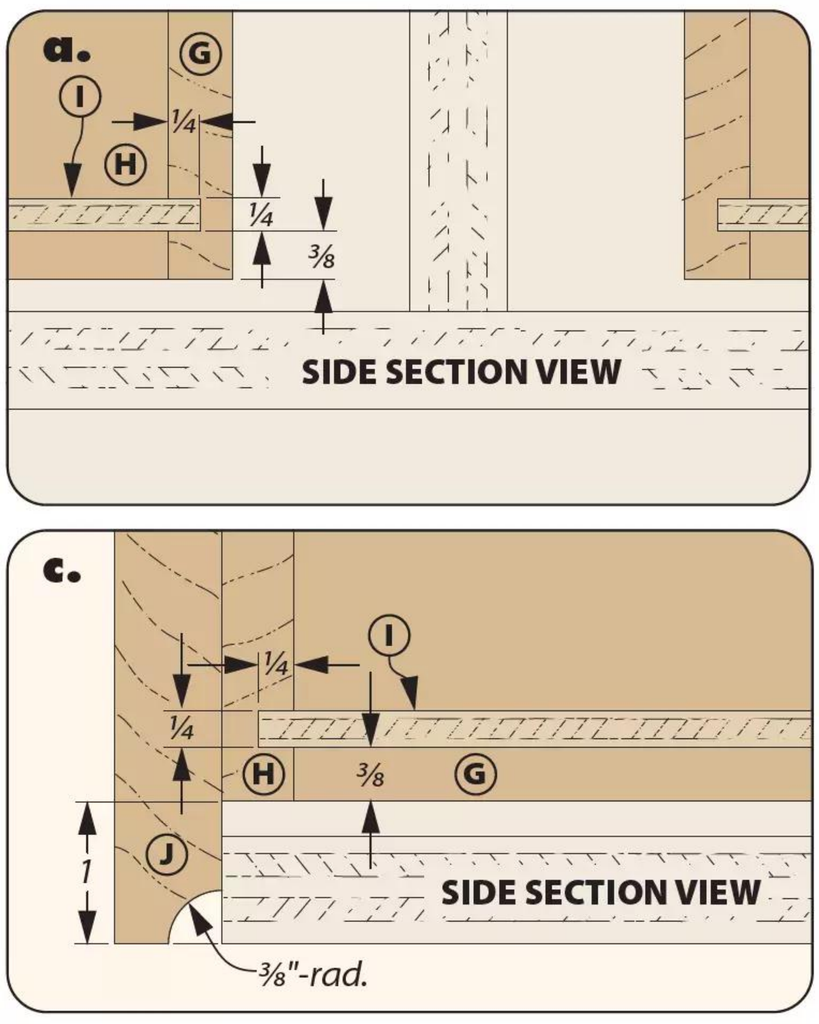
The two drawers shown in the right drawing wrap up this project. Since most of the parts so far have been plywood that will get painted, Dillon switched things up with clear-finished hardwood for the drawer box (front, back, and sides).

RABBETS HERE. The corners are jointed with rabbets. You can see this in detail 'b.' The rabbets are cut into the drawer sides to accept the front and back.

A groove to hold the bottom comes next. This is shown in details 'a,' 'c,' and 'd.' After sizing the bottom, the drawer box can be glued up. If you want, reinforce the rabbets with a few brad nails.

Detail 'd' shows the location of the slides on the drawer. A solid-wood false front unifies the drawer with the rest of the table. Take note of the cove routed on the lower edge in detail 'c.' This serves as a pull.

NOW FOR PAINT. As I said, the table is painted. However, it's worth the effort to seal the edges of the plywood. I like *Durham's Water Putty* for this job. Then this table is ready for a tray of coffee — or perhaps something stronger. W



Materials & Supplies

A	Ends (2)	¾ ply. - 9 x 17	**J**	False Fronts (2)	¾ x 8 - 23
B	Shelf (1)	¾ ply. - 17 x 34¾			
C	Aprons (2)	¾ x 1¾ - 34	•	(8) #8 x 1¼" Pocket Screws	
D	Bottom/Top (2)	¾ ply. - 22¼ x 47½	•	(4) ⅜" x 1" Dowels	
E	Partition (1)	¾ ply. - 6¼ x 21½	•	(6) #8 x 1½" Fh Woodscrews	
F	Sides (2)	¾ ply. - 8 x 47½	•	(4) #8 x 1¾" Fh Woodscrews	
G	Drawer Sides (4)	½ x 5⅜ - 22	•	(2 pair) 22" Full-Extension Drawer Slides	
H	Drawer Fronts/Backs (4)	½ x 5⅜ - 20	•	(1) ⅛" x 21¼" - 47¼" Glass Pane	
I	Drawer Bottoms (2)	¼ ply. x 21½ - 20	•	(8) #8 x 1" Fh Woodscrews	

GAME Project

Cubist Labyrinth

An abstractionist aesthetic on this classic Nineteenth-Century game makes for an engaging weekend in the shop and a fascinating diversion.

Imagine many of you reading this have seen some variation of the game in these photos before. It's a simple concept: tilt the board to move the ball through the maze, avoiding the holes along the way. The earliest recorded version comes from an 1889 patent by G. M. Crandall. It was called "Pigs in Clover," and newspapers at the time claimed it was a hit, with senators sneaking them into the Hall of Congress and even the president, Benjamin Harrison, apparently whiling away hours on them in the White House.

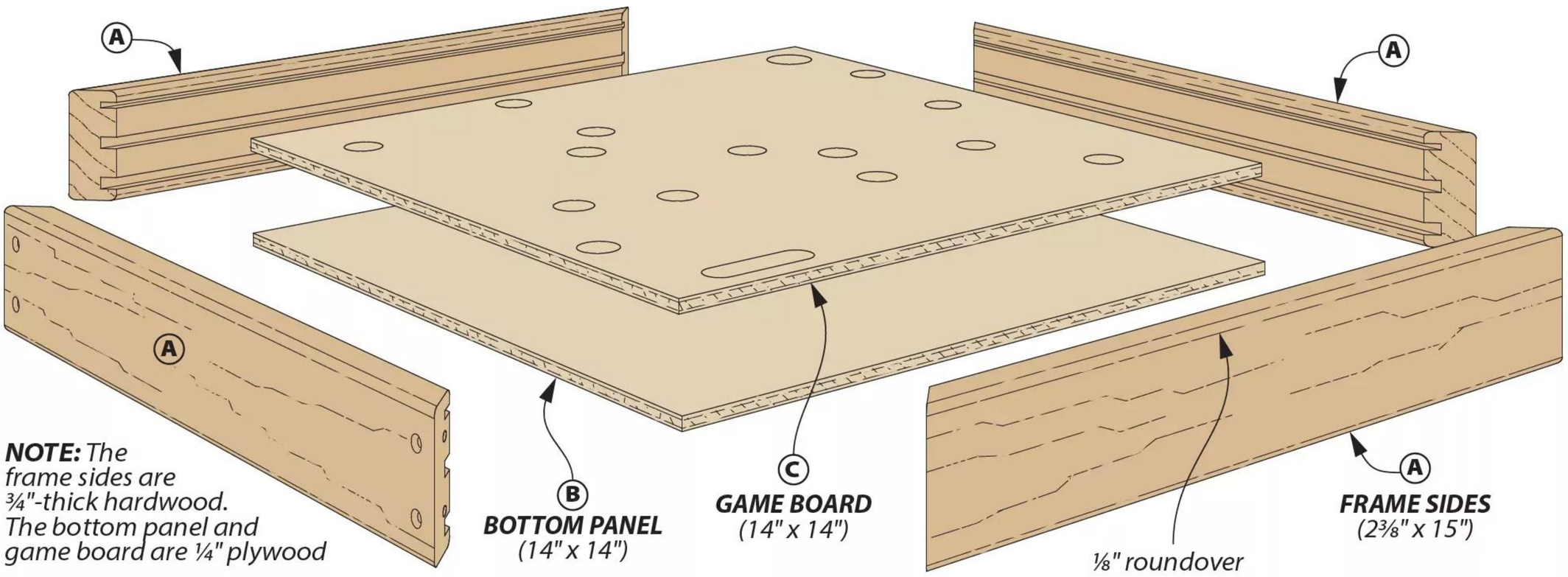
In terms of design, the version here takes a different road than the originals. A few splashes of color combine with raw maple to evoke an Abstractionist or Cubist style. Piet Mondrian's *Tableau II* and *Composition C* come to mind. Those paintings may look like little more than colored boxes, but that mundanity allowed Mondrian to accentuate the texture and quality of the paint itself, varying brush strokes and experimenting with different layers. In the same manner, the stark appearance of this game accentuates its components. Straight lines and square corners highlight the movement of the grain below. The painted blocks on the pale wood seem playful and inviting. This project may not take you very long to put together, but there's a good chance it'll hold your attention for some time after.

