

Fine
Woodworking®

Chests and Cabinets



Editors of
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Introduction

One of the best things about *Fine Woodworking* magazine is the array of furniture projects we offer. From simple mitered boxes to tables to chests, we've done them all.

The hard part as a reader is waiting for that perfect project to appear in one of our six regular issues. That's because we can fit only two or three projects in an issue, and we have to offer a variety of pieces. So over the course of a year we may do only one chest of drawers, or one blanket chest. But with *Chests and Cabinets*, you get a collection of some of the best storage projects *Fine Woodworking* has published.

Our editors scoured the pages of the magazine, looking for a perfect mix of projects to meet all skill levels, and putting them all in one place. With this complete collection, you'll get detailed instructions and plans, paired with rich, informative photographs, to guide you through each project.

Best of all, you can get right to building. No need to worry or fret over design, or making prototypes to get a feel for scale and appearance. Our expert builders and designers have done it all for you, providing tasteful takes on all types of chests and cabinets, from period-perfect pieces to one-of-a-kind, modern designs.

You'll get classic Shaker designs for a blanket chest, a chest of drawers, and two types of cupboards for your dishware. You can build an Arts and Crafts display cabinet or bookcase, or take on the challenge of a vintage lowboy or Pennsylvania spicebox. You'll even get great designs for wall cabinets and bookcases. And each project is loaded with tips and tricks for getting the most out of both machine and hand tools, techniques you'll use down the road as you build more and more furniture.

I hope you have fun in the shop with these projects. Now it's time to get to work.

—Tom McKenna
Editor, *Fine Woodworking*

Shaker Blanket Chest

CHARLES DURFEE

The earliest storage chests were simple boxes made of six boards. As they evolved, a base, or plinth, was added to lift them off the floor and give them aesthetic appeal. Although molding the edges created a more finished look, anyone who used such a chest soon found that they had to fish around for small items that ended up on the bottom. To solve this problem, furniture makers added first one drawer, and then two or even three drawers. Finally, the lid was eliminated, leaving a full chest of drawers as we know it today.

During the evolution from blanket box to chest of drawers, the grain in the sides changed from horizontal to vertical. Many of the single-drawer versions exhibit an intermediate stage in this evolution, with vertical grain in the sides nailed to horizontal grain in the front, which probably is the only way they could be joined. In this piece, the older style with all horizontal grain is retained, which enables the front, back, and sides to be joined with dovetails. As long as the sides don't get too tall, this is a superior form of construction: Seasonal wood movement results in the parts moving together, instead of against each other.

Match the dimensions to your hand-picked boards

Although the Shakers probably would have used painted pine, modern woodworkers may prefer the natural look of fine wood. I used some excellent single-log Pennsylvania cherry with lots of curl, nicely matched in grain and color.

You may need to adjust the overall dimensions if you want to use specific boards in particular places. In this case, I made the overall height a bit less than planned so that I could use an exceptionally fine single-width board for the front. You can lay out the actual dimensions on a story stick, using one face each for height, width, and depth. The story stick will give you all of the information necessary to begin construction, so you won't need any drawings.

After double-checking to ensure planning and layout make sense, mill and glue the boards for the front, sides, back, top, and drawer front. Leave the inner bottom oversize; it should be sized to just fit into its grooves. In addition, you can make up the bottom frame-and-panel. Remove any dry excess glue and flatten the boards using planes or sanders and a straightedge. To save time, I take the parts to a local mill shop and run them through a thickness sander.

With the case front, back, and sides cut to size, run the grooves for the inner bottom (on the front, the groove technically is a rabbet).

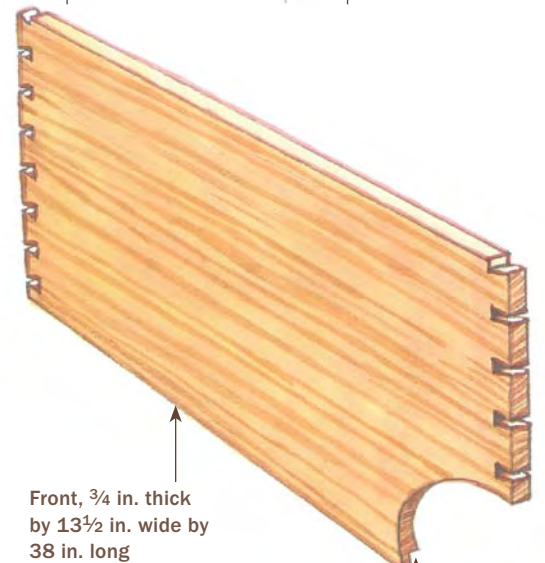
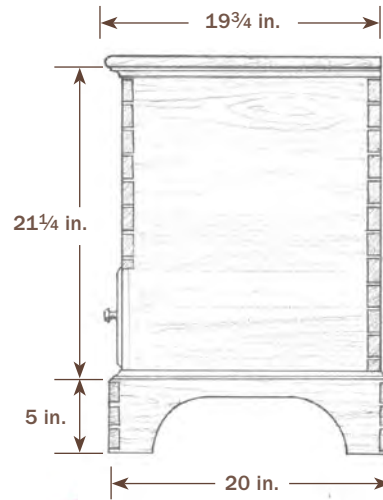
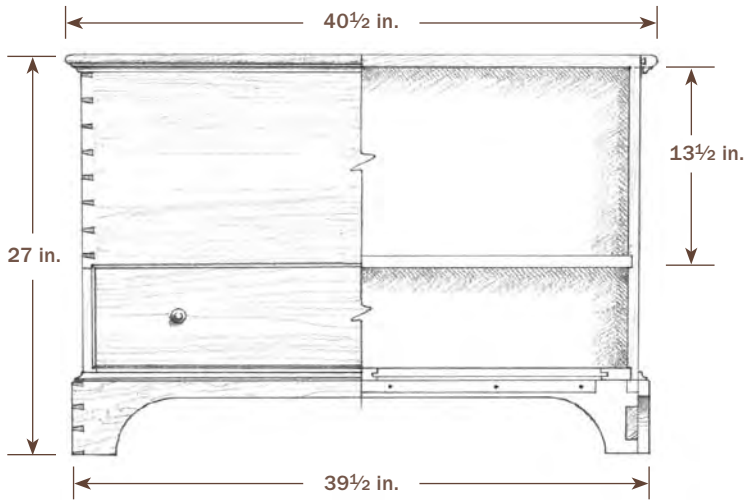
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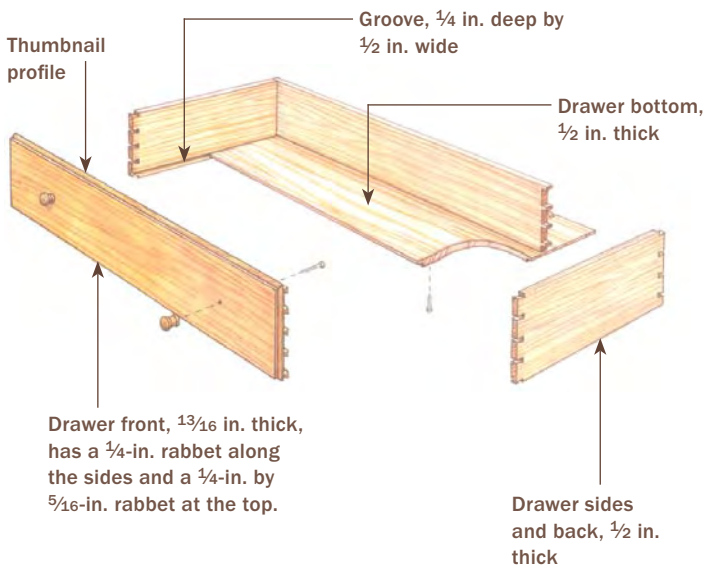
Dovetailed Blanket Chest with a Drawer

Because of the drawer, the front corners have fewer dovetails than the rear corners. The dovetail spacing may be slightly different on the back than on the front but should appear to be the same.



LIPPED-FRONT DRAWER

The cherry drawer front is lipped on the top and sides. The sides, back, and bottom of the drawer are made of a secondary wood.



Front, $\frac{3}{4}$ in. thick by $13\frac{1}{2}$ in. wide by 38 in. long

Rabbet, $\frac{1}{4}$ in. deep by $\frac{3}{4}$ in. wide

Top, $\frac{3}{4}$ in. thick by $18\frac{5}{8}$ in. wide by $38\frac{1}{4}$ in. long, not including molding

Inner bottom, $\frac{3}{4}$ in. thick by $17\frac{7}{16}$ in. wide by $36\frac{7}{8}$ in. long, glued at front only

The side molding on the top slides on dovetail keys and is glued only at the miters (see detail).

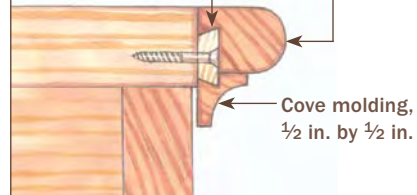
TOP-MOLDING DETAIL

The molding consists of a half-round and a cove glued together and attached to the chest lid.

Key, $\frac{1}{4}$ in. thick by $\frac{1}{2}$ in. wide

Half-round molding, $\frac{7}{8}$ in. thick by $1\frac{1}{8}$ in. wide

Cove molding, $\frac{1}{2}$ in. by $\frac{1}{2}$ in.



Back, $\frac{3}{4}$ in. thick by $21\frac{1}{4}$ in. tall by 38 in. long

Cedar lining, $\frac{1}{4}$ in. thick

Stopped groove in each side, $\frac{3}{16}$ in. deep by $\frac{3}{4}$ in. wide

Rabbet, $\frac{3}{8}$ in. deep by $\frac{3}{4}$ in. wide

Stopped groove, $\frac{3}{8}$ in. deep by $\frac{3}{4}$ in. wide

Bottom frame, $18\frac{1}{8}$ in. wide by $37\frac{1}{4}$ in. long

Panel, $\frac{1}{2}$ in. thick, with $\frac{1}{4}$ -in.-thick by $\frac{3}{8}$ -in.-wide tongues

Sides, $\frac{3}{4}$ in. thick by $18\frac{1}{2}$ in. wide by $21\frac{1}{4}$ in. tall

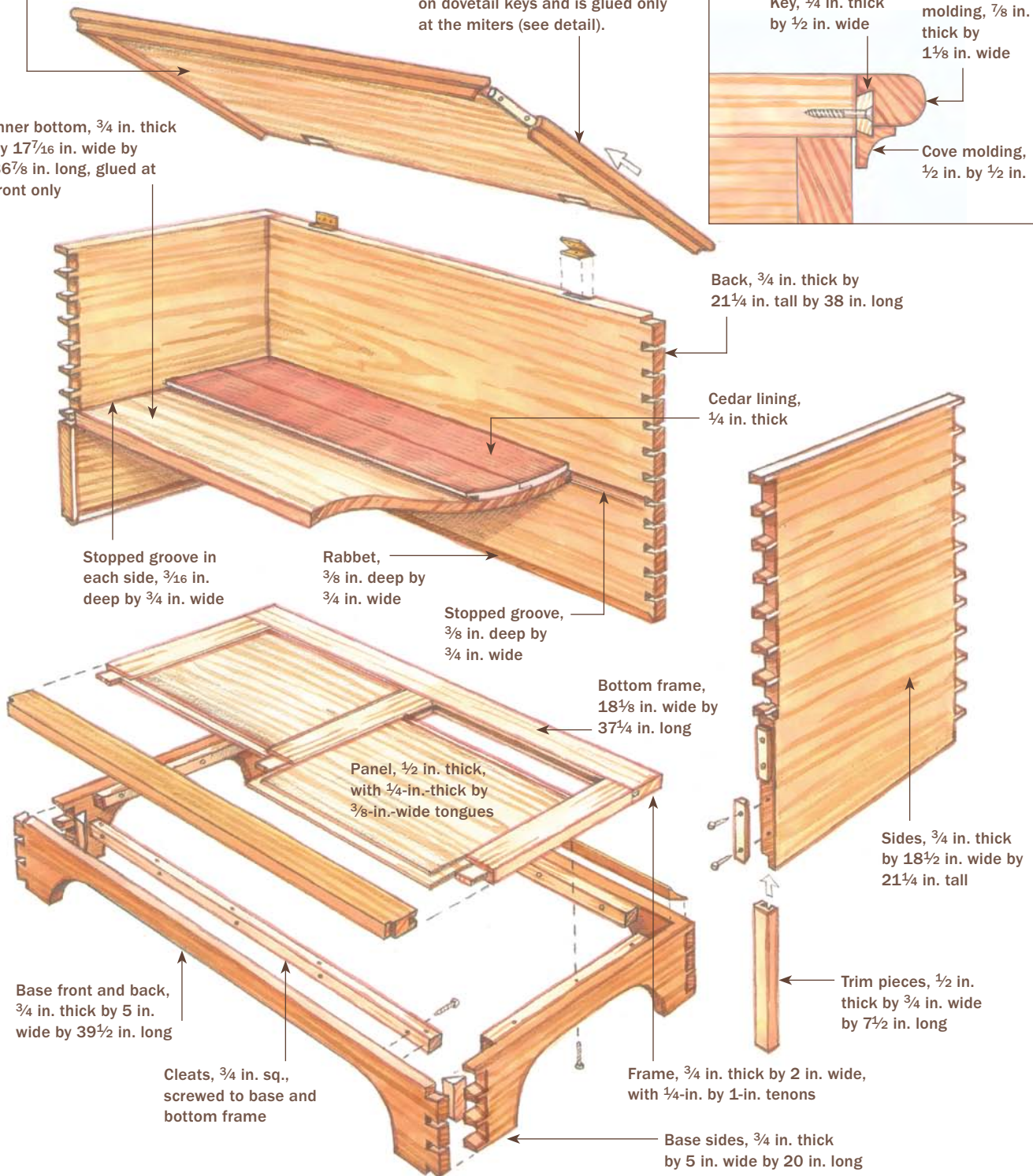
Base front and back, $\frac{3}{4}$ in. thick by 5 in. wide by $39\frac{1}{2}$ in. long

Cleats, $\frac{3}{4}$ in. sq., screwed to base and bottom frame

Frame, $\frac{3}{4}$ in. thick by 2 in. wide, with $\frac{1}{4}$ -in. by 1-in. tenons

Trim pieces, $\frac{1}{2}$ in. thick by $\frac{3}{4}$ in. wide by $7\frac{1}{2}$ in. long

Base sides, $\frac{3}{4}$ in. thick by 5 in. wide by 20 in. long





Lay out the dovetails. Use a pair of dividers to lay out the dovetails evenly. The spacing on the front corners may need to be slightly different from the spacing on the rear due to the presence of the drawer.



Extend the layout to the end of the board. After marking the tails on the face of the board with a sliding bevel, extend the lines across the end of the board using a square and a knife. The knife cuts will help guide the saw as you cut.



Mark the pins from the tails. With the boards secure, use a sharp pencil to transfer the location of the pins. A flashlight helps you see into the corners.



Line up the boards. Before laying out the pins, ensure that the boards are flat and meet at 90°.

The grooves need to be stopped before the ends and carefully aligned from the top so that all four grooves match up. I use a 3/4-in. straight bit in a plunge router and run the tool against a straightedge to ensure a straight cut. Make the rabbet for the frame-and-panel bottom in the same fashion, stopped at the rear corners only.

Construct the carcass with dovetails

There are a lot of dovetails to cut in this project, so you might as well decide on a

method of cutting them and stick with it. If you use a router setup, make sure the jig can handle the long row of the rear corners or has a way to index setups. I cut the dovetails with hand tools, which mostly is an exercise in marking and sawing accurately.

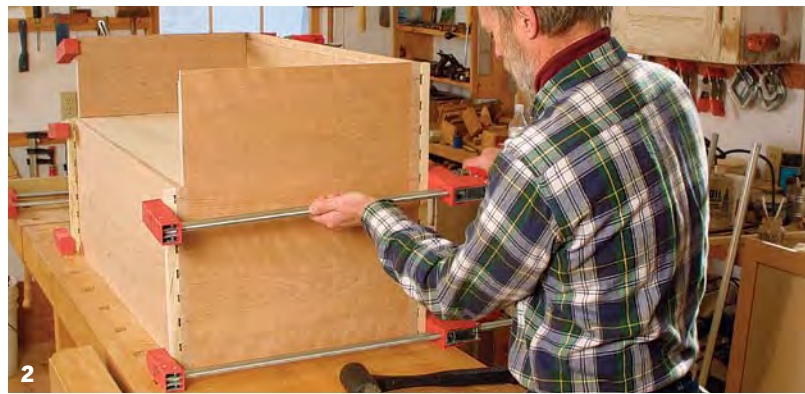
When laying out the joints, aim for a spacing between pins of about 1 $\frac{3}{4}$ in. on-center. This chest has the peculiar problem of the front and back rows being different lengths, due to the drawer opening. Try to have the front series end with a small half pin or a small half tail, for appearance's sake. Make your scribe marks on the front edge of the sides down to the drawer opening only.

