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EDITORIAL

Woodsmith Magazine
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from the editor Sawdust

I've learned most of my woodworking from the time spent in my workshop building projects or just trying out some task. That doesn't mean that I've learned alone. Quite the opposite, in fact. Skills found in woodworking books, projects from woodworking magazines, replayed YouTube videos, and live demonstrations from other woodworkers make up the bulk of my curriculum. Behind each of those lies at least one other woodworker who's excited about the craft and willing to share that with others.

Instead of picturing a lone woodworker building projects, we should instead imagine him or her surrounded by a cloud of fellow craftspeople across the world and throughout time. A bright line extends out to the recipients of the projects and those who pick up woodworking because of it. My role here at *Woodsmith* and with the *Woodsmith Shop* allows me to see and hear from woodworkers who have built projects from the magazine or show and what it's meant to them. I love to see the photos of what you've made. I also want you to know and recognize the people who helped make it happen. Take a look at the names in the masthead at left. Some of those names also pop up in the bylines of the articles.

One of my goals as editor is to connect you to the people behind the *Woodsmith* title. You can do that in real life with a visit to our shop and studio, check in on our weekly shop updates and tips videos, through the *ShopNotes Podcast*, as well as our in-person events like *Woodworking In America* and tours. This connection with other woodworkers as well as the projects we build go a long way toward creating the world we want to live in. I invite you to find your place and join us in building a world made by human hands.



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Projects

heirloom project

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Upgrade your home office or homework station with this handsome cherry desk inspired by Frank Lloyd Wright.

ShopNotes project

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designer project

Hall Bench 40

A modular construction technique lies at the heart of this eye-catching, versatile bench.

designer project

Book Tower 48

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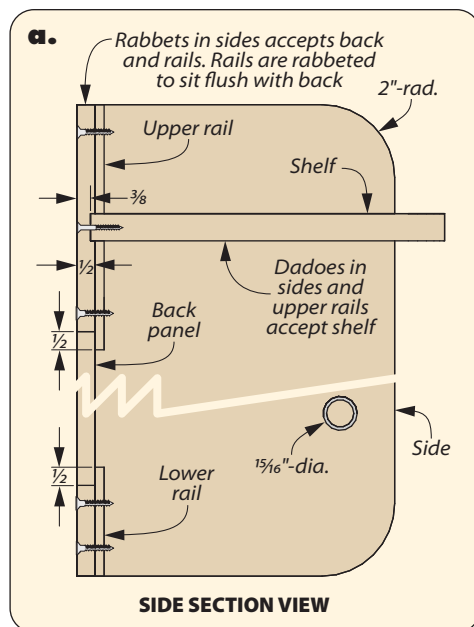
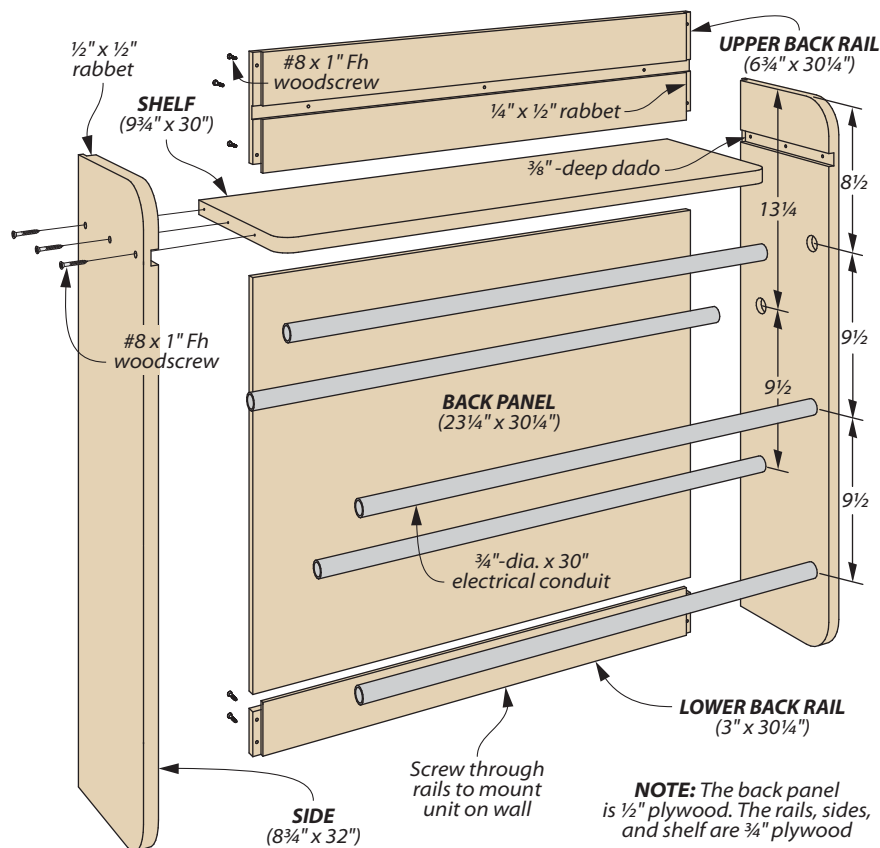


Finishing Rag Rack

Once you're done applying your finish, don't just throw your rags out. Spontaneous combustion is a real threat, especially if you're using an oil-based finish. Most oxidize as they cure, which causes heat, and a crumpled rag doesn't dissipate heat very well. The heat builds up, and eventually it can ignite the fumes.

My solution was to make a curing rack. This consists of a few plywood panels and a series of rods to hang the rags on (I used electrical conduit). You can see how I put it together below. After I'm done applying a finish, I simply hang the rags up to cure safely on the rack. Then, when the finish has fully dried, I can toss them in the trash.

*Cohen Evans
St. Paul, Minnesota*





Open Concept Hardware

The plastic bins shown here work great to store hardware. However, I wanted easier access than inside of a drawer or case. Some have hangers, which I used to attach them to the wall with a thin strip of aluminum.

A few washers provided clearance for the hangers. Now, my common screw sizes are all readily at hand when I need them.

*Dylan Huffman
Lubbock, Texas*



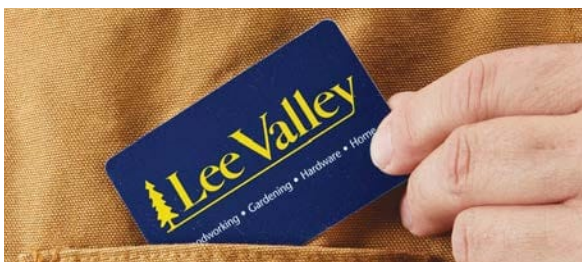
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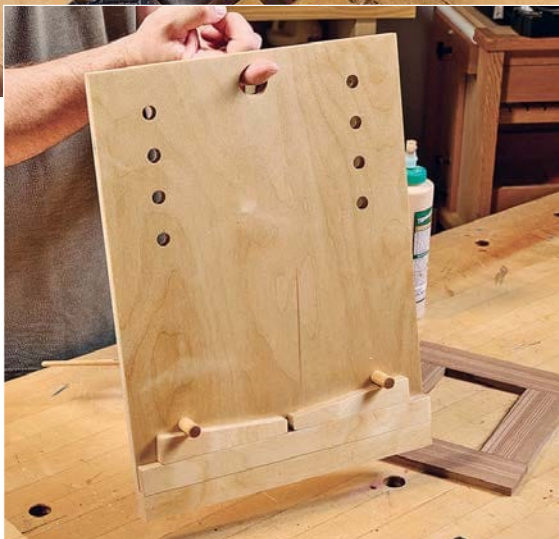
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Frame Glueup Jig

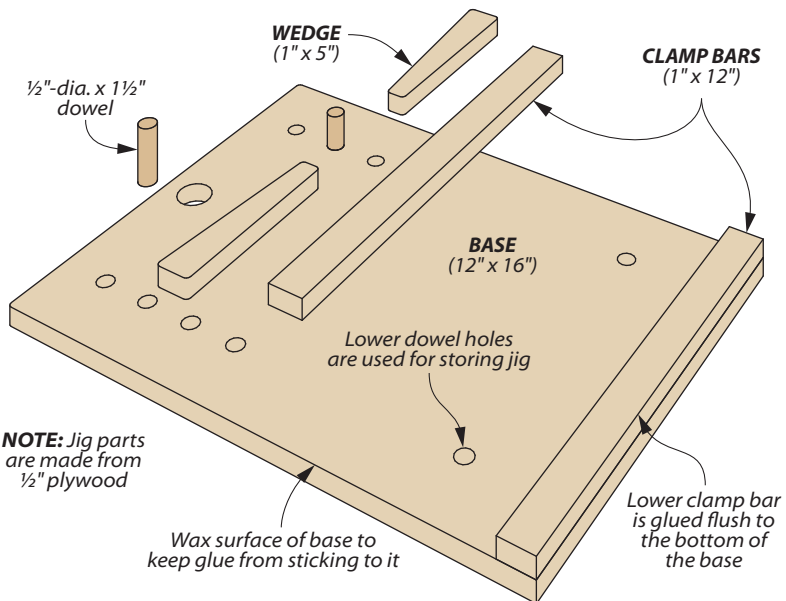
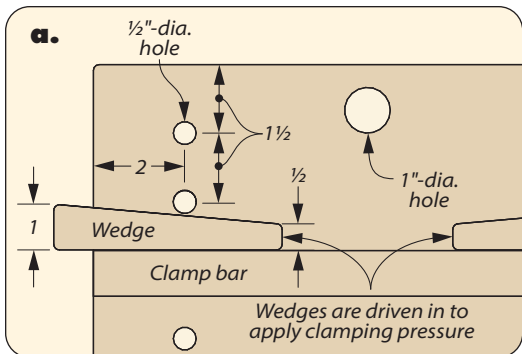
I build a lot of frames in my shop, but clamping them can be a pain, especially for butt-jointed frames. For these, I use an easy-to-build glueup jig.

The base of the jig is a plywood panel with a few holes for dowels. Clamp bars pin the assembly and apply the pressure.

One is glued to the lower edge of the base, while the other is loose. This one applies the pressure once the dowels are seated in the base and the wedges are driven in between. Plus, the jig can easily be resized to what you're building.

*Sean Griffin
Dayton, Nevada*

▲ When not in use, the dowels can be slotted in the lower holes, allowing the wedges to hold the loose clamp bar. A hole in the top allows the jig to be hung on the wall.



NOTE: Jig parts are made from 1/2" plywood

QUICK TIP



Fiat Lux. Henry Hahn of Council Bluffs, IA needed a good way to inspect his finishing job, but the lights in his shop provided poor visibility. His answer was to use a portable, tube-style work light. A pair of handscrew clamps created a convenient stand that he could set on his workbench as he applied the finish.

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B Ben Verified Buyer
★★★★★

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I am seriously impressed by the performance and build quality. It is also super quiet, which was an important consideration. The HEPA filter is also impeccable.



S Steve S. Verified Buyer
★★★★★

Best fit and performance
For a 2 car garage, this unit did the job over again, I'd definitely recommend this system.

B Bob B. Verified Buyer
★★★★★
Even the bandsaw is free!
This unit exceeded my expectations.

K Kevin L. Verified Buyer
★★★★★

I couldn't be happier with it.

Thanks for all of your help with the design and sale.

D Dennis H. Verified Buyer
★★★★★

The envy of all of my woodworking friends!!

I bought the Oneida dust collection system two years ago and just love it!! It is the best quality, works very well and is the envy of all of my woodworking friends!! I just wish I had bought it many years ago. It was easy to assemble and is so easy to empty the bin when full.

Another league

B Bob F. Verified Buyer
★★★★★

Worth the price. I spent a lot of time researching dust collectors, and finally read a Wood magazine article that showed actual flow/suction test data. Oneida was clearly superior in fan performance. With that coupled to the cyclone, the choice was pretty clear.



Scan
For more
information

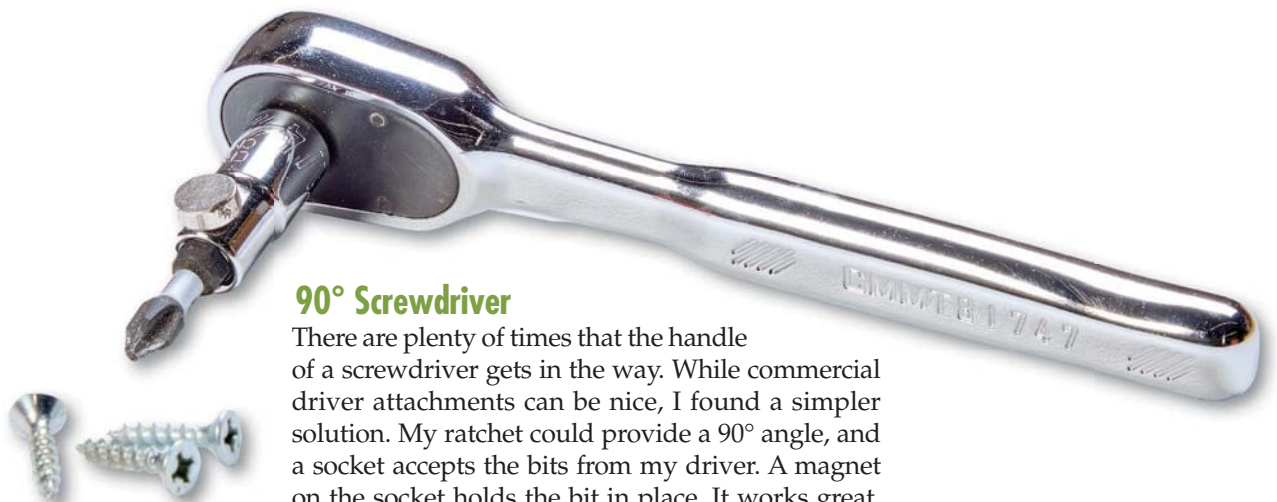


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90° Screwdriver

There are plenty of times that the handle of a screwdriver gets in the way. While commercial driver attachments can be nice, I found a simpler solution. My ratchet could provide a 90° angle, and a socket accepts the bits from my driver. A magnet on the socket holds the bit in place. It works great, just don't overdo it; ratchets output a lot of torque.

*Oliver McLeod
Denver, Colorado*



Drilling Cleaner Holes

When you need to make a large hole — say 2" or more in diameter — a hole saw is usually your only choice. However, rough edges and burn marks are common with these bits, and a pain to clean up.

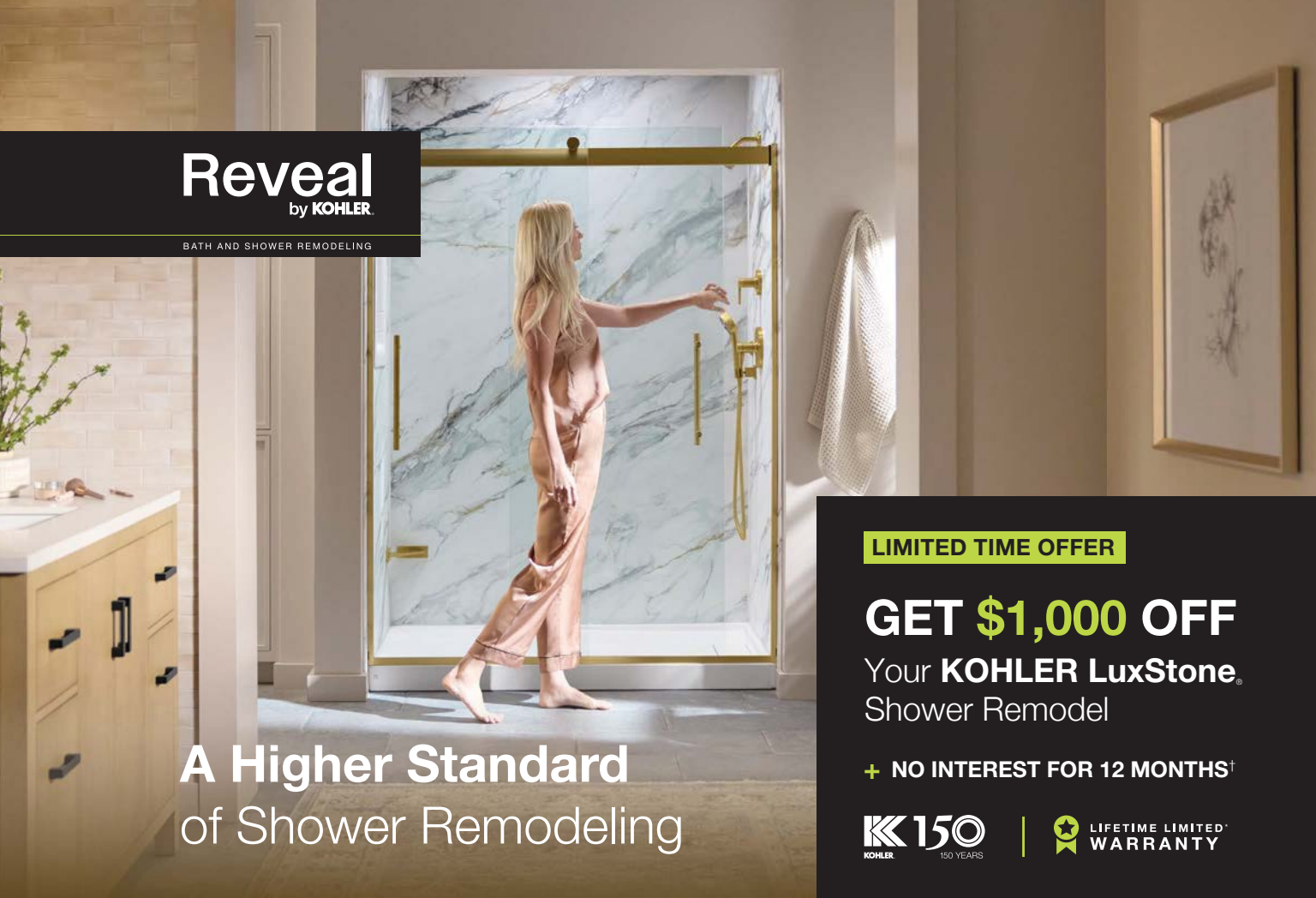
The issue isn't always a dull hole saw. While this makes a difference, the rough edges and scorching are often a result of the waste being freed and no place for it to go but deeper in the kerf.

The answer is to give it an "off ramp," so to speak. First, I score the hole I'm making, as in Step 1. Next, I drill an adjacent hole with a Forstner bit (Step 2). Then, as the primary hole is cut, the waste is redirected into the secondary one (Step 3). This lowers friction during the cut and allows the hole saw to perform much better.

*Reese Wise
Jupiter, Florida*

► Allowing the chips and dust to escape the kerf provides a burn-free operation with much cleaner edges.





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Comments & Questions



JAPANESE FLAVOR

Editors,

I was channel surfing on *You Tube*. There was two channels that might interest you. The first one is *YasuhiroTV*. This Japanese woodworker makes jigs for his circular saw and router.

For a person who would like to start woodworking without a lot of money, they can build small woodworking projects in their garage using these jigs. The second one is *JSK-Konbou*. This is more advanced woodworking as he builds woodworking machines; for example a compact wall-mount panel saw, and a drill press using a corded drill.

I will be constructing some of the jigs from *YaushiroTV* channel to help me on my woodworking projects. Thank you, I enjoy *Woodsmith* magazine.

Sincerely yours,
Clyde Nakashima

Hi Clyde,

Thank you for writing in and sharing about *YasuhiroTV* and *JSK-Konbou*. Both sites are really interesting. I think problem solving and ingenuity remain important components of our hobby's enjoyment despite the overwhelming number of commercial tools available. Of course, the woodworking jigs and tools are fun, but I have to watch the videos of the RC

ornithopter! That is fascinating!

All the best,
Chris Fitch

Creative Director/Woodsmith

DRAWER GUIDES & BOTTOMS

Hi Woodsmith,

I am making drawers to put into existing kitchen cupboards and I was wondering what slides to use: undermount or side slides? The drawers are 23" deep by 23", 29", and 35" wide. Should I use a center rail for the larger ones? And as for thickness of the bottoms, would $\frac{1}{4}$ " be sufficient or should I use thicker? I think the 23"-wide ones won't need it, but what about the others? I have subscribed to you for a long time, and you typically know what I need to know. Any help would be appreciated, or if you could direct me to someone.

Thanks!
Mary-Anne Loftus

Hi Mary-Anne,

Thank you for reaching out with your kitchen drawer questions.

1) Drawer Bottoms. I think we have all seen drawers with a sagging bottom, particularly kitchen drawers which often have heavy loads. Drawer bottoms of $\frac{1}{4}$ " thick material are often adequate, but it depends on what is used. MDF core plywood is commonly used as it is a less expensive, but it lacks long-term

strength for large or heavily loaded drawers. I think that veneer core plywood is best. Standard $\frac{1}{4}$ " hardwood veneer core is better than MDF core but varies in quality. $\frac{1}{4}$ " Baltic Birch plywood has excellent strength. Another option is to use $\frac{1}{4}$ " engineered underlayment plywood. It is commonly available from the big box stores. For wide drawers, a center rail is a good solution or use $\frac{1}{2}$ " plywood. The $\frac{1}{2}$ "-thick drawer bottoms can be rabbeted on all four edges to accommodate standard $\frac{1}{4}$ " bottom drawer construction. Using $\frac{1}{2}$ " plywood would be an easy upgrade for your wide drawers.

2) Drawer Slides. Having worked in a few cabinet shops and at Woodsmith for the last 40 years I can confidently say the side-mounted slides are a great choice. They are durable, come in different finishes, and are easy to install provided the components are parallel and the required $\frac{1}{2}$ " gap on either side of the drawer box is adhered to.

We have used the newer undermount slides on a few projects, most recently in Woodsmith 285 for the Nordic dresser. These undermount slides allow for a clean look with no hardware showing.

While I have not installed a set, our shop manager Marc Hopkins has become a pro at using Blum brand undermount slides. They will require some learning to use and the purchase of an installation jig, but

once past that you may want to use them on future projects.

Slides can be expensive, but for a kitchen cabinet that will see daily use go for quality — and consider the soft close options. I hope this helps.

All the best,
Chris Fitch
Creative Director/Woodsmith

MORTISE MADNESS

Gentlemen,

How come I never see you use a mortising jig. When making mortises you always drill and chisel.

Thank You,
Jim Crowe

Hi Jim,

Thank you for writing in with your observation. Yes, you are right, we do tend to drill and chop mortises in the TV show and in the magazine. The reason we do this is that we try not to use specialized tools or jigs that often, instead relying on basic tools that most woodworkers probably own. That said, most of us have plunge routers and there are lots of easy to make mortising jigs available

that make mortising fast and easy. So, it might be time for us to stop drilling and chopping everything.

All the best,
Chris Fitch
Creative Director/Woodsmith

Hello,

I found the link below for plans for this mortising jig; it looks like it is very flexible and my questions are: Is there a maximum



stock width that the jig supports? What is the range of mortise lengths that the jig supports? Can I use the jig to create a mortise that is not centered on a thick piece of wood? Can I use the jig for for two mortises parallel to each other on a thick piece of wood? Is the white carriage assembly plate that attaches to the router something that I would make or would

I purchase it from a 3rd party provider? Thanks in advance, and I look forward to hearing from you
Francis Martini

Hi Francis,

Thank you for your interest in the mortising jig. I pulled up the CAD model and was able to get the information you asked about.

The maximum stock width for mortises cut on their edges is 10". Maximum length of mortises: 5¾". The router can be moved to a position where the router bit is 3" on center away from the clamping face. Creating parallel mortises is easy with requiring only one adjustment.

The router is mounted to a piece of phenolic which is a very tough, durable material. The plans source it from Highland Hardware and it is still available from them, as well as others. The phenolic will need to be machined by you using standard woodworking tools. Other materials could be substituted. I hope this helps.

All the best,
Chris Fitch
Creative Director/Woodsmith



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5 handy TAPES & ADHESIVES

After a recent shop cleanup, I discovered that I have a shocking number of tapes and adhesives for various tasks. Once I find the ones that work for me, I generally stick (not sorry) with them for years, but it pays to keep an open mind for other possibilities. I'll share a few of my favorites here. Refer to Sources on page 66 for purchasing details.

FASTCAP SPEEDTAPE

Over the years, I've come to rely on double-sided tape for hands-free holding or attaching

templates. After trying out different brands, I settled on *FastCap's Speedtape*. This tape is different from other double-sided tapes in that it is much thinner than most. That means if you use it to temporarily hold down a template for routing, the template will sit flat on a workpiece rather than elevated slightly above it.

The tape can also be used to permanently bond two surfaces together in light-duty situations. A good example is when adding thin edging to plywood. The tape can easily be trimmed to size, and as you can see in the photo above, the tape is clear, so it is completely hidden.

The tape is available in four different widths: 1", 1½", 2", and 6½".

Custom widths are available by contacting *FastCap* directly.

SCOTCH 233+ MASKING TAPE

If you've been looking for a solution to help hold small or difficult-to-clamp parts in place, look no further than *Scotch 233+* tape. Originally designed for the automotive collision repair industry, it works great as a binding tape.

When pulled, the tape stretches slightly and has a relatively high tensile strength compared to other masking tapes. This allows you to pull the tape down firmly over your workpieces, creating a significant amount of clamping force (photo at left).





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The tape's strong adhesive sticks immediately. But once your glue has dried, it can be removed easily without leaving any adhesive residue on your project.

NEXABOND

The oils in some exotic hardwoods can make it difficult to use standard, water-based wood glues. That's when I turn to cyanoacrylate (CA) glue. But most CA glues cure quickly, allowing very little working time before the glue sets. That's where *Nexabond* comes in. This brand of CA glue comes in short, medium, and long handling times (photos at right).

With the "long" glue, you have up to five minutes to position your parts, depending on the wood species and relative humidity. And since CA glues don't contain water, they won't swell the wood fibers. This means you can cut tighter joints to secure your workpieces.



▲ Use instant glue when working with oily tropical hardwoods. Choose from three different handling times: short, medium, and long.



MEASURE-IT TAPE

It's not uncommon for me to build projects that will hang on a wall. Trying to mark the location for multiple wall anchors can sometimes be tricky. I normally just use my tape measure

and transfer measurements to the wall. Recently, though, I've been using *Measure-It Tape*.

This handy tape has inch markings laid out along its length that repeat every twelve inches. Its paper-like surface makes it easy

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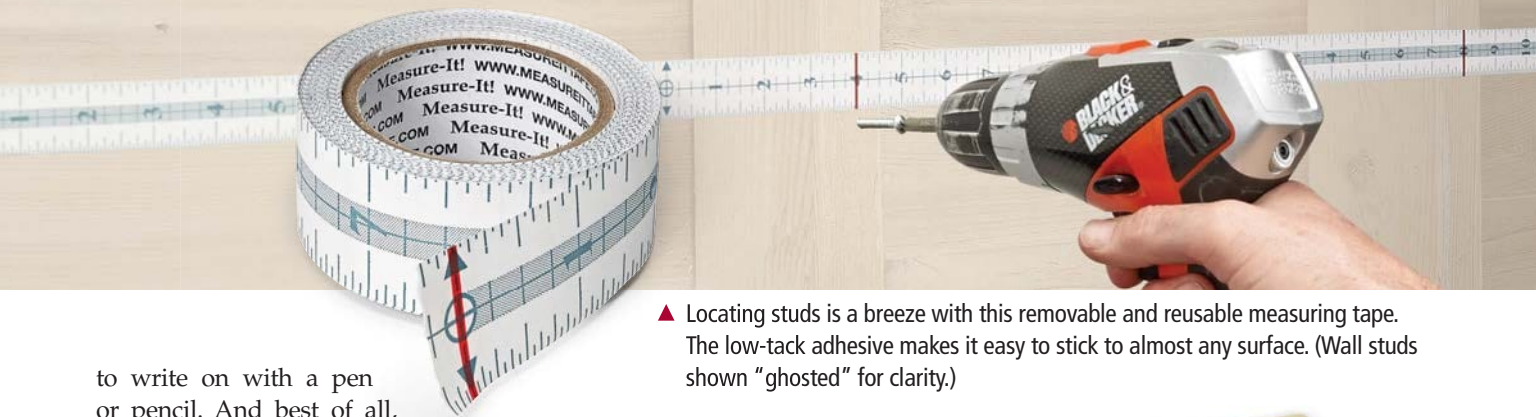


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to write on with a pen or pencil. And best of all, its low-tack adhesive allows it to be repositioned multiple times. To help identify stud locations, a red line has been included at 16" intervals (top photo, above).