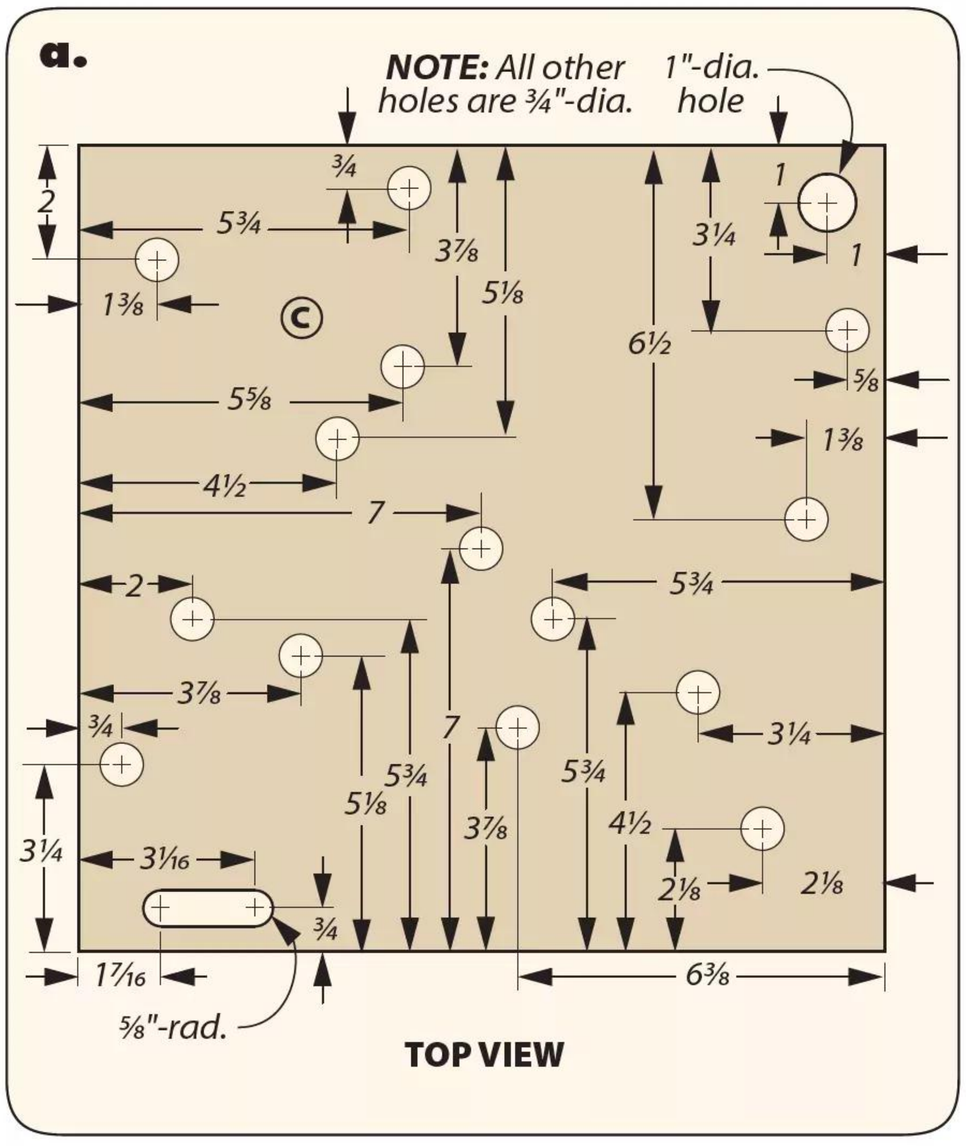
▲ This tilting game challenges both dexterity and balance — navigate the ball through the labyrinth while avoiding the pitfalls on the way.

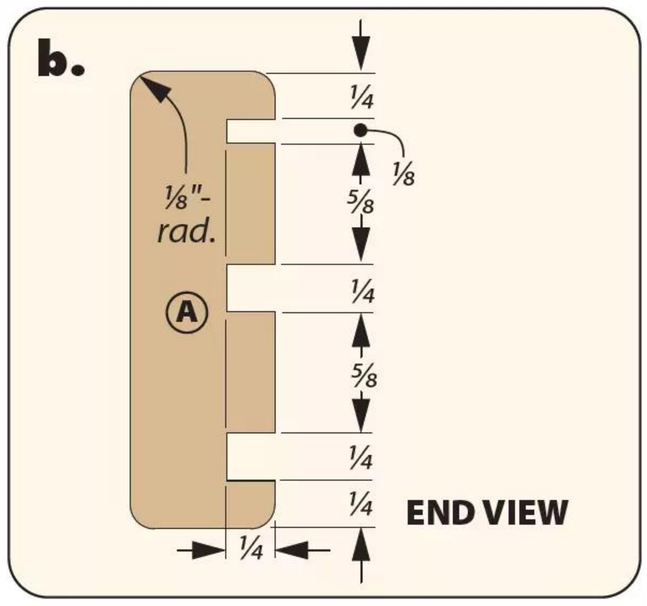
▼ One side of the game's frame is attached with screws, allowing it to be removed should you need to make adjustments to the interior down the road.

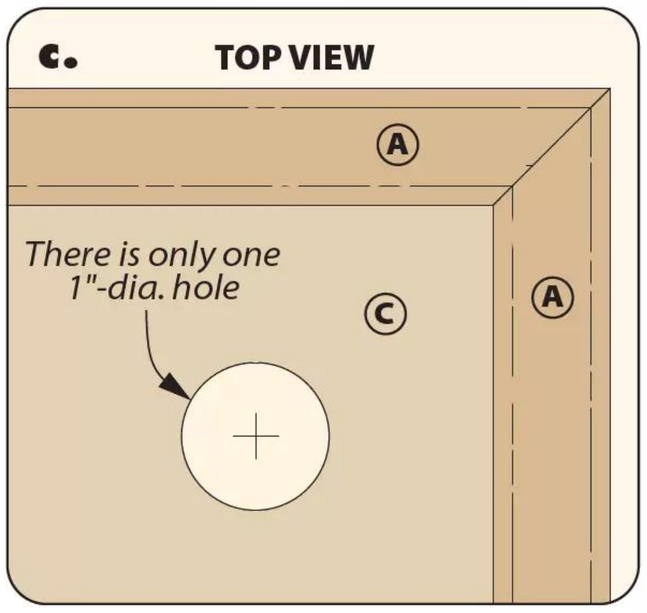
Written by: Rob Petrie; Project Design: Chris Fitch

Illustrations: Harlan Clark









Framing up the CASE

The first step in making this labyrinth is to create the case. It consists of four lengths of hardwood (I went with hard maple here). Within this frame lie two plywood panels and an acrylic lid — but we'll get to those later.

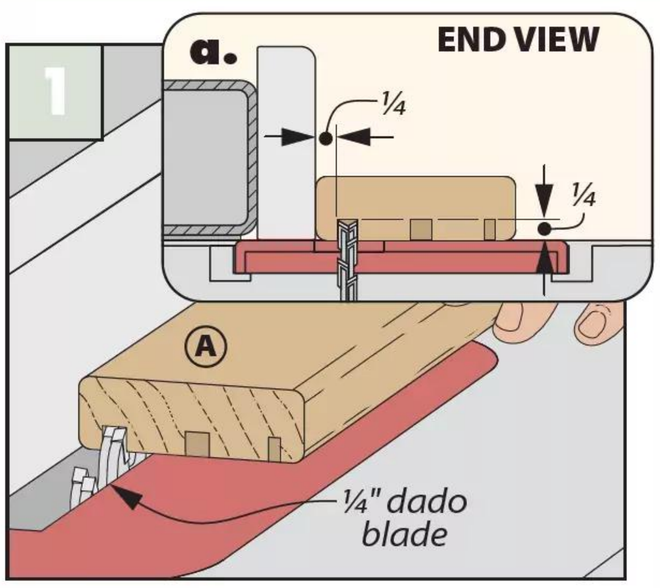
FRAME GROOVES. Start out by planing down and cutting the four frame pieces to size, but leave them a little over-long. Some extra length is nice to have when fine-tuning the miter angle.

The frame sides each have three grooves down their inner faces (detail 'b'). Two of these fit the bottom panel and game board while a third, narrower one will accept an acrylic cover. Before addressing these however, I routed roundovers along the edges of the frame sides.

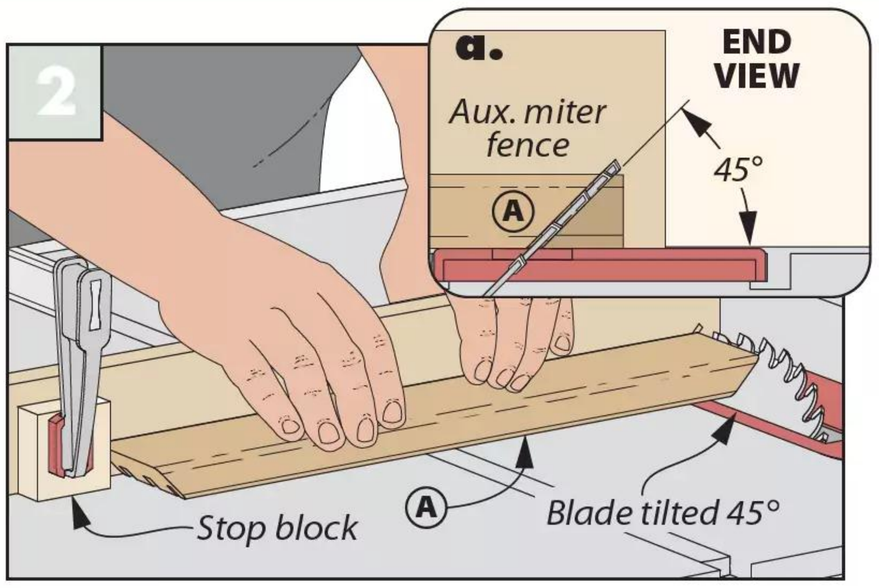
To cut the grooves, either a straight bit at the router table or a dado blade at the table saw works. I used the latter, as you can see in Figure 1 at left. Whichever method you choose, just be sure you're sizing the grooves for the panels to match the actual thickness of the plywood.