When cutting the dovetails, orient the outside face of the side toward you. Begin sawcuts at the top back corner; come across the top edge to set the saw in and then down the front face at an angle, keeping the saw completely in the kerf. Then finish the cut by raising the handle gradually. To ensure the cut is made to its full depth, I follow an old-timer's practice of cutting slightly past the scribe on the back side. After cutting the tails, check that they are square and do any necessary paring. In this way, any adjustments to get a good fit are done on only the pins.

Use the tails to mark the pins

When marking from one part to the next, make sure the front and back are perfectly square to each side and that the grooves line up so that the inner bottom will be able to slide in. I use a very sharp pencil lead extended from a lead holder for marking. It leaves a fine line, is much easier to see than a knife scribe, and doesn't accidentally cut the tail.

With the case dovetailing done, cut the recesses for the trim pieces on the lower front edges of the sides.



Assemble the chest in stages. Gluing this many dovetails is stressful enough without trying to do all of them at once. Before you start, make some cauls on the bandsaw to fit over the protruding pins. (1) First glue the front to the two sides and slide in the inner bottom, gluing the front edge into the rabbet and allowing the rest to float. (2) When this first assembly has dried, glue on the back, again using the cauls. (3) When the back is dry, fit and glue the frame-and-panel base into the bottom rabbet.

When Things Go Wrong With Your Dovetails

Hand-cut dovetails should not be perfect and indeed rarely will be. However, some faults that occur during fitting or assembly need to be repaired because they detract from the overall appearance of the piece.

WHEN A TEST FIT CRACKS THE WOOD

When dry-fitting dovetails, it takes only one too-tight pin to cause a crack. This needs to be repaired before the two boards are dovetailed together. It's difficult to force glue down into the crack, but by placing the board half hanging off the bench and then flexing it while pushing the glue into the crack with your finger, you can work the glue in from both sides until the joint is saturated. Place waxed paper over the joint to protect the clamp that keeps the two sides of the crack parallel, and then place another clamp across the board to pull the crack together.



Repair a crack. While flexing the board up and down, force glue into the crack (left). Use one clamp to keep both sides of the crack aligned, with waxed paper between the glue and clamp; then close the crack with another clamp across the board (below).



UNSIGHTLY GAPS BETWEEN PINS AND TAILS

Don't despair if there are gaps on either side of the pins and tails. If the gaps are very narrow, you can repair them by inserting some glue and peening the tail or pin with a ball-peen hammer.



The blows spread out the end grain until it fills the gaps. This method requires that the tail or pin protrude at least $\frac{1}{16}$ in. because it will be necessary to plane away the crushed surface end grain.

If the gaps are wide, the best way to fill them is by tapping in a thin wedge lubricated with a little glue. After the glue has dried, saw off the protruding part of the wedge and smooth the surface with a block plane. The end grain of the wedge will be an almost perfect match with the pin or tail.



Peen small gaps. Small gaps can be filled by inserting a little glue and then hitting the pin or tail with a ball-peen hammer. Do this before planing the pins flush so that the hammer marks can be removed.



Shim larger gaps. A narrow wedge driven into the gap beside a pin will make an almost invisible end-grain repair.

Dry-fit the carcass before final assembly

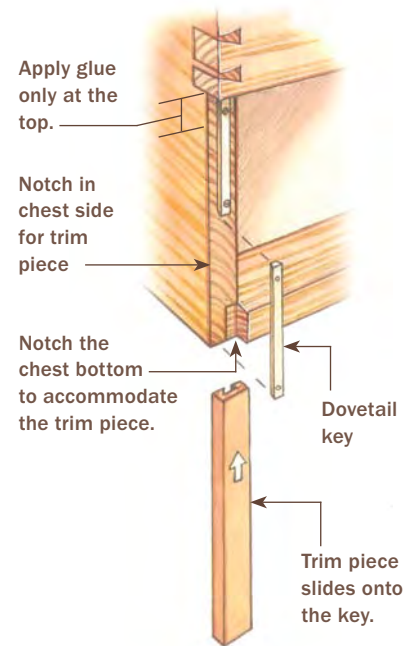
When dry-fitting the case parts, push the joints together as much as possible by hand, then use a rubber mallet. When the joints are almost there, resort to clamps. You walk a fine line when fitting exposed dovetails: Too tight, and you risk splitting the wood; too loose, and you leave gaps between the pins and tails. Fortunately, splits and gaps can be fixed (see “When Things Go Wrong with Your Dovetails” on the facing page).

For the glue-up, I make special clamp cauls (see the photos on p. 9) to span the pins because they protrude somewhat. To make the glue-up less nerve-wracking, break down the process into steps. Assemble the front, the two sides, and the inner bottom as a unit first. The front edge of the inner bottom is glued only to the front rabbet (the rest is left unglued to allow for seasonal movement). If necessary, cut a temporary spacer to hold the rear edges in the correct alignment. The second step is to glue on the back. When the back is dry, fit and glue the base frame into the bottom rabbet.



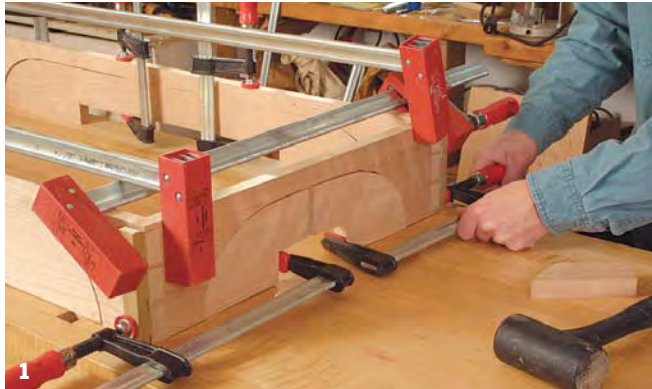
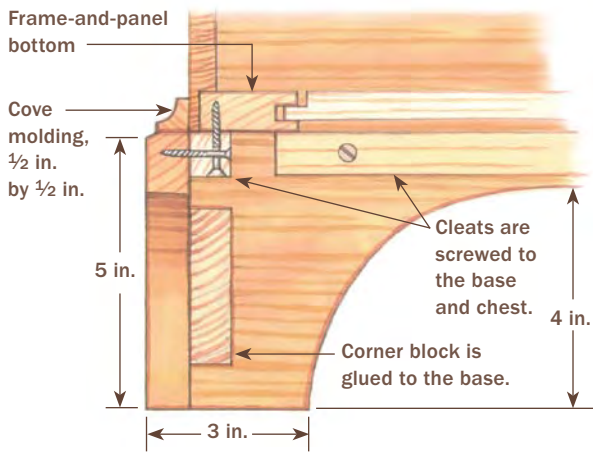
Trim Pieces Hide the End Grain

Trim pieces are attached with sliding dovetail keys that allow for seasonal movement. The pieces stop short of the bottom by $\frac{1}{4}$ in., with the gap concealed by the cove molding of the base.



Cap the end grain. To conceal the end grain, the sides are notched adjacent to the drawer, and trim pieces are attached over dovetail keys. (1) After assembling the case, notch the case bottom where it intersects the sides. (2) Then screw the dovetail key to the case using the trim piece to aid alignment. (3) Finally, saw apart the key to allow for seasonal movement of the case. Glue the trim piece only at the top.

Install the Bracket Base



Save the waste piece. After cutting the profile of the base, save the offcuts, which can be cut in two and used as clamping cauls when gluing together the base.



Attach the cleats. Screw cleats to all four sides of the base. Then drive screws up through each cleat to attach the base to the chest.

Conceal the end grain with trim pieces

With the carcass assembled, cut a notch in the base frame at each front corner for the trim pieces. On original Shaker chests, these trim pieces as well as the moldings were simply nailed on, which not only caused seasonal wood-movement problems but also were aesthetically unpleasing in an unpainted piece. A more elegant solution is to attach these cross-grain parts with sliding dovetail keys. I vary this method slightly, screwing the key on beginning at the inboard end and pulling off the molding, fastening as I go. The segments are cut out and the molding slid back on with glue at the inboard end. Leave the bottom end of the trim pieces about $\frac{1}{4}$ in. short of the case bottom to allow for seasonal expansion. The cove molding will cover the gap.



Fit the molding. Because the grain on the chest runs horizontally, the base molding can be glued to both the base and the sides.

Build the base and the top before attaching the molding

On this chest, the base runs around all four sides, as opposed to most Early American chests, which have bracket bases on the front and sides only. Saw the dovetails first and then cut out the profile on the bandsaw; you can save the cutouts to use as clamp cauls. Nail a plywood template to the back of the base pieces and clean up the profile on the router table with a top-guided bearing bit. Screw cleats to the inside of the base and drive screws through the cleats to attach the base to the chest.

Because the moldings overlap the top edge of the case, the top should be sized so that the front clearance is proportional to the amount of seasonal wood movement. I built this chest in the winter, and the wood's moisture content was 6%, so I sized the top with a minimal clearance of a strong $\frac{1}{16}$ in. ($\frac{3}{16}$ in. to $\frac{1}{4}$ in. should be sufficient clearance for a summer-built chest).

The top molding consists of a half-round and a cove made on the router table and then glued together. While you're at it, make some extra cove molding for the base. The front piece is mitered and glued to the top, while the sides are installed over dovetail keys, with glue at the miters only.

The drawer front is in the traditional style, lipped on the top and sides and molded all around. The sides and back on my drawer are quartersawn pine, and the bottom is poplar. You can find quartered stock at any lumberyard—just look through a stack of boards for ones with growth rings perpendicular to the board's face.

Cut the drawer front first, with its side rabbets trimmed so that they just fit into the opening. The top rabbet needs to have only about $\frac{1}{16}$ in. of clearance because seasonal movement of the drawer will be in the

same direction as the case. Cut the dovetails by hand, but use a Forstner® bit to drill out the bulk of the waste between the half-blind pins.

Attach the hardware and finish the piece

By now you will have something that looks like a chest. The top is secured with mortised-in butt hinges. I used extruded-brass hinges from Whitechapel (www.whitechapel-ltd.com), but you may opt for a more authentic style with thinner leaves. When the top is fastened, find the location for the stay. I used a brass chain, which isn't strictly traditional Shaker but still shares a similar simplicity.

Throughout the construction process, you should have been planing, scraping, and/or sanding to all but the final passes. I generally take out machine marks (including the tracks left by the thickness sander) with a handplane and scraper. The final work is done with a 220-grit disk in a random-orbit sander.

I used Minwax® Antique Oil Finish, but any oil/varnish mixture will work well. The first coat is always exciting—the figure fairly jumps off the surface—but it also reveals any dents, dings, and glue splotches that should be wet sanded with finish using 220-grit or higher sandpaper.

After the finishing is completed, add the thin cedar lining in the chest bottom. I used some leftover western red cedar clapboards. I planed them down, shiplapped the edges, and tacked them in, leaving them unfinished. Years hence, a light sanding will refresh the smell, allowing me to recall the pleasure of building this piece.

Hickory and Ash Blanket Chest

PETER TURNER

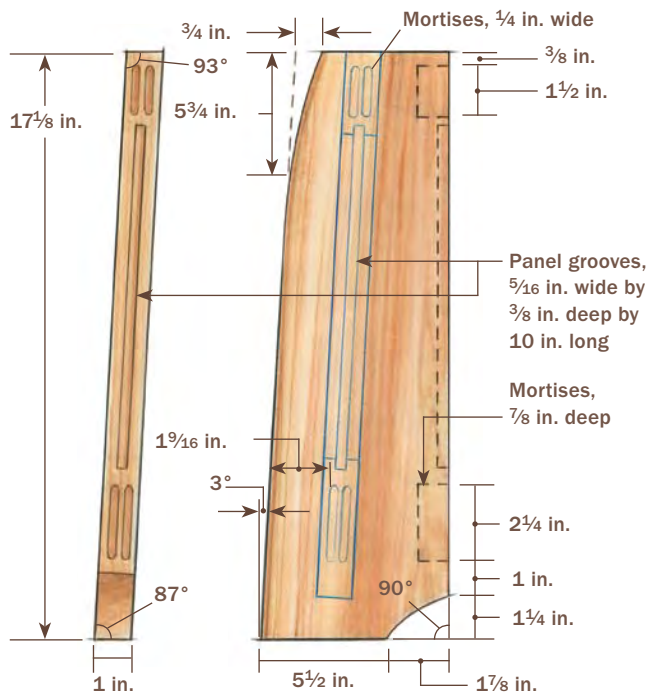


When thumbing through furniture books, I find myself drawn to long, low chests, similar to the wooden chests my folks had in our living room when I was a kid. So when I was invited to participate as a guest artist in the New Hampshire Furniture Masters Association's 2008 auction, a blanket chest

was one of the three proposals I submitted, and this is the piece the jury chose.

To present my proposal, I offered scaled drawings that gave top, front, and end views. The process of drawing usually lets my mind walk through the fabrication so I'm sure the piece will work. Everything comes off the drawings. When things get tricky, like

Legs Are the Cornerstones



angled or intricate joinery, I go back to them, laying pieces right on the full-size drawings to physically check measurements and angles. I did full-sizers of the leg blank and the ends, and to be extra sure, I made story sticks to lay out the frames and panels.

The legs of this frame-and-panel chest serve as end pieces for the front, back, and end frames. The top and panels are ash; the frames are hickory. I applied battens to the one-piece top to keep it flat. I kept all thicknesses beefy for heft and used double floating tenons for strength. To emphasize the length of the chest, the grain of the panels runs horizontally.

To keep the construction manageable, all the angles are the same, off from square by 3°. First, the angle is found on the outside top and bottom of each leg. Next, the end frames and panels also get the 3° angle, but the front and back frames and panels don't, which means the end joinery is angled but the front and rear are not. The front and rear



A simple jig establishes the angle. To keep the grain parallel with the outside slant of the leg, the author tapers the inside edge.



Now cut the legs to length. Putting the inside edge against the fence means you can avoid cutting a compound angle on the ends. A simple 3° blade tilt does the job.

assemblies lean into the angle on the end assemblies, so the tops of all the long top rails will need the angle too.

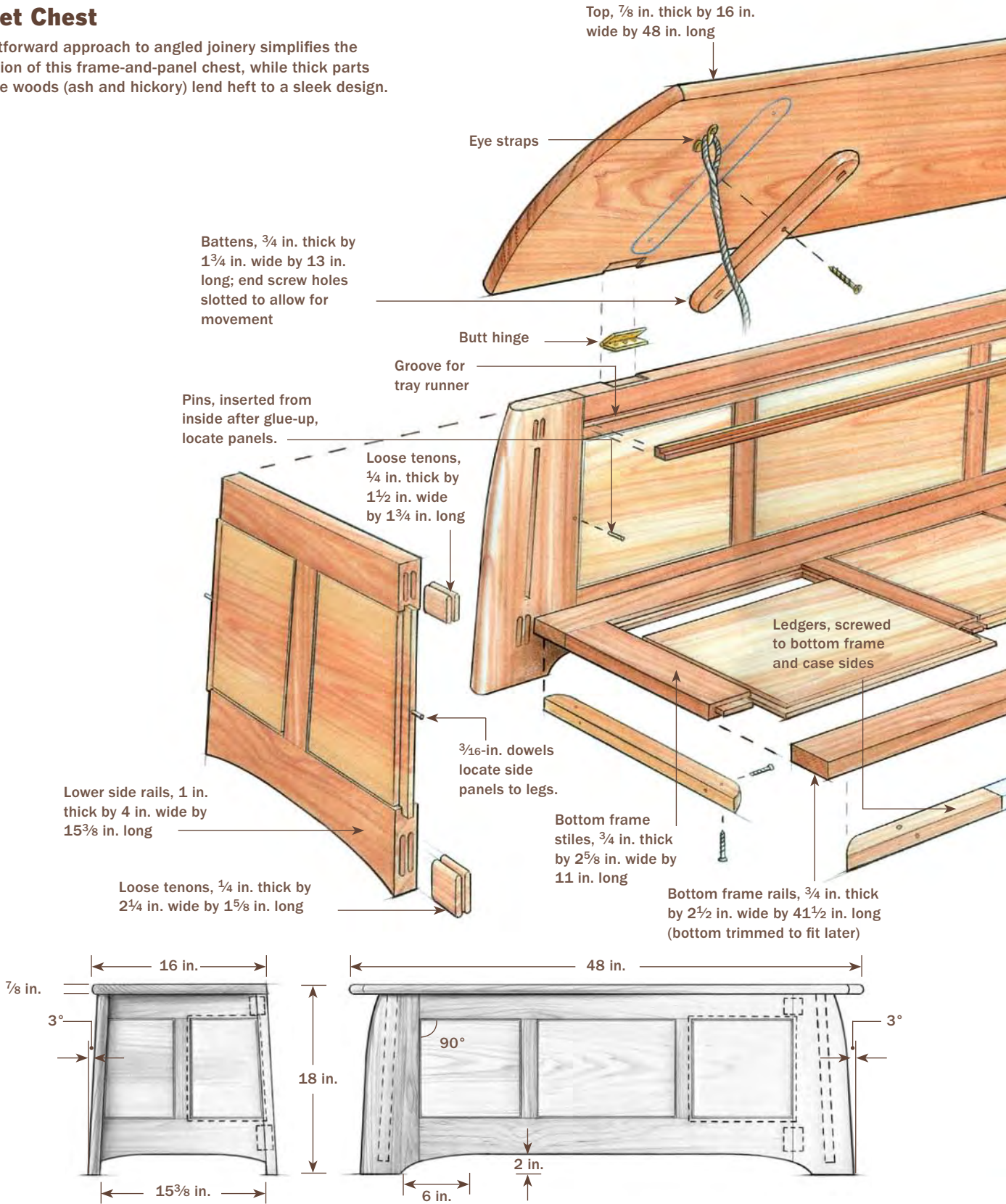
I favor floating tenons because of their efficiency when dealing with angled joinery. They are as strong as any integral tenon, and you don't need to fit angled shoulders—you just make simple butt joints. After planing my tenon stock to fit a test mortise, I rounded both edges of the stock on the router table and scored both faces with two shallow kerfs for glue relief. With a few crosscuts, I had my tenons.