GORILLA WOOD FILLER

Gorilla Glue recently introduced a line of wood filler for eliminating gaps. You can see in the photo at right that I used it to fill cracks in a knot. The filler comes in two colors: Natural and White. Both accept paint and stain and are water-resistant. It goes on easily and in about an hour, the entire area can be sanded smooth. **W**



▲ This moldable, spreadable material fills cracks or voids in your workpieces. It dries to a light tan color and creates a permanent bond with the surrounding wood that can be sanded and stained.



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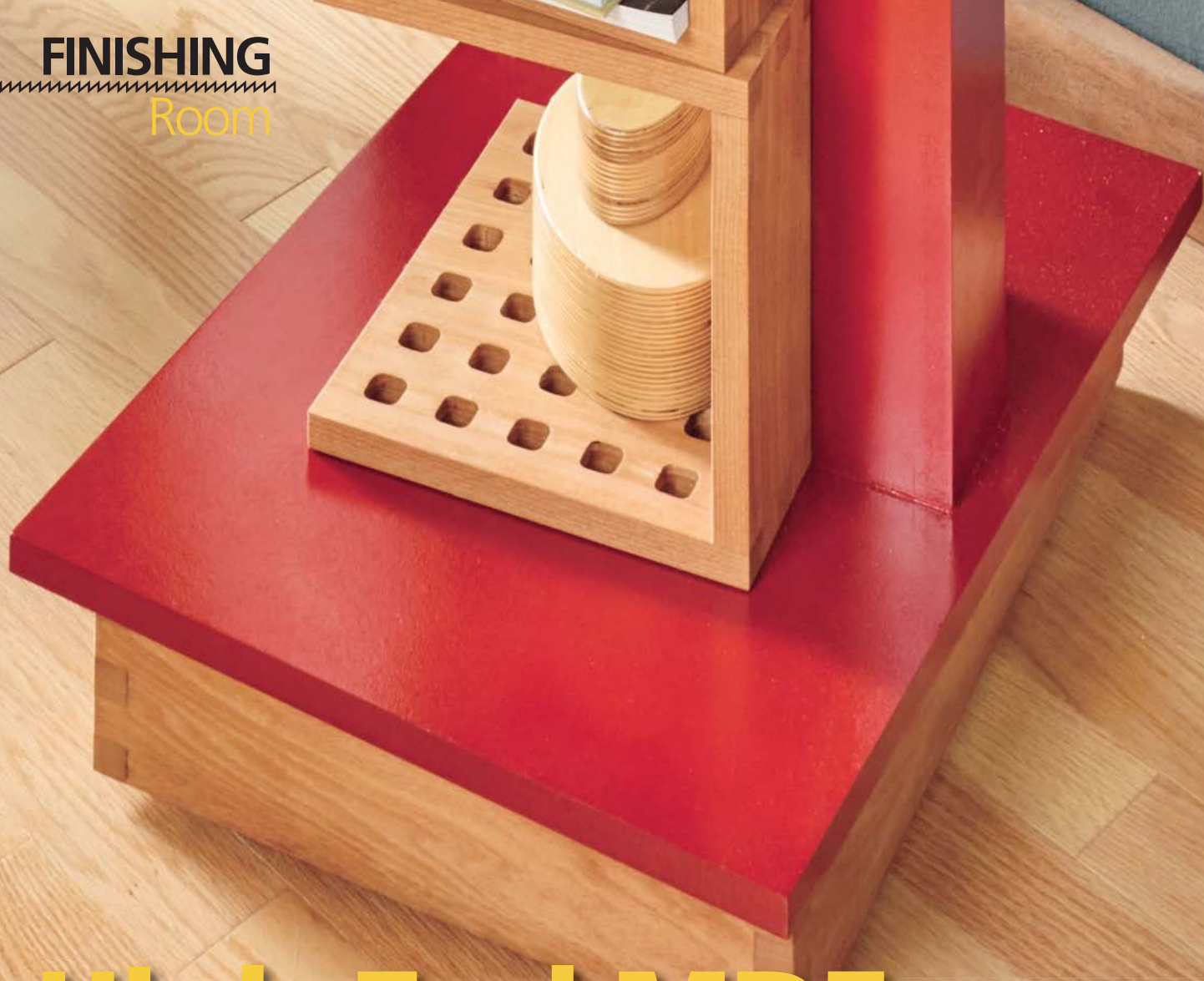
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High-End MDF Finish



▲ The products shown above make it easy to achieve an automotive-like finish without having to invest in costly equipment.

Automotive finishes are admired for their remarkable depth, clarity, and reflective quality. They combine aesthetic appeal with essential protection for the raw material below. And while originally developed for metal body panels, many of the same techniques can be successfully applied to MDF, transforming a humble engineered substrate into a surface with a luxurious, furniture-grade appearance. The process — similar to the one used in the automotive industry — begins with meticulous surface preparation. Unlike steel or aluminum, MDF is highly porous and prone to absorbing coatings unevenly, particularly along the exposed edges. The quality of the final finish is determined long before the topcoat is applied, so it's important to take your time and build upon light coats, sanding in between each application to ensure a smooth surface. Follow along on the next page for step-by-step instructions on how to achieve a flawless finish.

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- ▲ A higher-grade MDF like the ones shown above will absorb less paint, which provides a more stable base for the finish.



- ▲ Use a lint-free cloth lightly moistened with water to wipe the MDF. Avoid saturating the board, as MDF is sensitive to moisture.



- ▲ Once dry, continue by sanding the MDF to break the resin glaze, level the surface, and improve paint adhesion.

CHOOSE THE RIGHT MDF. Select a high-quality, smooth, ready-to-paint MDF with minimal surface defects. Avoid boards with a wax coating or rough edges like hardboard or chipboard. This will set you up for success, rather than have you chasing the deficiencies of a lower-grade MDF.

CLEAN & SCUFF. Make sure to thoroughly clean the surface of the MDF with a damp cloth to remove dust, oils, or manufacturing wax. Once dry, lightly sand the entire surface (face and edges) with low-grit (120-180) sandpaper to scuff and level any imperfections.

PRIME TIME. Next, apply a primer designed specifically for MDF. Here we used *Zinsser BIN* shellac-based primer. This product dries quickly, reducing the risk of moisture absorption and fiber swelling. It creates a hard,

non-porous layer that locks down the surface fibers, making it ready for any topcoat. Additionally, shellac-based primers are excellent at blocking stains, odors, and tannins.

APPLYING BASE COATS. Use a high-quality gloss paint (latex or oil-based) with a roller or brush. Using a spray can or HVLP gun helps avoid brush/roller marks; however, it's not a deal-breaker when it comes to achieving the desired finish. Like the primer, apply the paint in thin coats with ample dry-time in between. The idea is to continue to build upon these exceptionally flat layers.

BUILD THE GLOSS. For maximum shine, apply multiple thin coats of the same gloss paint used for the base coats, sanding between each layer to ensure a uniform surface for each of the subsequent layers.

SEAL COAT. After the final paint coat has cured, apply a few coats of a clear varnish, polyurethane, or lacquer to protect and enhance the gloss. For our application, we used *Rust-Oleum Gloss Clear*, a clear, oil-based protective top coating. It dries quickly and provides great coverage. Plus, it eliminates the need for spray equipment without sacrificing the quality of the topcoat's appearance.

OPTIONAL POLISHING. For a show-room shine, you can take the finishing a step further. Buff the surface using a foam pad and some liquid buffing compound after the clear coat has fully cured. Use a circular motion with light to moderate pressure. This will further enhance the gloss and will remove minor imperfections while protecting the underlying paint layers. **W**



- ▲ Apply primer designed for MDF with a roller or brush. Once dry, lightly sand with 400- to 800-grit sandpaper.



- ▲ Using a gloss paint, keep a wet edge. Apply two to three coats, sanding in between with 800-grit sandpaper.



- ▲ After the final coat of paint, apply a clear varnish to protect and further intensify the high-gloss finish.



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Mastering the Mortise

▲ Mortise and tenon joinery makes for sturdy, reliable connections in a wide range of projects.

Among the many woodworking joints, the mortise and tenon is perhaps the most iconic. Its biggest strength is, well, its strength. It's a durable joint, well-suited to high-stress applications, like the legs of a chair. It's a forgiving joint as well. While a perfectly fit mortise and tenon provides the surest connection, glue will make up for small variances and imperfections are nicely hidden by the tenon shoulder.

Best of all, modern tools make this joint far easier to create than needing to chop it out wholly by hand. In these pages, I'll show you two methods for making a mortise. Accessibility is the focus here, and both ways use common tools, require little setup, and are easy to get the hang of after a few operations.

DRILL PRESS MORTISING

My preferred mortising method is at the drill press. The drill press removes a good deal of the waste in advance, leaving you with just the sides and corners to address with a chisel.

LAYOUT. This method requires a unique layout. You'll need a centerline down the length of your mortise, as in the upper left photo on the next page. This will be used to locate the drill bit.



Mortise Layout. Begin by locating and laying out the mortise on your workpiece. In addition to its four sides, mark out its centerline to guide your drilling.

Scribe Kerfs. Scribe along the layout lines with a marking knife to create kerfs.

You'll also want to scribe along your layout lines with a marking knife. This will give you a physical reference for the tip of your chisel later on and make for a more accurate mortise.

DRILLING. Now for the drill press. Use a fence and locate it so the tip of the bit lands precisely on the mortise's centerline. The fine tip of a brad-point bit is ideal; it's far easier to locate accurately than your typical twist bit. The goal here is to make a series of overlapping holes.

Think about your spacing while you work. Make sure that you give yourself enough "meat" for the bit to grab onto

without deflecting. Chips will fill the mortise, and you'll want to keep these clear to prevent the bit from binding up in the hole.

CHISELING. Once you've finished the drill work, clean the mortise up with a chisel. Before you begin, I recommend you bury your workpiece in your vise (right photo below). This will support the side walls as you pare them. Keep in mind: a chisel is a wedge, and if you attempt to clear too much material from the inside of the mortise, the force will instead be directed into the mortise's walls.

Remove thin layers of material until you reach the kerfs.



▲ The tip of a brad-point bit makes it easy to precisely locate as you drill. Scribing your layout with a marking knife will make chisel cleanup more reliably accurate.

Make the final cuts by registering the chisel's tip in the kerfs. After paring the sides, turn to page 25 for the corners — that's where the two methods converge.



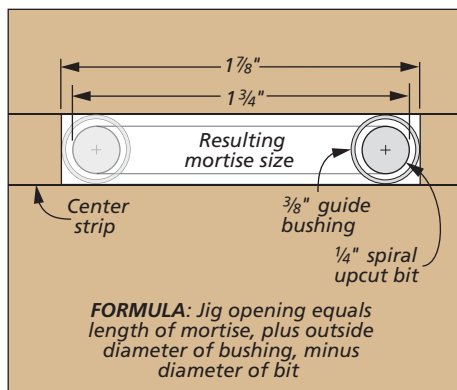
Stops. If you're cutting multiple identical mortises, set up stops on either side of the workpiece to ensure consistency.



Overlapping Holes. A series of overlapping holes along the mortise clears out most of the waste quickly.



Chisel Cleanup. Remove the remaining waste along the side walls and corners using a chisel.



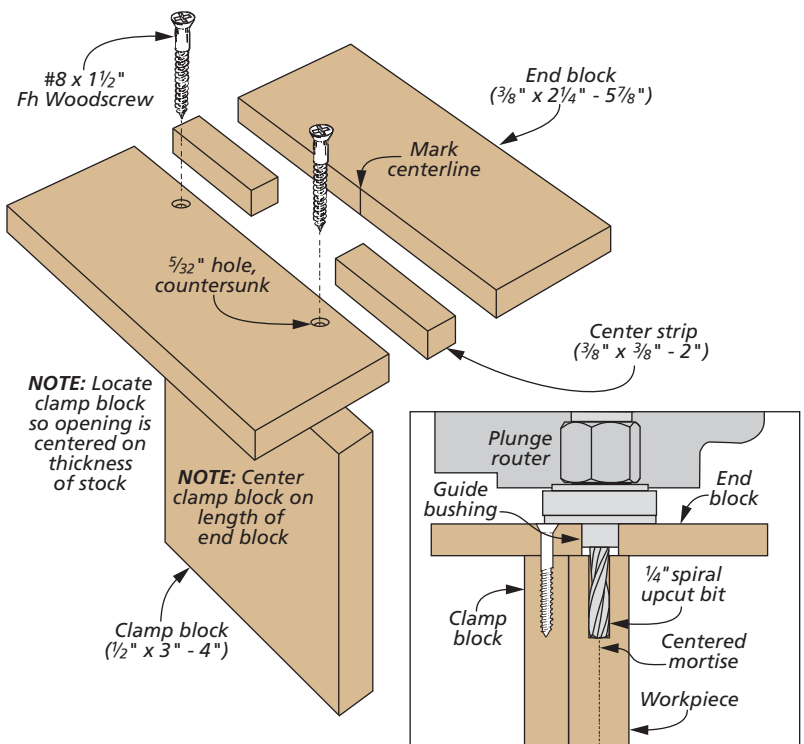
ROUTER JIG MORTISING

The router is a great tool for many operations, and that includes mortising. Making a mortise with a router is more involved than using the drill press, but it also has the benefit of more consistent results.

ROUTER JIG. The key to routing a mortise is the jig. You'll need a plunge router to to lower the bit down into the workpiece, but it'll be the jig that really determines the shape of the mortise.

There are a lot of router mortising jigs that woodworkers have invented. The one I'm showing here is as bare-bones as it gets.

The jig is five pieces of plywood. Two of these pieces are the end blocks, which provide support to the base of the router. Connecting these are strips that will determine the width of your mortise. The distance these strips



are apart from each other is what will determine the length of your mortise. The fifth piece of the assembly is the clamping block, which will attach the jig to your workpiece and hold it square.

BUSHING & BIT. A guide bushing is the first accessory you'll need. The bushing will follow the jig and keep your bit at a precise distance from the jig pieces. Therefore, the bushing you use will determine how much bigger the opening in the jig needs to be than your mortise. For instance, if you're using a $\frac{3}{8}$ " guide bushing and a $\frac{1}{4}$ " bit,

then your opening needs to be $\frac{1}{8}$ " longer and wider than the mortise to account for that $\frac{1}{16}$ " difference in radius.

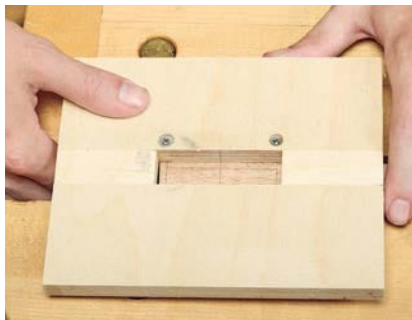
Of course, the bit is the other thing you'll need. A straight bit would suffice, but a spiral upcut bit will perform better. These are designed to draw the chips upward as they cut, keeping the mortise clear as you're working.

ROUTING. To do the routing, first clamp the jig to your workpiece in a vise. To ensure they're properly aligned, I mark out the center (lengthwise) of the mortise on the workpiece and the

Guide bushing



▲ A guide bushing and a straight bit or spiral upcut bit are the two accessories you need along with your router to make mortises.



▲ **Position Jig.** To position the jig over your workpiece, mark out the centerline of your mortise, then position the jig over the centerline.



▲ **Route the Mortise.** Rout around the jig to cut the mortise. Remove the waste in several passes, turning the turret to step down with each pass.



▲ **Clean it Up.** When chiseling out the corners of a mortise, cut across the grain to sever the wood fibers and reduce the chance of tearout.



▲ **Chop Chop.** Once the wood fibers are severed, remove the waste by chopping with the grain. Work back and forth down to the bottom.



▲ Different sizes of chisels are handy to have around. Use wide chisels on side walls and narrow chisels on the ends.

center of the opening in the jig, then align them, as in the center photo at the bottom of the previous page. To prevent deflecting, I set the stop on my plunge router to remove $\frac{1}{8}$ " to $\frac{1}{4}$ " of material with a pass. I then rotate the turret to lower with each pass until I reach full depth (resetting the stop if necessary). Once I've hit the full depth, all that remains are the corners.

SQUARE IT UP

Once you've removed the waste from your mortise the final step is cleaning out the waste in the corners. For this task, there are a couple things to take note of.

I recommend keeping a few sizes of chisels at hand. While a narrow chisel is nice to clean up the ends, a wider chisel works better for the side walls. A typical bench chisel will do the job fine,

but a mortising chisel can be helpful, especially for the ends. These are thicker and have a steeper bevel angle to better remove waste.

Sever the fibers across the grain first, then chop with the grain to remove the waste. Work back and forth to the bottom, then chisel at a diagonal to remove the last waste from the bottom corners, completing your mortise. **W**

LOOSE TENON MORTISING

A few words should be said about the loose tenon. These are easy-to-implement bits of joinery that require a mortise in both mating workpieces that a "loose" tenon can join.

TWO MORTISES. Because the tenon is separate, two mortises are needed. Luckily, these don't need to have square corners, as we'll round the tenon instead. I find routing these mortises is the faster method, as no chisel work is required. Laying them out is also easy; just butt the parts together and mark out the center of where the tenon will be on both. Then transfer those centerlines to the edge or end where the mortise will be — that centerline is what you'll line the jig up to.

Routing these mortises is done just as described on the last page. Once you've reached full depth on both, you just need the tenons to fit them.

LOOSE TENONS. Creating loose tenons in your shop is a two-part process, after the blank for your tenons is planed and ripped, use a roundover bit to round the blank's corners. The radius of this bit should be half the diameter of the bit you used to cut the mortises.

Once those are in, it's time to cut your tenons to length at the table saw. Use an auxiliary miter fence for support and attach a standoff block to the rip fence as a stop.







Executive Desk

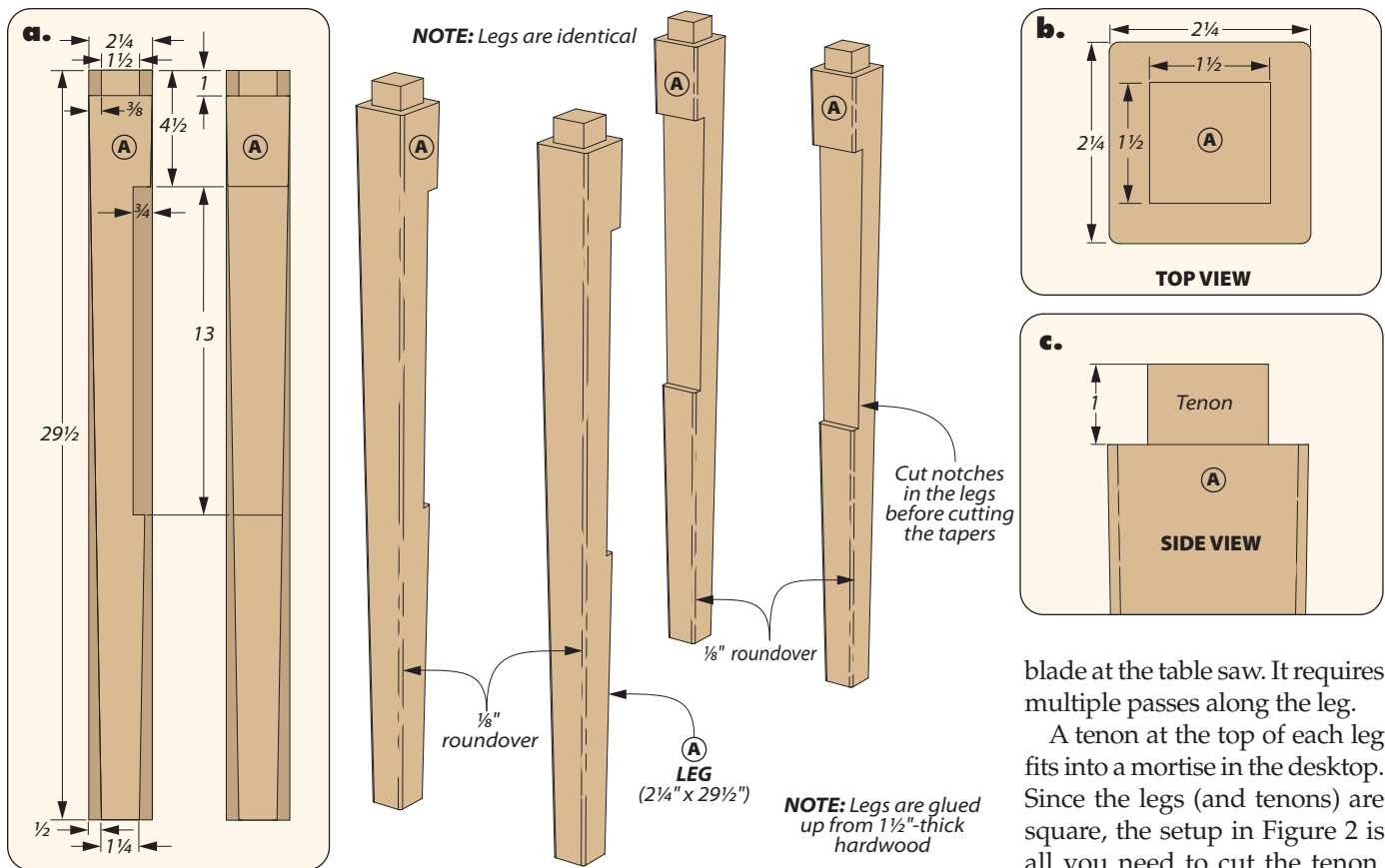
Transform a room —
or even a corner —
into a workspace with
this office essential.

The office in my parents' house was the place where Mom and Dad paid bills, wrote letters, and sorted the mail. When we got a computer, the desk turned into the place where my siblings and I played *Zaxxon* and *Time Pilot*. That sense of flexibility and adaptation carries through to what it means to have an office at home.

What hasn't changed is the need for a good desk. For me, a desk needs plenty of room. (I am not real tidy.) Plus, some storage close at hand. And it should have a sense of presence. Chris Fitch came up with this desk, and it checks those boxes and more.

PEDESTAL DESK LITE. One of the inspirations for this desk is a stout, impressive pedestal style. However, Chris wanted a lighter look. The solution was to bring the casework up and cradle it in the legs. In addition, the legs are tapered. The result is that the base of the desk is raised off the floor with a good balance of open and enclosed spaces.

WRIGHT STUFF. When it came to the details, Chris turned to the furniture of architect Frank Lloyd Wright. It would be easy to slap on some Wright-ian details and start building. Instead, Chris distilled concepts like clean lines and horizontal planes that define Wright's *Prairie* and *Usonian* styles. Cherry hardwood and plywood supply the warm color. In spite of its size, this desk comes together quicker than you think and with some pleasant time in the shop.



Load-Bearing TAPERED LEGS

Count yourself lucky if you can find good-looking material thick enough to get legs from a single piece. While gluing up leg blanks adds a few steps, it isn't a step down. In fact, you have more

control to arrange the pieces to get straight grain on all four faces for a more consistent look.

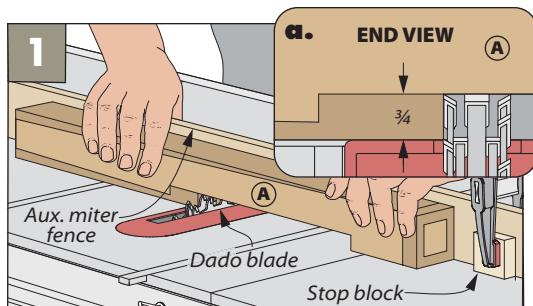
NOTCHES & TENONS. Turn the blanks into legs by cutting a wide notch into each leg, as shown in detail 'a.' These notches house the desk's cases. In Figure 1 below, you can see one approach to forming the notches: a dado

blade at the table saw. It requires multiple passes along the leg.

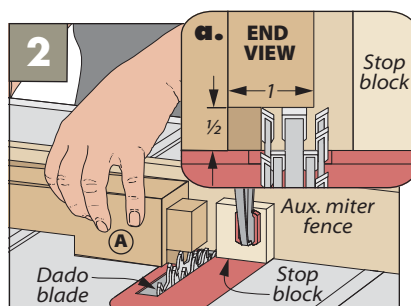
A tenon at the top of each leg fits into a mortise in the desktop. Since the legs (and tenons) are square, the setup in Figure 2 is all you need to cut the tenon. Since the tenon is longer than the width of the dado blade, you'll need two passes for each face.

TAPERS. Creating the notches and tenons works best on square parts. With those out of the way, you can cut the tapers on each face. I drew the tapers on each of the faces as well as across the bottom end, as shown in Figure 3b.

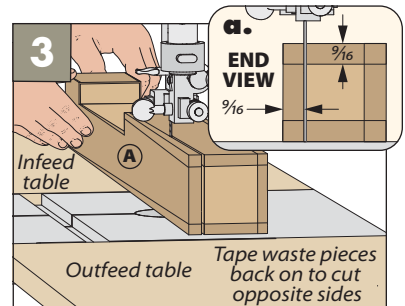
SHAPELY LEGS



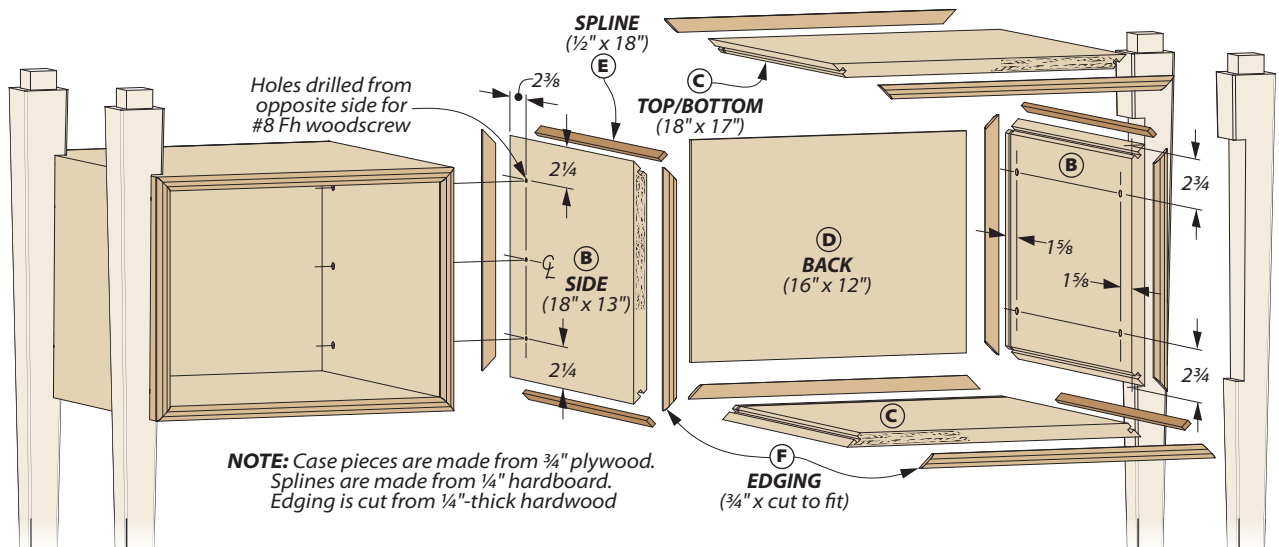
Wide Notch. A long auxiliary miter gauge fence offers support to the legs. Clamp a stop block to control the end of the notch.



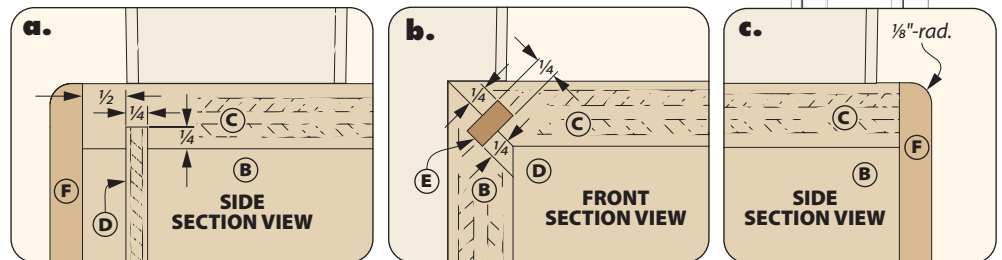
Leg Tenon. Shift the fence over and reposition the stop block to form a tenon on the leg.