MITERS & PANELS. The final elements of these sides are the

A GROOVED & MITERED FRAME

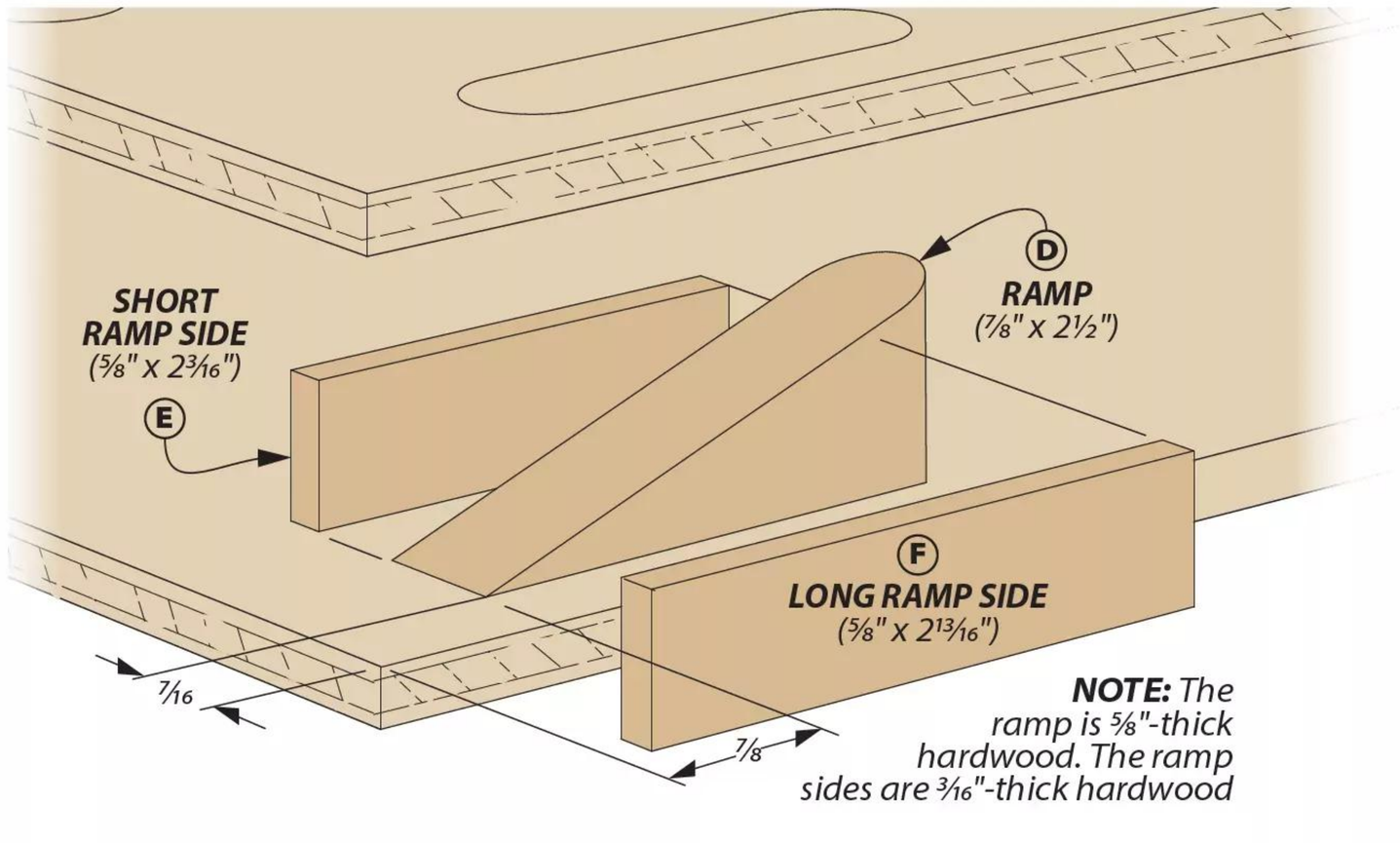


Interior Grooves. Two grooves accept the plywood panels, with a third narrower one for the acrylic.



Mitered Frame. After dialing in an exact 45°, miter the ends of the frame sides. A stop block ensures consistent lengths.

▲ CA glue along with an accelerator provides sufficient strength for these small parts and cures in moments.



NOTE: *The ramp is ⅝"-thick hardwood. The ramp sides are ³⁄₁₆"-thick hardwood*

miter joints. I beveled these at the table saw, using a stop block to ensure they all came out at equal lengths (Figure 2). From there, I cut the bottom panel and game board to fit within the grooves. The acrylic panel that encloses the upper portion has the same dimensions as these workpieces (shown on page 61), so you can cut it now as well. A crosscut blade at the table saw works well here.

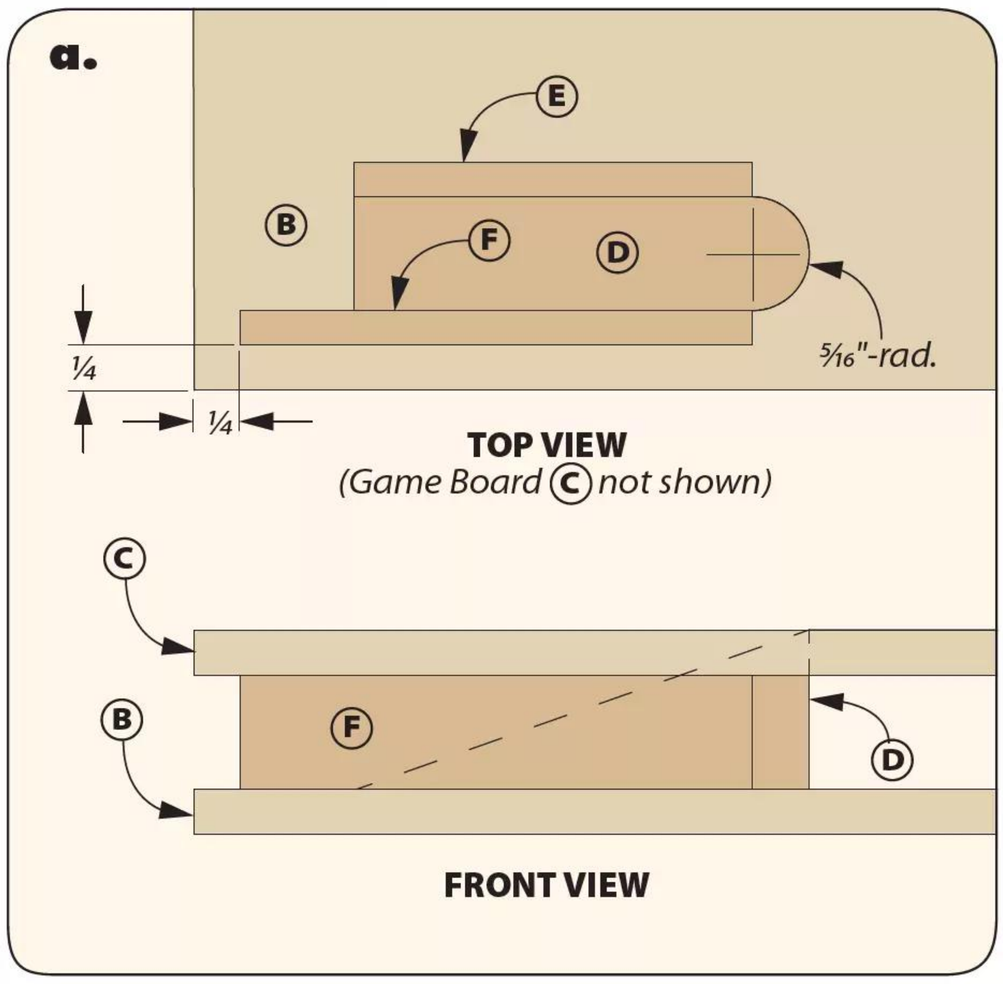
While the acrylic and the bottom panel can be set aside, the game board has a series of holes and a slot that need to be made (see detail 'a' on the previous page). After laying them out, drill the holes using a Forstner bit at the drill press. For the slot, I drilled out both ends, then connected them by routing from hole to hole with a pattern bit, and straightedge.

THE RETURN RAMP

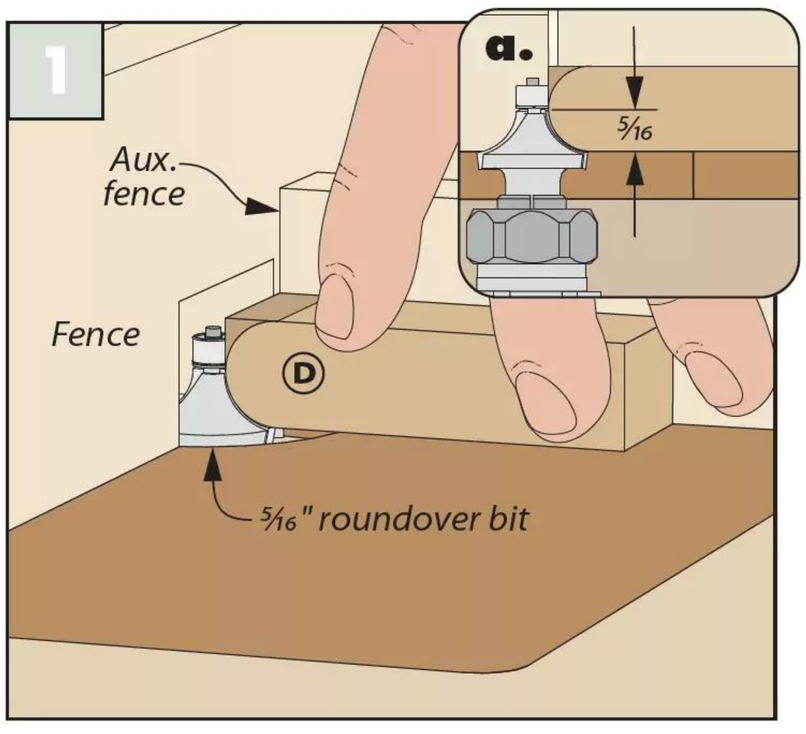
In playing the game, the ball will eventually drop down one of the holes. To return it to the game board, the ramp you see on this page is required. The ramp consists of three hardwood pieces. The ramp itself provides the lift to the second floor of the game, while the sides keep the ball from slipping off on its way.

After cutting the parts to size, it's the ramp that will need some work. Round over both edges along one end to form a bullnose, as shown in Figure 1 below. This is the upper end of the ramp. Cut the angle on the blank at the band saw and remove the blade marks with a sanding block.

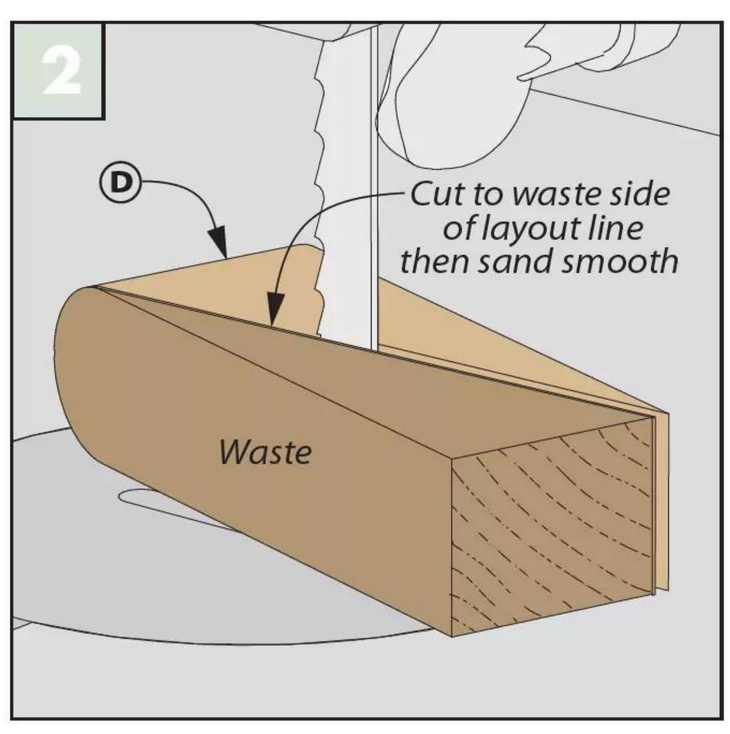
To attach the ramp pieces, I used a thick-viscosity wood CA glue and an accelerator. Apply CA glue to the bottom of the workpiece, spray accelerator on the plywood, then press the pieces together. Hold it until it dries, which should only be seconds. I recommend keeping a square on hand when placing these down to make sure they're aligned properly with the slot.