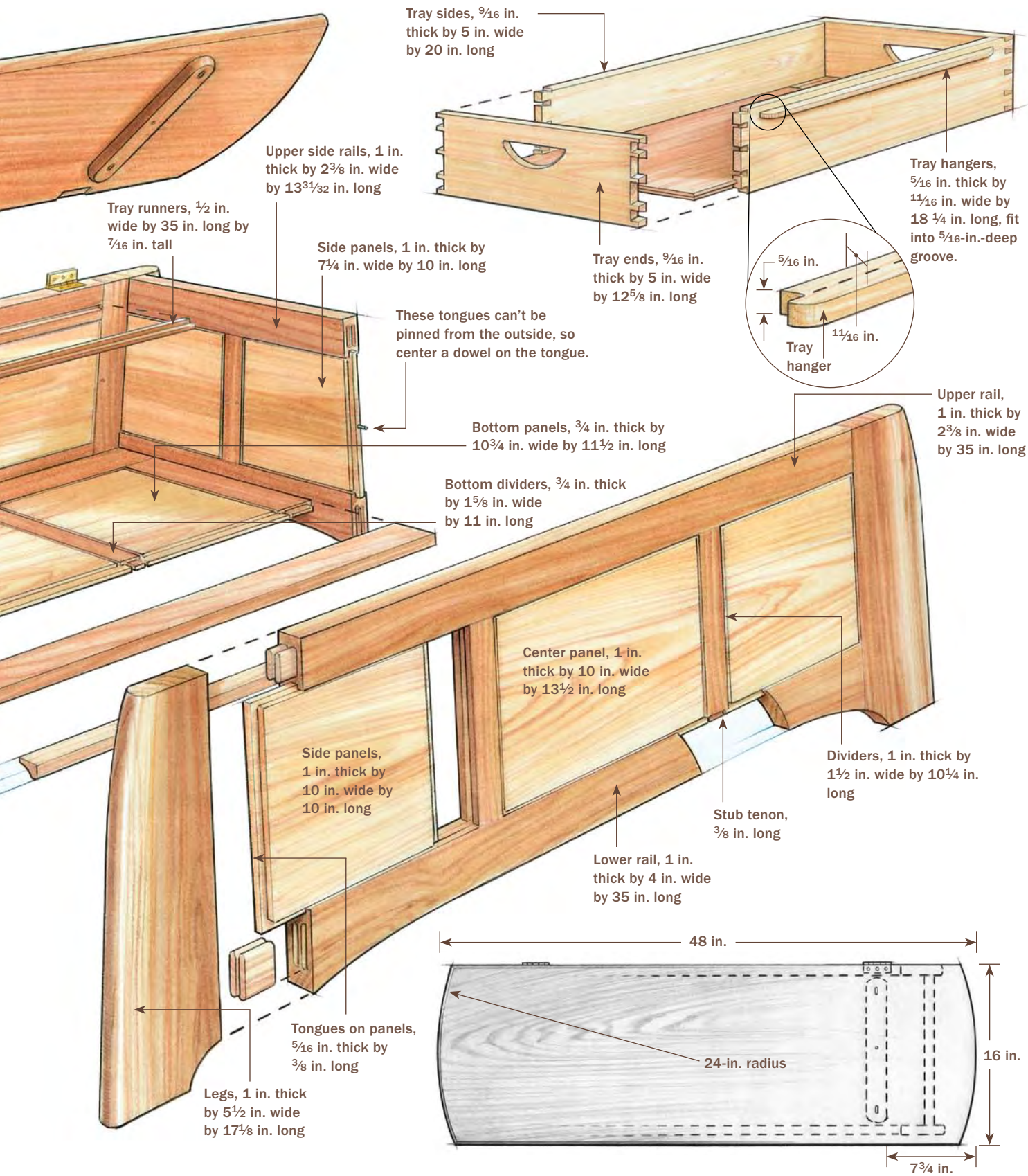
Taper the Legs First



Blanket Chest

A straightforward approach to angled joinery simplifies the construction of this frame-and-panel chest, while thick parts and dense woods (ash and hickory) lend left to a sleek design.







Create compound-angled legs

Generally, I like to start with the trickiest joinery. That way, I can get the most difficult parts finished and know it will only get easier as I go. On this chest, the mortises on the legs and rail ends called loudest to go first. Before I cut any mortises, I had to create the angles in the legs. By removing the wedge from the inside of the leg rather than the outside, I kept the grain orientation parallel to the leg's outer slanting edge. Then I cut them to length at an angle, which establishes the only compound angles in the piece (see photos on p. 15).



Cut mortises in pairs

Nearly all the parts of this chest are 1 in. thick. The weight called for substantial joinery, so I doubled the tenons to create twice the glue surface. There are a lot of mortises to cut in the leg edges, leg faces, and all the rail ends. I used a basic spacer method on the edge guide of my router to give me repeatability so that all the pairs of double mortises would match.

Face mortises. Run the router's edge guide along the outside edge when cutting both face and edge mortises. After cutting the first set of mortises, the author attaches a spacer with double-faced tape (top) to bump out the edge guide and make the second set of mortises parallel to the first (above).

Same method for edge mortises. When cutting double mortises on the leg edges, stack two legs to give the router base more surface to ride on.





Mortise and shape the rails. End rails have angled shoulders. The author cuts the 3° angle on one end of the rail and then uses a full-size drawing to mark the length (left) of the other end. He uses a simple vise-mounted jig when mortising the ends. It holds the rails square and gives a surface for the edge guide to ride on. The jig works for the angled rails too (right).

To cut the leg face mortises, transfer the locations from the drawing and use a plunge router with an adjustable edge guide. Though the tenons come in at an angle, I cut the mortises perpendicular to the leg face. The time savings makes up for the bit of glue surface that must be trimmed from the tenons.

I mortised the leg edges by again using a plunge router with an edge guide. To give the router base more surface to ride on, I stacked two legs together, flush at the angled edge. For the rail ends, I used a jig that mounts in my bench vise. For all of these doubled mortises, use the same spacer for the second cut.

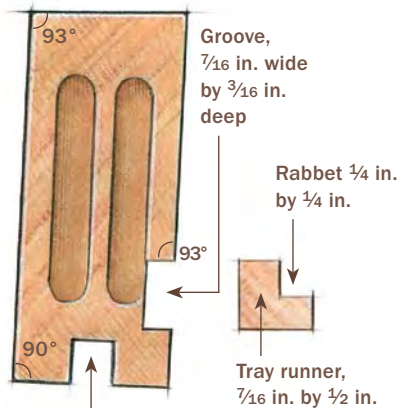
Later, I used a dado blade to cut grooves in the rails and dividers that hold the panels. But the panel grooves in the leg faces and leg edges cannot go through or they will be visible, so while you're working on the legs and the router is out, plunge-route all of these stopped grooves with a $\frac{5}{16}$ -in. straight bit. Square up the ends by hand.



Cut the curve in the lower rails. Once the mortises are cut, the author bandsaws the curve of the lower rails close to the line and then template-routes the final curve.

Groove the Rails

All of the panel grooves are square, but the long top rails need an angled groove for the tray runner.



Groove for panel, 5/16 in. wide by 3/8 in. deep

Once all the mortises and grooves are cut, bandsaw the curves that define the feet and give the lower rails their final shape. After glue-up, you'll return to the spots where the feet meet the bottom rails and refine the curve.

Panels and dividers are tongue-and-groove

After the mortises, it's time to work on the dividers, rails, and panels. Using multiple passes over the tablesaw blade and a stop clamped to the crosscut sled, cut stub tenons on both ends of the dividers. Then, using a dado set, cut grooves for the panels in the edges of the dividers.

Without changing the dado-blade setting, run the straight grooves (for the panels and divider tenons) in the long rails. And while the dado set is still in the tablesaw, make the angled grooves for the tray runners in the inside faces of the long upper rails. Finally, rip the angle on the top edge of the upper rails.

I like the look of uninterrupted surfaces on the same plane, so rather than inserting thin panels in a groove, I used thick panels and



Angle the dado set. Use a bevel gauge to ensure that the dado blade matches the 3° angle on the rest of the blanket chest.



Cut the groove. Once the dado blade is tilted, set the blade height and cut a through-groove to hold the tray runner.



Bevel the top edges. After switching back to a rip blade, the top edge of the top rails must also be cut to the 3° angle.

cut a tongue in the center to keep the faces of the panels flush with the frame. First I cut the angle on the outside edges of the end panels. Then I cut the tongues on the tablesaw.



Make the panels. The side panels are tapered. To angle the outside edges, the author uses the same jig he used to cut the angle on the legs.



Cut tongues on the tablesaw. With the panels facedown, cut around the edges on all sides. Then ride the panel on edge and cut off the rest of the waste material, leaving the tongue. Keep the panel between the blade and the fence so the offcuts fall to the outside of the blade.



Glue up in stages: front and back first. The author uses Unibond 800 for more open time. Place the center panel into the bottom rail, add the dividers and then the end panels, set the top rail on, and add the legs last (left). Center marks help locate the dividers and keep everything evenly spaced. Angled cauls keep the clamps aligned. Next, the author uses a coping saw to cut the curve at the top of each leg and then uses a block plane to take it to its final shape (right).



Add the ends. Lay the front assembly face down and add the end rails. Slide in the first panel, then the divider, and then the second panel (far left). Once you add the back assembly, gently turn the whole thing upside down and clamp securely (left). Use the same angled clamping cauls as before.

Glue up in sections

Start the glue-up with the front and back, each with two legs, two long rails, two dividers, and three panels. Use angled cauls and pipe clamps to help distribute pressure.

Once the front and back assemblies have cured, pin the panels in place from the inside with toothpicks. This keeps the gaps even as the solid panels expand and contract. Pinning the panels after the glue-up works with the front and back frames but doesn't work on the ends of the chest, where the panels fit into the face of the leg. There, I used a dowel centered in the tongue and groove.

After finish-sanding the interior, it is time to add the short sides (two angled short rails, one divider, and two panels per side), reusing the angled cauls to clamp the case. Take care that all top rails sit flush with the legs, or you'll have to take great pains to flush everything up after the glue-up.

While this assembly is drying, glue and clamp the bottom frame (two rails, two dividers, and three panels), and set it aside to fit into the case later.

Hinge the lid after glue-up is complete

On a one-piece top, I like to orient the lid's end grain so that the rings look like smiles. Then, at some point in the future, if it wants to cup, the front edge of the lid should dive into the front of the chest rather than up and away.

Rout the rear rail for its hinges. Place the oversize lid on the chest to adjust its position. Once you're sure about the placement of the lid, use the mortises in the rail to mark and then rout the corresponding mortises in the lid. By mounting the lid, you can test its fit again, mark and cut its finished dimensions, and grab a measurement for the rope stop.

With the top cut to length, I used a template and router with a flush-trimming bit

to cut the lid to shape. I made a full-size template for the end curves, but before using the template and the router to cut the shape, I wasted away close to the line with the band-saw. From there I used a handheld router and a 1/2-in. roundover bit with bearing to shape the ends and front edge to their final profile, a roundover with a distinct sharp edge.

Sliding tray glides on shopmade runners

The carcass glue-up gives interior dimensions for both the dovetailed sliding tray and the frame-and-panel bottom.

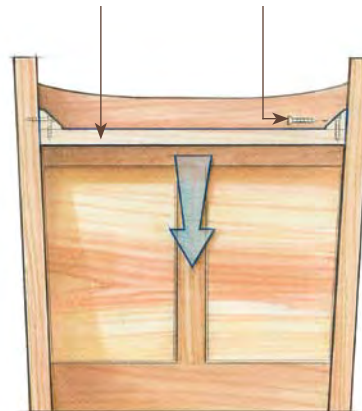
Cut the rabbet for the chest-mounted tray runners from wide stock on the tablesaw. Then rip the pieces to width. Chop the runners to length to exactly match the length of the upper rails. Give both ends a curve and then glue them into the front and back rails of the chest. It's important that the runners be fully seated in their grooves so that they provide maximum support for the sliding hangers.

After hand-cutting the dovetails, rout stopped grooves on the outside top of the tray

Install the Bottom and Top

Bevel the bottom and test-fit, repeating until the fit is snug.

Screw the ledger strip to the side and bottom.





Fit and secure the bottom. The ledger strips have pairs of holes: One is for screwing the strip into the side of the chest and the other is for fixing the bottom in place.

sides to hold the hangers and then glue and clamp the hangers into their grooves. To make the openings for the tray handles, I used a shopmade template and a router equipped with a guide bushing and 1/4-in. straight bit. First I marked the cutouts and removed the waste, just outside the line, with a jigsaw. Then I clamped the template on the tray and routed to the line, removed the template, and hit the edges with a 1/4-in. roundover bit to soften them.

Ledger strips hold the bottom in place

Because the sides and ends of the chest angle in, the frame-and-panel bottom must be fitted from the bottom and then secured with a ledger strip from underneath. I drilled and countersunk for pairs of screws in the ledger strips. There's a little trial and error as you sneak up on the fit of the bottom. Keep in mind that a small decrease in width and length allows the bottom to take a large jump up into the chest.



Attach the lid. The author uses a strip of wood, clamped to the back of the chest, to help hold the lid in place while he secures the hinges.

Apply finish and add a rope stay

I finished the lid and bottom before attaching them to the chest. The interior and tray got a couple coats of Zinnser® Bulls Eye® clear shellac, cut with equal parts of denatured alcohol. For the outside, both sides of the top, and the battens, I wiped on a mixture of equal parts tung oil, satin spar varnish, and thinner. When the finish was dry, I attached the battens, remounted the lid, and secured the bottom.

For the rope stay, I found a Web site (www.animatedknots.com) that showed me, step by step, how to create an eye in the end of a line. I positioned the eye straps and rope so that the straps clear each other when the lid is closed and the open lid rests just a bit past vertical.

Shaker Chest of Drawers

CHRISTIAN BECKSVOORT



Years ago, clients wanted me to make a blanket chest to store shirts and sweaters. Blanket chests are great for quilts and blankets, but they tend to allow small items to drift toward the bottom and get lost. For clothes, I mused, drawers would make the contents more accessible. And if I used the same outside dimensions as a blanket box, they could still place the chest at the foot of the bed and sit on it, or push it against the wall to use as a dresser. The different drawer depths would add to the versatility of what the chest could hold. They took my advice and they still love the finished chest.

As with much of my work, this design is heavily influenced by the Shaker design ethic, with its simple lines, functional design, solid construction, and cherry wood. There are a number of parts, but the construction is straightforward. I use half-blind dovetails to secure the sides to a subtop, and a sliding dovetail to secure the bottom to the sides. A vertical divider gets centered in the top and bottom and dadoed in place. Front and back rails are notched around the vertical divider and dovetailed into place. I use a sturdy frame-and-panel back, glued into a rabbet, so the piece looks beautiful from all directions. And the main top gets screwed in place from the underside of the subtop. This is the same construction I use on all my case pieces, so the anatomy could work for a taller chest, too.

Tackle the sides first

Most of the business happens on the side pieces. But before I hand-chop any half-blind dovetails, the side pieces get a rabbet, leg arches, a sliding dovetail, and a dado with a dovetail at the front.

(continued on p. 28)



Dual-purpose jig for dados and dovetails. Like many chests of drawers, the sides of this one need a dovetail-dado combo for the rails and drawer runners and a long sliding dovetail for the bottom. One simple jig handles them all. Setup is easy. Registering off the front edge of the side, it's easy to clamp the jig square and cut dados and dovetails precisely.