Taper Cuts. Take a smooth, even pass to cut each of the tapers on the leg to make cleanup easier.



This is band saw work for me. After you cut two sides of the leg, your layout lines have been removed. So I use masking tape to reattach the waste pieces to cut the other two sides. Clean up the blade marks with a hand plane or edge sander.



STORAGE CASES

The two cases come next in the order of operations. The drawing above details their construction. The sides are sized for a snug fit in the leg notches.

REINFORCED MITERS. The case pieces meet each other with miters. Figure 1 below shows how to do that at the table saw. The case sides require a few screw holes for connecting with the legs

and the modesty panel that lies just ahead. The drawing above shows those locations.

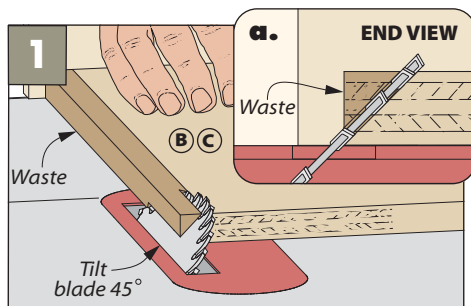
A groove cut in all four case pieces captures a back panel, as shown in Figure 2. This panel is rabbeted to fit the narrow grooves (detail 'a' above).

Before diving into assembly, I wanted to strengthen the case joinery. I did that by cutting grooves into the miter faces, as

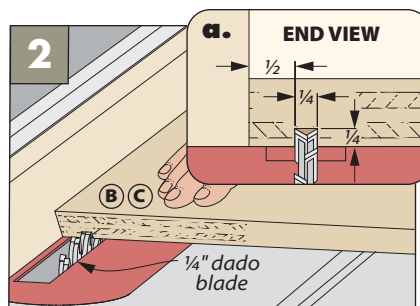
shown in Figure 3. These hold splines that register the parts and increase glue surface, as in detail 'b' above. Glue up the cases around the backs.

CLEAN EDGES. Chris wanted the desk to work in the middle of a room. So the back needs to look good, too. For that to work, apply edging to the front and back edges of the plywood and round the corners (detail 'c').

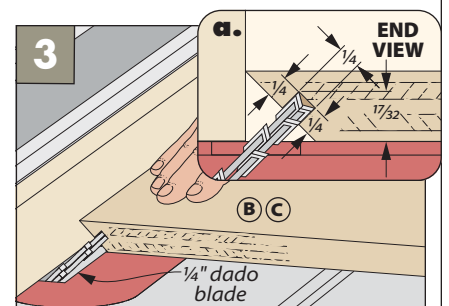
MITERS & GROOVES



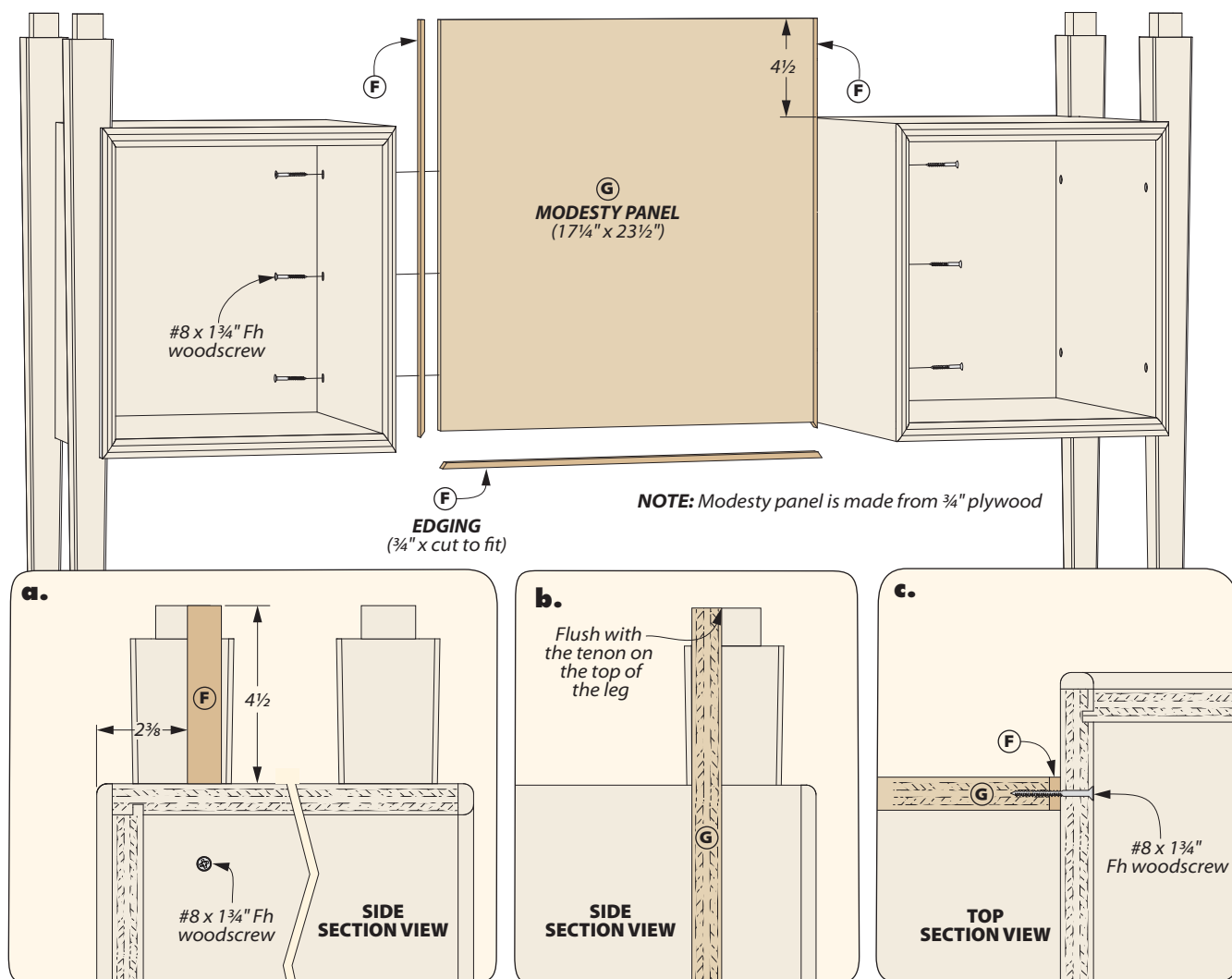
Miters. Tilt the saw blade and guide the case pieces with the miter gauge to form the corner miters.



Back Grooves. Install a dado blade and cut a narrow groove to hold the case back panel.



Spline Grooves. Tilt the blade again to cut the spline grooves square to the mitered ends.



Add a Panel to DRESS IT UP

What we have at this point are two pairs of legs each joined with a case. For this to become a standalone base, these pairs need to be joined together, but without adding a lot of bulk. The solution is a simple plywood panel.

This is usually referred to as a modesty panel as it blocks the view through the base of the desk. It can do more than serve as a visual element, however. It's used to increase the rigidity of the whole desk, as we'll see in just a bit.

SIZED & EDGED. The panel is cut to the size shown in the drawing above. Take note that the grain

should run vertically. From there, edging is added to the sides and lower edges. Portions of the sides are visible in the completed desk. The lower edge may also be subject to wear, and we don't want that edge to chip. Unlike the edging on the cases, this edging is left square.

JOIN THE CASES. To make the connection, woodscrews pass through the cases and into the edge of the panel, as shown in details 'a' and 'c.'

I set each case and leg assembly on its back. Then I placed spacers below the modesty panel to locate it in the proper front-to-back position (detail 'a'). The lower end of the panel is flush with the bottom of the cases. The upper edge should be flush with

the tops of the leg tenons. Check for this with a straightedge.

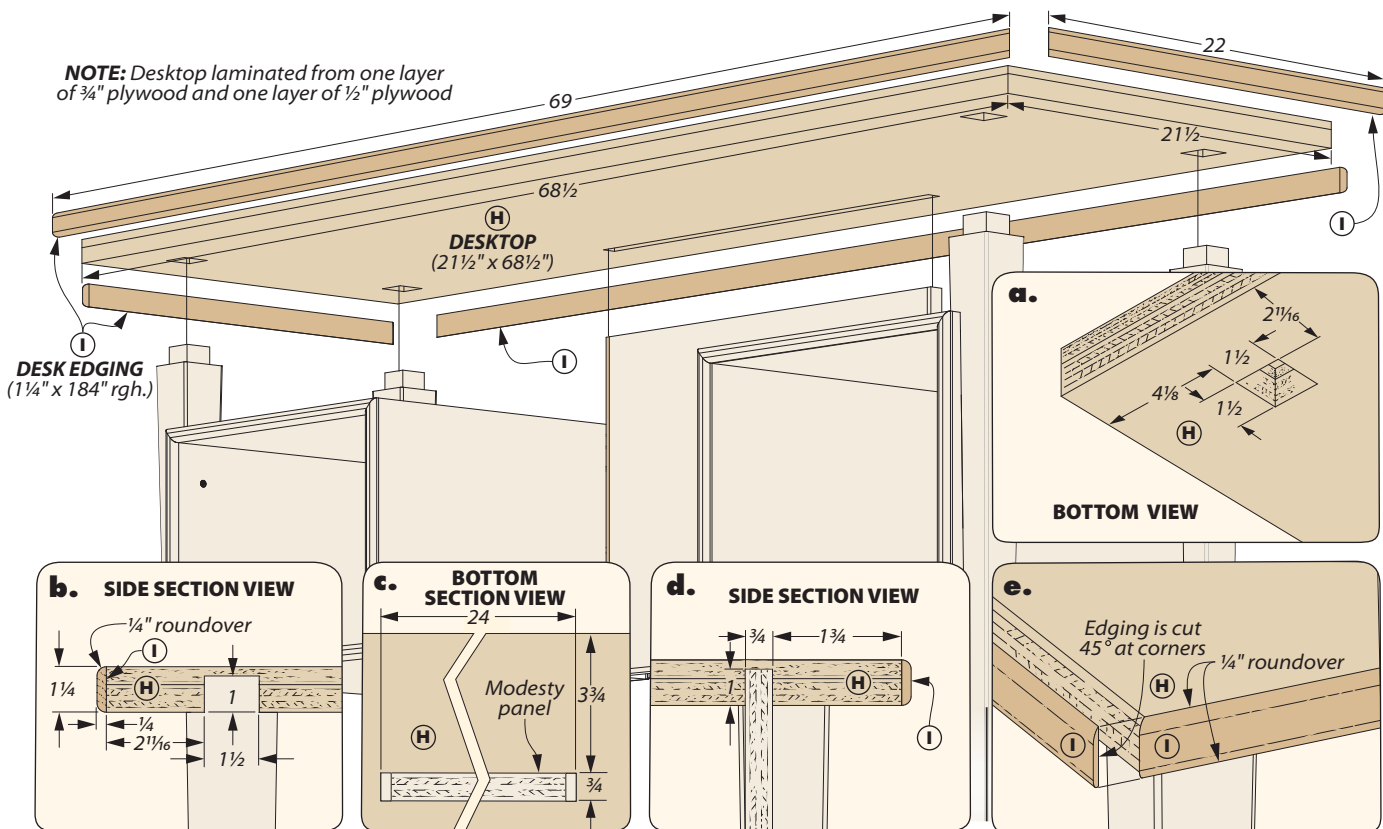
I held the pieces together with long clamps while I drilled pilot holes into the panel, then drove the screws home. The desk base can stand on its own feet off to the side for the time being.

EXPANSIVE DESKTOP

A desk isn't much good without plenty of space to spread out. In addition to surface area, the thickness of the desk matters too. A thin top could sag and would look flimsy, besides. Too thick, and the desk feels chunky and top-heavy.

The just-right thickness ended up being a layer of 3/4" plywood along with a layer of 1/2" plywood. (Chris chose plywood

NOTE: Desktop laminated from one layer of 3/4" plywood and one layer of 1/2" plywood



for its stability and ease of use.) I cut the pieces to size with a track saw. A circular saw and a straightedge guide accomplish the same task. Make sure to have a good blade installed. One of the pieces is cut to the final size. The other is left slightly oversize.

When laminating up the top, apply an even coat of glue and make sure the oversized piece

extends on all sides. Stack anything you can find to apply clamping pressure: weights, portable power tools, lumber, you get the idea. Just make sure the pieces are on a flat surface. Once the glue is dry, trim the overhanging edges flush with a hand-held router.

EDGING. The top is rimmed with hardwood edging. These thin

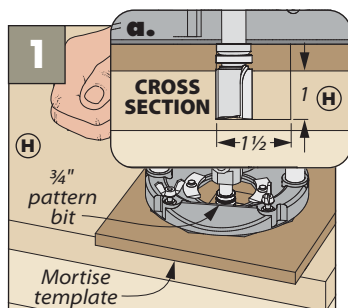
pieces are mitered at the corners, as in detail 'e.' I sanded them flush and rounded the edges with a roundover bit.

JOIN THEM UP. The tenons on the legs and the extended modesty panel fit into matching mortises and a groove in the underside of the desk's top. This is spelled out in the drawings above.

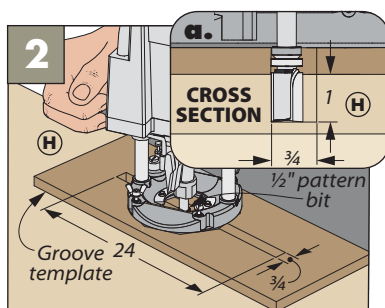
What's important is that the top matches the base you made. To do this, place the top on the base. Spend a few minutes to make sure the top is centered and parallel to the modesty panel. Trace the outline of the tenons and the panel on the underside of the top.

TEMPLATES & MORTISES. With the outlines, I made two templates: one for the mortises and another for the panel groove. Figures 1 and 2 at left show how they're put to use with a plunge router and a pattern bit. Secure the templates with double-sided tape. Rout each detail in several shallow passes.

ROUTING MORTISES & A GROOVE



Mortise Tip. You can speed up the mortising if you drill out most of the waste first.



Groove. Depending on your bit, you may need to remove the template to complete the groove.

blends in with the rest of the desk materials. The box along the bottom of the previous page steps through the approach to make them. You'll need to make four for the drawers and door.

I began by making a hard-board template of the two parts to ease the layout process. I made the lower lip of the handles first. This is shaped on an extra-wide blank for control and safety. Cut the curve and sand to the layout lines with a large sanding drum or use a rasp and file. Rout a roundover on the edge, as shown in Figure 2.

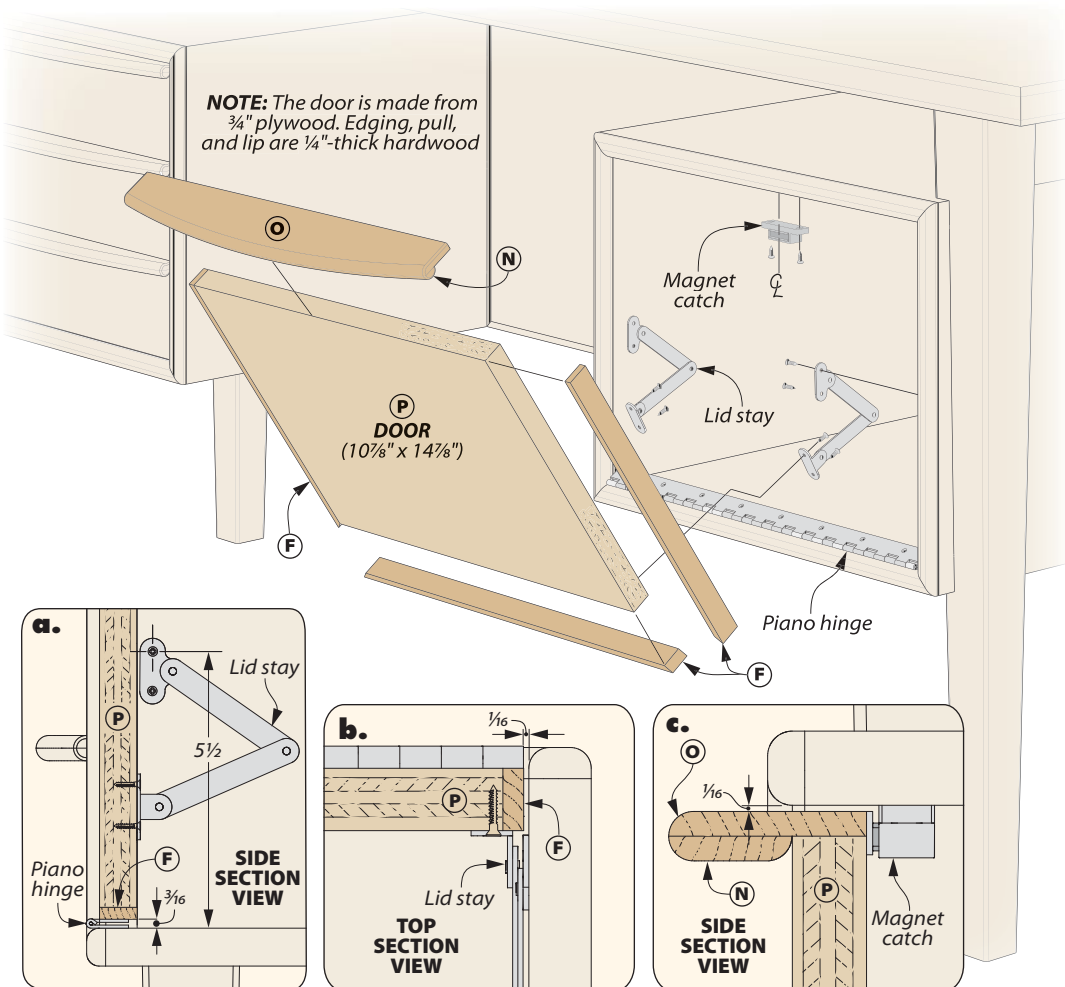
Glue this blank to a larger pull blank. The outer edge of this assembly is shaped into a curve at the band saw, as in Figure 3. Take the handle to the edge sander to work to the lines.

Step back to the router table to shape a roundover along the front edge, as shown in Figure 4. I used the fence here to help guide the workpiece. On the second pass, the router bit may leave a slight lip. You can blend this in with a sanding block.

The handle is glued to the top of the false front. Use screws to attach the false front, as in detail 'c.' Then attach the drawer slides.

DROP-DOWN DOOR

A drop-down door on the opposite side of the desk stores larger items to keep the desktop surface clear. Any Noir-style, private-eye



movie will offer you some ideas of what you can keep within easy reach here.

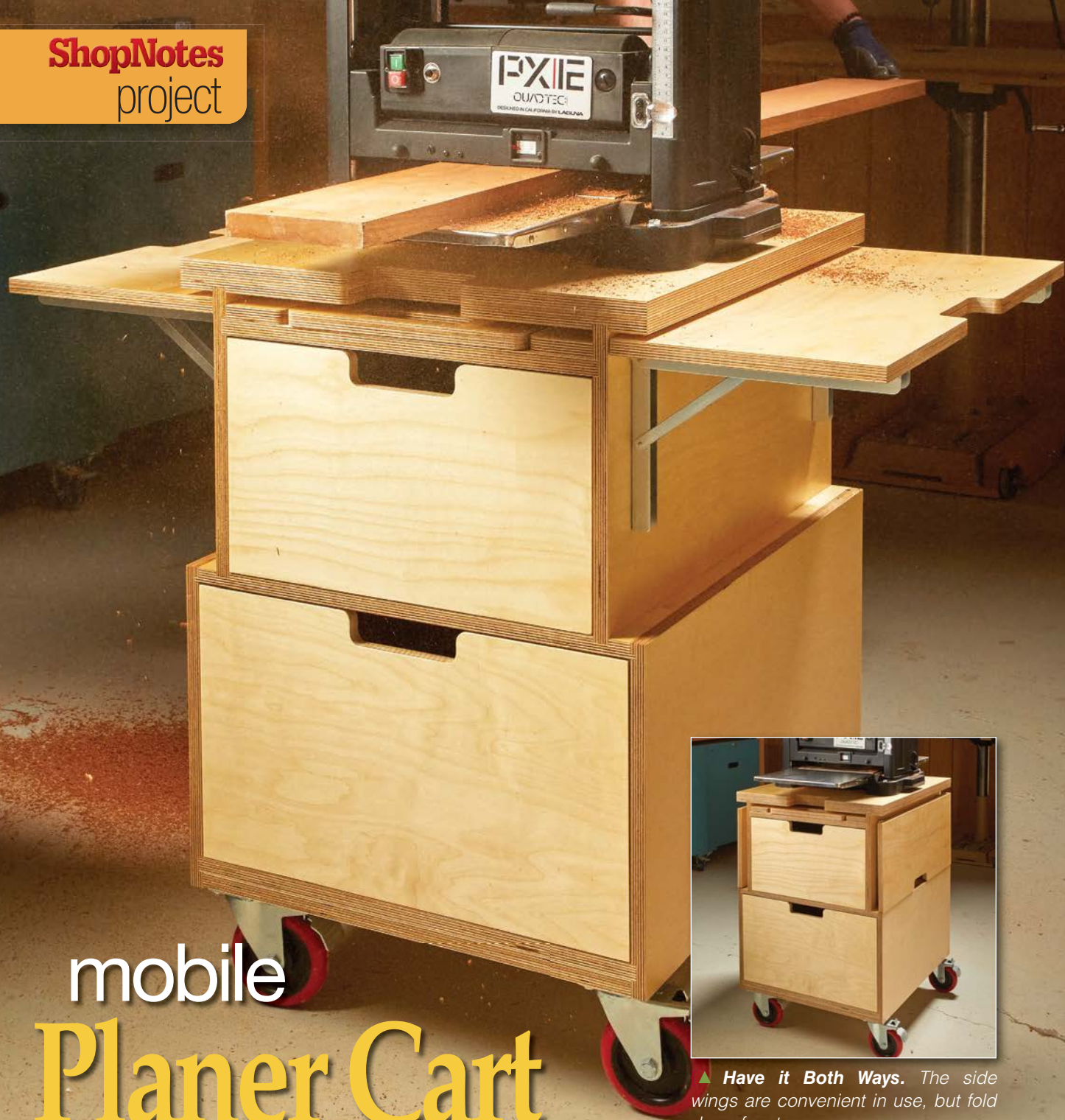
PLYWOOD & EDGING. The door is made from a piece of plywood. Edging wraps three sides, while the top edge incorporates the last of the handles you made earlier. The door swings on a continuous hinge installed at the bottom. This orientation keeps the door from obstructing

your access to the contents. A pair of stays are positioned to hold the door flat when open. A magnetic catch completes the hidden hardware suite.

The robust construction of this desk means you'll need some help getting it set up once the finish is dry (refer to page 66). With the woodwork done, you can get started on the desk work ... or plan your next project. **W**

Materials & Supplies

A Legs (4)	2 1/4 x 2 1/4 - 29 1/2	L Drawer Bottoms (3)	1/4 ply. - 15 1/2 x 14
B Sides (4)	3/4 ply. - 18 x 13	M False Fronts (3)	3/4 x 3 1/2 - 15 3/8
C Tops/Bottoms (4)	3/4 ply. - 18 x 17	N Lips (4)	1/4 x 1 1/2 - 15 3/8
D Backs (2)	3/4 ply. - 16 x 12	O Pulls (4)	1/4 x 2 - 15 3/8
E Splines (8)	1/4 hdbd. - 1/2 x 18	P Door (1)	3/4 ply. - 10 7/8 x 14 7/8
F Edging	1/4 x 3/4 - 288 rgh.	• (8) #8 x 1 1/2" Fh Woodscrews	
G Modesty Panel (1)	3/4 ply. - 17 1/4 x 23 1/2	• (6) #8 x 1 3/4" Fh Woodscrews	
H Desktop (1)	1 1/4 ply. - 21 1/2 x 68 1/2	• (3 pr.) 16" Drawer Slides w/Screws	
I Desk Edging (1)	1/4 x 1 1/4 - 184 rgh.	• (1) 1 1/2" x 14 7/8" Continuous Hinge w/Screws	
J Drawer Sides (6)	1/2 x 3 1/2 - 16	• (1) Lid Stay w/Screws	
K Drawer Fronts/Backs (6)	1/2 x 3 1/2 - 14	• (1) Magnetic Catch w/Screws	



mobile Planer Cart

▲ **Have it Both Ways.** The side wings are convenient in use, but fold down for storage.

A thickness planer allows you to work with lumber in thicknesses you can't find in a hardware store or home center. Portable planers, sometimes called lunch box planers, like these are a common choice for many woodworkers. But there's one issue with them — they're just too darn heavy to really fulfill that portable part.

That's where the cart shown here comes in handy. It turns a benchtop tool into a stationary one. No more back-breaking lifting as you hoist your planer in and out of storage, and since it has wheels you can move it anywhere you'd like to accommodate any length of board.

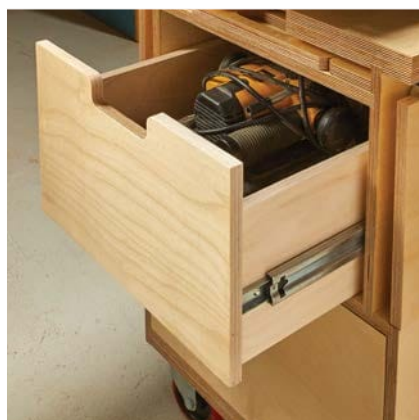
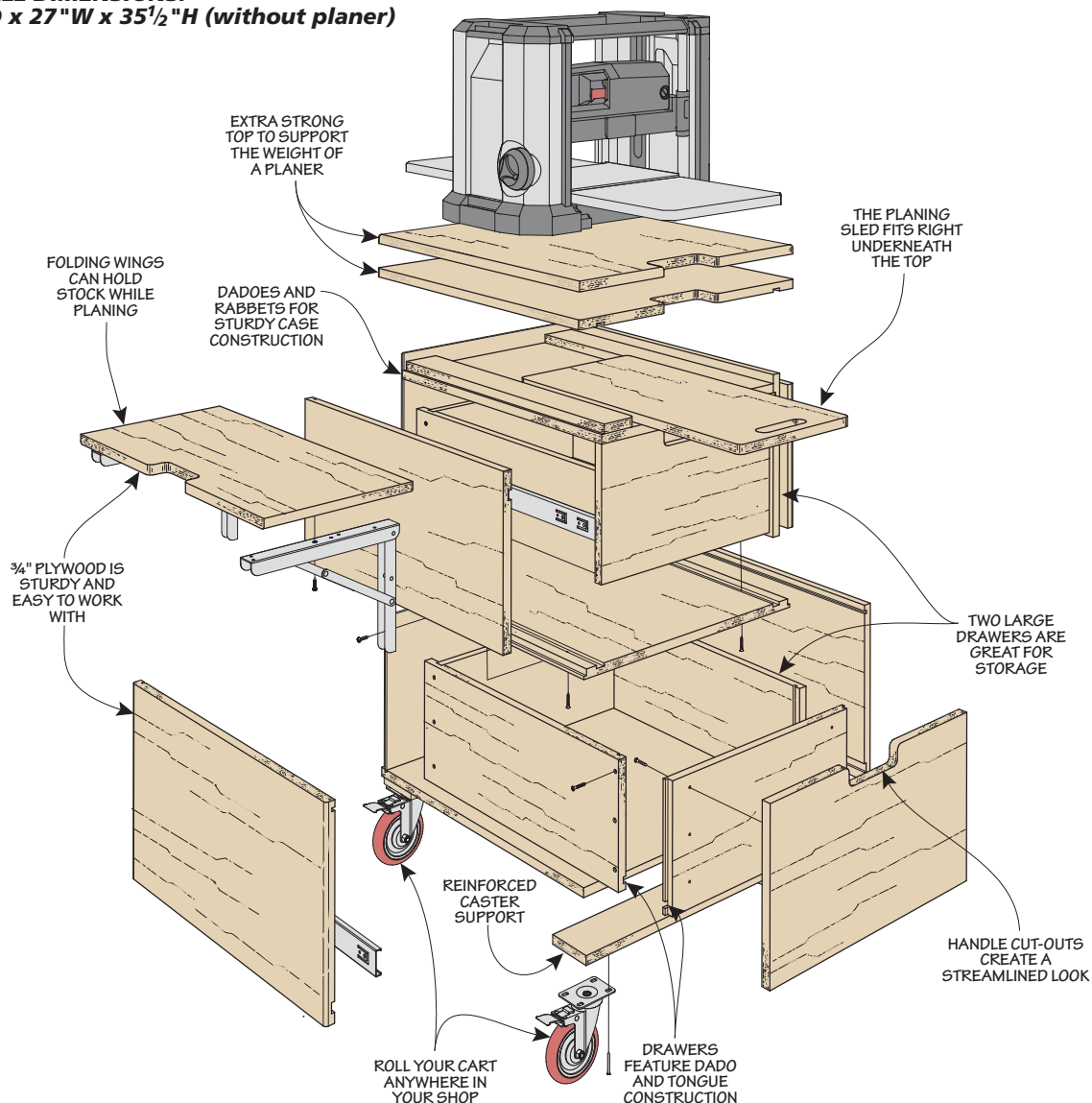
Every bit of space in the shop is valuable, so we've made sure that every inch of

space in this cart is utilized. There are two large drawers for storage of common shop supplies. Folding side wings provide extra work space (when you need it), and an on-board planing sled is perfect for small, thin boards that would otherwise be unsafe to run through the machine. To get the build rolling, it's time to head to the shop and start breaking down plywood.