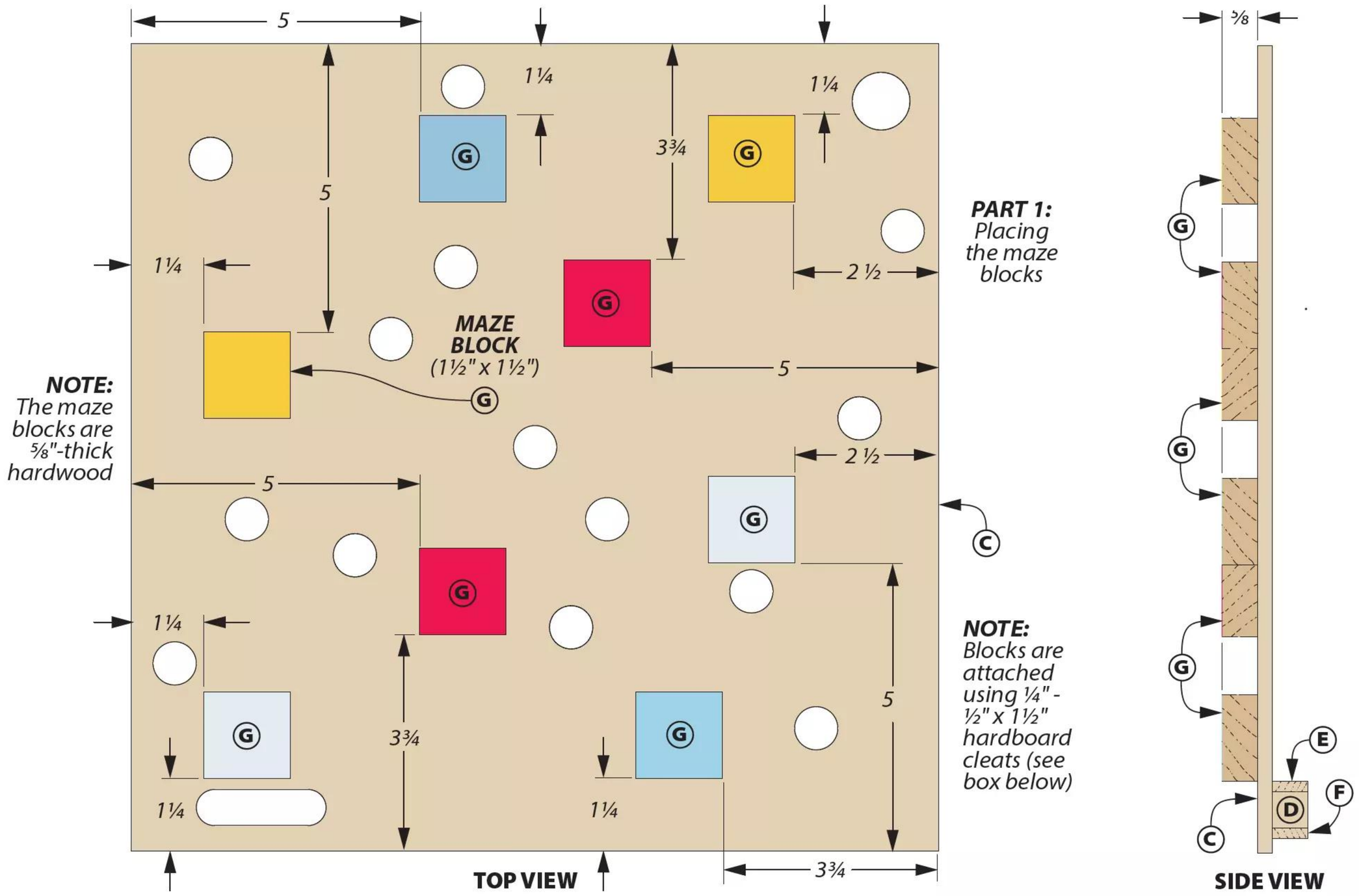
CREATING THE RAMP



Rounded End. Round off one end of the ramp at the router table using a roundover or bullnose bit.



Ramp Slope. Lay out the slope of the ramp, then cut it at the band saw, finishing it at the edge sander.



Begin with the BLOCKS

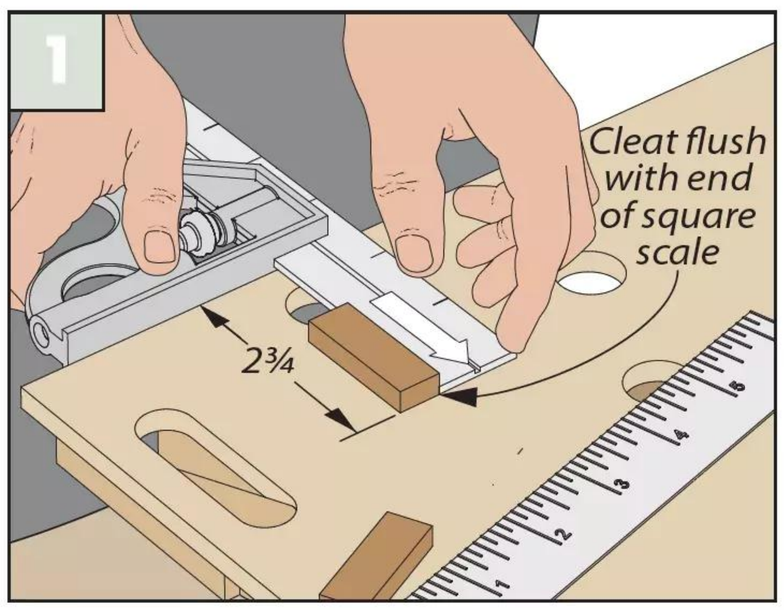
With most of the construction done, it's time for something more complex: the labyrinth. There is neither joinery nor shaping here. The key to this task is precise placement. There are two aspects involved: attaching the parts in three rounds and using some temporary cleats to ensure things are getting placed right where you want them.

MAZE BLOCKS. The maze consists of several hardwood blocks and a series of thin pieces of wood to act as walls. The blocks serve as a nexus point from which the walls branch out, making them an excellent place to start.

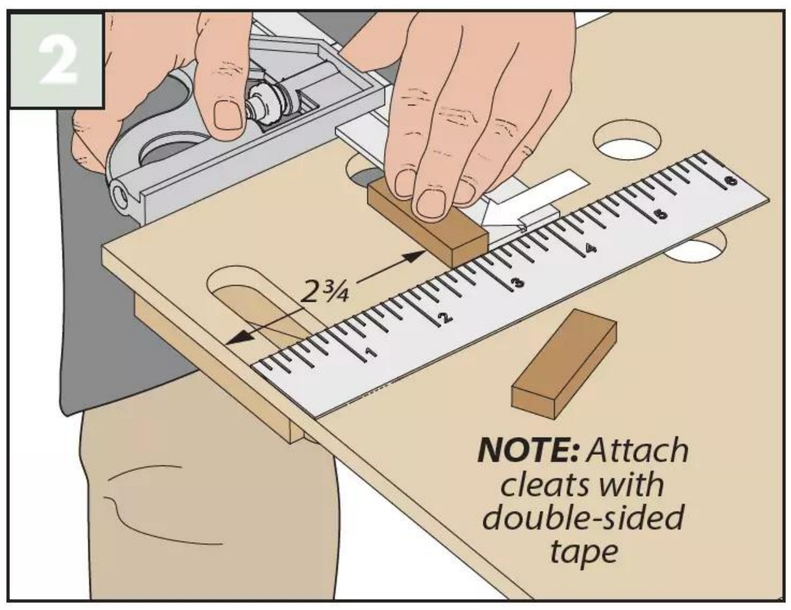
We added a bit of color to the maze blocks before sticking them down. We chose to go with a simplistic approach, using a few primary colors to contrast with the raw maple. Combined with the sharp lines of the walls, this evoked a Cubist style.

You can see the process I used to locate the blocks in the box at

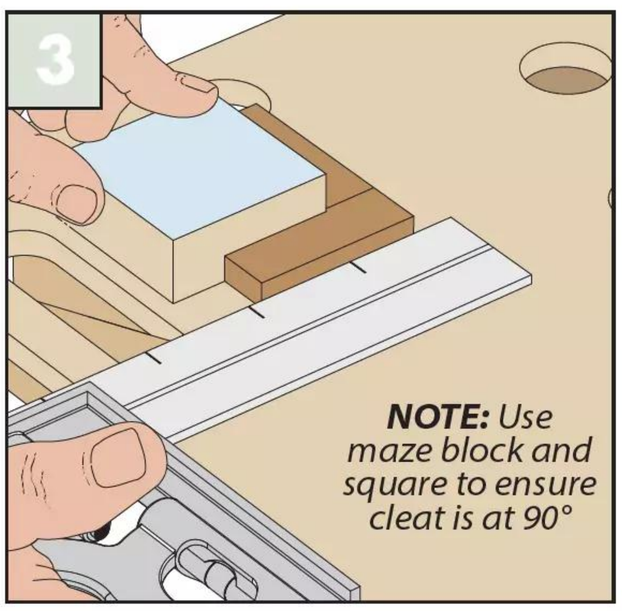
GUIDING THE MAZE BLOCKS



Square Location. Use the combination square to find where the far edge of the block will be and set the first cleat there.



Lateral Placement. Determine the distance the cleat needs to be from the adjacent edge using a ruler.