Dovetail meets dado. Use a $\frac{3}{4}$ -in. dovetail bit to cut the dovetail notch for the front and back rails (left). Without moving the jig (the author has two identical routers so he doesn't have to change bits), use a $\frac{3}{4}$ -in. straight bit to cut the dado that will hold the drawer runners (right).

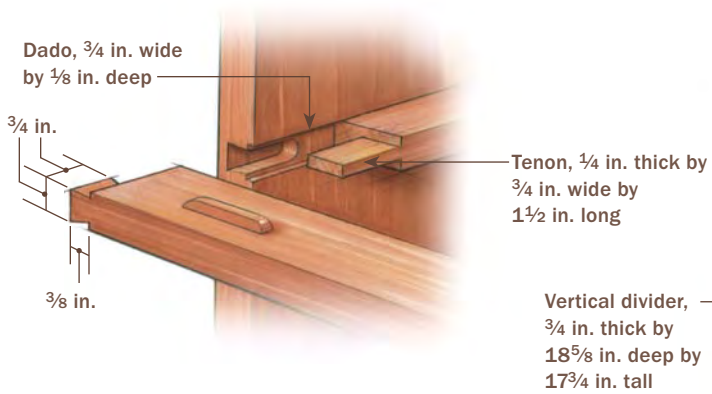


Two cuts for a long sliding dovetail. Before the final pass with a $\frac{3}{4}$ -in. dovetail bit, the author uses a smaller straight bit to waste away the material, making the dovetail cleaner and easier to cut.

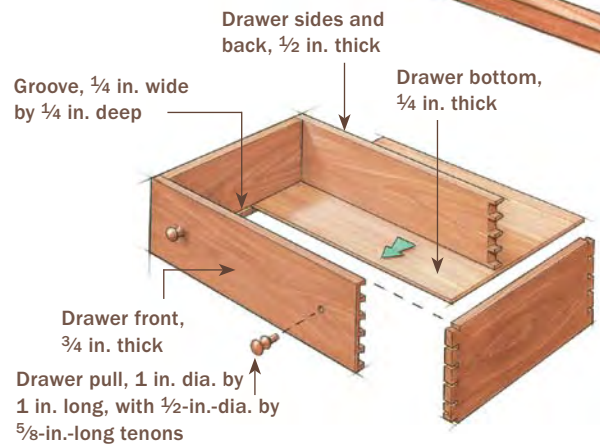
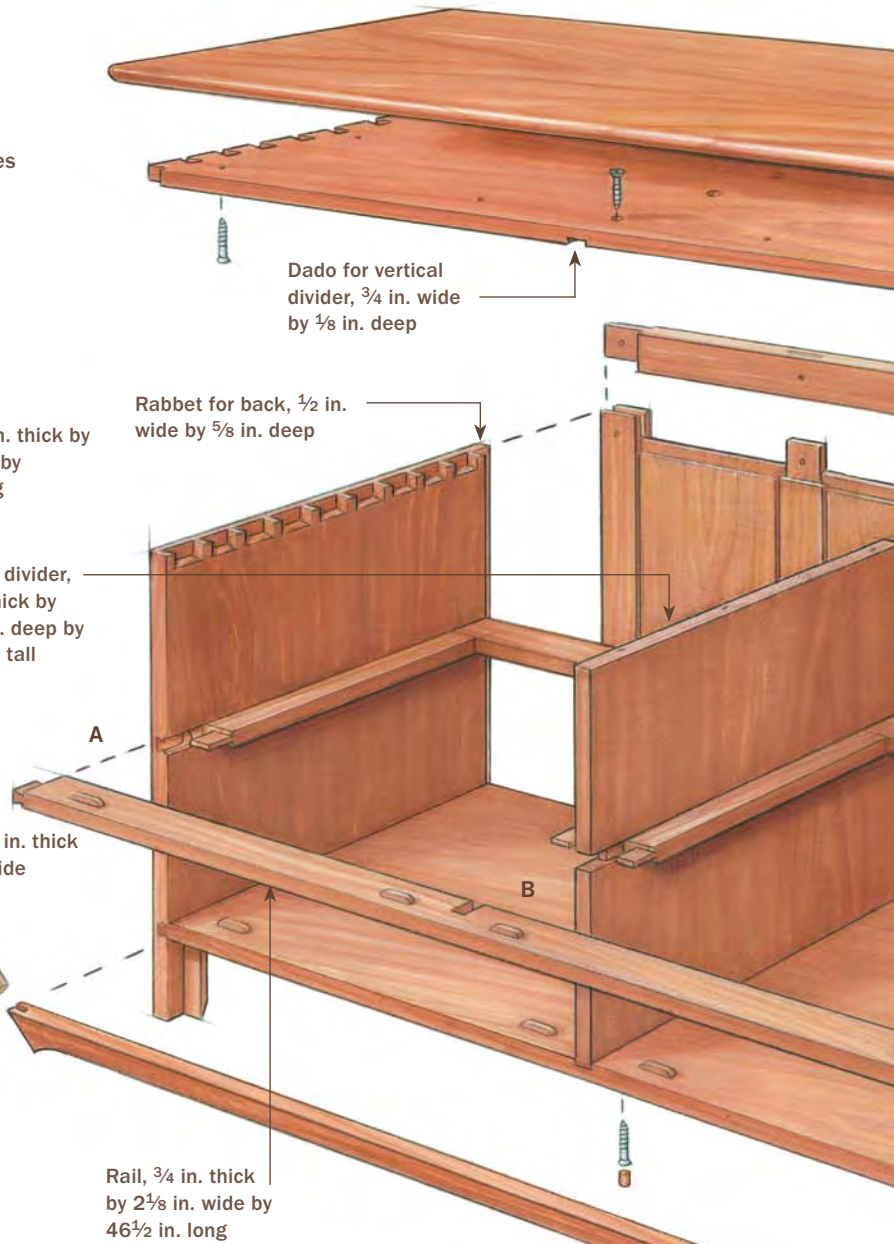
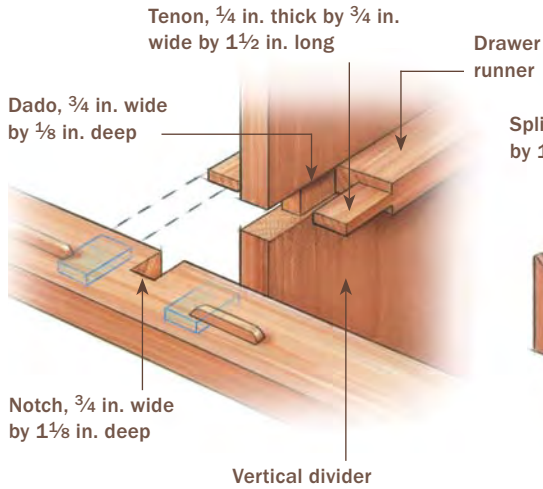
Built to Last

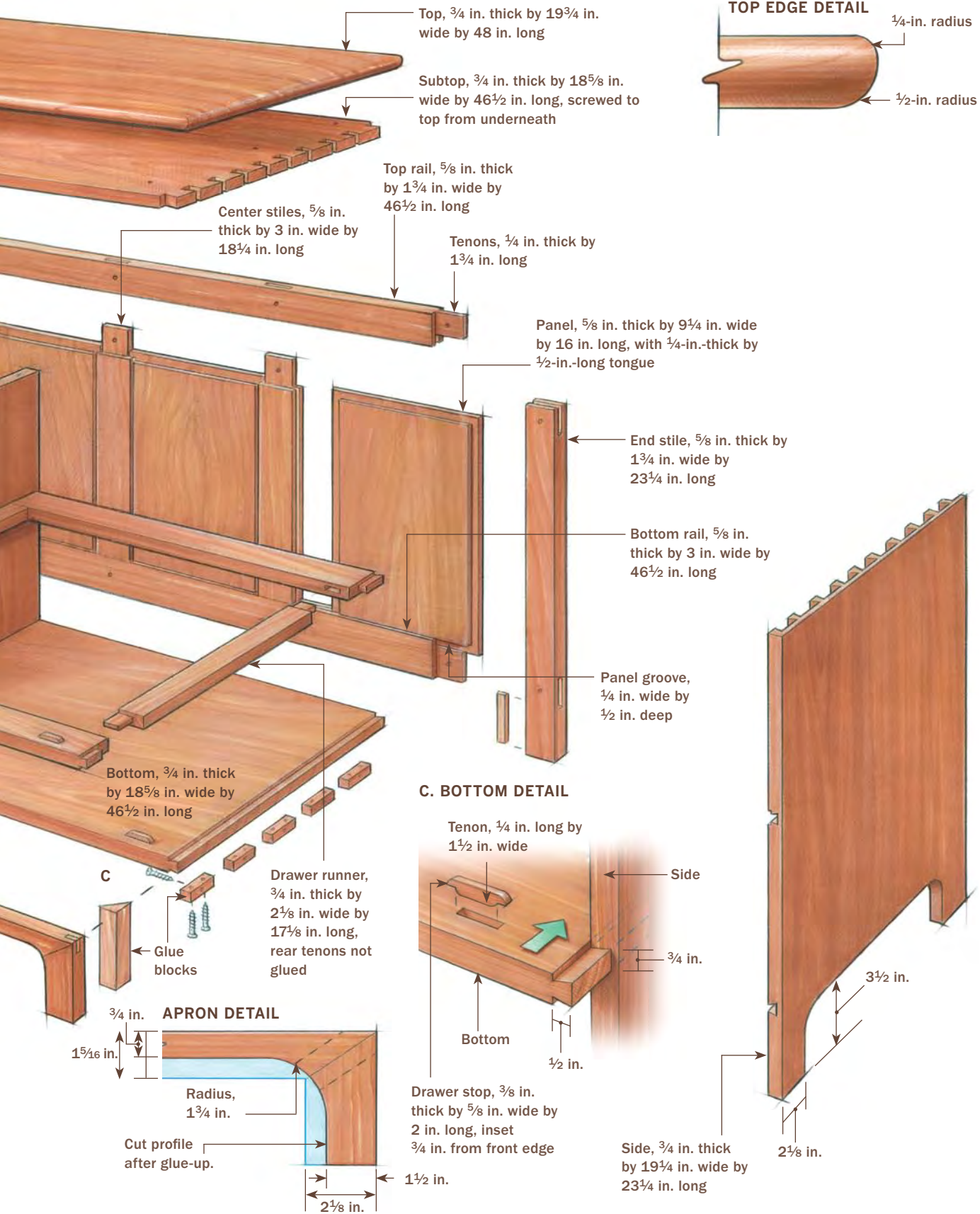
Half-blind dovetails, sliding dovetails, and dados ensure decades of flawless function. A frame-and-panel back makes the chest look good from all directions.

A. STRETCHER END DETAIL



B. STRETCHER/VERTICAL DIVIDER DETAIL





First, rabbet the side pieces with two ripcuts on the tablesaw. This rabbet will accept the back. Then draw the leg arches on the side pieces and use a bandsaw to cut them out and a block plane to smooth the straight edges. I clean up the arches using a balloon sander on my lathe and finish up with hand-sanding.

Now it's time to pick up the router and tackle the dovetail-dado that holds the front and back rails and the drawer runners as well as the sliding dovetail that holds the bottom. For all three I use a shopmade jig with two

parallel bars, spaced the width of the router base, clamping it square to the carcass side. The same jig works for the dados on the sides of the vertical divider and the dados in the subtop and bottom that hold the vertical divider. While the router and jig are out, cut the dados in each side of the vertical divider. Along with the dados in the sides, these will hold the drawer runners. Line them up with the dados on the sides but leave the piece a bit long until you glue up the carcass and get an exact measurement.



Half-blind dovetails in large panels. Half-blind dovetails make a strong but clean-looking case. They can be a challenge on big pieces, but the author has tricks for keeping the pieces flat and aligned. On the subtop, the author marks the centers of the pins and uses a dovetail guide to lay out the tails (top left). To saw the long, wide board, he rests it on the floor and secures it in a vise. A thick, straight hardwood board clamped near the action keeps the wide board flat (above).

Chop and pare, chop and pare. Keeping the wide workpiece flat, make a vertical cut in the scribed line, tipping the chisel slightly forward (top right). Make the first cut light. Then, paring horizontally in from the end grain, remove a chip (above). Alternate between cutting down and cutting in until about halfway through, then turn the board over and repeat the process until you've met in the middle. Follow the same procedure after sawing the pins.



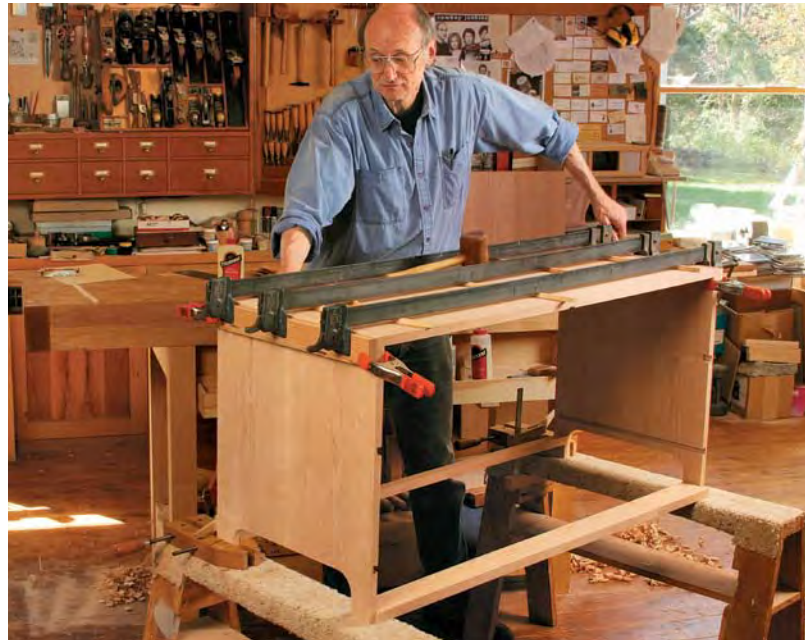
Dovetailing a large case piece

Cutting dovetails on a large piece is very similar to cutting dovetails on a smaller box or drawer, but there are a few more things to consider. Holding the pieces is more challenging, keeping them flat is important, and of course there is more material to remove. The good news, at least with this piece, is that even if your dovetails don't look perfect, they'll be hidden by the subtop. I always lay out and cut the tails first, then transfer them and finish up with the pins.

Once you have the dovetails cut, it's time to glue the subtop to the sides. But first rout the dadoes for the vertical divider in the subtop and bottom (using the same jig as before). To find the center of both, it isn't necessary to do a dry-fit. The subtop, the bottom piece, and the rails are all the same length, so just stack the top and bottom together with the ends flush and measure for the center. After routing the dadoes, glue the dovetailed subtop to the sides. The bottom doesn't go in yet, so use spacers at the bottom of the legs to keep everything straight and square.



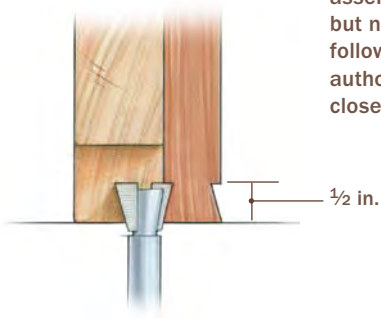
Nail down the tail board to mark pins. Mark the location of the tails on the pin board. On long, wide workpieces, the author uses a small nail to help in the transfer. Align the boards and predrill. Tap in the nail partway so it can be easily removed (top left). Using a marking knife and working from the nailed corner, scribe the tails onto the pin board (bottom left). Pivot the tail board into alignment whenever necessary.



Cut the pins and then glue the top and sides. Spacers between the legs keep the assembly square while the author attaches the subtop to the sides. To keep from marring the carcass with heavy bar clamps, he uses spacers on the top and cauls on the sides.

How to Tame Long Sliding Dovetails

Long sliding dovetails can bind and freeze during assembly, but not if you follow the author's steps closely.



While that assembly is drying, move to the router table to cut the sliding dovetails in the ends of the bottom and front and back rails. Then slide the bottom into place. I glued only the last 3 in. to 4 in. at the front of the sliding dovetail. Because the dovetail slot is deep, it weakens the sides of the case, so I added five glue blocks underneath each side. This strengthens and anchors the lower sections of the case sides to the bottom, yet still allows for wood movement.

Divider helps drawers run smoothly

The four drawers are separated by a vertical divider that is cut to fit after the case is assembled. With a handsaw, notch the vertical divider to accept the notched front and back rails, and then slide it in place. These notches line up with the dadoes that are already in the vertical divider. Don't glue the vertical divider in place because it is an end-grain to long-grain joint, and glue won't hold. Instead, screw it in place, plugging the holes in the bottom. The holes in the subtop will be covered by the top.

The bottom drawers run on the bottom of the case, but the top drawers run on a frame: two rails and four drawer runners. The runners are tenoned into the front and back

rails. The tenons get glued into the front rail but are left loose in the back rail to allow for wood movement.