Exploded View Details

OVERALL DIMENSIONS:

23½"D x 27"W x 35½"H (without planer)



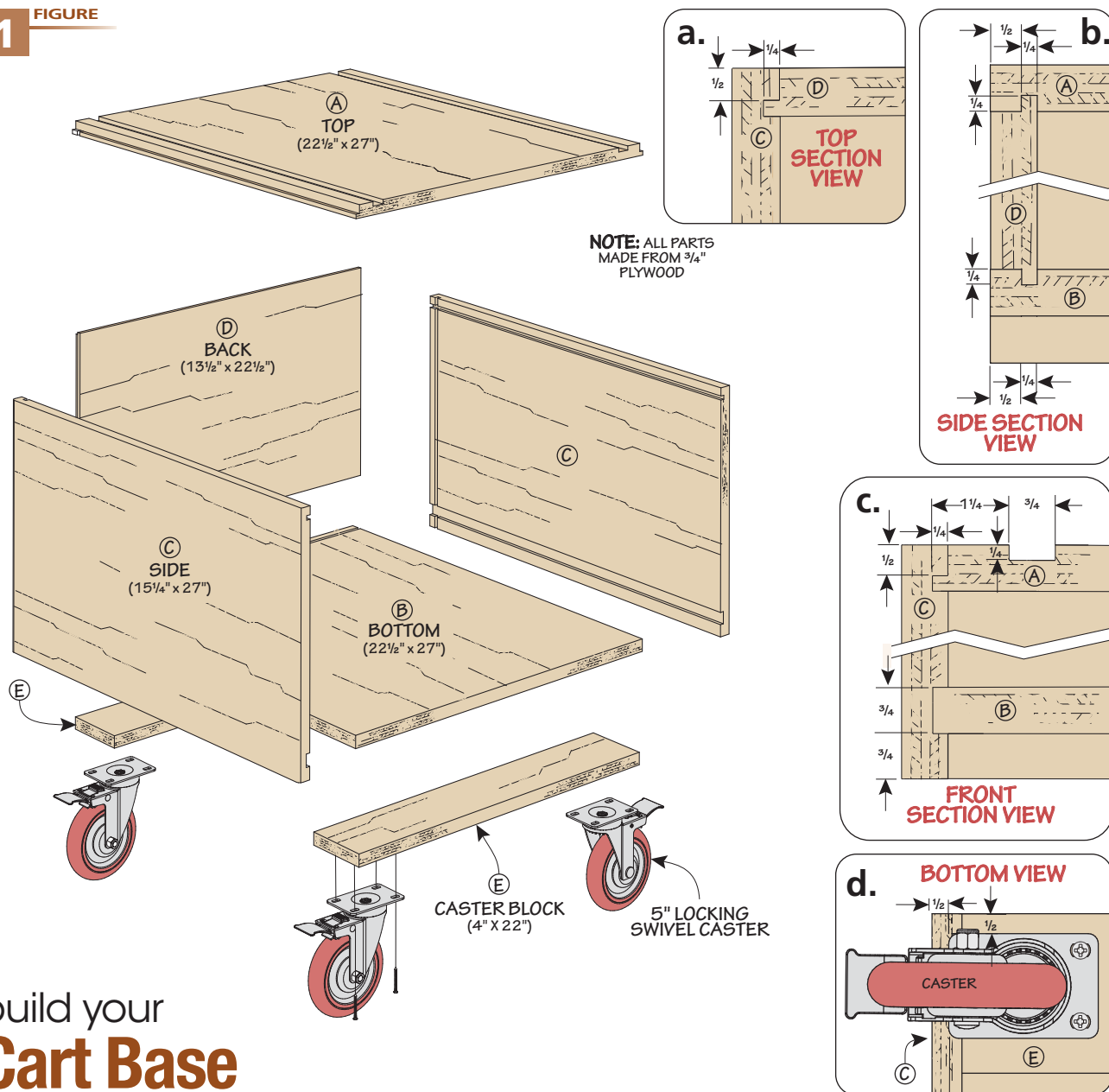
▲ **Extra Storage.** There's no wasted space with these deep drawers. They're great for holding accessories.



▲ **Safety First.** Attach short or thin stock to this simple sled to safely run them through the planer.



▲ **Party Trick.** The planing sled conveniently tucks right underneath the top when you're done.



build your Cart Base

Before we start, let's talk about tackling those sheets of plywood. Your table saw or track saw will make quick work of this step. Be sure to take the time to label each piece clearly as you cut it. Trust me, you'll thank yourself for this later on in the build.

This cart starts, basically, with a pair of boxes. These boxes are built on top of each other, one at a time. This construction method is approachable, and allows you to work on this in chunks.

LOWER CASE. The assembly of the planer cart cabinet features almost no screws at all. Ample use of rabbets, dadoes, and grooves creates

mechanical strength and glue does the rest. You can make these various cuts on either the table saw or using a router with a straightedge. You could also use a combination of the two, keeping one set at $\frac{1}{2}$ " and the other at $\frac{1}{4}$ ". I'm using nominal dimensions throughout the build, but you'll want to set your tools to match the material you're actually using. Most plywood, including the Baltic birch used here, is slightly undersize.

To make my life easier, I try to make all of my identical cuts at the same time so I didn't have to keep resetting for each piece. Looking at the lower case

in Figure 1, that meant the $\frac{1}{4}$ " dadoes in the top, bottom, and sides are first (see Figure 1b). These dadoes hold the back piece in place, and are located in the same place on all four pieces. You'll use the rip fence to form the dado in two passes. Set the fence to the correct measurement for your stock, then cut all four pieces. Once the outside edge is defined, move the fence over a nudge and finish the cut. Cutting a test piece is essential to a proper fit, don't trust your eyes alone.

You should cut the grooves that run near the top of the side pieces at the same time you cut those dadoes.

You can see how they're positioned in Figure 1a. Now, let's get the back rabbet to fit in the dados.

Since I had to swap in a dado stack already, I went ahead and took care of that. Then I buried the dado blade in a sacrificial fence attached to the rip fence and cut the rabbets all the way around the back. I used the same setup to cut the two rabbets that run along the outside edges of the top. Remove the sacrificial fence to cut the remaining grooves in the sides and top.

I decided to clean up all of the ridges left behind from the dado blade with a sanding block. This gives the joint a cleaner look and ensures a strong glue bond — even if no one else sees it.

Now it's time for some assembly. Apply a slow-setting glue to the dados and grooves and clamp everything up. Make sure the assembly is square.

Since planers are quite heavy, I decided to reinforce the bottom a bit with caster blocks. After the glue was all dry, I screwed the casters in place and started the upper case.

One quick note on casters: you might be tempted to get the small, inexpensive ones, but that's usually not a good idea. A bigger caster is much less likely to get caught on something and tip your entire cart onto the floor.

UPPER CASE

Building the upper case is similar to the lower. Cutting in the correct order will make quick work of your time at the table saw. I started with the smaller $\frac{1}{4}$ " dados on the sides.

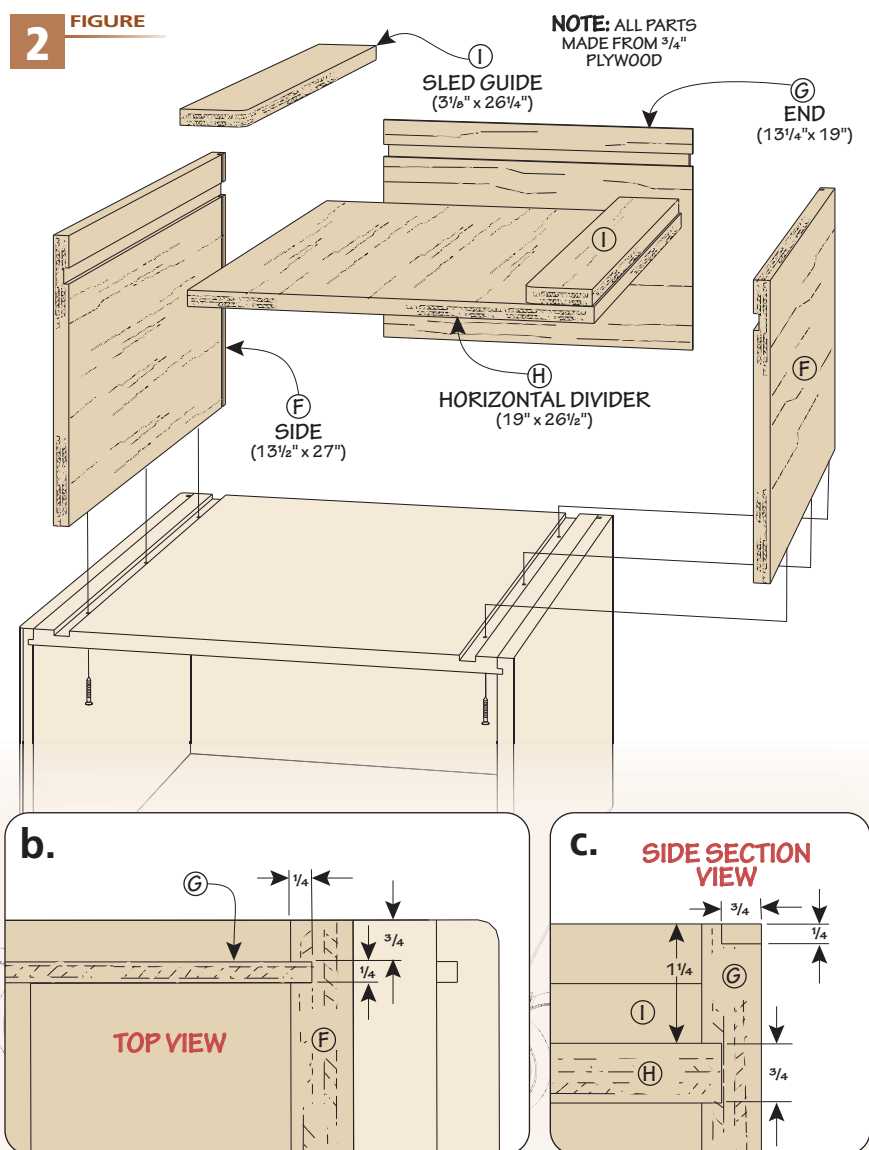
Now, it's back to a wide dado blade and sacrificial fence again. Cut the rabbets on the three sides of the end panel. The bottom edge will simply sit flat on the lower case.

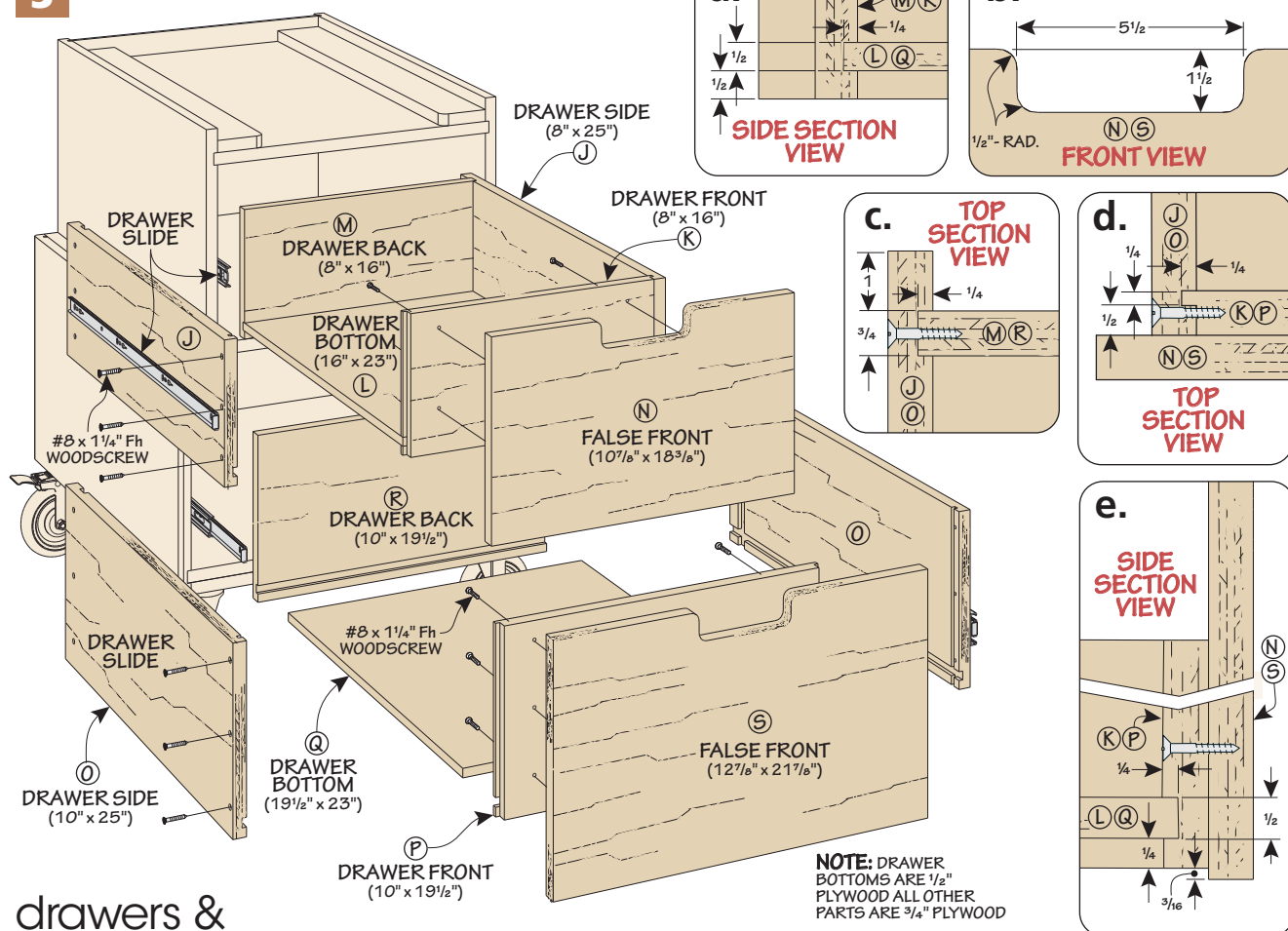
There are two different grooves to cut — the two on the side panel and one on the end panel. The cuts on the side panels are located $1\frac{1}{2}$ " from the top, and are on the same face as the narrower dados you cut earlier (Figure 2a).

The groove on the end panel is also located $1\frac{1}{2}$ " from the top, but it's located on the opposite face as the rabbets. This layout is visible in Figure 2c below. Like before, I cleaned up the bottoms of all my cuts with a sanding block before assembling. You could also use a small rabbet plane to smooth the grooves and dados.

For assembly, start with dropping the sides in to the grooves that run along the top of the lower case. Each side gets glued and screwed from the bottom — but don't tighten them all the way yet. Leaving them loose will give you play to install everything else. Add glue and drop the end panel into place. Make sure the rabbeted end is facing up. Spreading the sides slightly will allow the horizontal divider to be installed. Lightly clamp everything together, check for square, then finish driving in the screws.

The final detail to take care of is a pair of sled guides. These will "block out" the area for the thin stock sled that we'll make in a bit. For these, I simply cut them to size before gluing and pin nailing them in place.





drawers & Final Details

I wanted the drawers for this cart to be sturdy, yet quick to build, so I used simple tongue and dado joinery to hold everything together. These are great mechanical joints, and provide a positive connection that won't pull apart over time as you open and close the drawers.

Cut a narrow dado along the front end of each of the drawer sides, as in Figure 3d. A wider dado at the rear captures the drawer back (Figure 3c).

Then take care of the rabbets (tongues) on the drawer fronts. Adjust the dado blade setup to cut the grooves for the drawer bottom, as shown in Figures 3a and 3e. Glue everything up and finish with screws.

DRAWER INSTALLATION. Installing the drawer slides will go more smoothly if you use spacer blocks to mount the slides inside the case. You'll need to measure the offset to figure out exactly where you want

to mount the mating drawer slide on the drawer box. You want to take into account the distance up and down, as well as the distance front-to-back.

When mounting the slides, you want to drive your screws into the slotted screw slots first. This gives you some wiggle room when positioning the slide. After you've test fit the drawer in the case, make any adjustments that you need and drive a few screws into the "non-slotted" round holes.

FALSE FRONTS. Now move onto the false front. The idea behind a false front is two-fold. It's a clean look on the front of the cart, but it also is actually easier to build. This is because now that you have the drawer box mounted to the case, you can fine-tune the position of the false front before you actually attach it, which leads to an even reveal all the way around.

The hand cutout for the front can be made by drilling out the corners and

finishing the cut with a jigsaw. However, you'll get much better results if you make a router template to finish everything up.

There are a few different sized cutouts in this build, so I actually made a half template. It includes the inner radius, outer radius, and a few inches on either side of those. Clamp it in place and clean up half of the handle, then flip it to the opposite side of the cutout to finish up.

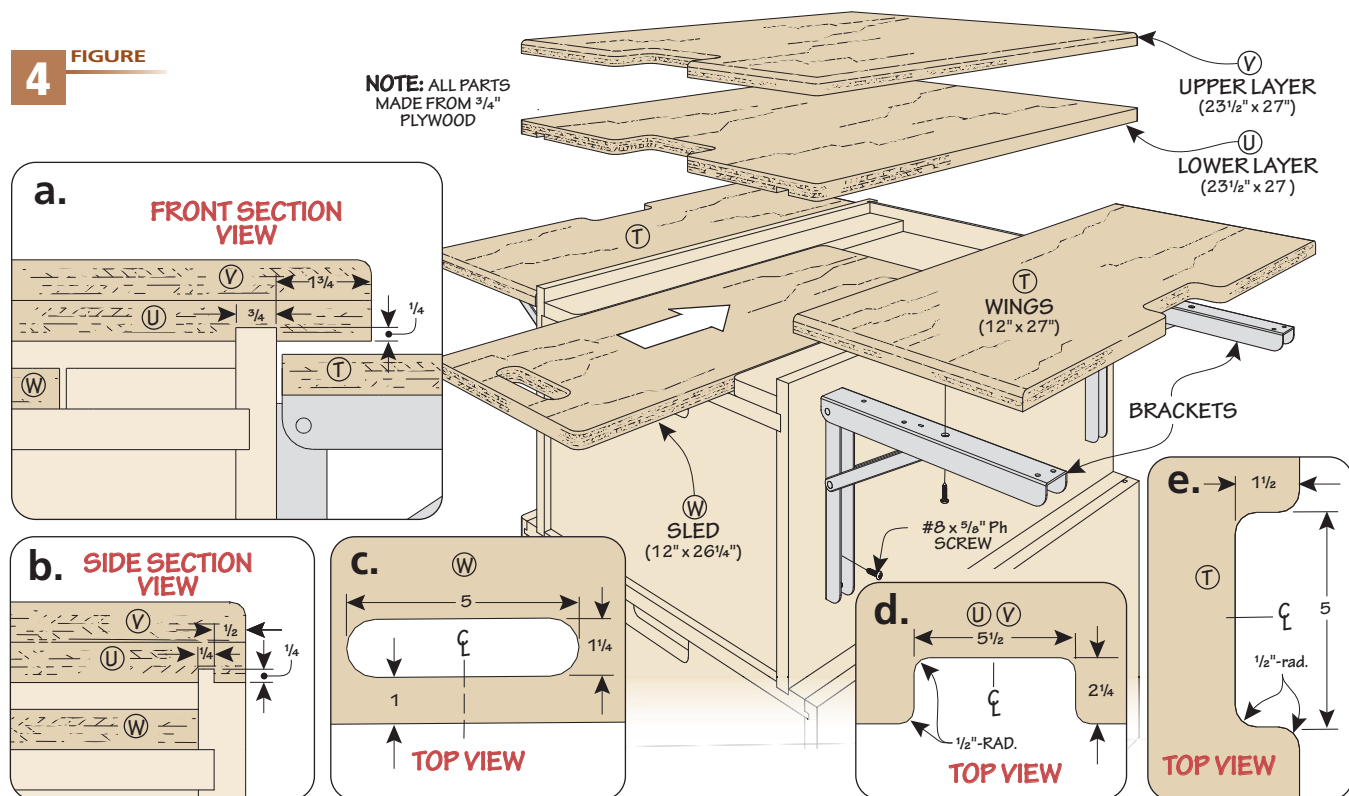
Lastly, ease the edges with sandpaper. Now you're ready to mount it. Use double-sided tape on the false front. Position it for an even reveal, then push it onto the drawer box. Open the drawer and drive several screws from the back side, as shown in Figures 3 and 3e. Repeat the same process for the other drawer.

FOLD-UP WINGS

The side wings of the cart are a convenient place to stack stock when using your planer, and fold away for equally

4

FIGURE



convenient storage for the cart itself. Handholds on the wings are made using the same method as the drawer cutouts. The dimensions are shown in Figure 4e. Use your router template to create a smooth, even profile.

The wings aren't difficult to install, but can be a bit finicky to get lined up correctly. After struggling for a bit, I turned the cart on its side. I screwed the hardware to the cabinet itself first, then attached the wings. I used a paper wedge to shim the wing out a bit so there was just enough clearance between it and the cabinet to fold without binding, as shown in Figure 4a.

TOP & PLANING SLED

The top itself is laminated from two layers of plywood. The bottom face features a pair of grooves and a dado that interlock with the upper case (Figures 4a and 4b). Up until this point all my joinery had been cut on the table saw. However, I decided last minute I didn't want the ends of the dados to be exposed on the sides of my top. So I broke out my compact router, attached an edge guide, and cut a stopped dado for a cleaner look.

With the lower layer complete, I glued on the top layer before making the cutout. The process is effectively the same:

drill out the corners, rough out the waste with a jigsaw, and then finish with router. The only difference is that you'll need to make a new template since the opening is deeper. You're finally ready to glue the top to the cabinet.

The planing sled is the last bit to build. After cutting to size you need to radius the outside corners and cut a handhold, as shown in Figure 4c. Like the cutouts, I made a simple router template to clean up the long edges.

Two coats of spray lacquer protect the plywood surfaces. After installing your planer on top, you're ready for your next project with the ideal milling station. 

materials & hardware

LOWER CASE

A Top (1)	3/4 Ply. - 22 1/2 x 27
B Bottom (1)	3/4 Ply. - 22 1/2 x 27
C Sides (2)	3/4 Ply. - 15 1/4 x 27
D Back (1)	3/4 Ply. - 13 1/2 x 22 1/2
E Caster Blocks (2)	3/4 Ply. - 4 x 22

UPPER CASE

F Sides (2)	3/4 Ply. - 13 1/2 x 27
G End (1)	3/4 Ply. - 13 1/4 x 19
H Horizontal Divider (1)	3/4 Ply. - 19 x 26 1/2
I Sled Guides (2)	3/4 Ply. - 3 1/8 x 26 1/4

UPPER DRAWER

J Drawer Sides (2)	3/4 Ply. - 8 x 25
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K Drawer Front (1)	3/4 Ply. - 8 x 16
L Drawer Bottom (1)	1/2 Ply. - 16 x 23
M Drawer Back (1)	3/4 Ply. - 8 x 16
N False Front (1)	3/4 Ply. - 10 7/8 x 18 3/8

LOWER DRAWER

O Drawer Sides (2)	3/4 Ply. - 10 x 25
P Drawer Front (1)	3/4 Ply. - 10 x 19 1/2
Q Drawer Bottom (1)	1/2 Ply. - 19 1/2 x 23
R Drawer Back (1)	3/4 Ply. - 10 x 19 1/2
S False Front (1)	3/4 Ply. - 12 7/8 x 21 7/8

WINGS

T Wings (2)	3/4 Ply. - 12 x 27
-------------	--------------------

TOP

U Lower Layer (1)	3/4 Ply. - 23 1/2 x 27
V Upper Layer (1)	3/4 Ply. - 23 1/2 x 27

PLANING SLED

W Sled (1)	3/4 Ply. - 12 x 26 1/4
------------	------------------------

- (4) 5" Locking Swivel Casters
- (16) 1/4" x 1 1/4" Lag Bolts
- (16) 1/4" Flat Washers
- (34) #8 x 1 1/4" Fh Woodscrews
- (2) 24" Full-Extension Slides
- (44) #8 x 5/8" Ph Woodscrews
- (4) 12" Folding Shelf Brackets

Farmhouse Hall Bench

Sturdy joinery, convenient drawers, and an elegant design make this easy-to-build bench a welcome addition to any hall or entryway.

Benches are an often-overlooked bit of indoor furniture. Not workbenches, mind you — we pay those plenty of attention — nor an outdoor bench you'd find at a park or on a patio, the kind the word "bench" brings to mind. The kind of bench I want to discuss is one that offers a quick and casual place to sit in your home, often in a transitional space (thus the term "hall bench"). It doesn't invite one to sit for a meal or a movie, but rather offers a brief place to pull on or kick off a pair of boots, to help kids with coats, hats, and gloves, or to give the dog a little attention after a good walk.

PANELS & PLANKS. Large workpieces make up a good portion of this project, allowing uninterrupted grain to contribute to its appearance. This made elm an excellent choice. Here, the more figured stock was used as the planks for the seat and backrest, while the straighter portions were glued up into the frames and the false fronts on the drawers.

A nice part of this simple style of construction is its repeatability. Want it longer? No problem. Cut longer planks for the seat and backrest, then add another frame panel and stretcher. Or, do you want it shorter? Easy — remove one section and make yourself a loveseat hall bench instead.

UNDERMOUNT SLIDES. The drawers add a lot of functionality to this project. They're deep and broad, and a key element of them is the undermount slides that support them. These nice bits of hardware ride smooth, hold a good deal of weight, and are wholly concealed when in use. This preserves the all-wood aesthetic, adding to the rustic appearance of this farmhouse hall bench.