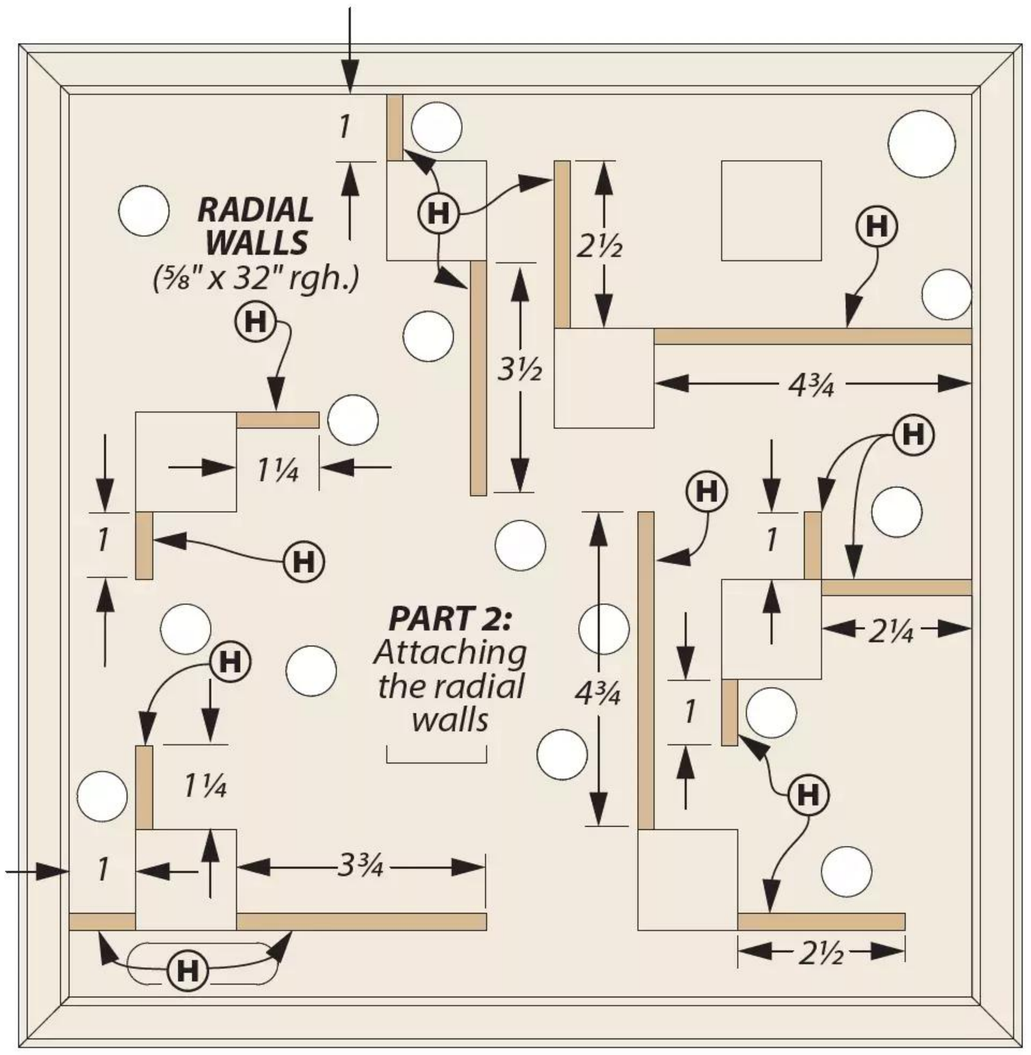
Second Cleat. Stick the first cleat down and use it to locate the second one square to it.

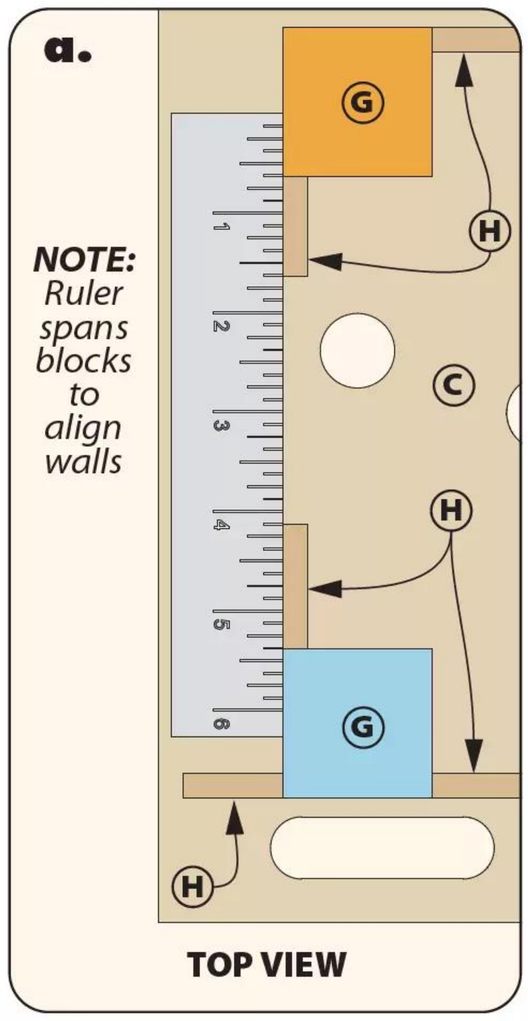
the bottom of the previous page. Put simply, I stuck down hardboard strips using double-sided tape as cleats, then used those to register the blocks. As with the ramp, CA glue and accelerant secured the workpieces.

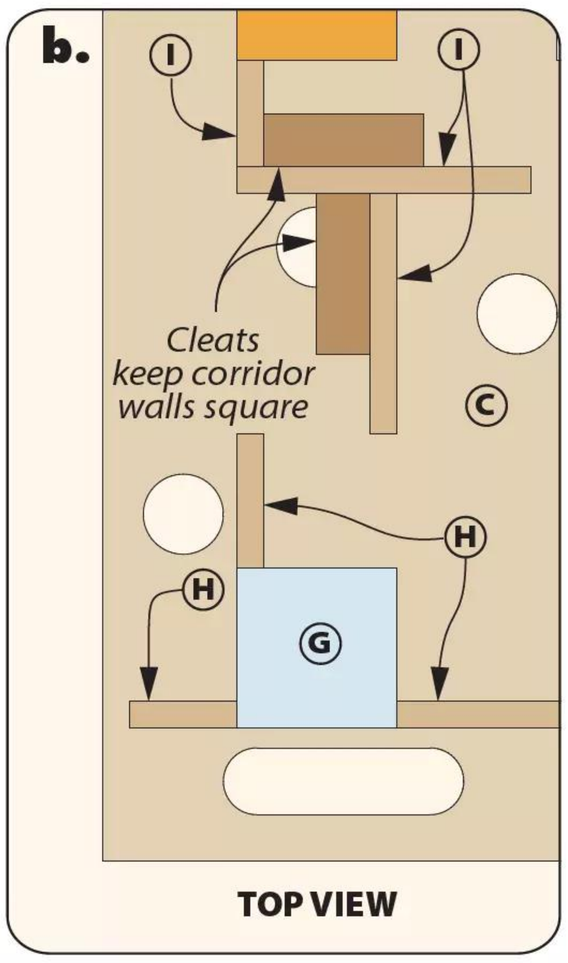
MAZE WALLS. Next come the walls. I divided these into two categories: the radial walls, which branch off from the blocks like spokes, and the corridor walls, which snake out to form the rest of the labyrinth. You can see the placement of the radial walls in the upper illustration at right — start with these. Here, you can use your ruler to ensure the walls are straight and square as you place them (detail 'a').

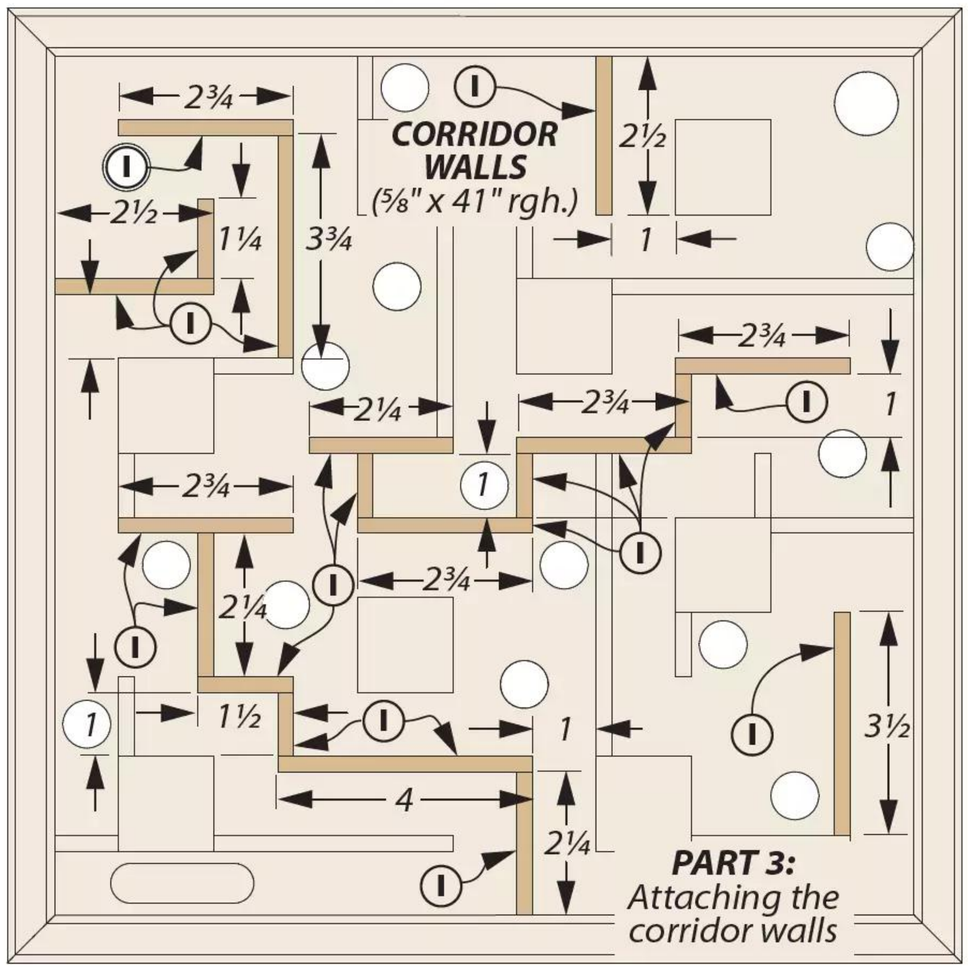
The lower right illustration shows the corridor walls. Placement gets tricky here, but strategic use of the cleats (like you see in detail 'b') helps keep things aligned. Dry-fitting the frame also helps with the walls that connect to those parts.