Finish panels before gluing in frames

A frame-and-panel back, although more work, gives as much diagonal racking resistance as plywood (unlike nailed shiplapped, tongue-and-groove boards) and looks much better. Once the case and all the dividers are in place, make the frame-and-panel back, leaving it a little too wide so you can sneak up on the perfect fit with a block plane. I profile the four panels with a 22½° panel-raising bit. I pin the rails and stiles for extra support and a nice design detail. Then I sand the inside face and fit



Big workpiece is an added challenge. A featherboard applies even pressure, keeping the long board on track and the cut precise. Go for a snug fit.



Please don't freeze. To prevent binding, don't use glue yet, and keep the bottom as straight as possible as you slide it in most of the way (left). Glue only the front 3 in. to 4 in. of the bottom (above); otherwise, the joint will seize while you are trying to bring the piece home. Use clamps to pull the bottom evenly and steadily. Clamping blocks that extend over the side keep the workpieces from getting damaged and, more important, stop the bottom when it is exactly flush with the sides.

the back to the case. I glue the back in place, secure it with small brads, countersink them, and plug the holes.

Complete the base and profile the top

To finish the front of the case, miter and spline the three-piece base assembly, bandsaw the arches to the same radius as the sides, and glue it into place. A one-piece base would

introduce cross-grain gluing and could self-destruct. This way, the base expands and contracts (up and down), while the case side it is glued to does not change in length.

Next, sand the entire case and then cut the top of the case to size, allowing a 1/2-in. overhang on the front and on each side. Rout the profile into the front and sides, sand the top, and screw it into place from underneath through the subtop.

Rails and Dividers Guide the Drawers

This simple system keeps drawers from racking back and forth, tipping up, or dropping down.

1. Fit the vertical divider and tap it into position without glue. Screw it in from the top and bottom.
2. Fit the front rail and glue it into the sides and onto the vertical divider panel.
3. Install the four drawer runners. Apply glue only to the front tenons.
4. The back rail is glued into the dovetail slots and onto the vertical divider. The back mortise-and-tenon joints are not glued. This allows the web frame to telescope in and out as the case expands and contracts.
5. Fit the back. The end stiles extend beyond the bottom rail and become an integral part of the back legs. Use a block plane to sneak up on the fit before clamping and gluing.
6. Apply the mitered front base assembly. Add glue blocks afterward to strengthen the corner joints.



Drawers are the final step

Before starting the dovetails on the drawers, groove the sides and front. Now lay out the tails, saw and chop them, and move on to the pins. I cut the pins and tails slightly proud and flush everything up with a belt sander after the drawers are glued. Knob holes also can be drilled at this point. I use a pencil

to mark the tight spots and a belt sander to remove material as I carefully fit the drawers to their openings.

Insert the drawer bottoms, and hold them in place with two saw slots and round-head screws in the underside of the drawer backs. The knobs are turned on the lathe, the tenons cut to length, and then glued into place.



Before applying a finish, I go over the entire piece to break and sand all edges including around the drawer openings, and the gaps between the frames and panels on the back. Then I sign the piece and give it three coats of an oil finish. The first coat is straight Danish oil, and the final two coats are a mixture of Tried & True™ varnish oil and spar varnish.

Classic Storage Cupboard

CHRISTIAN BECKSVOORT

In “Shaker Chest of Drawers” (p. 24), I wrote about a low chest of drawers and focused on its case construction, drawer runner system, and using a shopmade jig and router to cut dados and dovetail slots in the carcass. Since then, a client asked me to build a large cupboard to use in a kitchen.

This piece (and this chapter) picks up where “Shaker Chest of Drawers” left off. I’ll expand on how I approach Shaker casework, showing you how to apply the three-sided face frame to the front. I’ll also walk you through how I fit and install drawers. Also, because the drawers are so wide, I included a simple but effective center guide that keeps big drawers from binding.

The way I approached the doors is appropriate for almost any Shaker piece, so the editors gave that technique its own spotlight (see “Frame-and-Panel Doors Made Easier” on p. 42). By the way, because this piece will live in a kitchen, I sized the drawers to hold cutlery, kitchen linens, and even pots and pans. But this classic storage piece can be adapted to any room of the house. That’s what the Shakers would have done.

Large panels can be a challenge

Other than the size of the panels, the carcass construction on this piece is almost the same as the low chest in “Shaker Chest of Drawers.” There are a few differences: Because of the size of the pieces, I used a jigsaw instead of a bandsaw to cut the arches into the bottoms of the two sides. This chest has a permanent middle shelf that the low chest doesn’t, and also because of the size of the pieces, I got creative about dovetailing and how I transferred the tails to the pin boards. I laid out and cut the tails first on the subtop, then moved to the half-blind pins on the sides. I rested the long workpieces on the ground and tacked the top in place with a small brad, creating a freestanding inverted U. I stood on a stool to transfer the tails to the pin board, and then cut the pins at the bench. Once the dovetails, dados, and rabbets were cut, I glued the subtop and bottom to the sides.

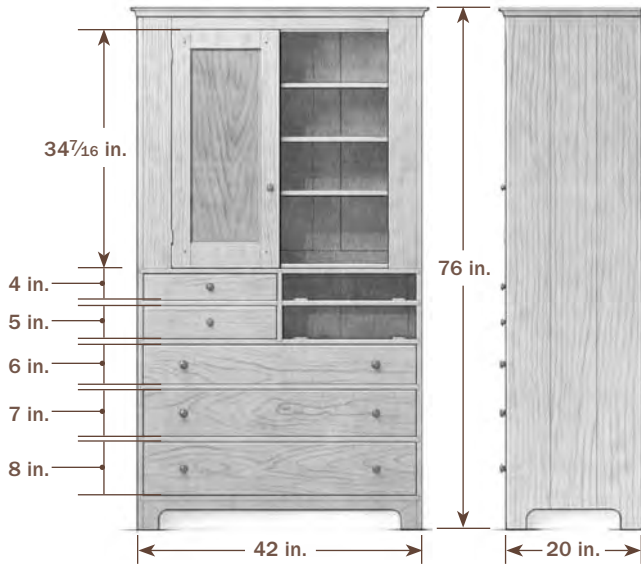
With the carcass together, it’s time to work on the web frames and runners that will hold the drawers in place and allow them to run smoothly. For step-by-step details on this, see “Rails and Dividers Guide the Drawers,” p. 32. To separate the top drawers, I added a centered vertical drawer divider and behind that a center runner. Although the three wide drawers at the bottom get an added center guide, don’t tackle that until you’ve glued the frames in place and made the drawers.

(continued on p. 39)



Cupboard Details

The subtop and fixed shelf are cut back to accommodate the face frame and back assembly. The middle shelf also acts as a stop for the lower edges of the doors.

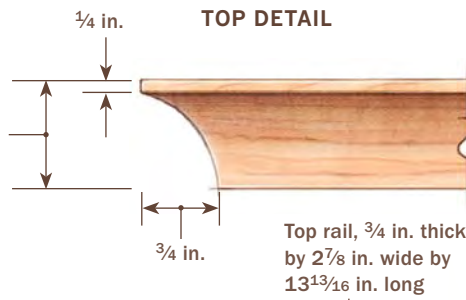


WEB FRAME DETAIL

Dado, $\frac{3}{4}$ in. wide by $\frac{1}{8}$ in. deep

Dovetail, $\frac{3}{4}$ in. thick by $\frac{3}{4}$ in. wide by $\frac{3}{8}$ in. long

Tenon, $\frac{1}{4}$ in. thick by $\frac{3}{4}$ in. wide by $1\frac{1}{4}$ in. long



Groove, $\frac{1}{4}$ in. wide by $\frac{1}{2}$ in. deep

Molding, quarter-round, $\frac{1}{4}$ in.

Door panel, $\frac{1}{4}$ in. thick by $11\frac{5}{16}$ in. wide by $23\frac{3}{16}$ in. long

Knob, 1 in. dia.

Peg, $\frac{1}{4}$ in. dia.

Bottom rail, $\frac{3}{4}$ in. thick by $3\frac{3}{4}$ in. wide by $13\frac{13}{16}$ in. long

Tenon, $\frac{1}{4}$ in. thick by $2\frac{1}{2}$ in. wide by $2\frac{1}{4}$ in. long

DRAWERS

Drawer front, $\frac{3}{4}$ in. thick

Knobs: small, 1 in. dia.; large, $1\frac{3}{16}$ in. dia.

Drawer bottoms: small, $\frac{1}{4}$ in. thick; large, $\frac{5}{16}$ in. thick

Drawer sides, $\frac{3}{4}$ in. thick by $18\frac{5}{8}$ in. long

Door frame rail, $\frac{3}{4}$ in. thick by $1\frac{3}{4}$ in. wide

DOOR

Top rail, $\frac{3}{4}$ in. thick by $2\frac{7}{8}$ in. wide by $13\frac{13}{16}$ in. long

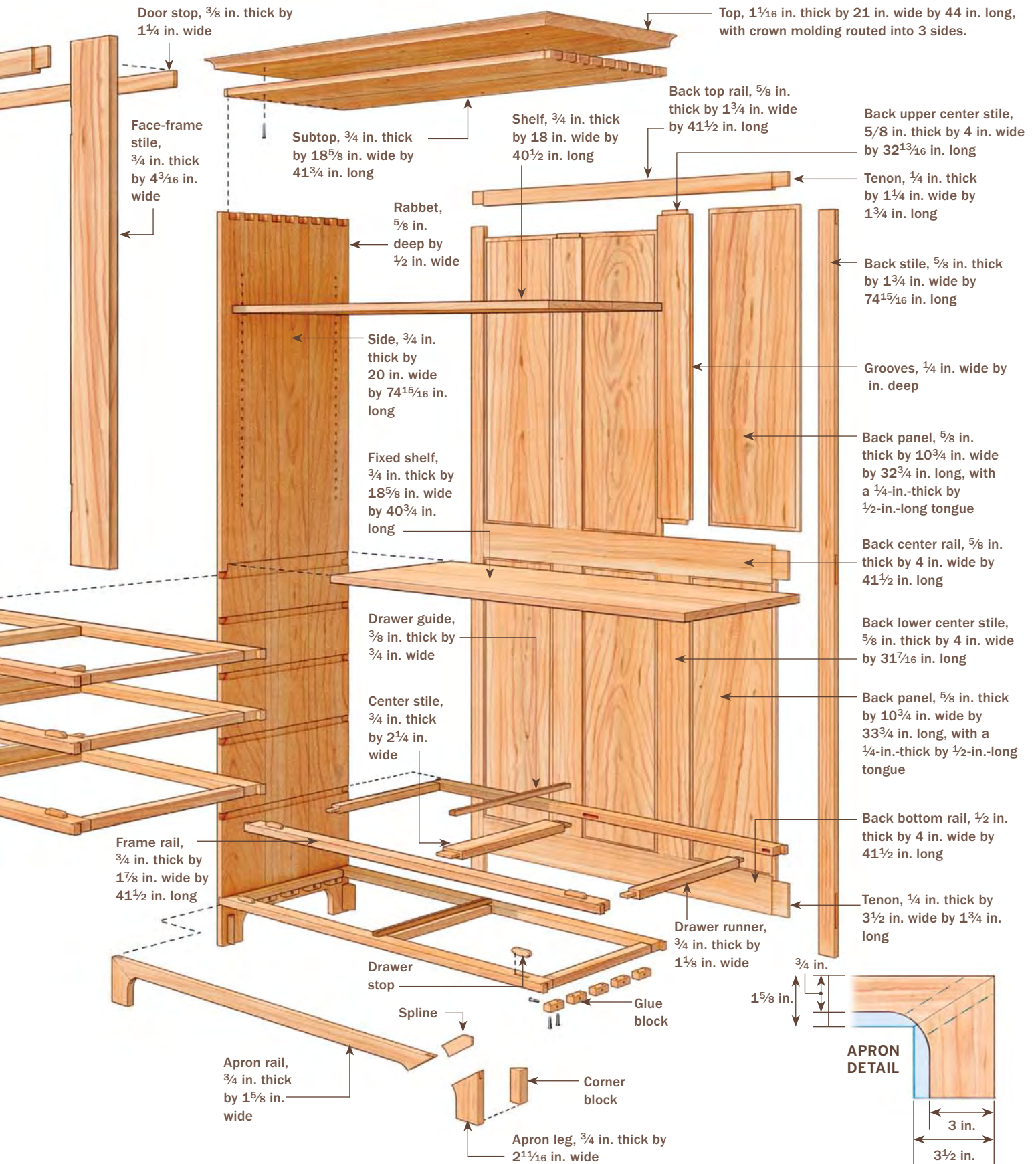
Stiles, $\frac{3}{4}$ in. thick by $2\frac{7}{8}$ in. wide by $34\frac{7}{16}$ in. long

Dovetail, $\frac{3}{4}$ in. thick by $\frac{5}{8}$ in. wide

Vertical divider, $\frac{3}{4}$ in. thick by $1\frac{7}{8}$ in. wide by $10\frac{1}{2}$ in. long

Drawer divider, $\frac{3}{4}$ in. thick by $1\frac{1}{4}$ in. wide

Drawer back, $\frac{3}{4}$ in. thick





Make a solid face frame. Mortise-and-tenon joints add strength and simplify assembly: One clamp will hold it together. Gluing the frame into the case makes it completely rigid.



Inset it. The face frame goes inside the sides of the piece, but overlays the subtop, which is cut short to accommodate it. Make the frame just a bit larger than the opening, and trim the side pieces with a block plane to perfect the final fit. Apply clamp pressure from top to bottom, front to back, and along the sides.



Add the middle shelf and back. The fixed middle shelf (left) sits on the web frame below it, sharing a wide dado in the case sides. A dab of glue at the front and a finish nail through the top drawer frame hold it in place. Keep the clamps on the face frame or allow the glue to dry completely before adding the middle shelf. A frame-and-panel back (above) adds rigidity and racking resistance. Fit it and glue it into the rabbeted sides.

U-shaped face frame is applied

Once the rails and runners are in place, make the face frame for the upper half of the cabinet. You can do one of two things: Use an applied face frame that butts against the inside edges of the sides or use a more complicated approach that involves notching or mitering the side pieces on just the upper portion. I use the first, less complicated method, which leaves the edge of the cabinet sides exposed all the way to the top. This requires careful wood selection to hide the glue joint where the outsides of the frame meet the sides of the carcass but saves time and effort because you don't have to notch the carcass sides halfway or cut a stopped miter on the sides and miter the face frames.

When the frame is glued in place, sand the entire face of the cabinet flush. Then glue the fixed middle shelf into place, sliding it in from the back and against the face frame.



Fit them individually. Start by rough-sanding the pins flush and get the drawer to just fit the opening (right). As you pull out the drawer, make pencil lines where the sides rub and use those lines as a guide to sand or plane the sides to an exact fit (above).

The back comes next. Because the back is captured in rabbets on the sides, I used 1 $\frac{3}{4}$ -in.-wide quartersawn cherry for the side stiles and the top rail. The bottom and center rails as well as the center stiles can be flat-sawn and wider, for strength. The six panels are flat and flush inside and out. Use a block plane to carefully fit the back so that it just drops into the rabbet, and glue it in. Now you can make and fit the doors (see p. 42).



How to fit wide drawers.

Careful fitting and smart stops are the key to good-looking drawers and a flush front. Size the front to the opening. Leave a small gap at the top edge to allow for wood expansion. Then cut the dovetails and assemble the drawer box.





Add stops for a flush front. All the drawers get a stop at both ends. Use a trim router resting on the front edge of the drawer frames to cut shallow, 1 $\frac{3}{4}$ -in.-long by $\frac{3}{8}$ -in.-wide grooves (left) for handmade stops. Then glue and clamp the stops into the grooves (right).

Wrap up some details, then tackle the drawers

With the doors complete, most of the hard parts are finished. While the case is still open, use a handheld drill and jig (a simple piece of plywood with predrilled holes) to drill holes on both sides of the upper section to accept pins for the adjustable shelves. Then glue in the mitered, splined apron in the base at the front.

Once the case is sanded, cut the top to size and then run a cove profile around the front and sides of the top on the router table. Screw it to the subtop from the inside.

Drawers are the last hurdle and the most time-consuming. I cut half-blind dovetails in the front and through-dovetails in the back, and I always cut the tails first. On the table-saw, groove the front and the two sides for the drawer bottoms. These grooves will help align things when it's time to transfer the tail layout to the pin boards. On the wide drawers, make sure to locate the grooves $\frac{3}{4}$ in. from the bottom to allow enough room for the center track.