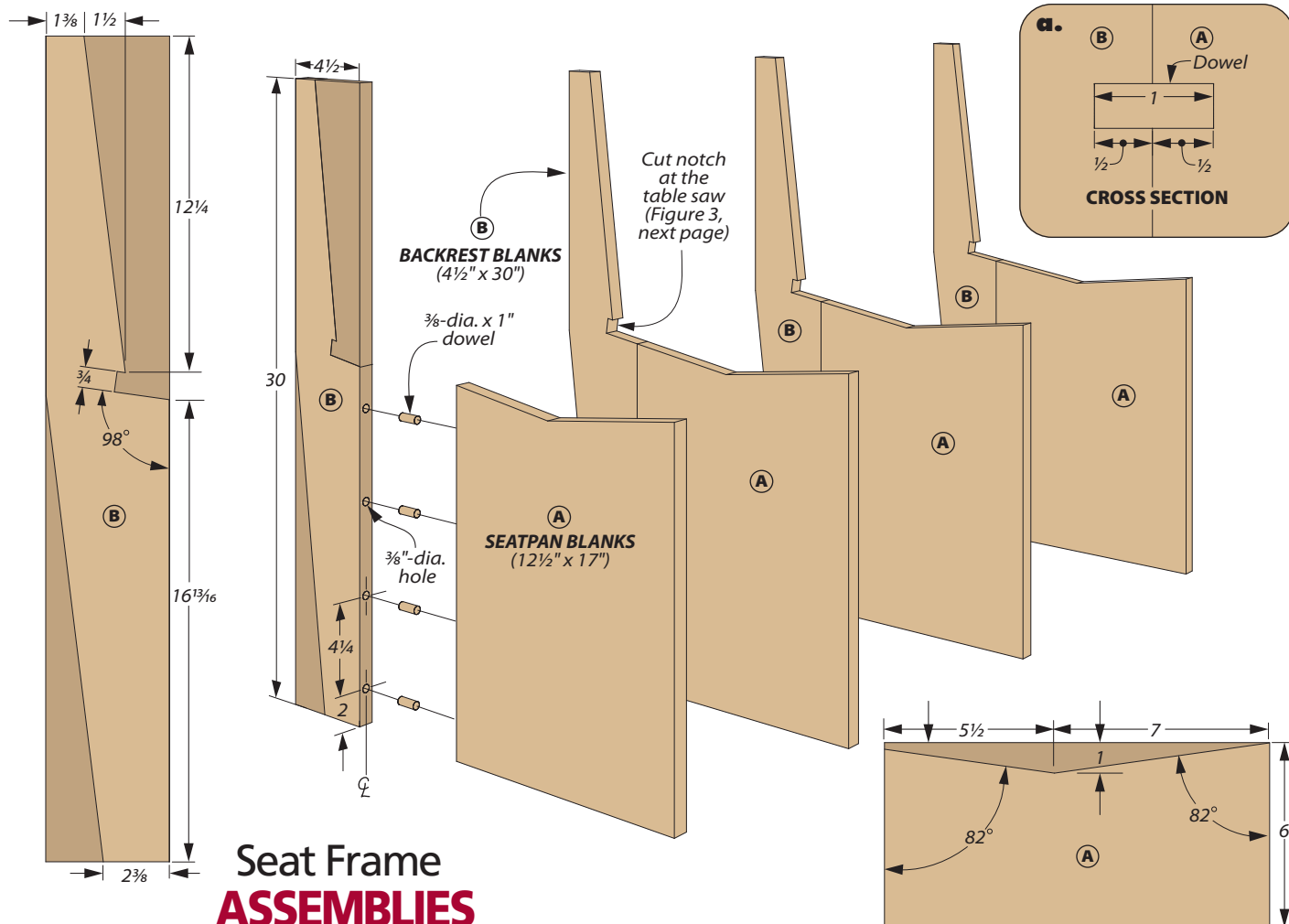
- Undermount slides provide a smooth ride and soft close to the drawers while remaining hidden. Page 47 details how to install these unique pieces of hardware.





▲ Long planks form the seat and backrest of this bench. The frame-and-stretcher design that supports these planks can be scaled up (or down) to best fit the space it'll fill.





The seat frames form the bones of this bench. These will support the planks for the seat and backrest and provide the side walls for the drawer cubbies. A good start here will set a solid

foundation for the rest of the work on this project.

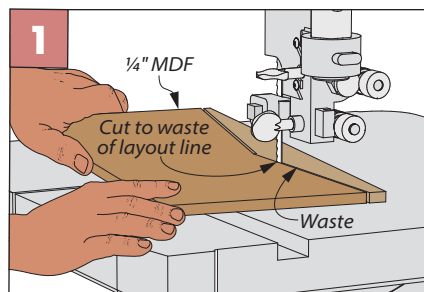
BEGIN WITH THE BLANKS. As you can see above, two different blanks comprise each frame piece. The seatpan blanks are pretty wide,

so your first step will be to glue up the panels to make these blanks in the first place. Once that's done, trim both sets of blanks to the sizes shown above and head over to the drill press.

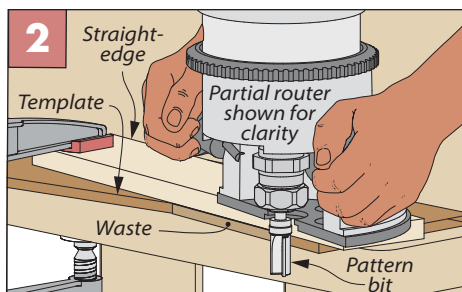
Dowels will join these blanks, and it's a good idea to make the holes for them while everything's still square. To ensure the holes will match, set up a stop along your drill press fence and drill the hole in each part before adjusting the stop, as in Figure 1 on the next page.

TEMPLATE SHAPING. As you can see above, both blanks have a rather unique shape. A triangular cut-out on the top of the seatpan blanks will hold the seat planks at their proper angles. The backrest blanks allow the back plank to recline slightly. For both, a template ensures each

MAKING A TEMPLATE



Band Saw. After laying out the template, rough-cut it at the band saw, staying outside the layout lines.



Routing. To achieve straight, clean lines on your template, attach a straightedge and rout along it with a pattern bit.

part is identical. The template can be created from a piece of hardboard or MDF. First, lay out the shape of the part on the template material according to the illustrations on the previous page. The notch in the backrest template doesn't need to be a part of the template — we'll take care of that later.

Figures 1 and 2 on the previous page show how to make the template. I began by rough-cutting the template's profile at the band saw (a jig saw works as well), then I routed the final edges. The routing is done with a pattern bit. A straightedge registers the bearing to create a clean, straight line for your template.

A similar process is used to shape the parts. Attach the template to the workpiece (double-sided tape is a good choice), then rough-cut the blank to shape at

the band saw (or jig saw). Leave a little material for your router to remove. When cutting the lower rear sides of the backrest blanks, don't toss the cutoffs. These will be used to aid our glueup shortly. After rough-cutting, use a pattern bit or a flush-trim bit to register against the template and create the final edges.

BACKREST NOTCH. After you've shaped all eight blanks, the four backrest blanks need a little extra attention. A notch in these accepts the rear seat plank, and I cut these at the table saw using a dado blade, as in Figure 3 below. It can take a bit of setup to dial in the right blade height and workpiece location for these cuts. I recommend making a few test cuts on scraps of equal length to the backrest blanks first. Once you have the right height and position, set

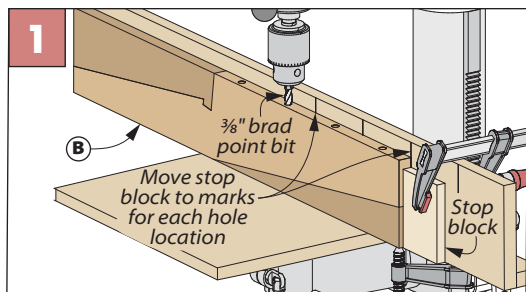
a stop along the miter fence so you can register each backrest blank against it.

ASSEMBLY. With those notches in place, assembly is all that remains on these parts. As I mentioned previously, the mating blanks are glued up using dowels. Figure 4 below shows how I performed the glueup.

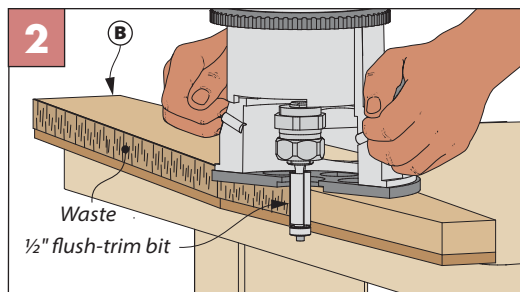
When applying clamps, you'll need to use the cutoffs from the back edges of the backrest blanks to support the lower clamps. Reattach these cutoffs using double-sided tape to prevent them from slipping as the clamps are tightened down.

Once the glueups are complete, remove the clamps and peel off the cutoffs and tape. Plane and sand the joint lines. With that, the frames are complete, and the next task on this bench will be joining them together.

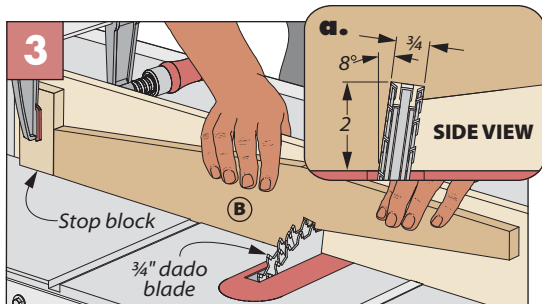
SHAPING THE BLANKS



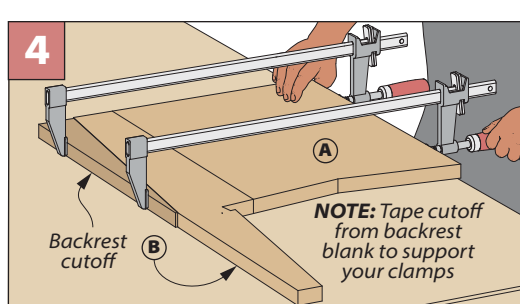
Dowel Holes. Before shaping the blanks, drill the dowel holes that will be used to join them. Use a stop for consistent spacing.



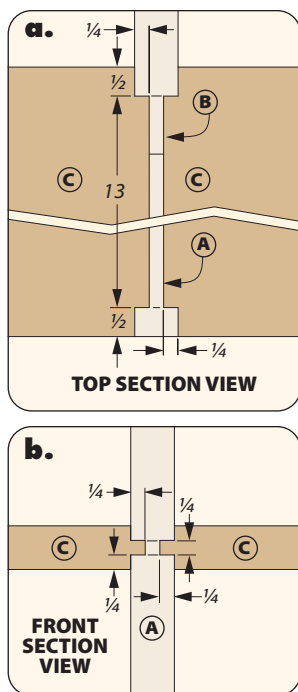
Rough & Rout. Attach the template to the blank, then rough it out at the band saw and rout to final shape with a flush-trim bit.



Seat Notch. After shaping the backrest blank, cut a notch into it at the table saw using a dado blade. This accepts the rear seat plank.



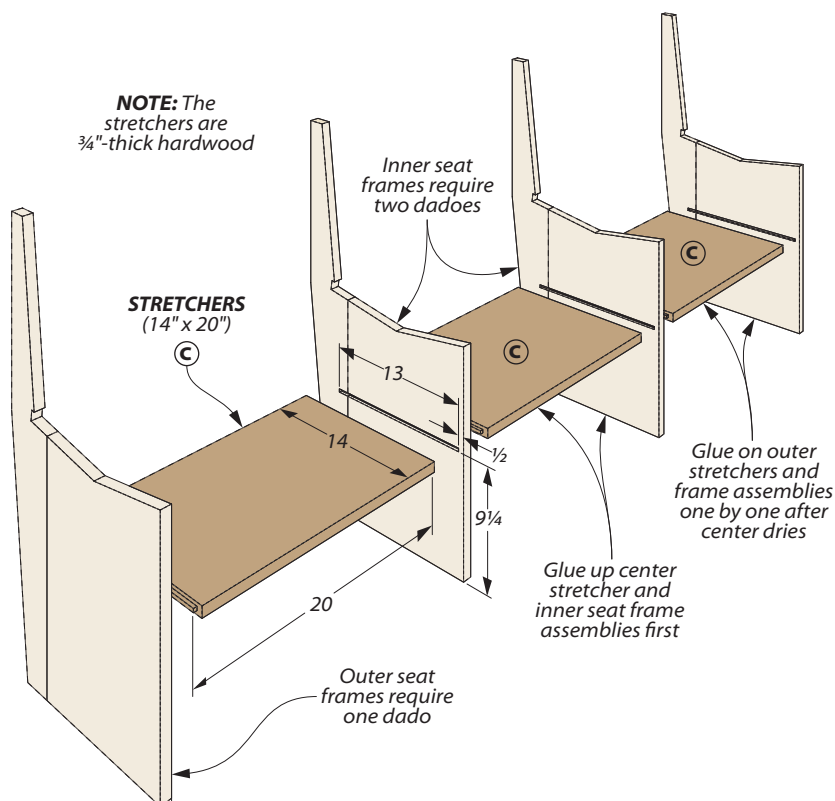
Glueup. Assemble the blanks by gluing them up with their dowels. Use the cutoff from the backrest blank to square up your clamps.



Stretchers & PLANKS

With the frames complete, it's time to join them together. This is done in two ways. First, the stretchers connect the frames by tongue and dado joints, forming the bottom of the drawer cubbies. Second, three planks will be laid across and screwed to the assembly, forming the seat and the backrest. First, we'll take care of the stretchers.

NOTE: The stretchers are 3/4"-thick hardwood



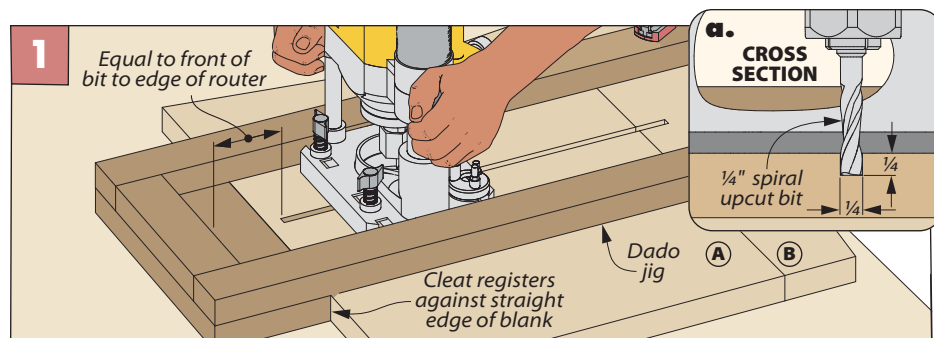
SEAT FRAME DADOES. I find it's good practice to make the "mortise" portion of a joint before the "tenon" side; it's easier to trim down an overly thick tenon than to expand a narrow mortise. So, I routed the dados into the seat frames before addressing the stretchers. Details 'a' and 'b' above show the dimensions of these dados. The outer

seat frames only have one on their inner faces while the inner frames have one on each face.

The cut should be made with a plunge router and a straight bit or a spiral upcut bit. A straight bit will suffice, but a spiral upcut bit will provide better chip clearance. If you don't have a plunge router, you can instead drill a hole at either end of the dado that is equal in diameter to the width of the dado, then rout between the two holes.

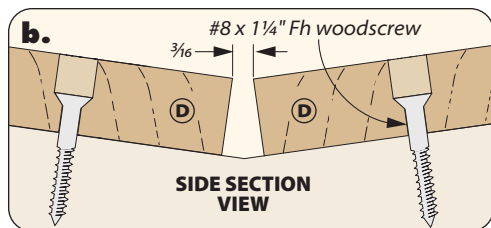
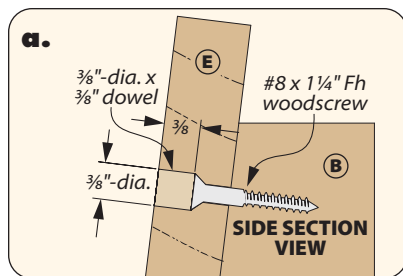
As for the routing itself, Figure 1 at left shows the technique I used. To guide the router, I used a dado jig consisting of five pieces. Two pieces create the sides, two pieces create the ends, and one is attached beneath as a cleat. The space within the guide should provide just enough width to fit the baseplate of your router and be just long enough to rout the full slot and stop the router at the end of it. The cleat should register against the flat front edges of the frames. Plywood or MDF are good, stable materials for this.

ROUTING STOPPED DADOES



Dado Jig. A four-piece frame creates the jig to rout stopped dados. The frame corrals the router base and

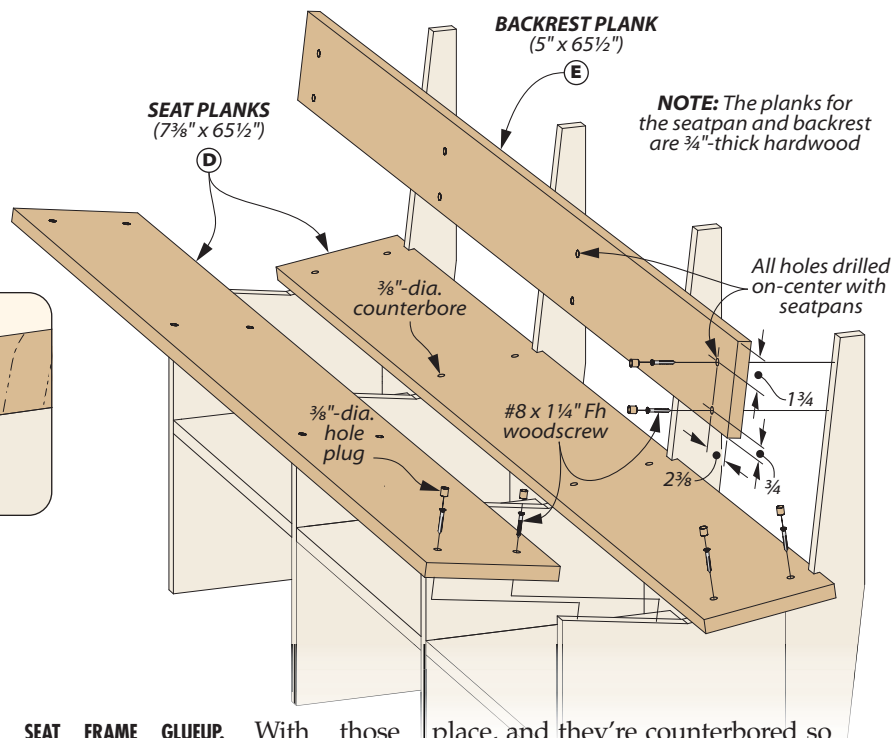
a cleat registers against the side of the blanks. A spiral upcut bit removes chips effectively, making for a cleaner dado.



After routing these dados, square their ends with a chisel.

STRETCHERS. As with the seat frame blanks, the width of the stretchers means you'll probably need to glue up the panels before any other work is done. Once that's taken care of, cut these blanks down to size.

Figures 1 and 2 below show how to make the tongues on the stretchers with a few rabbet cuts. First, bury a dado blade in an auxiliary rip fence and remove the waste on the faces with rabbet cuts on each side. Next, attach a tall auxiliary fence to your miter gauge and raise the blade. Then, cut the stretchers on end to form the edge shoulders of the tongues.



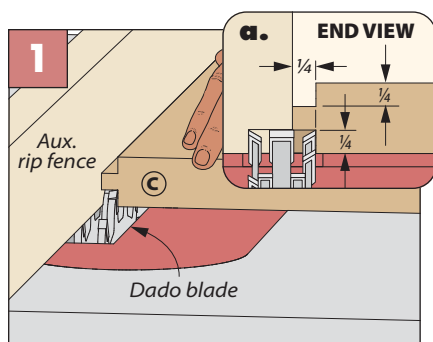
SEAT FRAME GLUEUP. With those tongues complete, the frames and stretchers can be assembled. Begin by gluing up the inner two frames and the central stretcher. Clamping squares work great to keep the assembly from racking. Once that glueup is complete, glue on the outer frames and their stretchers one side at a time.

SEAT PLANKS & BACKREST

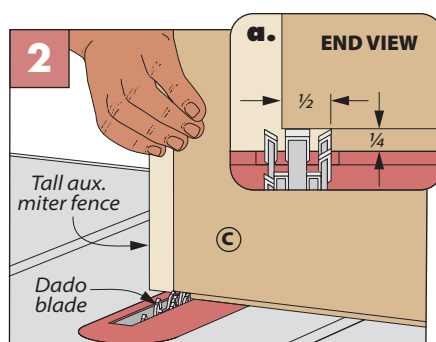
The seat planks and backrest are the next parts to add before the drawers. Woodscrews hold these in

place, and they're counterbored so you can add plugs to hide the screw holes as well. You could match the plugs to your wood to hide them, but we chose to use a contrasting wood for some light accents. Drill the counterbored holes, then clamp the planks down to the assembly (as in Figure 3) before screwing them in place. Finally, glue the plugs into the counterbores. Seat them a bit proud and, once dry, sand them flush to the surface of the planks, or knock them down with a block plane. Now, all that's left are the drawers.

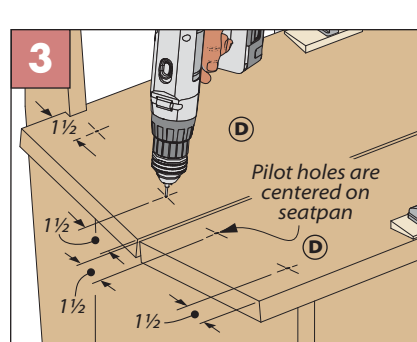
STRETCHERS & SEATING



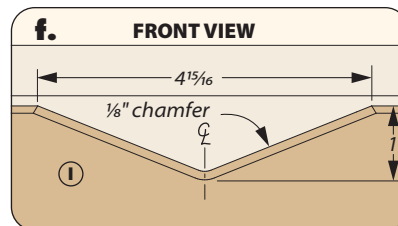
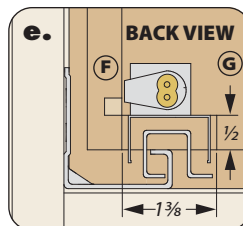
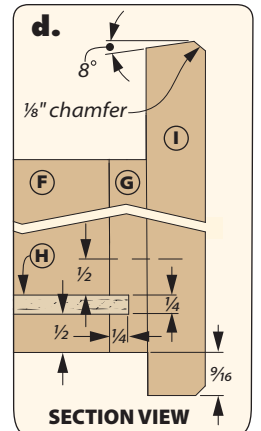
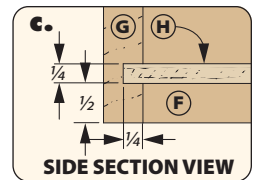
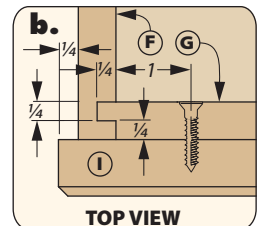
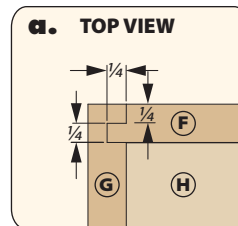
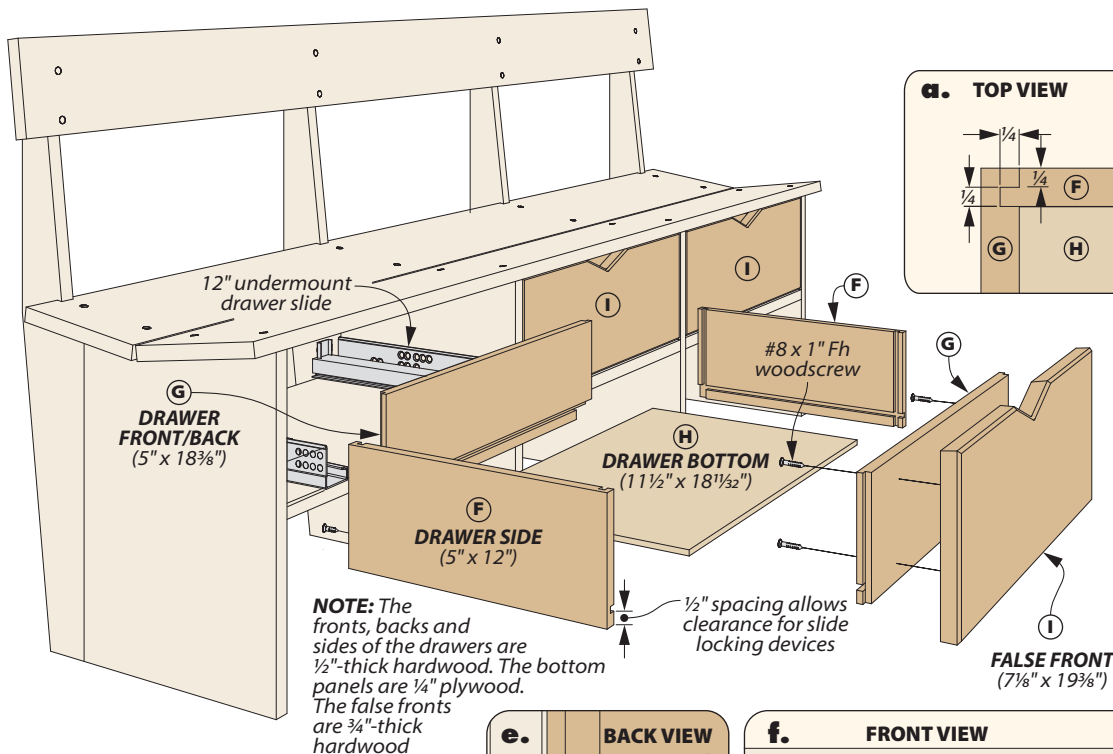
Rabbet Cuts. To create the tongues on the stretchers, first cut rabbets along their edges at the table saw.



Edge Shoulders. Cut the ends of the tongues off using a tall auxiliary miter fence to create the edge shoulders.



Seat Planks. Clamp the planks to the assembly, drill the counterbored pilot holes, then drive in the screws.



Make some DRAWERS

The final parts of this bench are the drawers. These are wide and deep for a variety of options: hats and gloves for winter, leashes and tennis balls for the dogs, or whatever else you need before stepping out the door.

DRAWER JOINERY. The joinery here is simple, yet effective. Like the stretchers below, these drawers

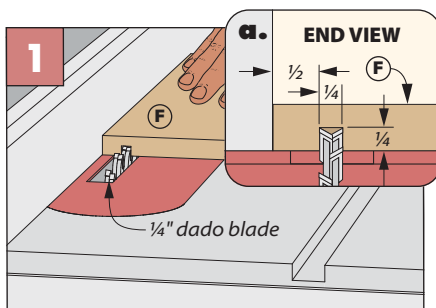
utilize tongue and dado joints. Additionally, a bottom panel is contained within grooves in the front, back, and sides. For both of these, a dado blade at the table saw works well (as in Figures 1 and 2 below).

The other half of this joinery is the tongues on the fronts and backs. As with the stretchers,

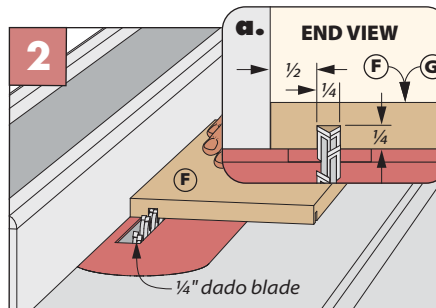
I made these with rabbet cuts, burying a dado blade in an auxiliary rip fence and using a miter gauge for support.

DRAWER ASSEMBLY. Next, the bottom panel can be cut to size and the drawers can be glued up. While these dry, this is a good time to make the false fronts. Details 'b,' 'd,' and 'f' give you

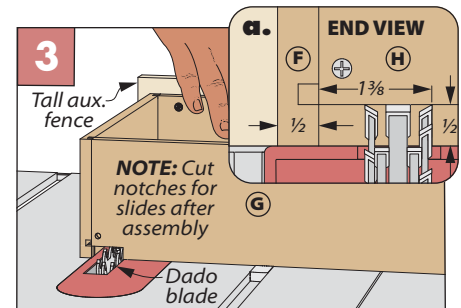
TABLE SAW DRAWER JOINERY



Side Grooves. Cut the dados in the sides to accept the tongues in the front and back at the table saw.



Bottom Grooves. A groove cut in the bottom of each drawer piece accepts the bottom panels.



Slide Notches. Notches in the drawer backs accept the undermount slides. Cut these after assembling the drawers.

some idea of what's going on. While cutting these pieces to width, add the bevel shown in detail 'd' by tilting the table saw blade. I created the V-shaped cutouts in the top the same way as I did with the seat blanks: a template followed by rough cutting, then finishing with the router. Finally, a chamfer around the front edges of the false fronts softens their look. Hold off on attaching them for now, however. This is best to do after installing them, which is our next task.

UNDERMOUNT SLIDES

Undermount drawer slides have picked up in popularity over the last few years, and there's a good reason for it. They ride smoothly and they're concealed from the top and side of the drawer.

Steps 1 through 3 at right show the installation. A notch in the drawer backs accepts the slides (since they're mounted underneath). This needs to be made after construction, and it can be routed or cut at the table saw. I used the table saw, as in Figure 3 on the previous page. Align the cut, push the drawer through, then stop and turn off the saw after removing the waste from the back piece. Alongside those notches, holes in the back of the drawer are also needed, so drill these out now.

In terms of the actual installation, the key is that the locking devices and the slides need to line up precisely. This is a factor of the width of the cubby versus the width of the drawer (the dimensions shown here already account for this).