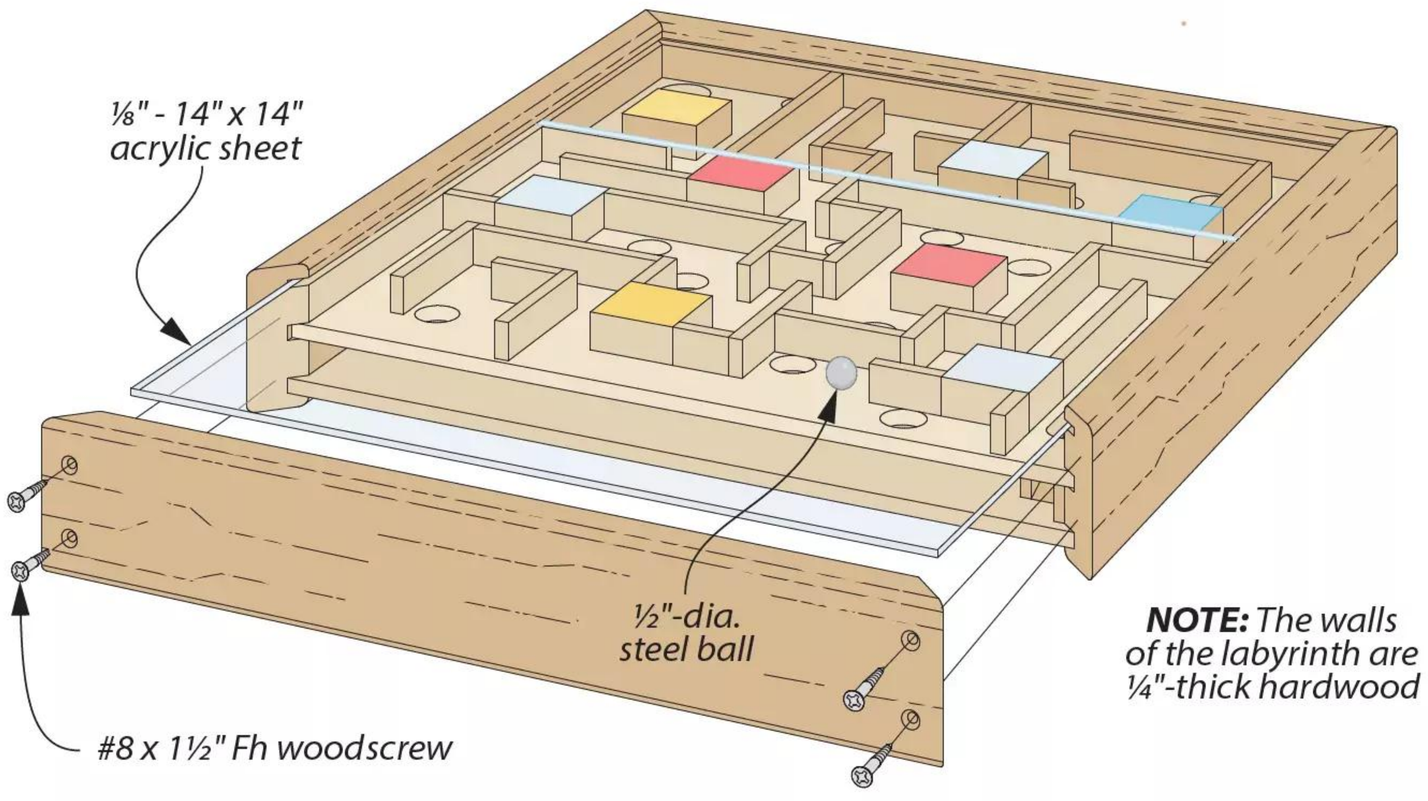
CLOSING UP. When all the maze pieces are attached, glue up three of the frame sides with the panels and acrylic in between (no glue on those though). You'll need a marble (or a steel ball) to play with, so toss it inside. Once you screw on the final side, the labyrinth is ready to roll.











NOTE: *The walls of the labyrinth are ¼"-thick hardwood*

Materials & Supplies

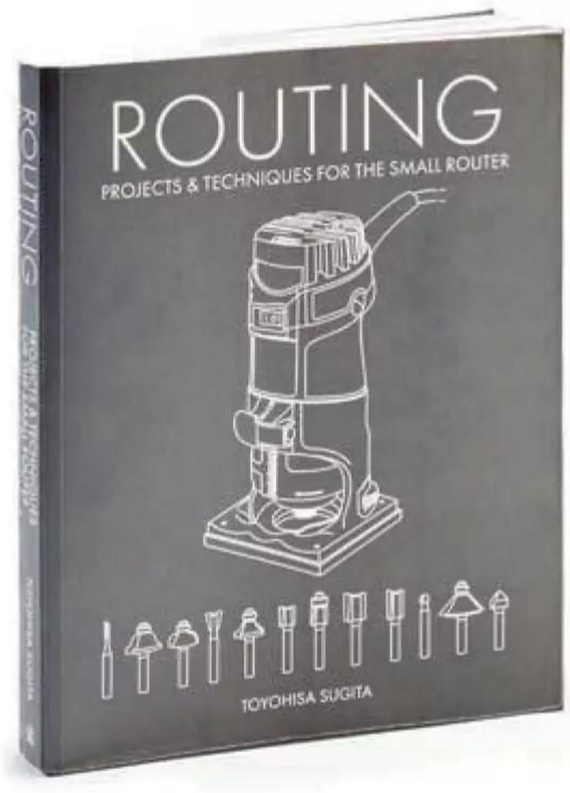
A	Frame Sides (4)	¾ x 2⅜ - 15
B	Bottom Panel (1)	¼ ply. - 14 x 14
C	Game Board (1)	¼ ply. - 14 x 14
D	Ramp (1)	⅝ x ⅞ - 2½
E	Short Ramp Side (1)	3/16 x ⅝ - 2 3/16
F	Long Ramp Side (1)	3/16 x ⅝ - 2 13/16
G	Maze Blocks (8)	⅝ x 1½ - 1½
H	Radial Walls	¼ x ⅝ - 32 rgh.
I	Corridor Walls	¼ x ⅝ - 41 rgh.

- (4) #8 x 1½" Fh Woodscrews
- (1) ⅛" - 14" x 14" Clear Acrylic
- (1) ½"-dia. Steel Ball

BOOK
Review

Routing by Toyohisa Sugita

When someone just getting into woodworking asks if I have any recommendations, one of my first suggestions is to get a router and learn to use it. There's a lot you can do with a router. For a beginner, investing the money in bits and accessories and time in building the skills will pay dividends that few other tools can match. Additionally, a smaller palm router is an easy-to-handle tool for those new to working with power tools.



▲ *Routing* by Toyohisa Sugita, *GMC Publications*, RRP $35, available online and from all good bookshops.

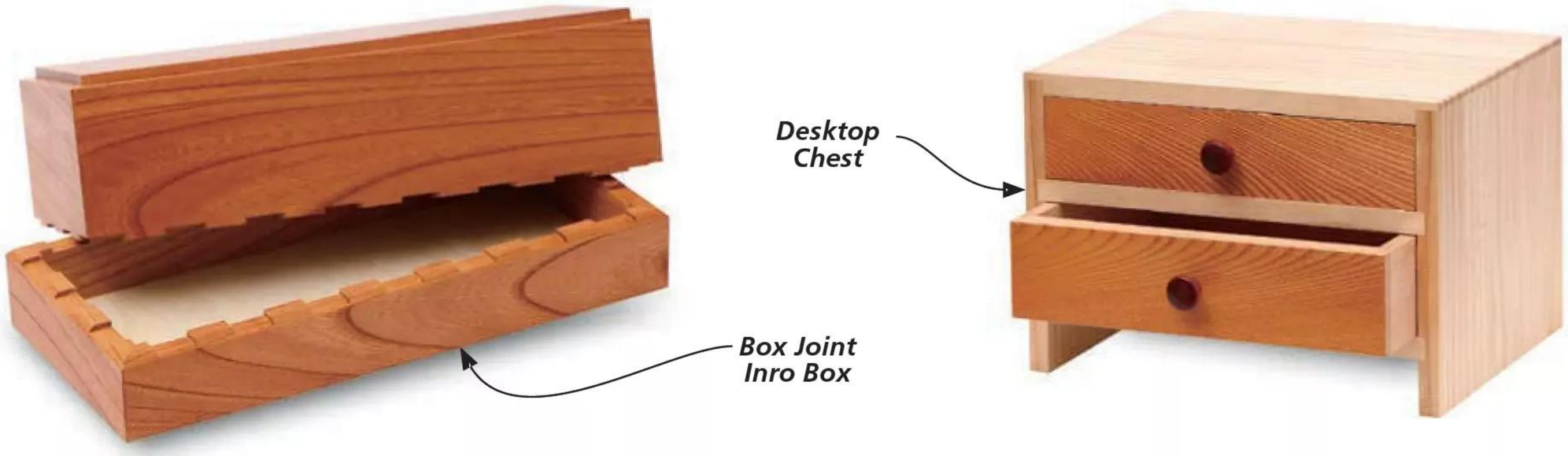
Recently, at the *Woodworking in America* event we held here in Des Moines, I got to meet a woodworker by the name of Toyohisa Sugita. This turned out to be quite serendipitous: one of Sugita's books had recently been translated into English and crossed my desk only a few months back. This book was *Routing*.

A BIT ABOUT ROUTING. *Routing* is a book that covers the use of palm routers, or trim routers. Sugita begins from the ground up, with the first chapter covering the fundamentals of using a router: how it functions, what bits you'll need, avoiding back-routing, etc. The following two chapters build on those basics, and Sugita's method quickly becomes evident.

At the event, Sugita gave a demonstration, not of routing, but rather of hand sawing. However, his approach remains the same for both methods. He showed a few of his jigs, which used spacers to locate his cuts on a few joints. In *Routing*, his style is the same, and much of the book focuses on the use of guides and jigs to eliminate any "eyeballing" or guesswork.

A PRACTICAL APPROACH. In talking with Sugita, it came up that his style of woodworking stemmed from a rule he set for himself early in his career: he'd figure out a way to ensure his joints

Written by: Rob Petrie; Photos and Illustrations provided by *GMC Publishing*



were perfectly fit after the initial cut, without need for fitting with planes or chisels. That's an admirable goal for any woodworker, I'd say, if a lofty one. Sugita's answer to that riddle was to make sure that every joint he made was cut with a jig that he could dial in to his exact measurements.