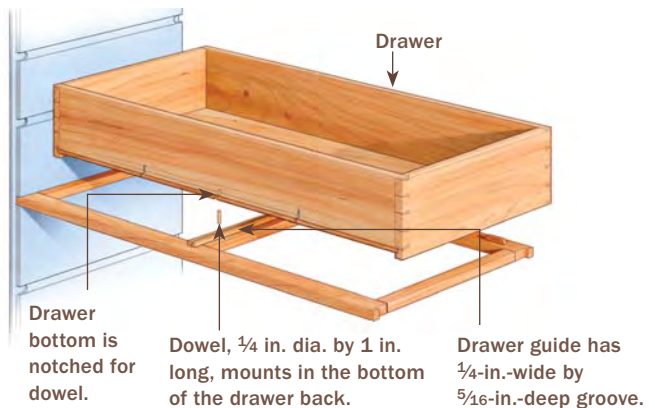
After you complete the drawers, turn the knobs, glue them in place, and add drawer stops to the fronts of the web frames. Next,

make the tracks for the wide drawers to run on. They are fitted, centered, and glued and screwed to the front and center rails. Now drill a hole and insert a dowel into the drawer back, centered exactly. Finally, test-fit each drawer and make adjustments.

I finished the case with Tried & True Danish oil. Once dry, I screwed in the drawer bottoms, polished the brass hinges, and added leather bumpers to the door and drawer stops.

Center Guides Keep Them in Line

Wide drawers have a tendency to bind, but this simple dowel system keeps them running smoothly.





Make a groovy center strip. The center guide is simply a piece of wood with a groove that runs straight through.



Center a dowel on the drawer bottom. The author measures for the center to lock in the location and uses a doweling jig to drill straight.



Use a stick to keep it on track. To keep the guide centered as you mark around it, use a notched stick at the front and then the back. Glue and screw the guide only to the front and back rails of the web frames.

The High Art of the Lowboy

PHILIP C. LOWE



The Queen Anne lowboy is about as traditional as American furniture gets, but from a modern perspective this 18th-century piece is still highly practical. The lowboy can be used as a dressing table or hall table, and the design has lost none of its elegance in the last 300 years.

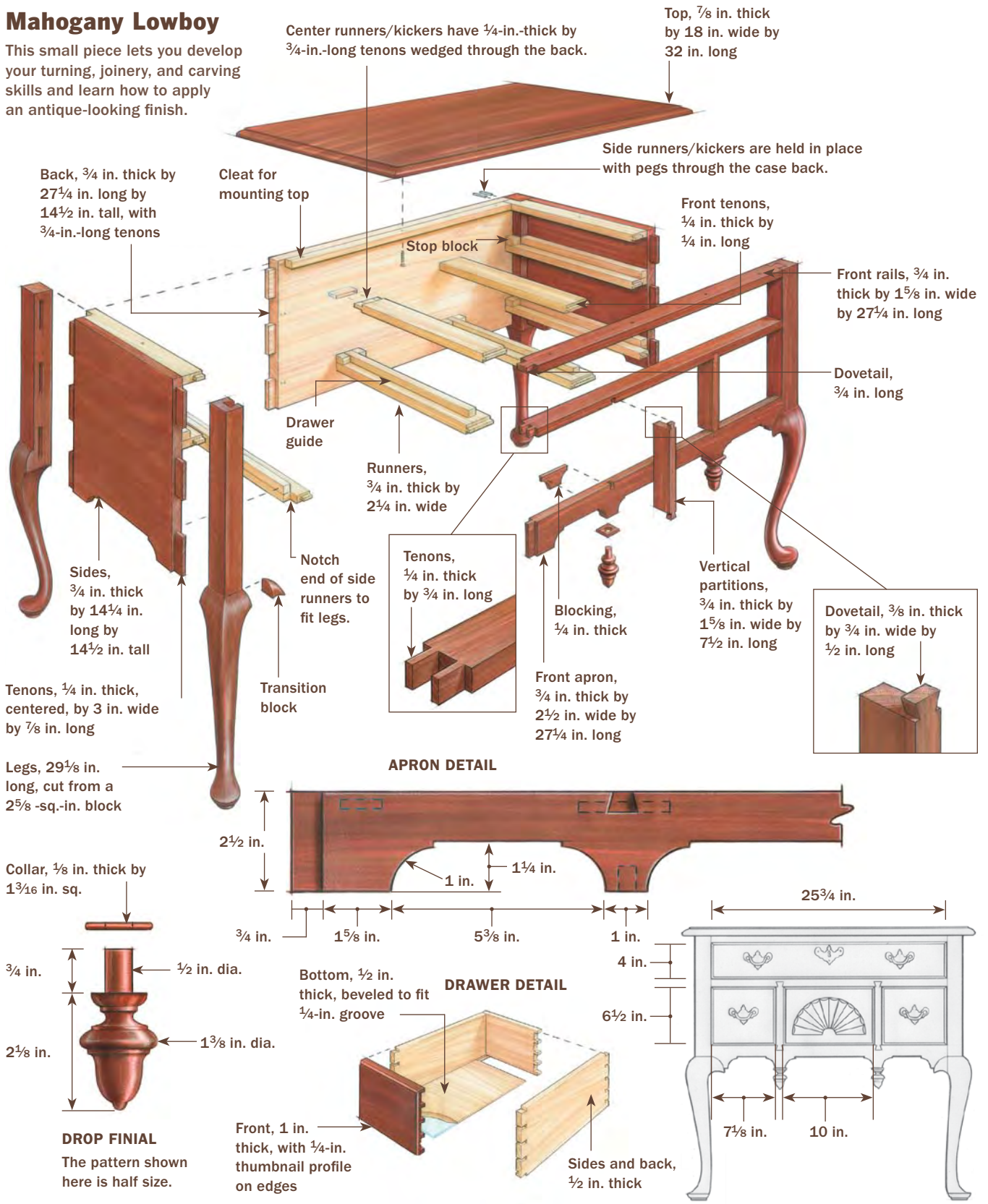
For an intermediate woodworker looking to grow as a craftsman, the lowboy is an ideal project. It's not overly big or complex, but it is a satisfying, high-level test of many skills; so

many, in fact, that you're almost guaranteed to learn one or two new ones before you're done. The piece combines a mortise-and-tenoned case with cabriole legs, dovetailed drawers, and a tabletop with a hand-shaped edge profile. A fan carving decorates the center drawer.

I've modified some of the period construction details to build a case that will accommodate seasonal wood movement. It's not an exact reproduction, but it captures the spirit of the early pieces.

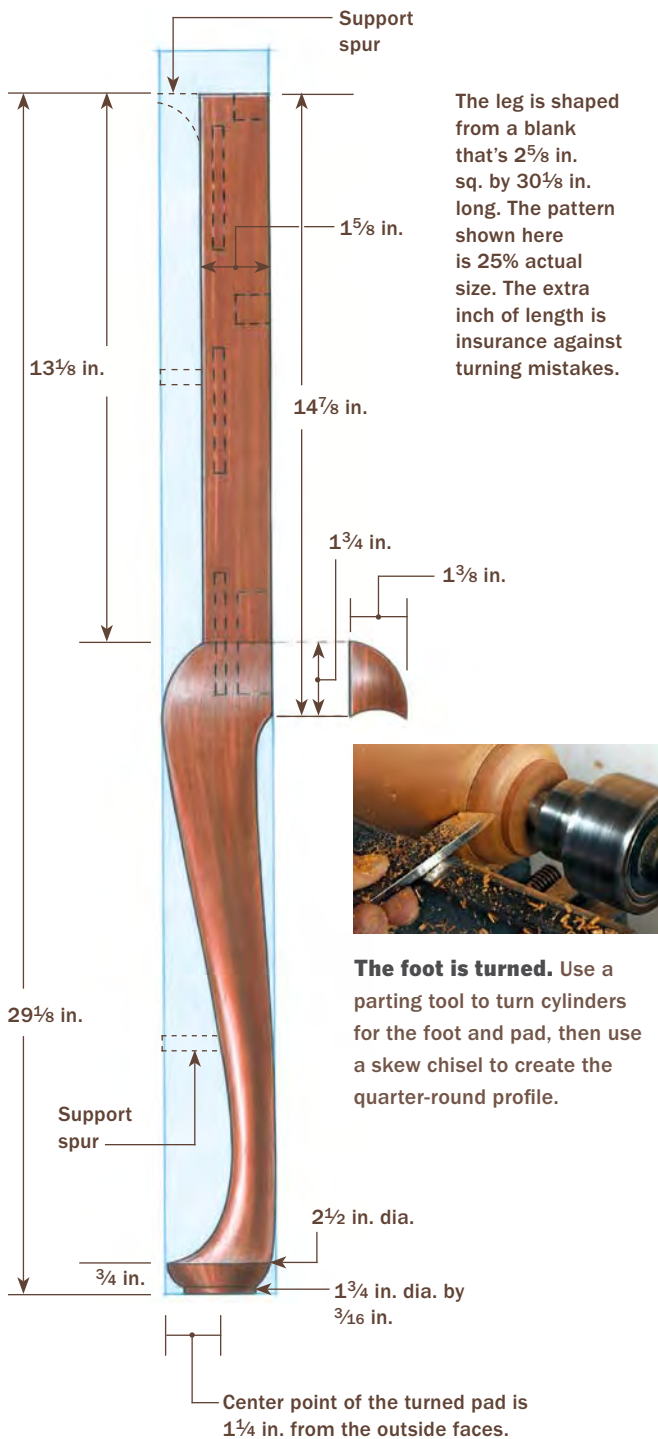
Mahogany Lowboy

This small piece lets you develop your turning, joinery, and carving skills and learn how to apply an antique-looking finish.



Turn and Shape the Legs

The legs take shape in two distinct stages. Start by laying out and turning the pad foot. Then rough out the leg's overall shape at the bandsaw and refine it with chisel, rasp, file, and scraper.



The cabriole leg: grace under pressure

These cabriole legs are slender but balanced and strong enough to support a heavy case piece without stretchers. They also do more than just hold the case off the floor; their long top posts are an integral part of the case itself. The case can't go together until the legs are done, so let's begin with the four legs.

It's most practical to turn the foot and cut the mortises before sawing and shaping the curved cabriole profile. The first step is to orient the leg blanks for the best figure. Mark the inside corners of each leg, then trace the cabriole pattern on these two adjacent surfaces. On each leg, use a cutting gauge to score a line defining the post block. Set the gauge to the dimension of the waste to be cut away. Score these lines on the tops of the legs, too; this helps keep the position of the leg clear.

To lay out the turned foot, scribe a line around the bottom of the blank to mark the top of the foot. Draw center marks on the two ends of the blank to locate the points of the lathe centers for the offset turning.

Turning and mortising

At the lathe, use a parting tool to turn a cylinder for the foot from the layout line to the end of the blank. Then turn a narrower cylinder at the very end of the blank to establish the pad at the bottom of the foot. Next, use the point of a turning skew to score a line where the square corners of the blank meet the cylinder, defining the top of the foot. Use the skew to soften the hard corners of the square and then shape the foot by rounding off the cylinder to a quarter-round. Sand the foot while it is on the lathe.

Each leg is mortised on the two inside faces to accommodate one case side and either the solid back or the front apron and rails.



Cut the curved profile.

Start cutting the profile by first defining the edge of the spurs. Then make cuts to complete the basic profile.



Rotate the blank and cut again. Save the cutoff with the pattern drawn on it and tape it back in place to guide this second cut. The spurs will steady the leg for these subsequent cuts.



Layout lines guide the shaping. Start with a centerline on each face, then split the distance from the centerline to the edge of the leg with a line that runs from the knee to the ankle.



Chamfer the corners to form an octagon.

Use a flat chisel. To stay with the grain, always work from the convex surfaces to the concave ones.



Shave away the remaining corners.

Use a flat-soled spokeshave to cut a second, narrower set of chamfers, effectively rounding the leg.



Smooth the surface. Finish rounding the profile with a rasp and a smooth file.

Referencing from the top of each blank and factoring in the extra inch, use a combination square to mark the tops and bottoms of the mortises. Use a cutting gauge and reference from the inside corner of each blank to mark the fronts and backs of the mortises. Cut the mortises at the drill press or mortiser.

Saw and refine the shape

At the bandsaw, cut the leg's curved profile into one of the laid-out faces. Tape on the waste piece at the back of the leg and cut the other face. Be sure to save the long waste piece sawn from the post. You can use this material for transition blocks. Next, with the leg held in a bar clamp and vise, use a spokeshave to remove the bandsaw marks and smooth all four surfaces.



Trim the post. Dimension the post block with a pair of stopped cuts on the tablesaw. These cuts are made to the right and left of the fence so the inside corner of the post block is against the fence. The untrimmed waste just above the knee is removed after glue-up.



Lay out matching tenons. Clamp one of the front rails to the back panel and scribe the shoulder lines for both pieces simultaneously. Clamp the scribed rail to its mates and scribe shoulders on the remaining pieces.



Cut the joinery with a dado set. For consistency, cut face-side tenon cheeks on all of the pieces before adjusting the setup (if needed) to cut the opposite cheeks.



Mark out and cut the tenons. For the sides and back panel, you need to fashion multiple tenons from the full-width tongues. Hold each panel against its mating post and scribe the mortise locations on the tongue (above). Remove the waste with a coping saw and chisel (right), leaving a little room for the tenons to move in the top and middle mortises. This allows room for seasonal expansion of the sides and back toward the top. The transition blocks prevent downward expansion.



After cleaning up the cuts, finish shaping the leg by cutting a series of chamfers at the corners to round the profile. File the leg and scrape with a card scraper. Then trim the post blocks and cut the posts to length.

Precise joinery ensures a square case

Building the case is a challenge in precision. There are no steps or reveals to mask inaccuracies where the sides, back, or rails meet the corner posts. Everything is flush.

With the mortises already cut in the posts, the next step is to lay out and cut the tenons on all of the mating pieces. I begin with the back and the front rails. These pieces must match exactly in overall length from tenon shoulder to shoulder. This helps ensure that the case comes together squarely and cleanly, with no gaps.

It's also crucial to locate all of the tenons correctly on the thickness of the stock so that the outside case surfaces are flush with the posts when the joint is assembled. To do this



Mortise for the runners and kickers. The top rail is dovetailed into the tops of the leg posts. The author rabbets the tail to enhance accuracy when transferring the layout.



Locate the kickers and runners. They are tenoned into the front rails and apron, and those mortises can be cut by machine, but the back panel's width means its mortises must be cut by hand. The mortise locations are picked up from the dry-fit front assembly (above) and marked on both faces of the back panel. Use a ¼-in. chisel to chop the through-mortises, working in from each surface (right).



consistently, scribe the end grain for both cheeks using the outside face as a reference for your marking gauge. Set the gauge for ¼ in. to scribe the outside cheeks and ½ in. to scribe the inside cheeks.

To cut the cheeks, set the stock face-side down on the tablesaw and raise a dado cutter to just under the lower scribe line on the end of the first workpiece. Adjust the rip fence for ⅓ in. less than the tenon's length and use the miter gauge to help control the workpieces. For the intermediate front rail, use a ½-in. dado stack to remove the waste from between the twin tenons. Hold the piece vertically against a miter gauge. Use a sacrificial backer block and use the miter fence as a stop. Raise the blade to just below the scribe line before making the cut.

At the workbench, use a shoulder plane to fit the tenons to their mortises. To help keep the outer surfaces flush, avoid paring too much stock from either tenon cheek. After paring to the shoulder lines with a chisel, cut the multiple tenons from the full-length tongues on the back and side panels.

Before you can start gluing up, you'll need to dovetail the top rail, then mortise the front rails and the case back for the kickers and runners that will support the drawers. Then, with the case dry-fit, locate and fit

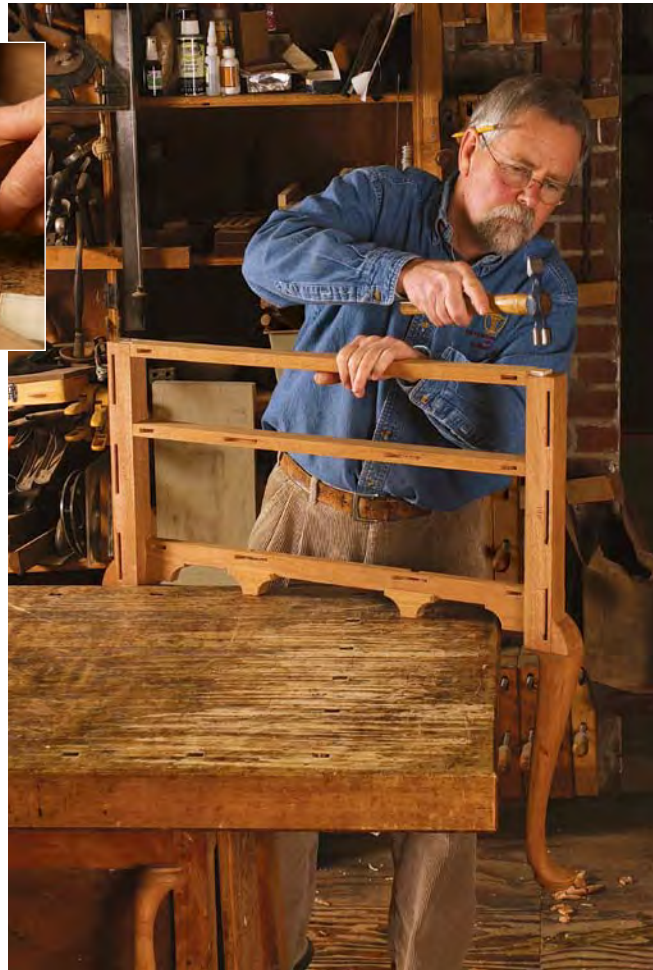


Measure to locate the drawer partitions. The whole case is dry-fit at this point (above). The vertical drawer partitions are dovetailed into the top of the apron and the bottom of the intermediate rail. The clamp helps hold the partitions in place while you knife the profile on the front surfaces of the apron and rail (left). Now disassemble the case, saw the mortise, and chop and pare to fit.