Next, screw the slides into the cubby and the locking devices into the bottom of the drawer. After you have all the screws driven in, insert the drawers in along the slides until the slides click into the locking devices. After the drawers are in, you can then attach the false fronts to the drawers. With that (and some finish), the bench is complete. **W**

Materials & Supplies

- | | |
|----------------------------------|--|
| A Seatpan Blanks (4) | $\frac{3}{4}$ x 12 $\frac{1}{2}$ - 17 |
| B Backrest Blanks (4) | $\frac{3}{4}$ x 4 $\frac{1}{2}$ - 30 |
| C Stretchers (3) | $\frac{3}{4}$ x 14 - 20 |
| D Seat Planks (2) | $\frac{3}{4}$ x 7 $\frac{3}{8}$ - 65 $\frac{1}{2}$ |
| E Backrest Plank (1) | $\frac{3}{4}$ x 5 - 65 $\frac{1}{2}$ |
| F Drawer Sides (6) | $\frac{1}{2}$ x 5 - 12 |
| G Drawer Fronts/Backs (6) | $\frac{1}{2}$ x 5 - 18 $\frac{3}{8}$ |
| H Drawer Bottoms (3) | $\frac{1}{4}$ ply. - 11 $\frac{1}{2}$ x 18 $\frac{11}{32}$ |
| I Drawer False Fronts (3) | $\frac{3}{4}$ x 7 $\frac{1}{8}$ - 19 $\frac{3}{8}$ |

- (16) $\frac{3}{8}$ "-dia. x 1" Dowels
- (24) #8 x 1 $\frac{1}{4}$ " Fh Woodscrews
- (24) $\frac{3}{8}$ "-dia. x $\frac{3}{8}$ " Wood Plugs
- (12) #8 x 1" Fh Woodscrews
- (3 pr.) 12" Undermount Drawer Slides

UNDERMOUNT DRAWER SLIDES

1

First, screw the slides into the seat frames with their bottoms resting on the stretchers.



2

Second, screw the locking devices into the bottom of the drawers. A jig assists in drilling the pilot holes (refer to page 66).



3

Third, push the drawers in place over the slides until they click into the locking devices.



4

If you need to remove the drawer, the locking devices can be released to free them from the slides. To replace the drawers, simply slide them back into position.



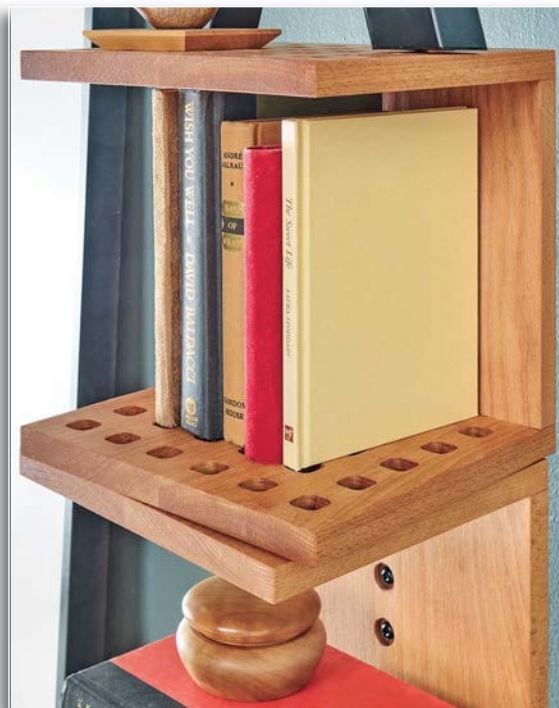
Skewed Book Tower

Minimalist sensibilities, warm colors, and jaunty angles belie the solid construction of this piece.

That which is square often dominates what we see. Look around yourself now — I'd hazard to guess you're surrounded by parallel lines and 90° corners. It makes sense. Structurally, this provides most furniture and buildings with optimal strength. On a page (like this one here), rectangles offer the most efficient use of space. Beyond the logic of it, there's something satisfying about the uniformity, whether it's a brick wall, a tile floor, or the paintings of Dutch abstract expressionists. Equally, there is something fun about disregarding this rigidity. When something is just slightly askew, it seems to be used, to be lived in. It evokes a little mischief. This leads me to the project you see here.

From the front, this book tower appears to be a loose stack of wood shelves, seemingly unsupported. The illusion is dispelled from the back, where a post provides the shelves with a sturdy spine. Finger joints connect the solid-wood parts and add an aesthetic of geometric strength to contrast with the alternating angles. MDF constructs the top of the base and the supporting post, with a high-gloss paint that adds a cheery look beside the warm tones of the beech. All in all, this project makes for a fun build and a visually light yet fascinating addition to your home.

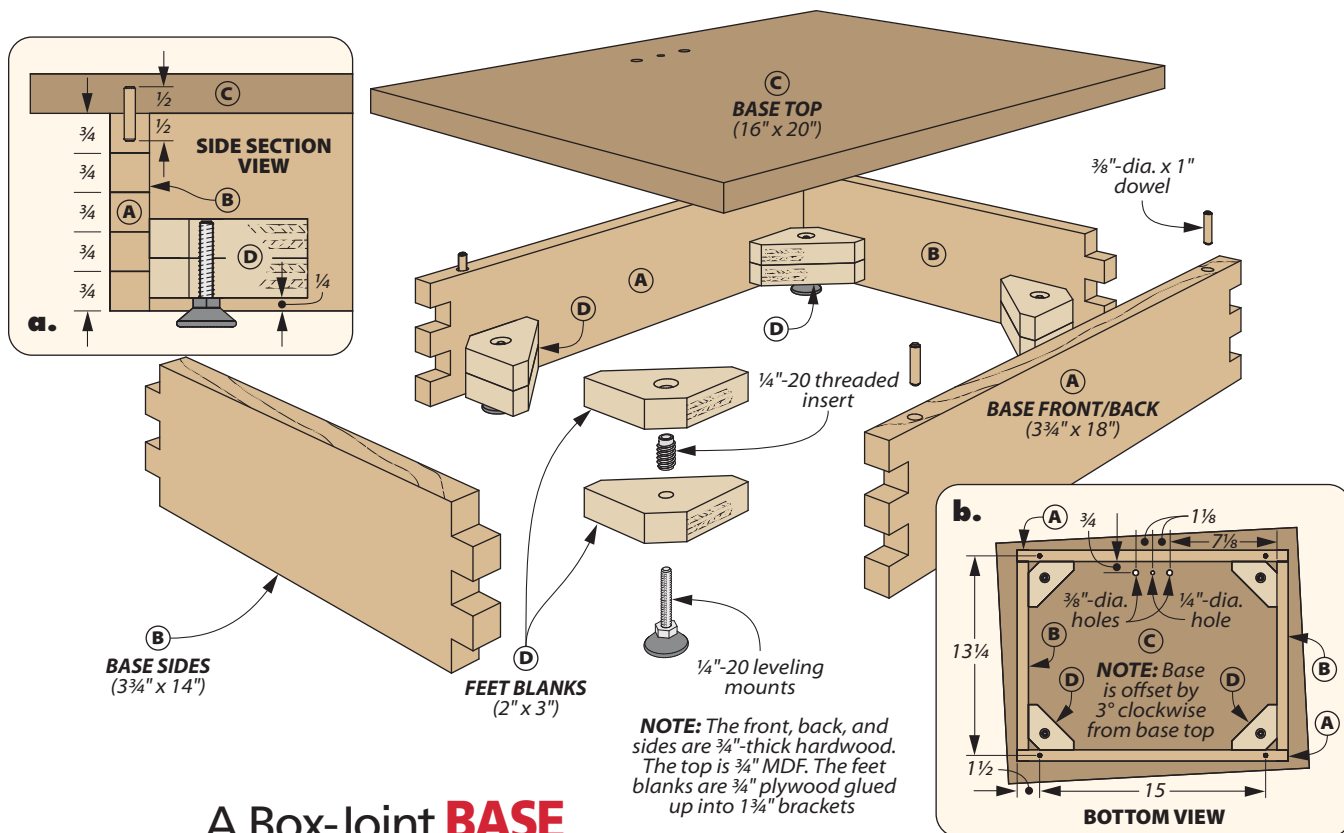
► Beveled faces on the post hold these shelves at offset angles, granting this tower a devil-may-care demeanor.



◄ Finger joints connect the solid-wood parts, creating square lines to contrast with the angled shelves.

► Painted MDF provides a sturdy post to support your books. Its stability is important in keeping these angles aligned long-term.





A Box-Joint **BASE**

This tower begins at the base. It's a four-piece frame topped with an MDF panel. Within the frame are leveling mounts threaded into feet blanks to ensure the tower sits plumb.

BASE FRAME. The front, back, and sides were the first pieces I tackled. Beech was my hardwood

of choice, and after sizing the parts, I turned to the joinery.

FINGER JOINTS. Finger joints make for a solid connection and add a nice sense of geometry to the base. Best of all, they're a pretty easy joint to make at the table saw. Figure 1 shows how.

A dado blade makes the cut while a tall auxiliary miter fence supports the workpiece. A key locates the workpieces for each cut. The key needs to be 3/4"-thick, 3/4"-wide, and 2"-long. Cut another 1" length from the same strip to use as a spacer as well.

Alongside the key, a tall auxiliary miter fence supports the workpieces being cut on-end. The key needs to be 3/4" from the blade, so cut a notch for the key in the fence, then use the 3/4"-wide spacer to position the fence.

To cut the fingers in the front and back, follow Figure 1 at left, with the workpiece butted against the key. For subsequent cuts, slot the new notch over the key. For the sides, make the initial cut with the last notch on the front or back

piece slotted over the key and the side butted against it.

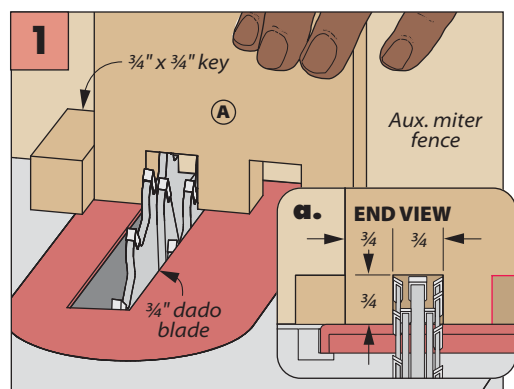
After the finger joints are cut, the front and back need holes on their top edges for dowels that will secure the top. Once those are drilled, glue up the fingers.

OFFSET TOP. The top panel is just a piece of MDF. The catch is that it's offset from the frame by 3° (detail 'b'). To achieve this, lay the top out and center the frame on it. Then, use a bevel gauge to adjust it to 3° while making sure the edges stay evenly spaced. Once it's in position, mark the location on the top with a pencil.

Since you've already drilled the holes in the frame, dowel centers work great to transfer the locations to the top. After they're marked, drill them out. Then, join the top and the base by gluing them up with the dowels.

Now, there are a few more holes in the top. We waited to make these because they're parallel to the base frame, not to the edges of the top. These will accept dowels and a bolt to hold

TABLE SAW FINGER JOINTS



Fence & Key. Make the first cut with the workpiece against the key, then slot the new notches over the key for subsequent cuts.

the post. You can see them in detail 'b' on the previous page.

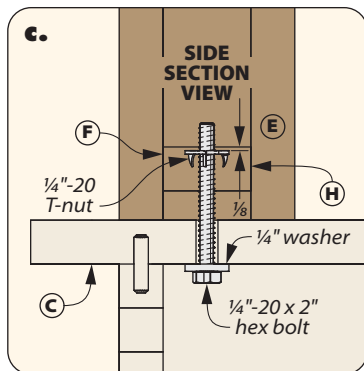
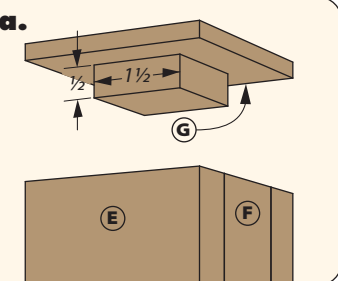
LEVELER FEET. With this tall, thin book tower, it's ideal to have the project standing plumb. Leveler mounts create adjustable feet for this purpose. These thread into inserts in the feet blanks glued inside the frame (detail 'a').

BEVELED POST

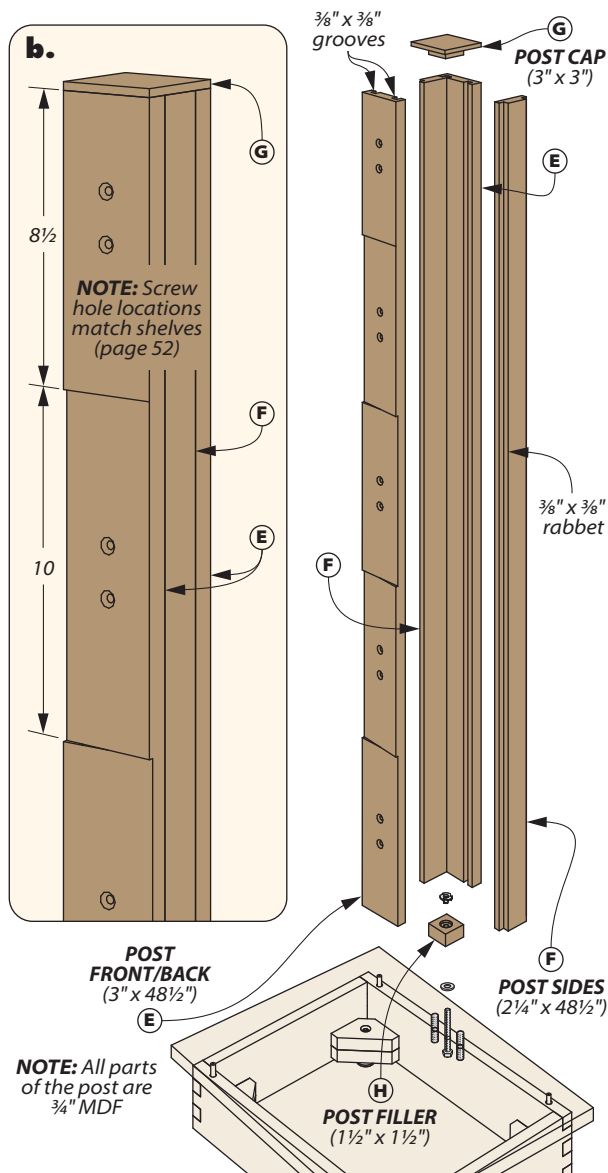
With the base complete, it's time for the post that the shelves will attach to. Like the base, the front, back, and sides make up most of this assembly, so I began there.

FOUR-PIECE POST. Tongues and grooves join the post. The grooves in the front and back were cut at the table saw with a dado blade, while the tongues on the sides were made by rabbeting their edges using a dado blade recessed in an auxiliary rip fence. When these are completed, glue them together.

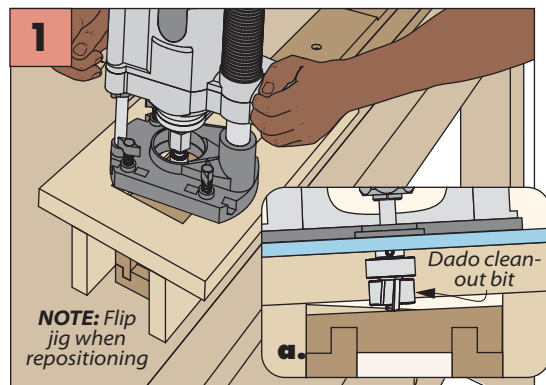
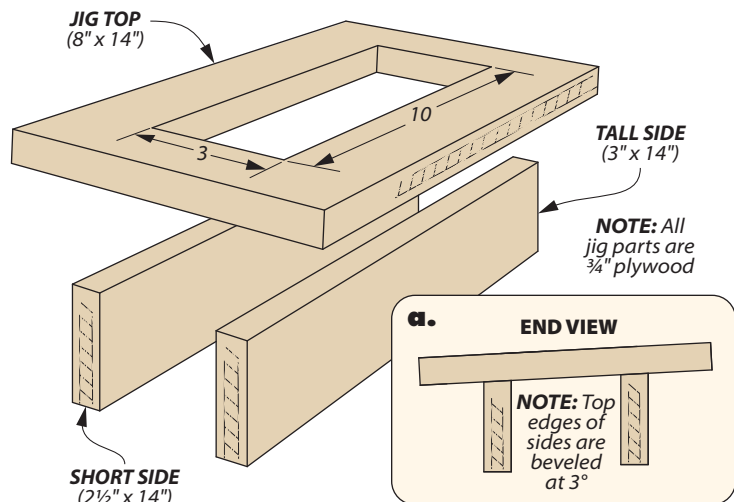
ALTERNATING FACES. The alternating bevels across the front face of the post hold the shelves at their angles. To create these, I used the router jig shown below. The routing is done one section at a time using a dado cleanout bit.



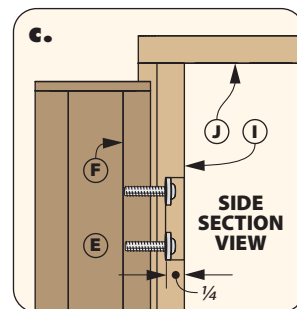
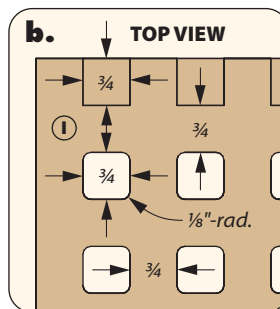
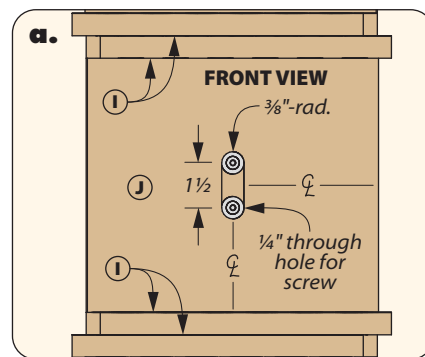
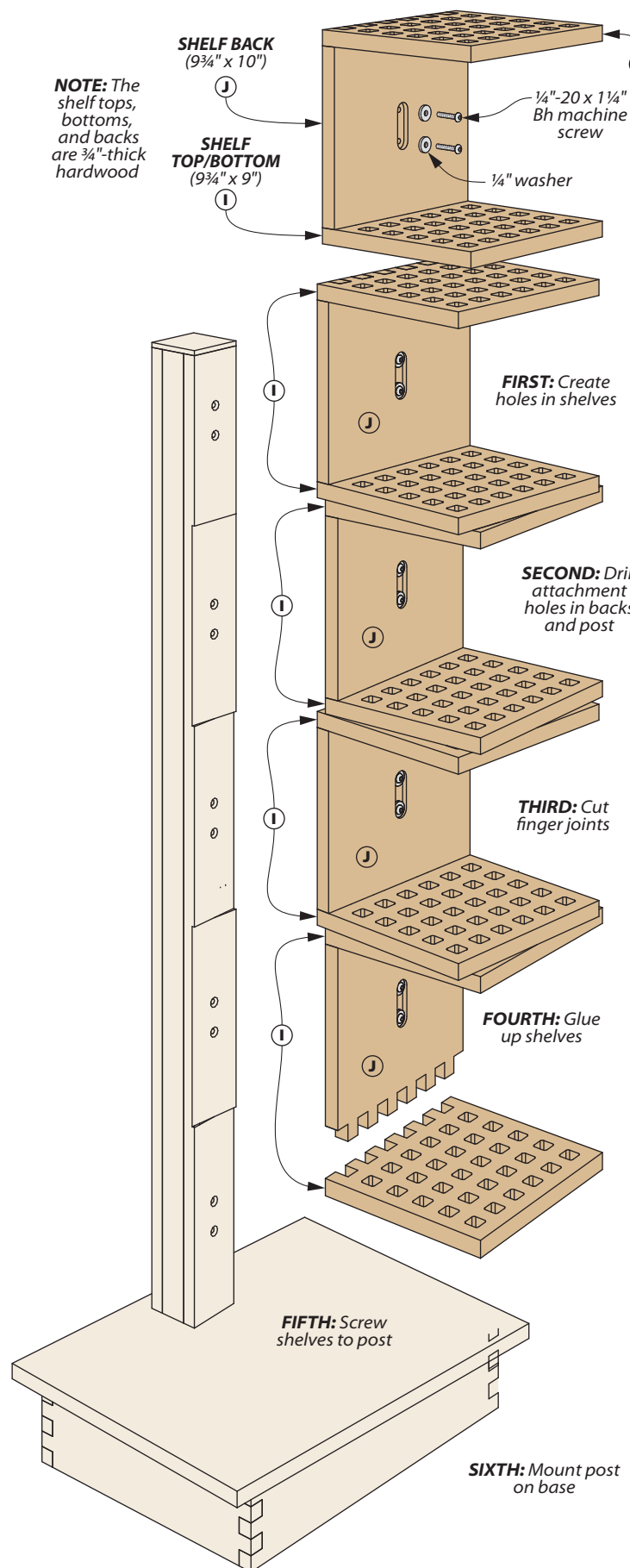
CAP & FILLER. Last are the cap and filler. The cap is rabbeted to fit into the top (detail 'a'). The filler is cut to fit in the bottom of the post. A counterbored through hole accepts a T-nut and bolt to attach the post to the base (detail 'c'). After drilling it, insert the T-nut and glue the filler into the post. Once dry, the post is complete and it's time for the shelves.



BEVELED ROUTER JIG



Beveled Faces. Position the jig over one section of the post, then rout across it. When repositioning for the next cut, flip the jig around.



Honeycomb **SHELVES**

The skewed shelves are the last element of this tower. Detail 'b' and page 48 show how they're joined: more finger joints. The shelves are attached to the post with screws (details 'a' and 'c'). Before any of that, however, we need to address the holes that adorn the tops and bottoms of these shelves.

A HOLEY TEMPLATE. The box on the following page shows how I cut the holes in the shelves. A template was the best choice to keep everything identical. Rather than cut each hole in the template, I used a strategy similar to cutting the finger joints.

Materials & Supplies

A	Base Front/Back (2)	3/4 x 3 3/4 - 18
B	Base Sides (2)	3/4 x 3 3/4 - 14
C	Base Top (1)	3/4 MDF - 16 x 20
D	Feet Blanks (8)	3/4 ply. - 2 x 3
E	Post Front/Back (2)	3/4 MDF - 3 x 48 1/2
F	Post Sides (2)	3/4 MDF - 2 1/4 x 48 1/2
G	Post Cap (1)	3/4 MDF - 3 x 3
H	Post Filler (1)	3/4 MDF - 1 1/2 x 1 1/2
I	Shelf Tops/Bottoms (10)	3/4 x 9 3/4 - 9
J	Shelf Backs (5)	3/4 x 9 3/4 - 10
	• (6) 3/8" x 1" Dowels	
	• (4) 1/4"-20 Threaded Inserts	
	• (4) 1/4"-20 Leveling Mounts	
	• (1) 1/4"-20 T-nut	
	• (1) 1/4"-20 Hex Bolt	
	• (11) 1/4" Washers	
	• (10) 1/4"-20 x 1 1/4" Bh Machine Screws	

I began by cutting twelve strips to length. I cut lap joints in them using a key and miter fence (Figure 1) and assembled them on their lap joints to make a grid (Figure 2).

Then I headed over to the drill press. On each piece, I attached the template and drilled holes to remove most of the waste, as in Figure 3 below. The holes aren't just circles, but squares with radiused corners. To achieve this shape, I routed around each opening using a pattern bit (Figure 4). You'll likely need to make a second pass on each shelf with the template removed to reach full depth, registering the bearing on the previously cut portion.

SHELF BACKS. Now, it's time for the shelf backs. Aside from the finger joints, they need two

recessed through holes in their centers (detail 'a,' previous page). These accept washers and screws to attach them to the post. First, drill out the counterbores for each hole using a Forstner bit. Then use the dimple left by the bit's tip to make a centered through hole. Rout the waste between the counterbores using a pattern bit with a straightedge on either side to make the recess.

Finally, drill pilot holes in the post to match. Using the shelf backs as guides, countersink those holes as well. This helps pull the shelves snug to the post. We used machine screws for their higher thread count here.

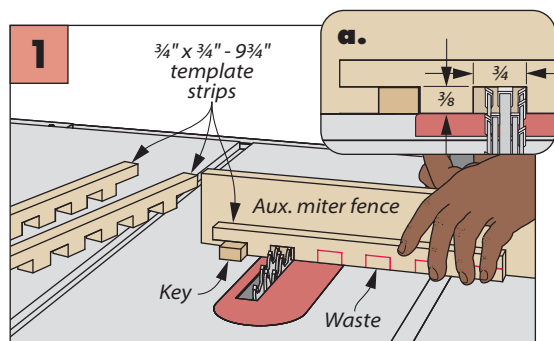
FINGER JOINTS. Next come the finger joints. These are the same size as the fingers in the base

(detail 'b') and have the same spacing, so you can use the same setup from that process. After cutting the fingers, glue up the shelves.

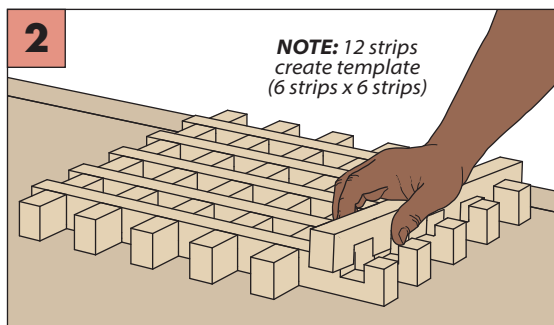
BRING IT TOGETHER. Before assembling your pieces, you'll want to paint the post and base top (and finish the solid-wood parts). The method for the high-gloss paint is detailed on page 18.

That aside, a hex bolt threads through the base top and into the T-nut in the post filler to secure the post. The two other holes accept dowels, which keep the post square to the base. The shelves attach to the post with screws and washers (detail 'c'). After you drive these home, your book tower is complete and ready to be ornamented with your collection. **W**

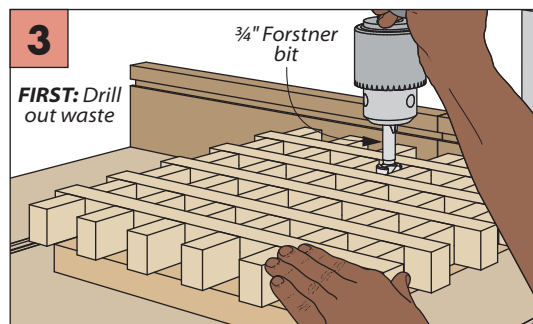
SHELF HOLE TEMPLATE



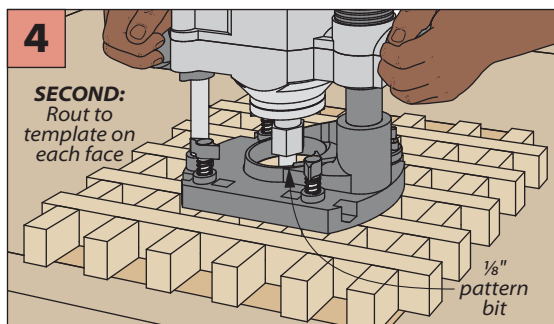
Finger Joint Jig. To cut the half-laps in the template strips, a similar setup to cutting the finger joints is used, only with a shallower cut.



Grid Glueup. After cutting all the lap joints, glue up the twelve strips to form a grid. This will be the template for drilling and routing.



Drill Out Waste. Attach the template to the shelf with double-sided tape, then use a Forstner bit at the drill press to remove most of the waste.



Rout It Out. Finish the shelves by routing along the template. You may need to remove the template and make a second pass to reach full depth.





- ◀ A shop-made hub and petals rotate in the warm air rising from the lit candles in the feet below.

Holiday Tree Carousel

This traditional decoration combines the flicker of candlelight with motion to set the scene.



- ▲ Splines offer a straightforward method to assemble small pieces like those in the frame. Take a look at page 57 to learn how to glue up curved pieces with ease.