WHAT'S IN THE BOOK? I found Sugita's approach in this book to be an excellent starting point for beginners. As I mentioned previously, his first chapter is dedicated to the fundamentals of router use. The second chapter of *Routing* covers handheld use. He provides his designs for several handheld accessories, such as an auxiliary baseplate and an edge guide. The chapter culminates in a simple mitered box to make use of the techniques learned earlier.

The third chapter moves on to working with a benchtop router table (or a trimmer table, as Sugita calls it). Like the previous chapter, this one starts with the basics. The parts of the router table are explained, as are common operations (rabbets, dadoes, grooves) and safety protocols (which way to push the piece, which side of the bit it should be on). The last section of this chapter provides instructions on building a benchtop router table and a fence to go with it.

The final chapter of *Routing* is devoted to projects. You can see two of these above. These projects either aim to give some instruction on fundamental joinery, or be used as more accessories for your shop. For instance, the left box illustrates how to create both a box joint and a half-blind rabbet.

While *Routing* is quite beginner-friendly, there's still plenty more experienced woodworkers can pick up. In the following pages, I'll dive into one of the projects to show Sugita's style and a jig I particularly enjoyed.

ABOUT THE AUTHOR

Toyohisa Sugita. Toyohisa Sugita is a Japanese author and woodworker based out of Tokyo. His woodworking career began at the age of 28 when he started constructing his own cruising yacht. He completed the vessel at the age of 33, and his work over those years illustrated to him the importance of jigs in woodworking. In the four decades since, he has worked on the development, manufacturing, and sale of woodworking products, along with authoring several books and producing a number of educational videos. Today, Sugita developes his own woodworking products and continues to write, in addition to performing demonstrations across the world, including Japan and the U.S.

Routing has been translated into English and published in western markets by *GMC Publishing*. If you're interested in purchasing a copy of *Routing*, refer to sources on page 66.

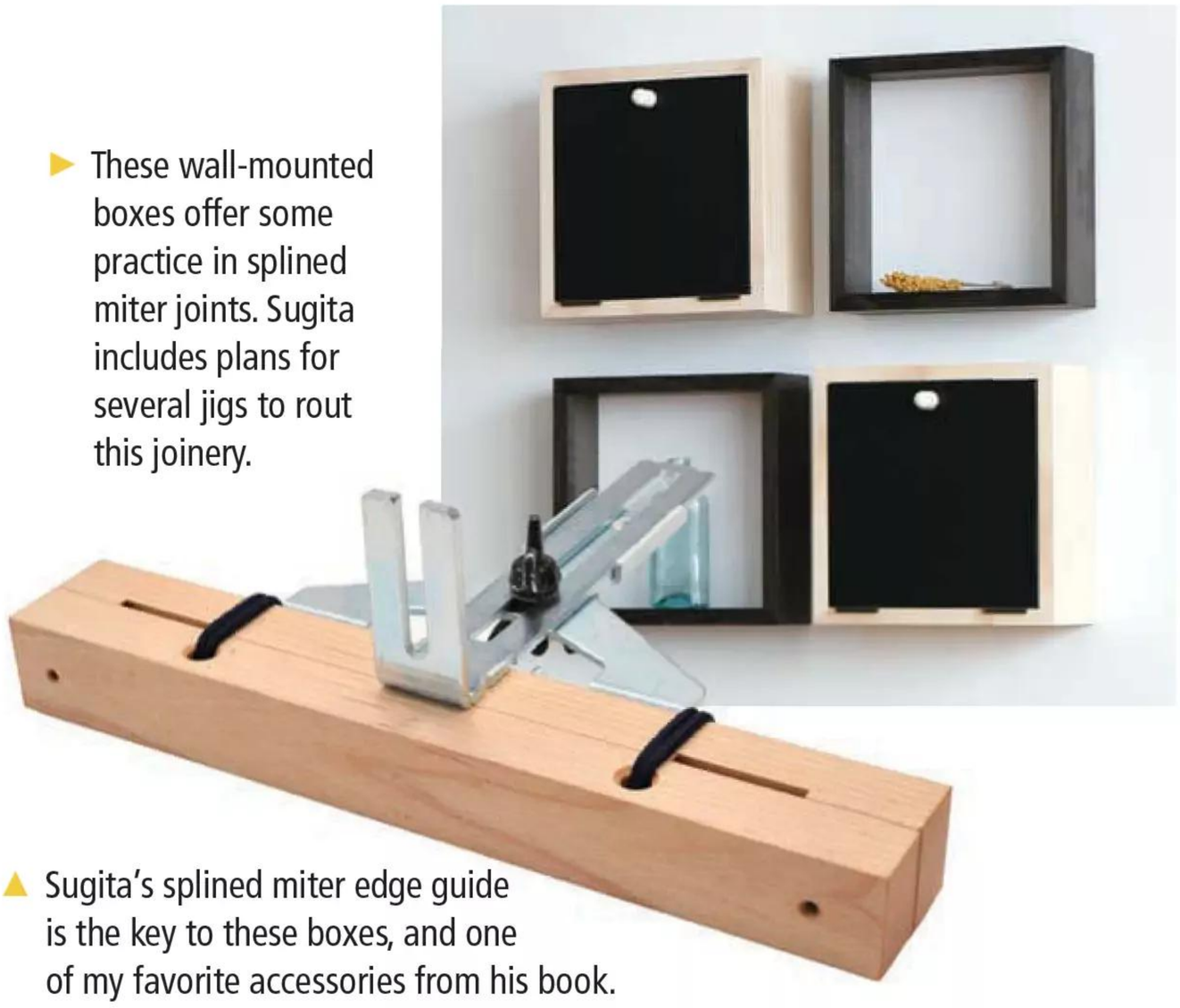
▲ Photographed above is the 27½' cruising yacht that kicked off Sugita's woodworking career.

WALL-MOUNTED BOXES

To show you what you can expect from *Routing*, I'll break down one of the projects included in the final chapter of the book. The "Wall-Mounted Box" is shown at right, and utilizes several techniques taught throughout the course of the book, including cutting splined miter joints and creating a French cleat. In addition, Sugita shows how to construct a flush-trimmed door panel to close them up.

PROJECT BREAKDOWN. Each project begins by breaking down the construction, either into the basic operations or by pointing out the key features of a particular project. For the wall-mounted boxes, there are ten basic operations to be performed. From there, each operation is walked through step-by-step with photos of Sugita to help guide the reader. The photos on this page come from his book.

DIMENSIONING BY HAND. In the photo at left below, you can see Sugita sizing his material with a hand saw. The only power tools used in *Routing* are the router and occassionally a drill. Sugita does his planing and dimensioning by hand, using a guide in this case to rough-out the mitered ends of the workpieces.



▲ These wall-mounted boxes offer some practice in splined miter joints. Sugita includes plans for several jigs to rout this joinery.

▲ Sugita's splined miter edge guide is the key to these boxes, and one of my favorite accessories from his book.

While he doesn't go in-depth on precisely how to dimension by hand, he offers some useful tips, such as how to construct the 45° guide shown at left below.

BUILDING ON SKILLS. Sugita finishes that mitered edge by routing it to the final size and angle. For this task, he provides both a handheld and tabletop method. The handheld method is learned in the second chapter, utilizing a set of pins to ensure workpieces are precisely positioned. By the time the reader gets to the projects, they will have gone through his chapter on using a router table, so Sugita uses this project to show a method of mitering at the table instead.

MITERED SPLINE JIG. Sugita continues the project by showing how to cut dadoes for the back panels along the newly mitered workpieces. However, what I'd like to discuss is the operation after that, which involves the mitered spline jig you see above.

As I mentioned before, althougth this book is geared toward giving beginners the tools they need to use a router effectively, there are still plenty of techniques and designs that

▲ Sugita eschews the table saw when sizing material, instead using hand saws to reach a rough shape. The router is then used to cut the piece to final size and give it a clean, finished edge.

▲ The book builds on its techniques as it progresses. The method shown to finish the miter joints on these boxes utilizes skills and jigs addressed in previous chapters.

seasoned woodworkers can make use of, and one of those things is the mitered spline jig you can see on the previous page and the photos at right. This is another jig that Sugita introduces early, in his second chapter, but which he demonstrates the practical use for in this project.

Put simply, Sugita's jig uses the spline that will join the miter to size the dadoes for them. He provides the designs for it in the second chapter (along with the angled table the workpiece sits on), and it is a jig that I find to be emblematic of Sugita's style. It eliminates guesswork and opts to use a physical spacer (the spline in this case) to accurately size the joint. I've made the jig myself, and even begun to use it in my own shop.

▲ Sugita's spline joint jig uses cutoffs from the splines to ensure that the width of the dado will match the thickness of the spline exactly.

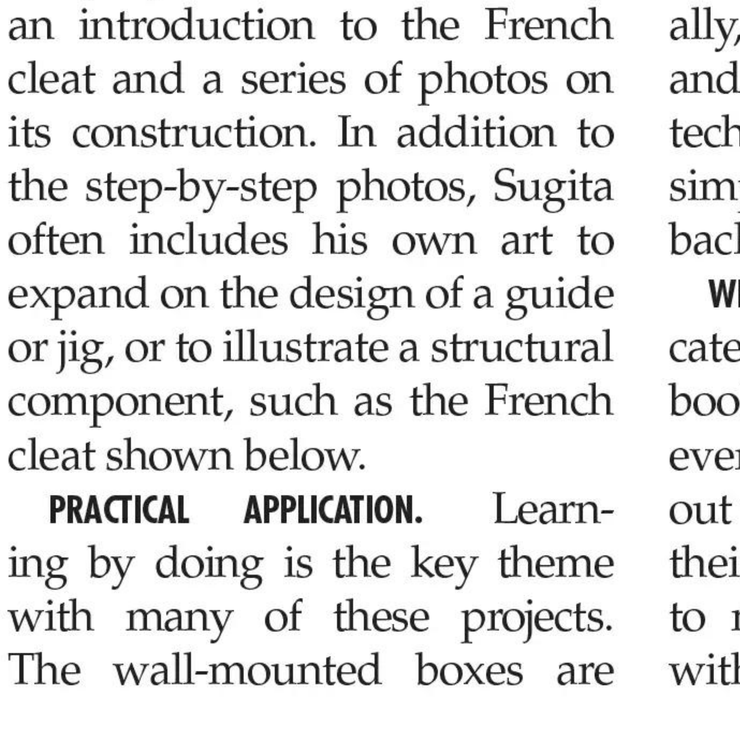
▲ After the initial cut, removing the spline correctly positions the jig to finish the groove with a second cut.