Glue up the front and back.

Apply yellow glue to both mortises and tenons. Once each assembly is in clamps, lay a straightedge across both post blocks to make sure they don't twist out of square. On the front assembly, check the diagonal dimensions and adjust the clamps to bring it into square. Glue the partitions in place after the front assembly has dried.



the dovetailed vertical partitions. Finally, bandsaw out the shape of the front apron and clean up the profile.

Transition blocks marry legs to case

Start building the case by gluing up the back and front assemblies separately. The legs transition into the case with blocks that are glued on and shaped to match the curved profile. It's much easier to apply and shape the two blocks on the front apron now than when the case is fully glued up.

Begin by holding each block in position to see whether it is flat against the apron and the back of the knee. If needed, plane the

block to fit. When this is done, draw the pattern on the front and saw the front profile, saving the offcut. Now return to the bench, hold the block in position again, and trace the shape of the leg onto the surface of the block that mates to the leg. To bandsaw this profile, set the transition block back onto the offcut and saw, staying $\frac{1}{16}$ in. from the line.

Glue the two front transition blocks in place using a rub joint and hold them with a spring clamp if needed. Use a chisel, rasp, and scraper to shape the blocks. The side transition blocks are attached and shaped in the same way, but are installed after the case has been glued up.



Add the transition blocks.
The blocks are shaped in place. After cutting the basic curves in the bottom and front of the block, glue it in place with a rub joint (above left). With the block in place, pare away excess material to reach the final, rounded shape. Start with a chisel, making a series of side-to-side passes (above right). Then use a carving gouge with a shallow profile in a series of bottom-to-top passes to blend the curve further (left).



The final glue-up. Back and front assemblies are joined by gluing the side panels into the rear posts, gluing the interior kickers and runners into their mortises in the front, and then settling the front assembly into position.



Wedge the tenons. The center runners are secured in back with wedged through-tenons. Glue the wedges and tap them home. When dry, saw them off and plane them flush.

Dry-fit the case for layout

The next step is to add the sides without glue and clamp the case snug so you can accurately fit the crossmembers that span the interior. These are the runners that support the drawers from underneath and the kickers that sit above the drawers and prevent them from tipping downward when pulled out. In the space separating the upper and lower drawers, the crossmembers serve both of these functions. Rip all of the runners and kickers and crosscut them to a little over final length.

Measure from the back side of the apron and middle rail to the inside of the back. Use a knife to mark these distances on the parts. Cut the tenons with a dado blade and fit

them. On the center runners and kickers, make handsaw cuts $\frac{1}{4}$ in. from the edge and $\frac{1}{4}$ in. from the shoulder to accept wedges for the through-tenons in the back panel. The left and right runners and kickers are notched to fit around the post blocks.

20 mortises, 20 tenons, one glue-up

The case is ready to come together. With clamps ready, apply glue to the mortises in the back legs and to the corresponding tenons on the sides. Seat the sides. Next, glue the center runners and kickers into their mortises in front, then apply glue to the front leg mortises and matching side tenons. Gently lower the front into place, taking care

to seat the unglued tenons of the runners and kickers in the rear-panel mortises. Stand the assembly upright and use bar clamps to seat the joints. Before the glue sets, check the diagonals for square. When all is square, drive the wedges into the through-tenons at the back of the case. Clamp the side runners in place, drill into them through the back, and drive wooden pegs to secure them.

Drop finials adorn the front apron

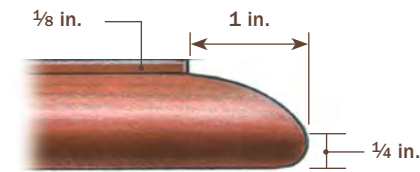
In order to create a 1-in.-sq. platform for each drop finial and collar, glue $\frac{1}{4}$ -in.-thick backer blocks to the rear of the $\frac{3}{4}$ -in.-thick front apron, matching the latter's profile. Drill a $\frac{1}{2}$ -in.-dia. hole into the center of each platform and into two blanks for the collars. Turn and sand the finials, including the $\frac{1}{2}$ -in.-dia. tenon.

To mark the size of the collar, slip it over the finial's tenon and insert the tenon into the apron. Using a $\frac{3}{32}$ -in.-thick spacer held against each edge of the platform, scribe a line around all four sides of the collar. Hand-saw to these lines and then clean up the edges with a block plane. To create the bead, bevel all eight edges, moving the piece across the bottom of a plane, then refine the curve with sandpaper. Last, glue the collar to the platform and the finial into the apron.

Crowning touch: a hand-shaped top

The two-board top has a thumb-molding profile that is characteristic for this period, and I enjoy creating it with hand tools. The top is fastened with screws through the front rail, the two top kickers, and the cleat on the top inside surface of the back panel. Elongate the screw holes in the back to accommodate movement.

Hand-Shaped Edge Profile



No router in sight. Start by using a dado blade to cut a $\frac{1}{8}$ -in.-deep rabbet. Then use a handplane to shape the profile (left). A shoulder plane allows you to work all the way into the corner (below).



Stain and shellac for a flattering finish

I finished the piece with a water-based stain (Cuban mahogany from www.wdlockwood.com) and shellac. This approach evens out variations in the color, shows the figure well, and yields a richer tone than the brassy color that natural mahogany sometimes has. Next, I applied dark grain filler to help show the pore structure and followed with a few more coats of shellac. The last step is to rub out the finish with 0000 steel wool and apply a coat of paste wax.

Arts and Crafts on Display

MICHAEL PEKOVICH



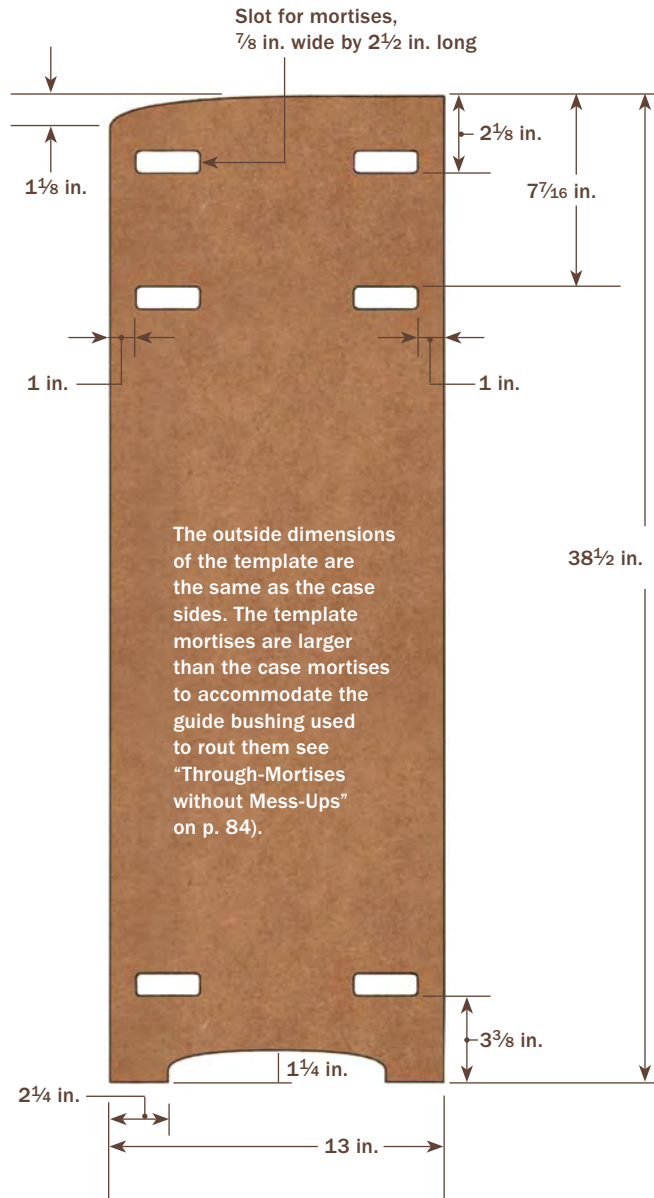
Simple is not always easy. Take Arts and Crafts furniture. Woodworkers fond of the style—with its beefy parts, rectilinear lines, and exposed mortise-and-tenon joinery—may think the furniture is easy to make. But this simple form is unforgiving of mistakes. Make one slip-up in

proportions, hardware choice, or finish, and the design falls down. I've been building Arts and Crafts furniture for a long time, and I've worked through the challenges in making a piece that's true to the style.

This case piece is an original design, yet it would not be out of place in an antique

Full-Size Template Simplifies the Sides

To cut matching mortises that align perfectly, make a full-size template from $\frac{1}{4}$ -in.-thick medium-density fiberboard (MDF). The template is quick to make using a $\frac{3}{8}$ -in. straight bit on the router table.



Stickley catalog. With its quartersawn white oak, exposed joinery, fumed finish, and hand-hammered hardware, it breathes Arts and Crafts. The leaded-glass doors are typical too and add to the handcrafted look. You can have panels made by a local artist or you

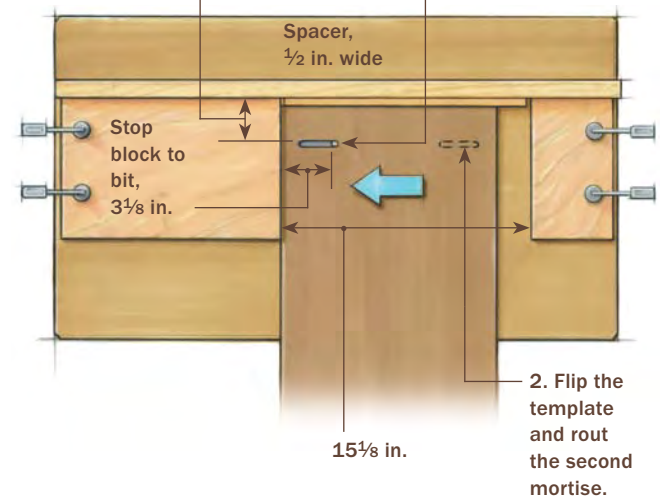


First cuts. Clamp stop blocks on both sides of the bit for the stopped cuts. With the spacer in place (see the drawing below), plunge through the template and make one pass in the first mortise slot. Just flip the template to do the opposite slot.

Stop Blocks and a Spacer Ensure an Accurate Template

Fence-to-bit distance: Top mortises, $2\frac{5}{8}$ in.; divider mortises, $7\frac{15}{16}$ in.; bottom mortises, $3\frac{3}{8}$ in.

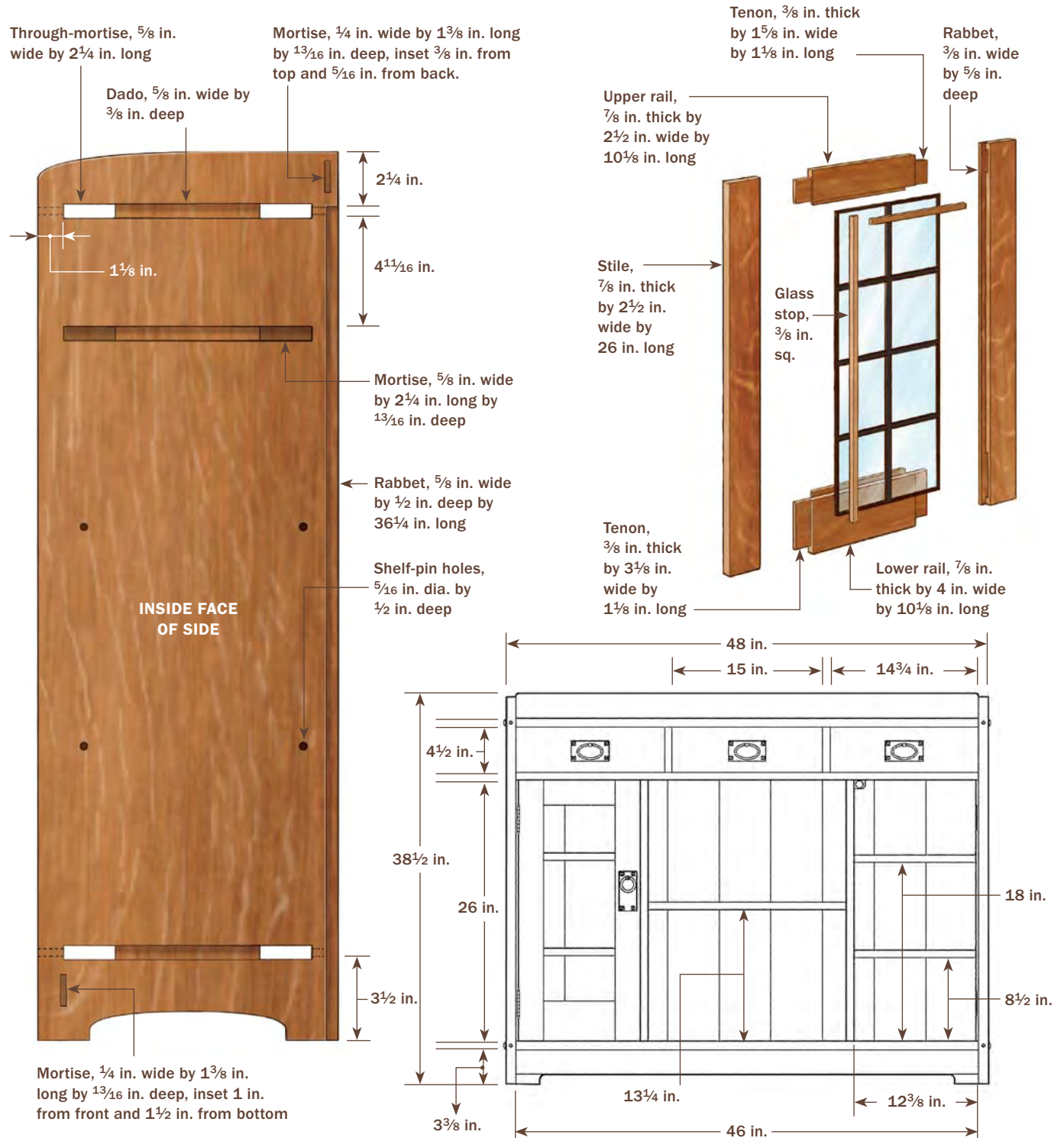
1. Drop the template onto the bit and make the first pass.



Second cuts. After the first passes, remove the spacer between the fence and template and finish routing the mortise slots. Adjust the fence and repeat the process for each set of mortise slots.

Original Piece, Traditional Design

In Arts and Crafts furniture, it's all about the wood and small details. The tight grain and magnificent ray fleck of quartersawn oak is the primary ornamentation. To give the piece a solid feel without being clunky, the author varied the thickness of the parts. The sides are a full 1 in. thick, the top and bottom are $\frac{7}{8}$ in. thick, and the remaining interior dividers are $\frac{3}{4}$ in. thick. Also, each piece is slightly inset from the other, creating subtle shadow lines.