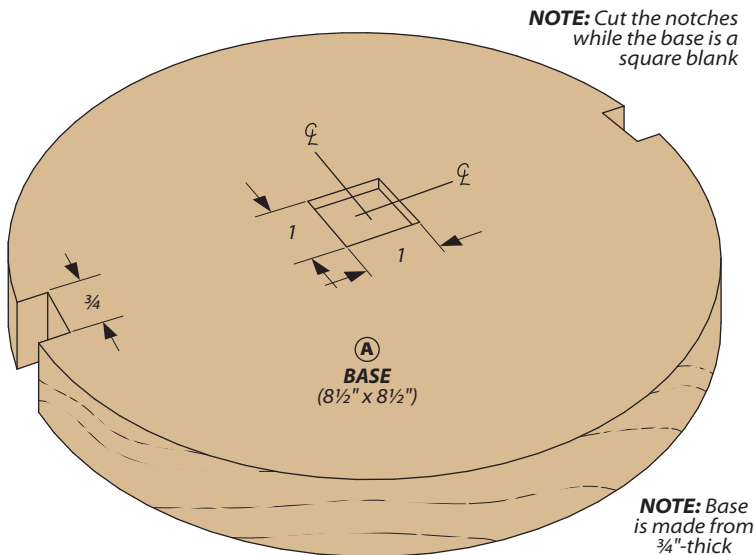
Many northern cultures light up winter holidays and festivals with candles and lanterns to brighten the darkest time of the year. Clever folk used the heat released by the flame to add motion and liveliness to create fun decorations. Chris Fitch, our resident clever folk, designed this project inspired by the “Christmas pyramids” from the Ore Mountains that form the border between Germany and the Czech Republic. A little searching reveals that these pyramids could be towering and elaborate.

Our *Woodsmith* version takes a quieter approach to a tabletop display. This peaceful winter scene spins on a steel shaft that turns against a small steel plate. In spite of the scale, there’s plenty going on: a little turning, some carving, and head-scratching to figure out how to make angled grooves for the petals on the top.

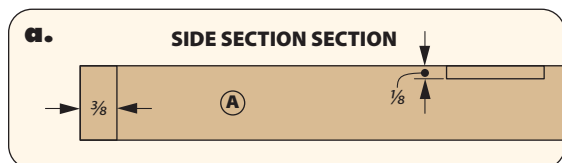
You’re welcome to follow the plans closely, but there’s enough room to riff on the final look. Maybe swap out (or add) different animals or figures. Change the paint colors or shape of the tree. This project is also one of those that could be made in multiples — perfect for gift-giving.

If you’re like me, a project like this offers the perfect reason to turn on the lights and the heater in my shop as the season turns darker and colder — here in Iowa, anyway.

- ◀ A herd of carved deer circles around the tree. Most of the shaping is done at the band saw. Add as much detail as you want.

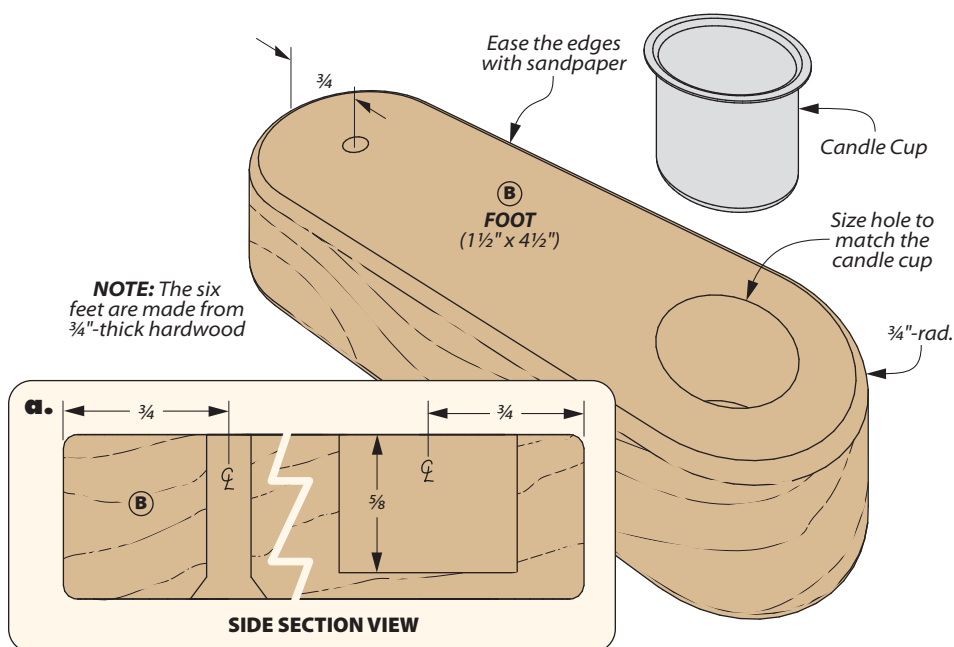


NOTE: Base is made from 3/4"-thick hardwood

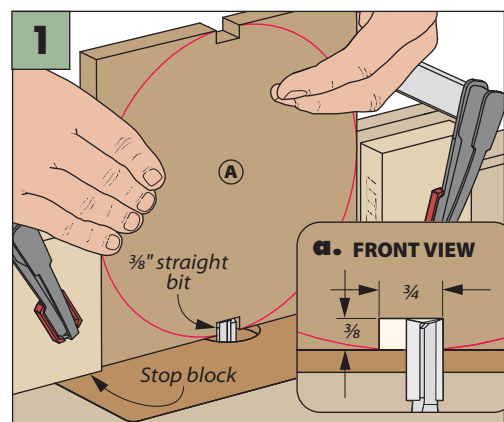


Graceful STRUCTURE

In the drawing above, you can see the base that anchors our project. A pair of notches on the sides register a set of uprights. A center recess houses a pivot point for the rotating assembly. I'm sure you've noticed that's also round. However, that's really the last step in the process.



ROUTER TABLE



Notches. A tall auxiliary fence on a miter gauge guides the base to cut a centered notch along each side of the blank.

Instead, the base begins life as a square blank. This shape makes it easier to form the notch on each edge. Figure 1 above shows how I do this on the router table with a miter gauge and a straight bit.

There are two key features of note here: I use a bit that's narrower than the notch. This allows me to sneak up on the final size and center the notch. That's where the two stop blocks come in. These keep the workpiece

aligned to the bit. With the base still square, mark the centerpoint and draw the final size of the base with a compass. Then lay out the shallow mortise in the center, as shown in the upper drawing and in detail 'a.'

This one is small enough that you could cut it with just a chisel. Another option is to remove most of the waste with a Forstner bit and square up the corners.

The completion of these steps means you can now cut the base to shape and smooth the edges. A circle-cutting jig works well. Another option is to hone your band saw skills. Cut as close to the line as you can, then clean up and smooth the edges at the edge sander. Minor irregularities won't be noticed, promise.

FEET. A set of six feet supports the base and holds the tapered candles that power the motion of the carousel. The lozenge-shaped feet are shown in the drawing at left. The process to make these follows a similar path to that of the base. I drilled the hole for the candle cup and the mounting clearance hole before shaping the rounded ends of each piece.

ARCHED FRAME

The top of the rotating assembly is supported by a frame that reaches up from the base, as in the drawing at right. Two arches meet at the top and are joined with a spline. Figure 1 below shows how to cut the spline slots in square blanks.

SPLINES. I made a few splines that fit snugly in the grooves. These are cut slightly oversized to make the glueup easier. The two arch blanks can then be assembled. The square shape makes it easy to clamp these pieces together.

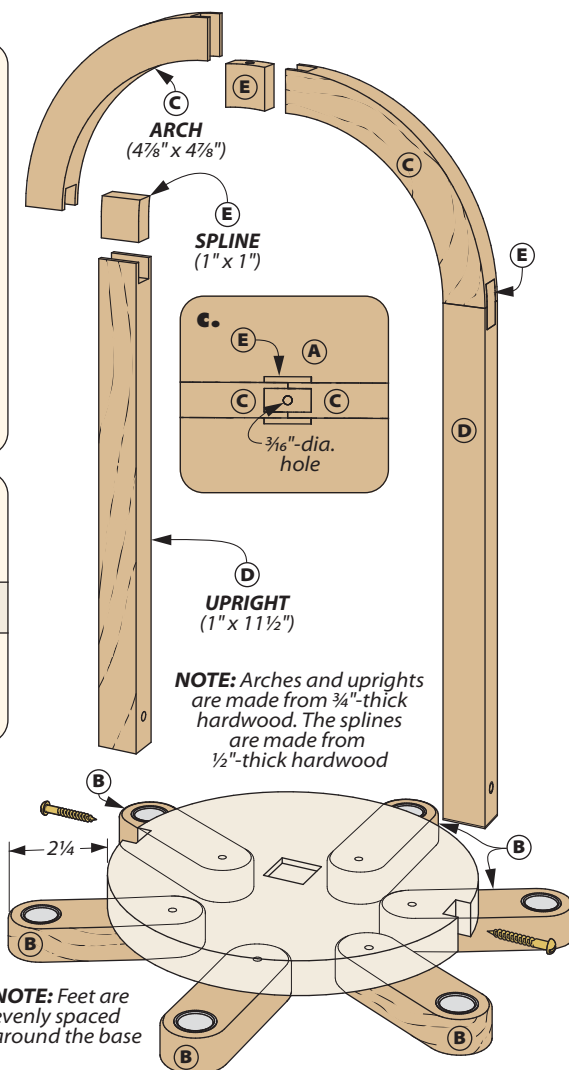
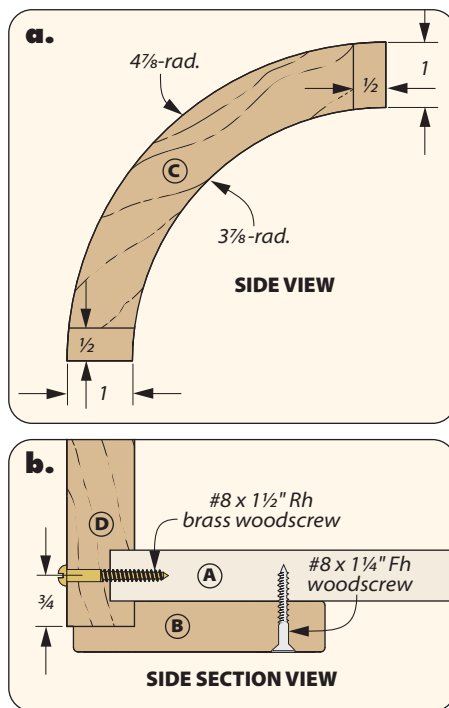
UPRIGHTS. Two uprights complete the curved framework. They're straight sticks with a slot across their top end. Take a look at Figure 2 below to see how to cut the slots.

Glue the uprights to the arch blanks with splines. Figure 3 picks up the shaping. I cut out the frame at the band saw. I used a block plane and edge sander on the outside. A large sanding drum smooths the inside.

Screws secure the frame to the base, as in detail 'b.' After an

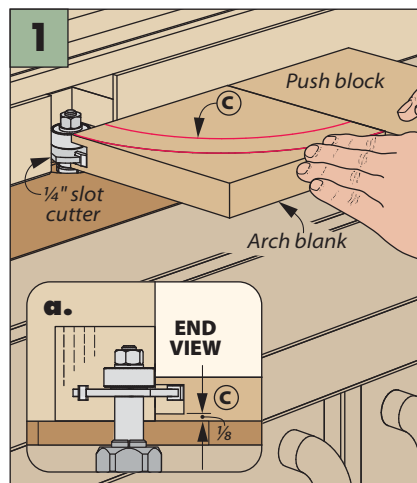
initial fit of the frame, I removed it for now to work on the other, spinning portions.

The feet can now be attached to the base with screws. Use a compass set to the radius of the base to step out six intervals around the perimeter to locate the feet.

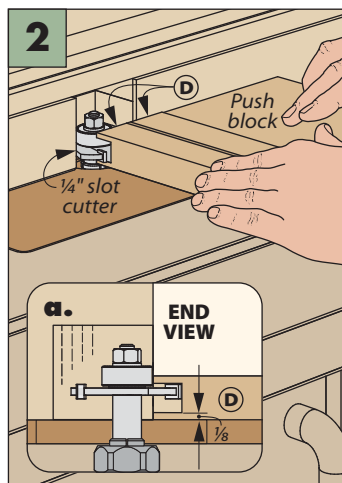


NOTE: Feet are evenly spaced around the base

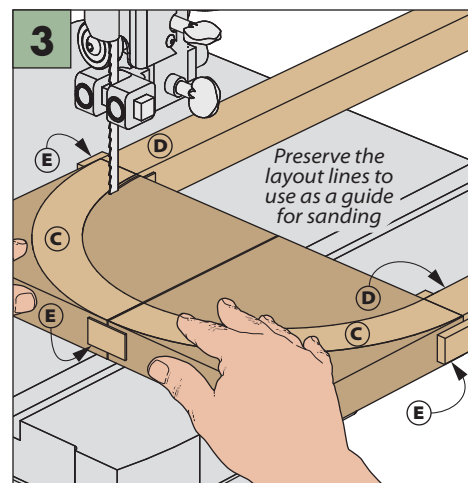
FRAME JOINERY & SHAPING



Square Arches. Cut a slot in the arch blanks. Flip the workpiece to center the slot and establish its width.

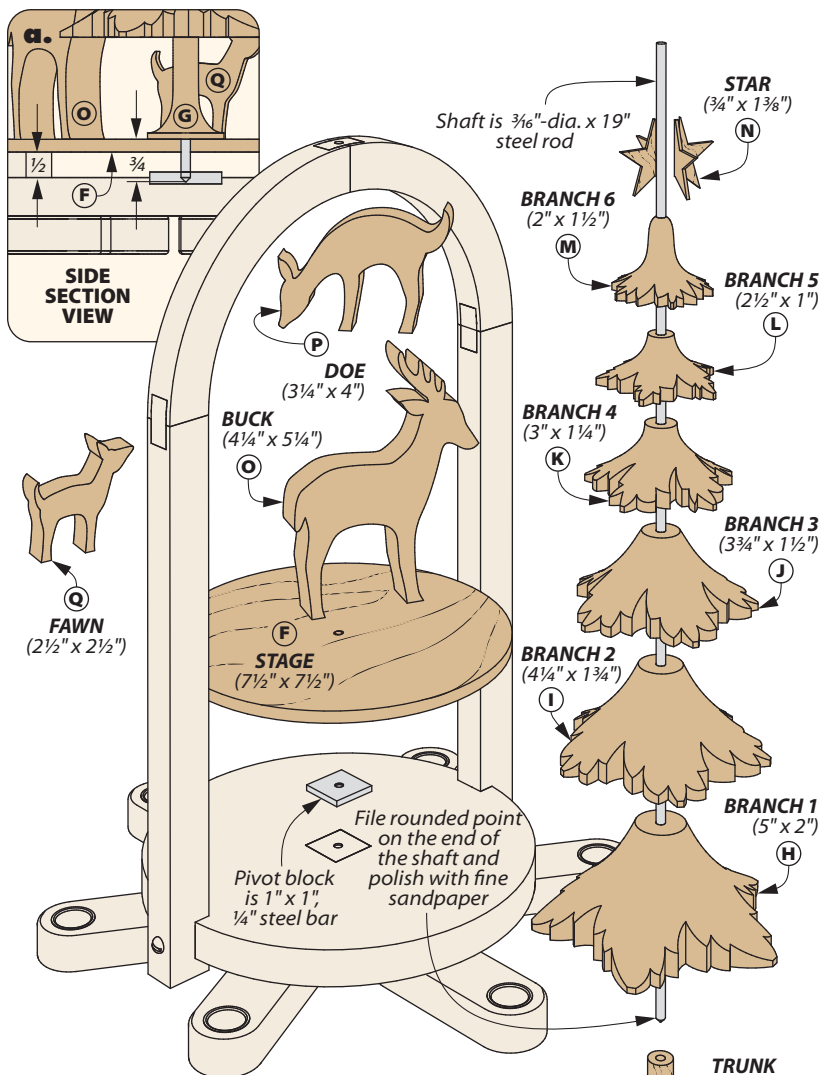


Upright Slot. A backer block supports the upright blank, keeping it square to the fence.



All At Once. Cut the frame assembly to final shape after the glueup, then sand the profile to an even curve.

Spin a CHRISTMAS TREE



NOTE: Stage is made from $\frac{1}{4}$ "-thick hardwood. Trunk is cut from $1\frac{1}{2}$ "-thick hardwood. The remaining tree parts are glued from layers of $\frac{1}{2}$ "-thick hardwood. The stars are made from $\frac{1}{8}$ "-thick hardwood. The deer family is carved from $\frac{3}{4}$ "-thick hardwood

A winter scene fits within the base and frame and forms the visual appeal of the project. A tall tree and a family of deer occupy a stage. A thin steel shaft runs through the tree and allows the whole works to turn like a carousel.

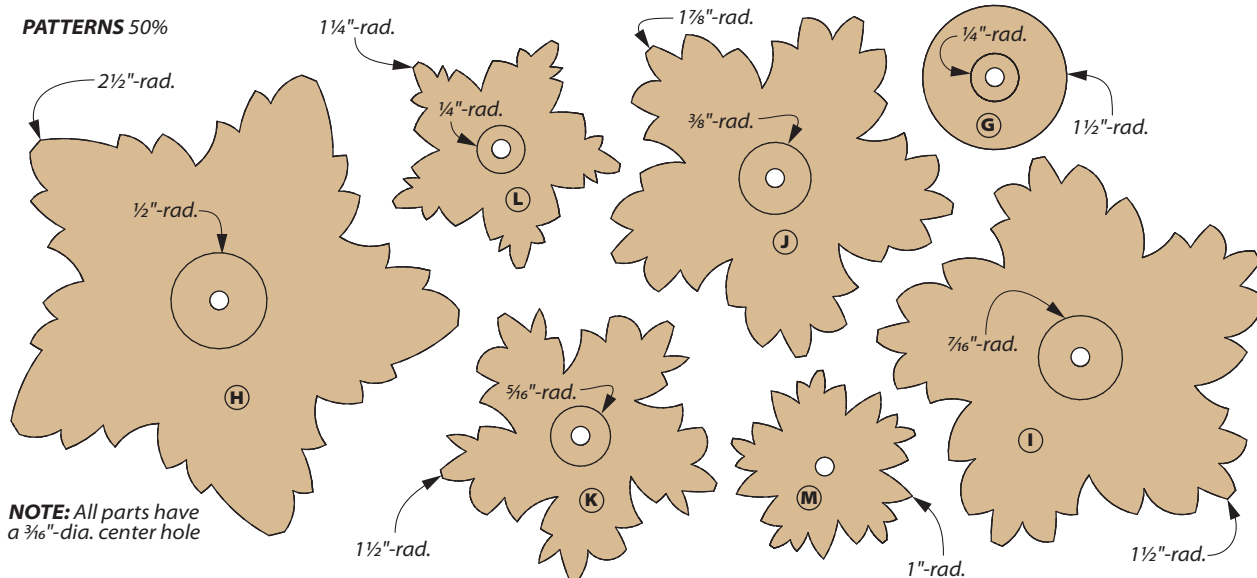
SET THE STAGE. Before we get to all that, make a pivot block that fits into the recess in the base. This square piece of steel has a dimple in the center to hold the lower end of the shaft. I formed the dimple with the tip of a drill bit. Use a file to form a rounded point on the bottom end. Polish the point with fine sandpaper or even against your sharpening stones to reduce friction when spinning.

A round stage is the first of the parts for this assembly. While it's square, drill the center hole. Then cut it round at the band saw.

TREE, IN SECTIONS. Just like the Christmas tree I have, this one comes together in sections and doesn't require watering. For ease of shaping, I glued up extra-long blanks for the tree from basswood. Each blank needs a center hole and is then cut round to match the radius shown in the drawing below.

If you have a lathe, you could turn the flared profile of the trunk and sections. Another option is shown at the top of the next page. I threaded the section onto a length of threaded rod and trapped it between nuts. One end is chucked into the drill press. The lower end of the threaded rod rests in a hole in a scrap block to keep the assembly from wobbling. With the drill press set at a high speed (2000rpm), I used a coarse rasp to establish

PATTERNS 50%



NOTE: All parts have a $\frac{3}{16}$ "-dia. center hole

SHAPE TREE SECTIONS



Turn With a Rasp. Capture tree sections on threaded rod with washers and nuts. Shape the profiles with rasps and files.



Form Branches. Trace portions of the paper patterns onto the sections. Cut along the lines at the band saw to shape the branches.

the rough taper and the size of the flat area at the top of each section. Then a fine rasp and a file smooth and refine the shape. Finish up with some sandpaper for a paint-ready surface.

I used the patterns to create the look of branches. I cut apart the patterns and traced the details. As the upper right photo shows, I used that as a guide to cut at the band saw. No need to be picky here, the more random, the better.

Thread the trunk and tree sections onto the steel rod and glue them to the stage. A few drops of

instant glue secure each piece to the rod as you go along.

THE STAR & HERD

A star sits atop the tree. It's made up of four sections, as shown in the lower right drawing. These are small and thin enough to cut with a coping saw or with a scroll saw. I glued them to the shaft with instant glue and painted them in place.

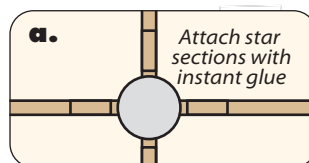
I'VE HERD OF DEER. A small family of deer accompany the tree on its holiday journeys. Don't get hung up on the carving here. I cut these from soft, friendly basswood at the band saw (my favorite carving tool).

Turn the cutouts into deer with the help of a sharp knife or chisel. You'll form bold chamfers

around the edges. (You can even use files.) Blend these chamfers with smaller ones on either side and the deer begins to emerge.

Take this process as far as you want. I prefer the faceted look over smooth shapes, but that's just me. Just make sure that you remove the blade marks.

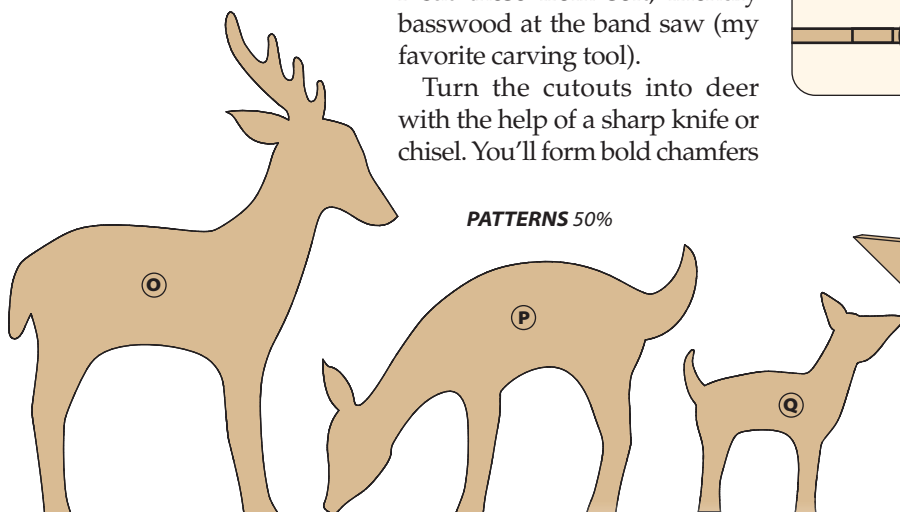
Paint each deer and glue them to the stage. Then you can install this section in the frame. Make sure to give it a spin to see how well it works.



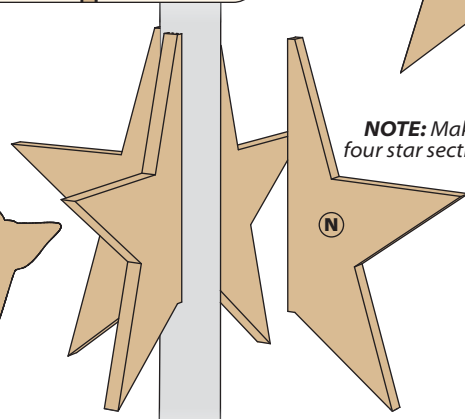
PATTERN 100%

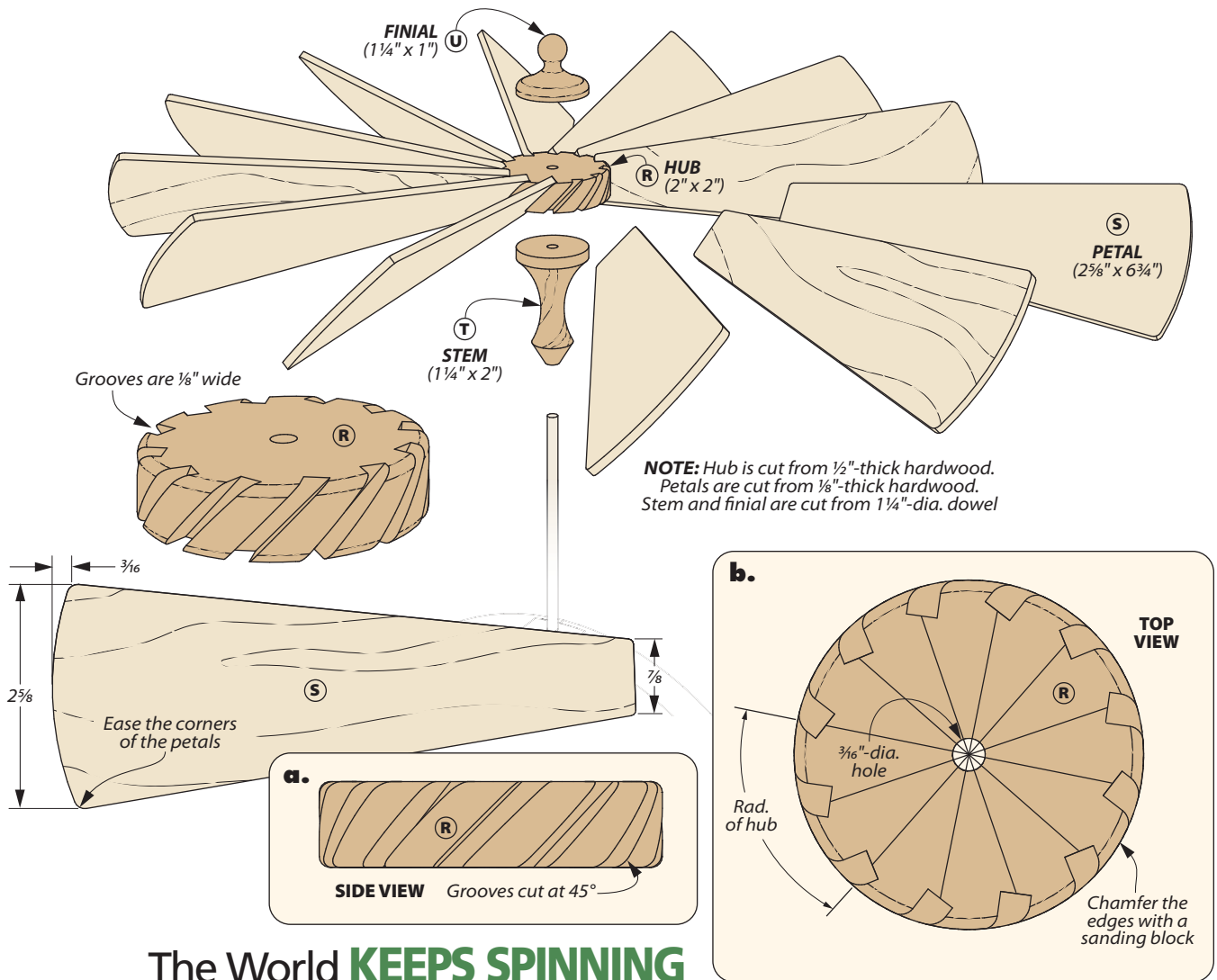


NOTE: Make four star sections

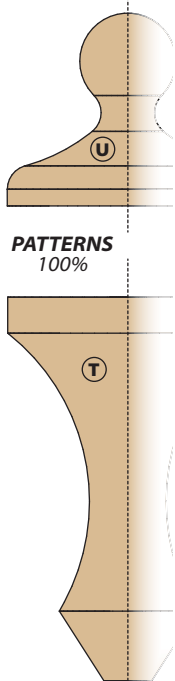


PATTERNS 50%





The World **KEEPS SPINNING**



If candles, and the heat they produce, are the fuel of this project, then what's next is the motor. Perched above the frame and tree, the rotor assembly you see above catches the warm updraft and causes the whole works to spin. So while the previous pages were dedicated to artistic carving, we're diving deep into mechanics and engineering here.