ART & PHOTOS. After showing the reader how to create the mitered splines, Sugita takes them through gluing up and painting the project. This is followed by an introduction to the French cleat and a series of photos on its construction. In addition to the step-by-step photos, Sugita often includes his own art to expand on the design of a guide or jig, or to illustrate a structural component, such as the French cleat shown below.

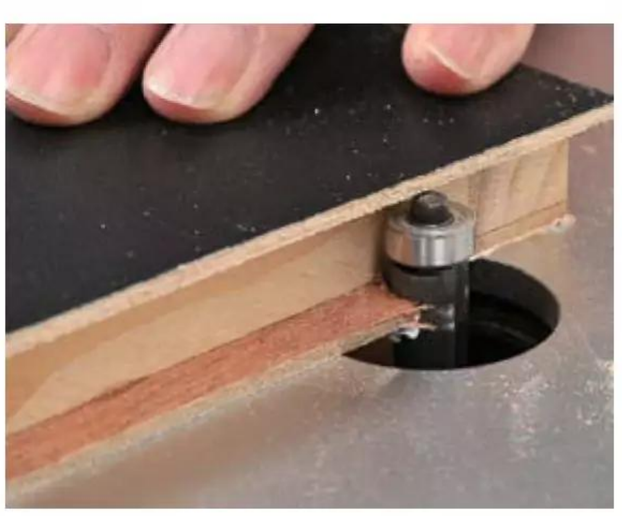
PRACTICAL APPLICATION. Learning by doing is the key theme with many of these projects. The wall-mounted boxes are completed with a pair of simple, flush-trimmed panel doors. Flush-trimming is shown here for the first time, however a reader doesn't need to be working on this particular project to find the information useful. Common operations like this are indicated as "Tips" in the table of contents. Additionally, this book is well-indexed, and the location of a certain technique can easily be found simply by looking it up in the back of the book.

WHAT YOU'LL LEARN. As I've indicated earlier, *Routing* is a great book for beginners. It contains everything someone starting out would need to know about their router, and it offers ways to make a variety of projects with only a router, drill, and a few hand saws, so not having a dream shop yet isn't an excuse to put off woodworking. In terms of structure and presentation, Sugita does an excellent job at laying down the groundwork, then "testing" the reader's knowledge by providing them projects that utilize their skills.

For the more experienced router-wielder, there is still plenty you can pick up. The jig I showed here is just one example. Sugita offers his take on a number of common jigs and guides that emphasize his focus on both precision and approachability. If you've an urge to expand your routing horizons, whether you're a beginner or a woodshop veteran, then I recommend checking out *Routing*. W



Drawings and step-by-step photos guide the reader through each operation, such as with these French cleats that hold the boxes.



▲ Common operations, such as flush-trimming, are demonstrated in the projects, and indicated in the table of contents for easy reference.

Sources

Most of the materials and supplies you'll need to build the projects are available at hardware stores or home centers. For specific products or hard-to-find items, take a look at the sources listed here. You'll find each part number listed by the company name. See the left margin for contact information.

MAIL ORDER SOURCES

Project supplies may be ordered from the following companies:

Amana Tools
800-445-0077
amanatool.com

Amazon
amazon.com

Benjamin Moore
855-724-6802
benjaminmoore.com

Carbon Method
616-366-4232
carbonmethod.com

Diablo
diablotools.com

Freud
800-334-4107
freudtools.com

HNT Gordon
026-628-7222
hntgordon.com.au

IndiePubs
indiepubs.com

McMaster-Carr
630-600-3600
mcmaster.com

National Hardware
800-346-9445
national-hardware.com

Penofin
800-625-5235
penofin.com

Rockler
800-279-4441
rockler.com

Sculpt Nouveau
760-432-8242
sculptnouveau.com

Woodcraft
800-535-4486
woodcraft.com

Woodpeckers
800-752-0725
woodpeck.com

TIPS & TECHNIQUES *(p.6)*

- **Amazon**
  Jewelry Cleaner. . . B0D7L961CR

COLORING WOOD *(p.14)*

The *General Finishes* dye that I used on my tool chest came from a local woodworking store. Shellac is widely available at home centers and standalone paint stores.

- **Woodcraft**
  General Finishes Dyes . . . .varies
  Zinnser Shellac. . . . . .varies

CUTTING PLYWOOD *(p.18)*

If you use plywood for your woodworking projects, then consider equiping your shop with tooling that gives the clean professional cuts.

- **Woodpeckers**
  *Plywood Bits. *USHPBSET-7P
- **Freud**
  *10" x80T saw blade. . . .*LU80R010
- **Amana**
  *8" x44T dado set *658040

GREAT GEAR *(p.22)*

If you're interested in either the prep kit or the carbon coating kit from *Carbon Method*, give them a call or take a look at their website in the margins.

- **Woodpeckers**
  Joinery Sled. . . . . .JSLED

PATINATION *(p.26)*

All the products I used in the patination process are available on *Sculpt Nouveau*'s website (see margin). I used their metal cleaner and degreaser to prepare the copper. The dye-oxides come in a variety of colors; I chose green-blue and red. To seal the leaves, I used their "ColorLoc" and "Ever Clear" sealants.

MODERN WORKBENCH *(p.28)*

HNT Gordon makes the bench and tail vise used on the workbench, as well as ½" bench dogs for the dogholes.

The benchtop relies on the uniformity of Baltic birch plywood for its final appearance. So substituting with another sheet stock isn't recommended. Laminated veneer lumber (LVL) offers the closest comparison, but since it's made from pine, the appearance will be quite different.

- **McMaster-Carr**
  *Leveling Mounts *62805K14
  *Drawer Slides *11435A27
  Pull Handles. 1855A64
- **Rockler**
  *Inset Euro Hinge *34807

WALL SHELF *(p.36)*

Outside of a few screws, dowels, and wood plugs, there isn't much required for the wall shelf. The paint we used is from *Benjamin Moore*. The case is "Million Dollar Red." The back is "Feather Gray."

GINKGO GATE *(p.44)*

The gingko gate was finished with *Penofin*'s "Ultra Premium Red Label" wood stain. It's great for outdoor use and easy to reapply annually.

When creating the gingko cutouts, I recommend using a blade like the scroll cut blade from *Diablo* listed below. The high TPI count will yield a cleaner cut, and a shorter blade adds stability.

- **McMaster-Carr**
  12 ga. Copper Sheet . . . 9801K55
  #6 Copper Tacks 97839A210
- **National Hardware**
  Decorative Gate Kit . . .N343-467
- **Diablo**
  Scroll Cut Blade . . DJT101AOF5

COFFEE TABLE *(p.50)*

We sourced the glass for the coffee table from a local glass shop. Full-extension drawer slides are available from most home centers. The paint color we used is "Newburyport Blue" from *Benjamin Moore*.

CUBIST LABYRINTH *(p.56)*

While it may seem reflexive to add finish to a project, sometimes raw wood is the best choice. It retains its brightness, and over time it will acquire a unique, aged look. As for the blocks, any paint will do. We simply used red, orange, green, and blue spray paints.

- **McMaster-Carr**
  Clear Acrylic. 8560K259
  ½" Steel Balls 9528K24

BOOK REVIEW *(p.62)*

Routing by Toyohisa Sugita can be found online, or at your local book retailer. As a limited offer for *Woodsmith* readers, *Routing* can also be purchased from *indiepubs.com* at a 20% discount using the code "IPP4031" until April 28th of 2026.

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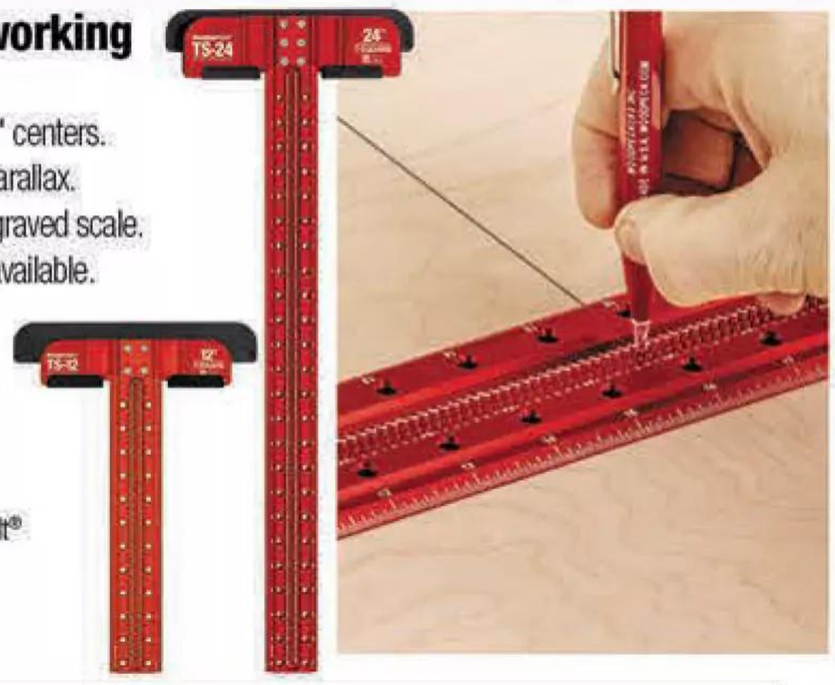

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TS-24 24"....**$159.99**
TS-32 32"....**$189.99**

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- Half-Laps, Bridle Joints, Sliding Dovetails, Tenons & More!
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1/4" Shank *9/16" cutting height*....~~*MSRP $52.77*~~ **$46.99**
1/2" Shank *13/16" cutting height**....~~*MSRP $90.61*~~ **$79.99**
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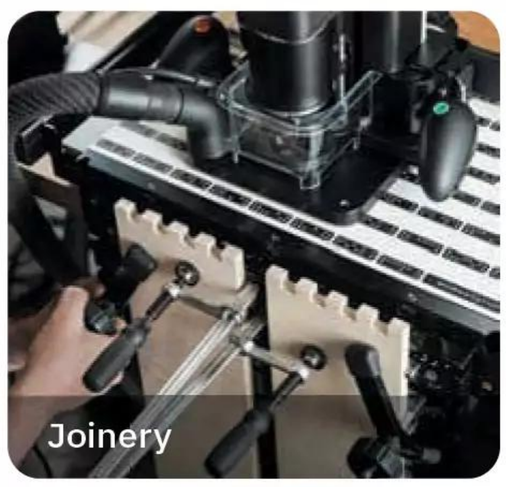
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