GROOVED HUB. Let's kick things off with the hub. This piece reminds me of the hub from a set of *Tinker Toys*. It has a hole in the middle and a series of grooves around the edge to hold an array of petals.

I made the hub from an oversized cherry blank, beginning with drilling the center hole.

I used this hole to align the blank under a circle cutter in the drill press. Once the blank is aligned, clamp it down and remove the pilot bit from the circle cutter. Carefully drill through the blank to form the round shape. (A 2 1/2" hole saw would do the trick, too.) Sand the edges smooth.

ENGINEERING. The next step is to cut 12 angled grooves to hold the petals in the proper orientation to the airflow. Chris' solution for this is characteristically ingenious and simple.

On the hub, you'll need to do some layout. Set a compass to the radius of the piece. Step around the outside to mark six spaces. Reset the compass to divide the spaces in half, creating 12 marks

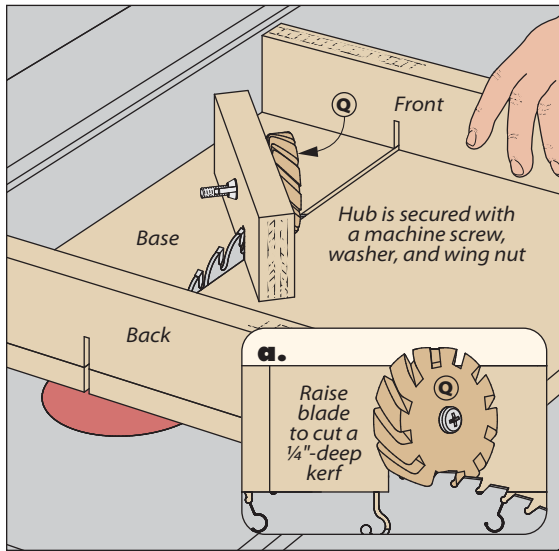
like the hours on a clock. Connect the marks with lines that crisscross the face.

Chris mounted the hub to a block of wood with a machine screw, washer, and wing nut, as shown in the drawings at the top of the next page. The block attaches to the base of a table saw crosscut sled. If you don't have a sled already, you can whip up the one outlined in the drawings.

The block is mounted at 45° to the blade's kerf. Use a small square to center the hole in the hub over the blade kerf. Secure the block with double-sided tape or screws from below so that you can remove it.

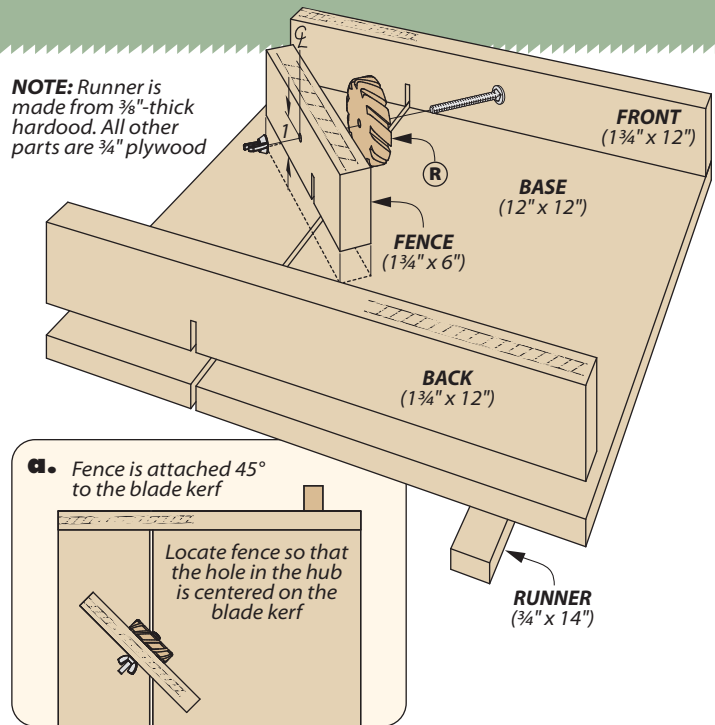
GROOVING. Rotate the hub to align one of the lines with the

TABLE SAW SLED FOR GROOVES



Hub Grooves. A mounting block holds the hub at the correct angle to the table saw blade to form the grooves and keeps your hands away from the cut.

NOTE: Runner is made from $\frac{3}{8}$ "-thick hardwood. All other parts are $\frac{3}{4}$ " plywood



kerf in the sled. The blade is set to cut a $\frac{1}{4}$ "-deep kerf. (I recommend a crosscut blade.) Tighten down the wing nut one last time and make the cut.

Loosen the wing nut and rotate the hub to make the next groove. Repeat the process until all the grooves are cut. I sanded away the pencil marks and eased the edges of the hub with a sanding block, as in detail 'b' on the previous page.

PETALS. The hard part is complete. The petals that fit those grooves come next. I made a template to trace the shape onto the thin, basswood petal blanks. I cut each one to shape at the band saw and sanded to the layout lines. With quick-setting glue, center each petal into a groove. Make sure that the petals are coplanar as you work your way around.

STEM & FINIAL. A pair of decorative pieces sandwich the hub and petals. There's a stem below and a finial at the top. I made these from a length of cherry dowel to

match the hub. I drilled a center hole all the way through the stem and a little more than half-way through the finial.

To create the shapes shown in the left margin drawings on the previous page, I threaded them onto a piece of threaded rod.

The process to shape the stem and finial is similar to what I used for the tree sections. Starting with a rasp, I turned the dowel section into a cone.

With a pencil and ruler, I marked the locations of the details. I turned on the drill press and held the pencil against each piece to enhance the marks.

Then, with rasps and various files, I formed each detail. You may find it helpful to redraw lines from time to time. When you're satisfied, smooth the surfaces with sandpaper, working up to 400-grit.

Thread each piece onto the steel rod, gluing it to the rod and the adjoining piece. At last, you can light the candles and watch the holiday show. **W**

Materials & Supplies

A	Base (1)	$\frac{3}{4}$ x 8 $\frac{1}{2}$ - 8 $\frac{1}{2}$
B	Feet (6)	$\frac{3}{4}$ x 1 $\frac{1}{2}$ - 4 $\frac{1}{2}$
C	Arches (2)	$\frac{3}{4}$ x 4 $\frac{7}{8}$ - 4 $\frac{7}{8}$
D	Uprights (2)	$\frac{3}{4}$ x 1 - 11 $\frac{1}{2}$
E	Splines (3)	$\frac{1}{2}$ x 1 - 18
F	Stage (1)	$\frac{1}{4}$ x 7 $\frac{1}{2}$ - 7 $\frac{1}{2}$
G	Trunk (1)	1 $\frac{1}{2}$ x 1 $\frac{1}{2}$ - 2
H	Branch 1 (1)	5 x 5 - 2
I	Branch 2 (1)	4 $\frac{1}{4}$ x 4 $\frac{1}{4}$ - 1 $\frac{3}{4}$
J	Branch 3 (1)	3 $\frac{3}{4}$ x 3 $\frac{3}{4}$ - 1 $\frac{1}{2}$
K	Branch 4 (1)	3 x 3 - 1 $\frac{1}{4}$
L	Branch 5 (1)	2 $\frac{1}{2}$ x 2 $\frac{1}{2}$ - 1
M	Branch 6 (1)	2 x 2 - 1 $\frac{1}{2}$
N	Stars (4)	$\frac{1}{8}$ x $\frac{3}{4}$ - 1 $\frac{3}{8}$
O	Buck (1)	$\frac{3}{4}$ x 4 $\frac{1}{4}$ - 5 $\frac{1}{4}$
P	Doe (1)	$\frac{3}{4}$ x 3 $\frac{1}{4}$ - 4
Q	Fawn (1)	$\frac{3}{4}$ x 2 $\frac{1}{2}$ - 2 $\frac{1}{2}$
R	Hub (1)	$\frac{1}{2}$ x 2 - 2
S	Petals (12)	$\frac{1}{8}$ x 2 $\frac{5}{8}$ - 6 $\frac{3}{4}$
T	Stem (1)	1 $\frac{1}{4}$ x 1 $\frac{1}{4}$ - 2
U	Finial (1)	1 $\frac{1}{4}$ x 1 $\frac{1}{4}$ - 1

- (2) #8 x 1 $\frac{1}{4}$ " Brass Rh Woodscrews
- (6) #8 x 1 $\frac{1}{4}$ " Fh Woodscrews
- (1) $\frac{3}{16}$ "-dia. x 19" Steel Rod
- (1) $\frac{1}{4}$ " Steel Bar - 1" x 1"

Dadoes & Grooves

Way back in Little League, we spent a lot of time fielding ground balls and catching a pop fly. A lot of time. These essential skills needed to become second nature so that when a grounder occurred in a game, the response was automatic.

A similar principle applies to woodworking. There are some fundamental tasks that come up in nearly every project: like dadoes and grooves. When we take the time to understand their

function and learn how to create them with confidence, our projects end up better.

It's pretty easy to take them for granted. They just don't demand the same kind of attention as box joints or dovetails. But despite this, dadoes and grooves are unmatched for their versatility. There are a wide variety of ways that they can be used in building furniture. They can strengthen a joint or simply help keep pieces aligned. They're great for holding panels or drawer bottoms. They

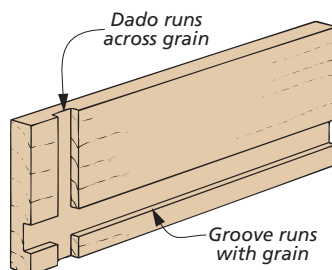
are often combined with other types of joints, like tenons and half laps. And they can be used with glue alone or with screws.

TABLE SAW. There's not really a whole lot involved when it comes to making dadoes and grooves. This article focuses on forming these details at the table saw. There's more to it than just knowing how to make them. Here's a look at a few ways we commonly use dadoes and grooves and some tips for getting a perfect fit.

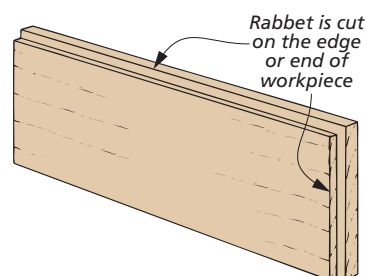
DADO, GROOVE, OR RABBET

Let's start with some terms. You've likely heard "groove," "dado," and "rabbet" used for simple joints. The difference between a dado and a groove has to do with grain direction. A dado runs across the grain of the wood. And a groove runs with the grain of the wood. This is really the only distinction.

RABBET. As for a rabbet, this difference here is the location on the workpiece. A rabbet is nothing more than a dado or groove that is cut on the end (or edge) of a board. You can see this in the far right drawing.



▲ Grooves run parallel with the grain while dadoes run across the grain, usually at a right angle.



▲ Rabbets are cut on the ends or edges of a board. They can run with the grain or across it.

CENTERED GROOVES

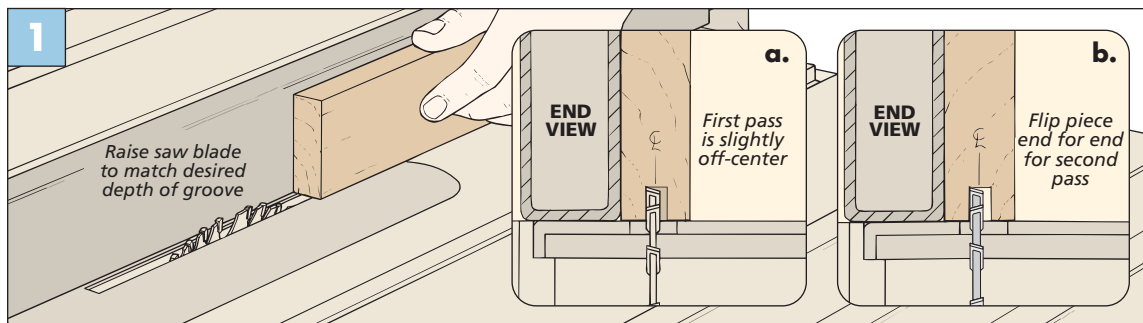
One place where I use grooves all the time is for holding panels, such as the panel in a frame and panel assembly. Grooves house a panel and hold it in place very effectively. When combined with stub tenon joinery, the result is a strong frame and panel assembly.

Quite often though, the panel is a piece of $\frac{1}{4}$ " plywood or $\frac{1}{4}$ " hardboard. Since these materials are usually a bit under $\frac{1}{4}$ " in thickness, you can't use a stack dado blade to cut the grooves.

SINGLE BLADE. Instead, I cut narrow grooves with a single saw blade. Set the rip fence so the blade is roughly centered on the thickness of the stock. Then as you see in Fig. 1, make a couple passes over the blade, flipping the workpiece end-for-end between each pass. This makes the groove slightly wider and centers the groove on the thickness of the workpiece. If the groove is too narrow, nudge the fence away from the blade just a hair and try again.



▲ Narrow grooves can be used to hold panels for doors or drawers. Or they can be combined with stub tenons to create strong frames.



WIDE GROOVES

When it comes to case construction for furniture projects, I often use grooves. They do two things. First, they lock the individual components together, increasing the strength of the carcass. And second, they make the assembly a whole lot easier, since all the pieces register together so that they won't shift out of place.

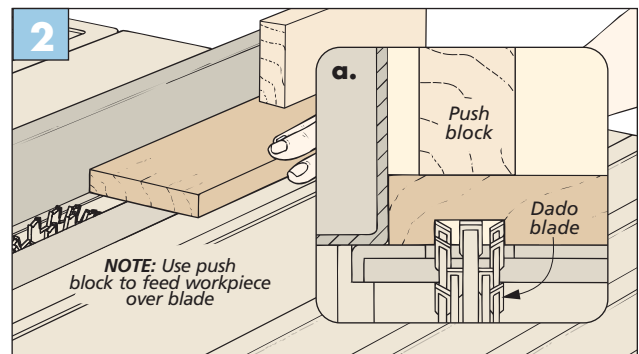
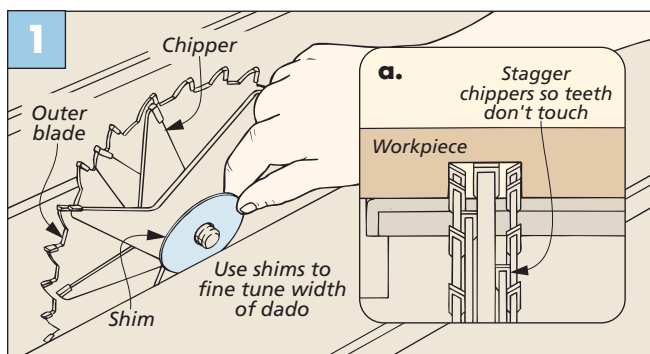
STACK DADO SET. For most projects, I cut grooves to match the thickness of the stock I'm working with. In these cases, I use a stack dado set to cut the grooves. The trick is to get the dado set

adjusted to the correct width. To do this, you'll need to use a combination of chippers along with the outside blades of the dado set. And if you are working with plywood, you'll probably need to use shims between the chippers to fine tune the fit (Fig. 1). I always make a few test cuts first before cutting the grooves in my actual workpieces.

As you can see in Fig. 2, cutting grooves on a table saw is similar to ripping a board (except that you aren't cutting all the way through the workpiece). You use the rip fence to guide



◀ Wider grooves are useful in case construction for adding strength and simplifying assembly.



DADO JOINT

In a dado joint, the end grain of one part connects to the face grain of another. By cutting a dado in one piece, you create a pair of shoulders or ledges to hold the mating piece. This locks the piece in place, which prevents twisting and racking.

To create this joint, I usually use the dado blade to match the width of the dado I want to cut. To cut the dado, I use the miter gauge to support the workpiece. I use the rip fence as an end stop to position the dado on the workpiece, as shown in Fig. 1.

Quite often, I need to make a series of dados that are evenly spaced from either end of the workpiece. In this case, you can

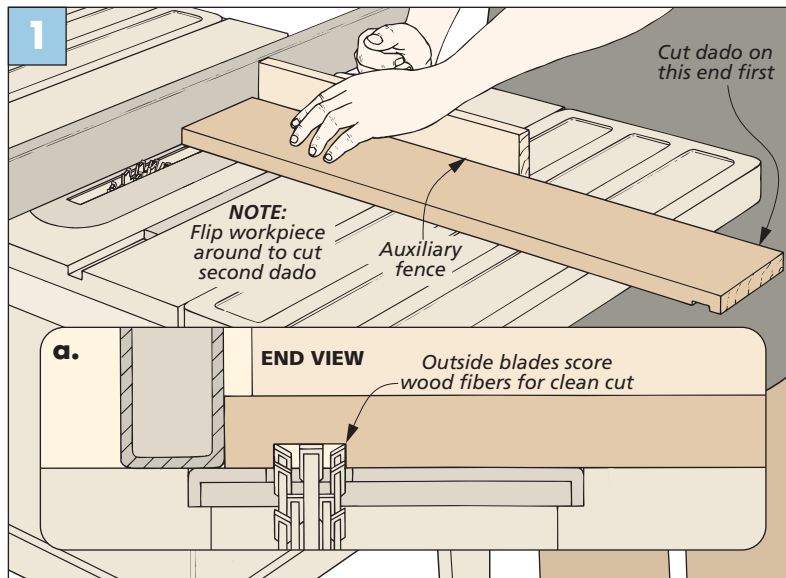
cut the dados in “pairs” by flipping the workpiece end-for-end before readjusting the rip fence for the next set of dados.

CROSS-GRAIN CUTS. Cutting dados is a little bit different than cutting grooves. Because you are cutting across the grain, there is a greater tendency for chipping or tearout. There are a couple of things you can do to minimize these problems.

First, it helps to back up the cut with a long plywood auxiliary fence attached to your miter gauge, as in Fig. 1. This fence prevents the dado blade from blowing out the back edge of the workpiece as it exits the cut. As a side benefit, the fence provides support to the workpiece.



▲ A dado joint can be used to hold a shelf in a bookcase or to join the parts of a cabinet or case.



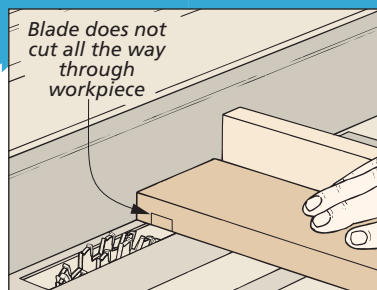
SPLINTERING. In addition to tearout at the back of the cut, you may also have to deal with splintering along the edges of the dado. This is especially true in plywood. As you can see in Fig. 1a, some dado sets have outer blades with teeth that are designed to score the fibers of wood along the dado sides to minimize splintering. Depending on how sharp your blade is or the type of material you are cutting, you may still experience some splintering.

In these cases, I often find that a slower feed rate helps to reduce this splintering. If the splintering is really bad, I place a piece of masking tape over the area where the dado is going to be cut. The tape helps to back up the wood during the cut, keeping any splintering along the edges to a minimum.

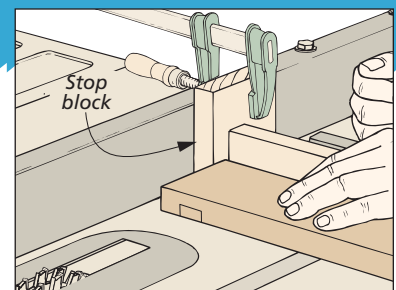
RIP FENCE AS A STOP

As a general rule, you shouldn't use the rip fence as a stop when pushing a piece through the saw with a miter gauge. The danger is that the cut-off piece can kick back at you.

However, when cutting dados, you're not cutting completely through the workpiece. So there's no cut-off piece to worry about. But if using the rip fence as a stop still makes you feel uneasy, an alternative is to clamp a block of wood to your fence as a stop.



Non-Through Cuts. It's acceptable to use the miter gauge and rip fence together when you're not cutting completely through the workpiece.



Stop Block. Clamping a stop block to the rip fence allows you to use the miter gauge for through cuts as well as non-through cuts.

DADOES FOR DRAWERS

Drawer joints are subjected to a lot of strain and pressure from the constant opening and closing of the drawer. Although you could join the sides of the drawer to the front and back with butt joints or rabbets, neither of these provides much strength. I often use a tongue and dado joint, as shown in the photo at right. This joint offers good strength and is easy to make here at the table saw.

As an overview, tongues formed on the ends of the drawer front and back fit into narrow dados cut in the drawer sides. This creates an

interlocking joint that stands up to the tugging of the drawer as it is opened and closed. (This joint works best with false front drawers. For drawers without false fronts, see the locking rabbet joint below.)

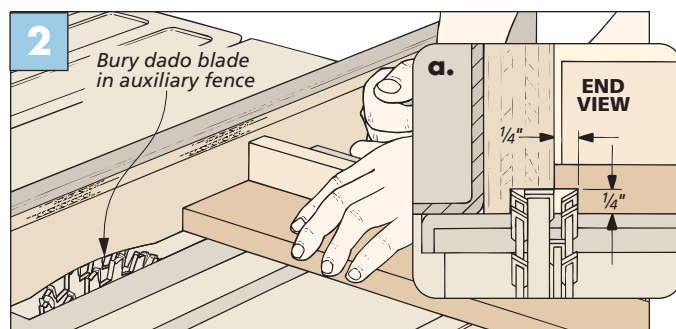
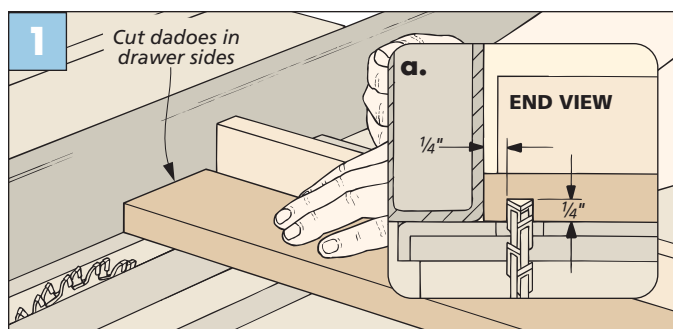
TWO-STEP. As you can see by the drawings below, this joint is made in two steps. First, dados are cut near the ends of each drawer side (Fig. 1). I usually do this with a dado blade, using the rip fence as a stop and the miter gauge to guide the workpiece through the saw.

The second step is to create the tongues on the ends of the front and back. This is done by



◀ The drawer front and back interlock with the sides using this tongue and dado joint.

cutting a rabbet on each end. As shown in Fig. 2, I “bury” the dado blade in an auxiliary fence that’s attached to the rip fence. The trick is to size the tongues to fit snugly in the dados cut in the drawer sides.



LOCKING RABBET

The locking rabbet joint is similar to the tongue and dado, but it provides a little more glue surface. This joint works well when you can’t (or don’t want to) use a false front.

In this joint, the drawer front and back get a slightly different treatment. Like the tongue and dado, the process starts with cutting the dados in the sides.

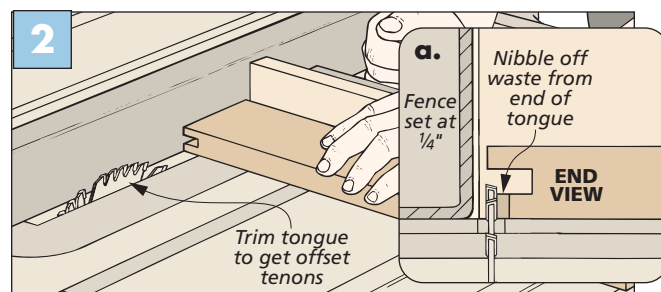
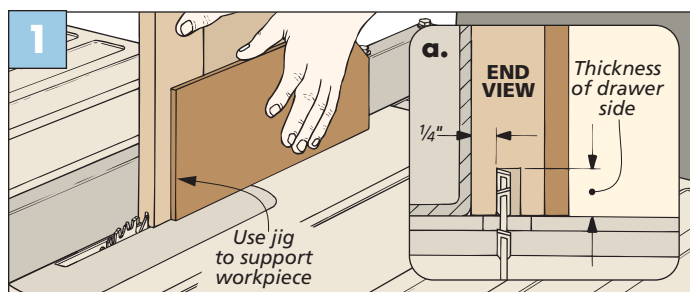
Then a centered dado is cut on each *end* of the drawer front and back, as you can see in Figure 1.

This dado is cut in two passes, turning the workpiece around after the first pass. The goal here is to create a tongue that will fit snugly into the dados in the sides. (To hold the workpiece upright and against the fence, I made a support jig.)

Next, simply trim back the inner tongue by nibbling away the waste in a couple of passes (Fig. 2). When the drawer is assembled, the drawer sides should be flush with the ends of the drawer front and back. **W**



▲ A locking rabbet joint looks good, is fairly easy to make on the table saw, and provides a reasonable amount of strength.



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:

Lee Valley
800-871-8158
leevalley.com

McMaster-Carr
630-833-0300
mcmaster.com

Old Masters
800-747-3436
myoldmasters.com

Rockler
800-279-4441
rockler.com

MASTER THE MORTISE (p.22)

Many of the tools used in this article are common across most shops. However, I've included SKUs for the guide bushing (or template guide, as *Veritas* calls it) and the spiral upcut bit I used.

- Lee Valley

Guide Bushing 05J6624

Spiral Upcut Bit 17N1124

EXECUTIVE DESK (p.26)

The trick with the desk was to enhance the cherry without stain. The solution is to use *Old Master's Tung Oil Varnish*. Several coats warm up the cherry and offer a just-right level of protection.

- Lee Valley

16" Drawer Slides 02K4216

Continuous Hinge 00N0106

Lid Stays ... 00T0711 & 00T0721

Magnetic Catch 01L0520

PLANER CART (p.34)

You've probably noticed that a lot of our shop projects are made from Baltic birch plywood. In some cases, the flatness and consistency are what's important.

For the planer cart, appearance is the main factor. The uniform plies give the exposed edges a clean look that doesn't require edging strips. Baltic birch looks great in photos, too. We admit it can be pricey. This means you can feel free to use another plywood product if that suits your tastes and budget. The key is selecting sheets that are as flat as you can find. This is especially true for the auxiliary bed. So that might be one place to splurge on Baltic birch.

- Rockler

Polyurethane Caster 81359

Full-Extension Slides 45861

12" Folding Bracket 65798

FARMHOUSE HALL BENCH (p.40)

The undermount slides are the only pieces of hardware for the hall bench that you likely won't find at a hardware store. For the dowel plugs, I recommend cutting your own rather than using cutoffs from dowels so face grain is shown rather than end grain. As for finish, a few coats of tung oil enriched the color and depth of the well-figured elm.

- Lee Valley

12" Undermount Slides ... 68591

Undermount Slide Jig 64695

SKewed BOOK TOWER (p.48)

There are two parts to the finish on the book tree. The MDF was painted with a high-gloss paint treatment, so refer to that section for more information (page 18). In contrast, we wanted something with a natural look for the solid wood. Tung oil thinned with mineral spirits in a 50/50 ratio was the right choice, and it's quite easy to apply.

- McMaster-Carr

Threaded Inserts 90192A133

Leveling Mounts 9538N11

Machine Screws 91255A544

HOLIDAY TREE CAROUSEL (p.54)

The steel hardware for the shaft and the bar stock came from the hardware store. Just make sure the shaft is flat. We mixed craft paints to get the colors that looked good to our eye. The cherry is finished with tung oil.

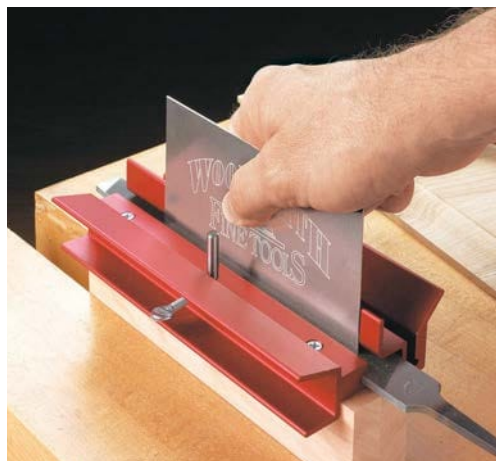
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Nov./Dec. issue by Editor-in-Chief,
Logan Wittmer



RUNNER-UP

Nicole Kazmierczak
Curiosity

Natural colors of cherry, black walnut, poplar, and more wood types are highlighted in this sketch brought to life.

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