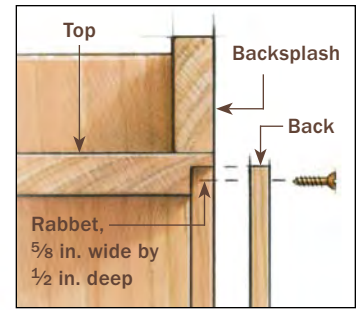
Drawer dividers, $\frac{3}{4}$ in. thick by 5 in. tall by 12 $\frac{1}{4}$ in. wide, inset $\frac{1}{4}$ in. from case front

Horizontal divider, $\frac{3}{4}$ in. thick by 12 $\frac{5}{16}$ in. wide by 47 $\frac{1}{2}$ in. long, inset $\frac{3}{16}$ in. from case front

Backsplash, $\frac{7}{8}$ in. thick by 2 $\frac{1}{2}$ in. wide by 47 $\frac{1}{2}$ in. long

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

UPPER BACK DETAIL

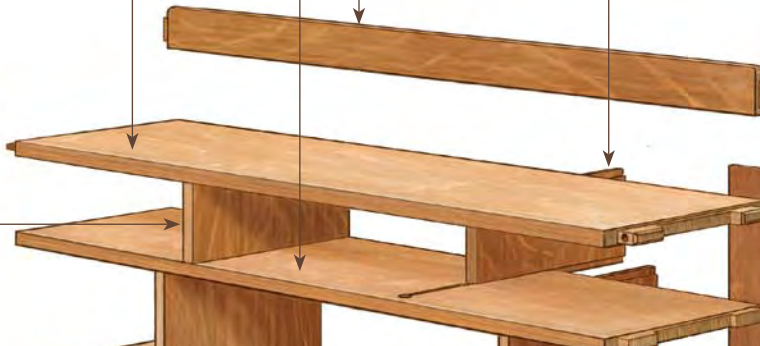


Side, 1 in. thick by 13 in. wide by 38 $\frac{1}{2}$ in. long

Top, $\frac{7}{8}$ in. thick by 12 $\frac{7}{8}$ in. wide by 48 $\frac{3}{8}$ in. long, inset $\frac{1}{8}$ in. from case front

Dovetail key, $\frac{1}{2}$ in. wide by $\frac{1}{4}$ in. long, top and bottom

Shiplapped back slats, $\frac{3}{8}$ in. thick by 5 $\frac{1}{2}$ to 6 in. wide, are screwed in place.



Lower dividers, $\frac{3}{4}$ in. thick by 12 $\frac{1}{4}$ in. wide by 26 $\frac{1}{2}$ in. long, inset $\frac{1}{4}$ in. from case front

Shelf pins, $\frac{5}{16}$ in. dia. by 1 in. long

Shelf, $\frac{3}{4}$ in. thick, notched for shelf pins

Hinge strip, $\frac{1}{4}$ in. thick by $\frac{7}{8}$ in. wide by 26 in. long, inset $\frac{1}{4}$ in. from front edge

Bottom, $\frac{7}{8}$ in. thick by 12 $\frac{3}{8}$ in. wide by 48 $\frac{3}{8}$ in. long, inset $\frac{1}{8}$ in. from case front

Sliding dovetail stops 1 $\frac{1}{8}$ in. from front of case.

Apron, $\frac{7}{8}$ in. thick by 2 $\frac{3}{8}$ in. wide by 47 $\frac{1}{2}$ in. long

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

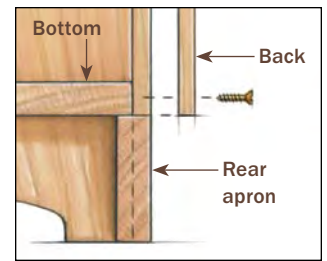
Tenon, $\frac{5}{8}$ in. thick by 2 $\frac{1}{4}$ in. wide by 1 $\frac{3}{16}$ in. long

Stub tenon, $\frac{3}{8}$ in. long

Rabbet, $\frac{5}{8}$ in. wide by $\frac{3}{8}$ in. deep

Rear apron, $\frac{7}{8}$ in. thick by 3 $\frac{3}{8}$ in. wide by 47 $\frac{1}{4}$ in. long

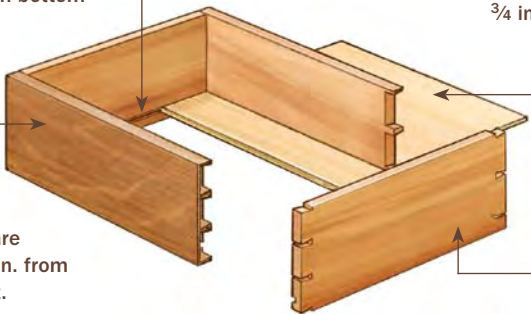
LOWER BACK DETAIL



Groove $\frac{1}{4}$ in. sq., inset $\frac{3}{8}$ in. from bottom

Drawer front, $\frac{7}{8}$ in. thick

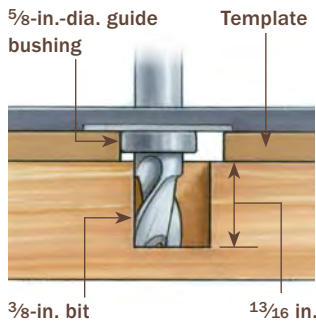
Drawers are inset $\frac{5}{16}$ in. from case front.



Bottom, $\frac{3}{8}$ -in.-thick pine, rabbeted to fit groove

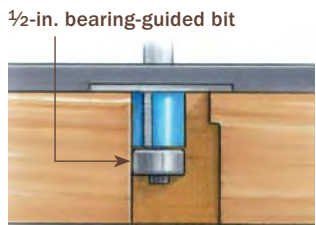
Sides and back, $\frac{5}{8}$ -in.-thick beech

Through-Mortises without Mess-Ups

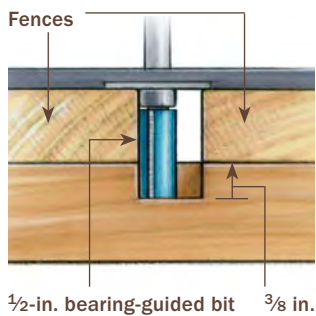


Start on the inside face.

To make it easier to hold the workpiece and template, the author uses an elevated clamping table. A bushing guides a spiral upcut bit.



The Paolini trick. To complete the through-mortises with no tearout, the author uses a trick he learned from Greg Paolini. Drill a hole through each mortise (right), flip over the piece, insert a bearing-guided bit in the hole, and rout out the remaining waste (far right).



Connect the slots.

To rout the shallow dadoes that connect the through-mortises, clamp fences on both sides of the mortises and use a top-bearing-guided bit.



TIP Place tape over the divider mortises so you don't drill through them accidentally.



Two-part tenons. The dado blade does most of the work. After cutting the tenon cheeks and shoulders with a dado set, cut the through-tenons to width, using a tall fence to support the board. The scrapwood behind the tenons backs up the cut and reduces tearout.



Saw off the stub tenon. Use the bandsaw to cut the stub tenons to length. The fence ensures a parallel cut.

can make them yourself. If you are interested in building in this style, I hope you'll find a few valuable lessons here. Also, this piece is a versatile one: I designed it to hold books and cherished items, but it could work as a sideboard, too.

When building an Arts and Crafts piece, the most important step is to choose good wood. The tight grain and magnificent ray fleck of quartersawn oak is the primary ornamentation, so don't skimp on the lumber. I found some great boards online that I supplemented with lumber from a local yard.

With a large project like this, I start from the outside and work my way in because it's easier to build the case first and fit the interior dividers after. The top and bottom of the case attach to the sides with through-tenons. To help keep the case square and the wide boards flat, I added a stub tenon between the through-tenons.

The through-tenons are prominent features of the design, so you must get them right. For clean cuts and no gaps, I fitted the router with a guide bushing and straight bit and cut the mortises using a full-size template (see "Through-Mortises without Mess-Ups" and photos on the facing page). Then I cut the dados between mortises for the stub tenons. Finally, I squared up the mortises with a chisel.

To cut the remaining mortises for the backsplash and the lower apron, attach a fence to the router and use a spiral upcut bit. Then square them with a chisel.

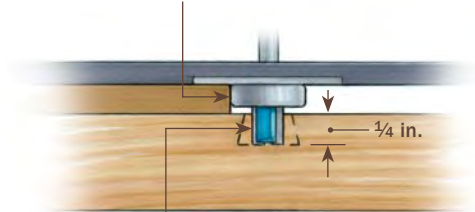
Once the mortises have been cut, cut out the foot recess and profile the tops of the sides. Clean up the cuts with a block plane, a spokeshave, and files. The last task is to drill holes for the tenon pins. For this, I used a doweling jig to help keep the bit aligned.



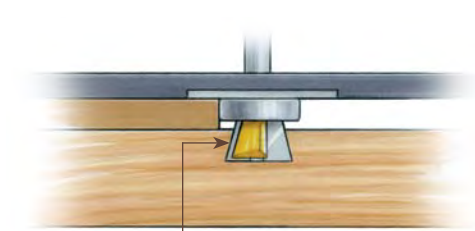
Use a fence to guide the slot cuts. To ensure that the dovetail slots are parallel, clamp a medium-density fiberboard (MDF) fence to the workpiece to steer the router's guide bushing.

Sliding Dovetails Made Easy

5/8-in.-dia. guide bushing



1/4-in. straight bit



1/2-in. dia. 14° dovetail bit



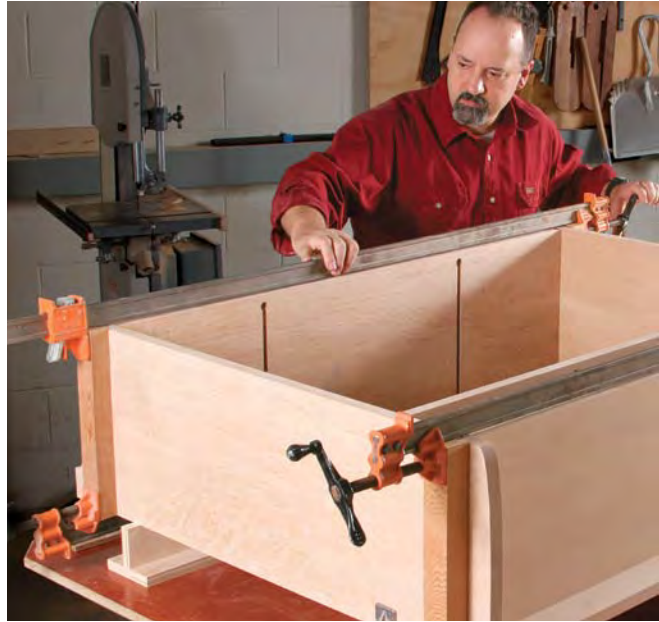
Remove the waste. Drill a 1/2-in.-dia. hole at the stopped end, then rough out the slot using a 1/4-in. straight bit. The 1/4-in. piece of MDF opposite the fence prevents the router from tipping.



Final cut. Use a 1/2-in. dovetail bit to finish the slot. The hole at the end of the slot lets you drop the bit into the cut before turning on the router. The hole will be hidden by the divider.



Glue-up without screw-ups. The case glue-up involves eight pieces. That many solid parts can be a pain to assemble and align during a single glue-up. So assemble the piece in stages. Start with the backsplash and apron first. Dry-fit the case to ensure proper alignment when gluing the backsplash and apron to the case top and bottom. These parts will help keep the case square in the later stages.



Top, bottom, and sides. Use grooved clamping cauls over the through-tenons to get pressure where it's needed (far left). Place the case on T-supports to make clamping easier (left). Be sure to keep glue off the ends of the through-tenons.

Crosspieces must line up shoulder to shoulder

Now it's time to cut the tenons on the top, the bottom, the horizontal divider, the backsplash, and the apron. These parts have three different tenon lengths among them, but they all have the same shoulder-to-shoulder length. To ensure the case remains square, it is critical to get this dimension exactly right.

To help, I use a trick I learned from contributing *Fine Woodworking* editor Steve Latta. Cut the parts all the same length, and then cut the tenon shoulders using the same setting on the tablesaw. Test the fit, and then trim the through-tenons to width. Next, cut

the stub tenons to length using a bandsaw. Once you're sure everything is fitting well, trim the through-tenons to their final length and chamfer their ends.

Now rout the slots for the stopped sliding dovetails that connect the vertical dividers to the top, the bottom, and the horizontal divider. Then cut the rabbets in the sides and top for the back panel.

Assembly: keep it square

It's critical that the case remains square as you assemble it. Otherwise, you'll be fighting to fit the doors and drawers. To simplify the glue-up and to help keep the case square, I first glued the backsplash and apron to the



Vertical dividers. After cutting the dividers to length, use the dovetail bit to cut the keys. A tall fence supports the long boards and a featherboard keeps the piece snug against the fence.

case top and bottom, respectively. Then I glued up the sides, top, and bottom.

After the glue is dry, drill holes through the tenons and dry-fit the pins. Cut the pins to length and chamfer the exposed end of the pins before gluing them in.

Once the case is assembled, cut the vertical dividers to length and rout the dovetail keys on the ends, using the same dovetail bit used to rout the slots. After installing the dividers, cut and fit the shiplapped back panels.



Long sliding dovetails with no binding. The trick is to slide in the dividers from the back almost all the way without glue, leaving about 2 in. exposed, and then apply glue to that exposed end and into the slot at the front. Now you can drive the divider home with a mallet.

Build the drawers and doors

With the case glued up, it's time to build and fit the drawers and doors. All three drawer fronts are cut from one board for continuous grain and color. Original Stickley pieces typically use white oak for the drawer sides as well, but I chose beech because of its dense, fine grain.

The doors are rabbeted for simple leaded-glass panels. I wanted them to be inset $\frac{5}{16}$ in. from the front of the case, which means I couldn't hinge them directly to the case sides. So I added $\frac{1}{4}$ -in.-thick hinge strips to the inside of the case, inset $\frac{1}{4}$ in. from the front edge. The strips provide clearance for the doors to open and it's easy to cut the hinge mortises before installing them.

Fumed Finish Made Easy

Fuming wood involves exposing it to ammonia fumes, which react with tannins in the oak to darken its color. The longer the wood is exposed, the darker it becomes.

Most people build a complicated tent to house the workpiece and contain the ammonia fumes. But I just drape plastic sheeting over the piece. It works as well as the tent and makes it easier to take the cover off the ammonia once it's safely inside. The sheeting also makes it easy to remove sample blocks to check the finish.

Though my method is low-tech, I still treat the ammonia carefully because it's a toxic chemical that can damage your lungs, skin, and eyes. Be sure to set up the fuming area in a low-traffic, well-ventilated area. Wear goggles and gloves when you're pouring it, and be sure to wear gloves when you take the lid off the container once it's under the plastic. Also, when you remove the sheeting, it's a good idea to run a fan in the space to help ventilate the area. The good news is that the fumes dissipate quickly.



Respirator not required.

Drape plastic sheeting over the piece as a tent. Then put the ammonia in a covered container and slide it under the tent. Wear gloves when you reach under the cover to remove the lid.

How to dial in the color.

The effect won't be apparent until finish is applied, so it's a good idea to throw in a few sample blocks, remove them at hour intervals, and wipe on some finish to preview the final effect.



Warm it up. Fuming imparts a greenish-gray cast to the wood. The author warmed up the look with a coat of garnet shellac before applying Waterlox. He rubbed out the finish with steel wool and brown wax made from melting Kiwi brown shoe polish into paste wax using a double-boiler setup.

Details that would make Stickley proud

No matter how true you are to the Arts and Crafts ideals when you build a piece, you can kill the design if you choose the wrong hardware or mess up the finish. For this piece, I chose traditional hand-hammered hardware (the hinges were from Horton Brasses www.horton-brasses.com, part no. PB-409B) and fumed the wood before applying a topcoat. Fuming may intimidate people, but I've developed a low-tech method

(for details, see "Fumed Finish Made Easy" above).

After fuming, I warm up the wood with a coat of garnet shellac. Then I switch to Waterlox®, a wipe-on tung oil varnish. The last step is to rub out the finish with steel wool and apply a dark wax. This fills the open pores of the oak and pops the rays.

Now screw on the back slats, add the glass panels to the doors, install the traditional hardware, and the piece is ready for your living room.



The Versatile Huntboard

GARRETT HACK

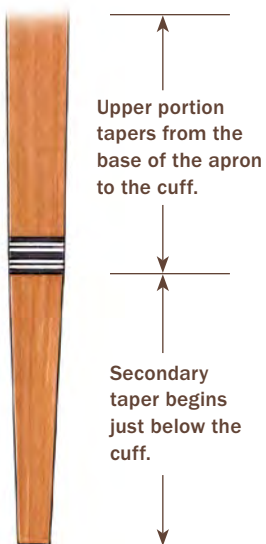
The huntboard is a wonderful furniture form, a relaxed country cousin to the more formal and high-style sideboard. It's essentially a tall serving table, with drawers and doors for storage of dinnerware. I've long admired the form, so for one year's annual auction of the New Hampshire Furniture Masters, I decided to design and build a cherry huntboard.

Typically, when designing furniture, my first thoughts are about form, proportion, shape, and detail. But versatility also can be an influence, especially for speculative work.

I want potential bidders to see what they need—a sideboard in this case—but I also think my work could have many lives beyond the one I design for. This piece would be at home serving as a desk or a display table in a foyer or hallway.

The focus of my design is the three central drawers, with flanking doors adding a sense of balance. The case itself is deep and tall and is engineered to withstand the weight of a collection of flatware and dinnerware. It's also designed to withstand seasonal wood movement.

Leg Tapers



Start with the legs.

The foot of each leg is highlighted with a cuff-banding inlay and a secondary taper that give the piece a light, elegant appearance. After cutting the primary tapers on the bandsaw, miter and glue in the cuff-banding sections (1). Cut the secondary taper on all four sides, staying well clear of the cuff. Refine the taper with a handplane. Make guide marks just below the cuff (2) and at the toe of the foot, then plane until both marks are gone (3).

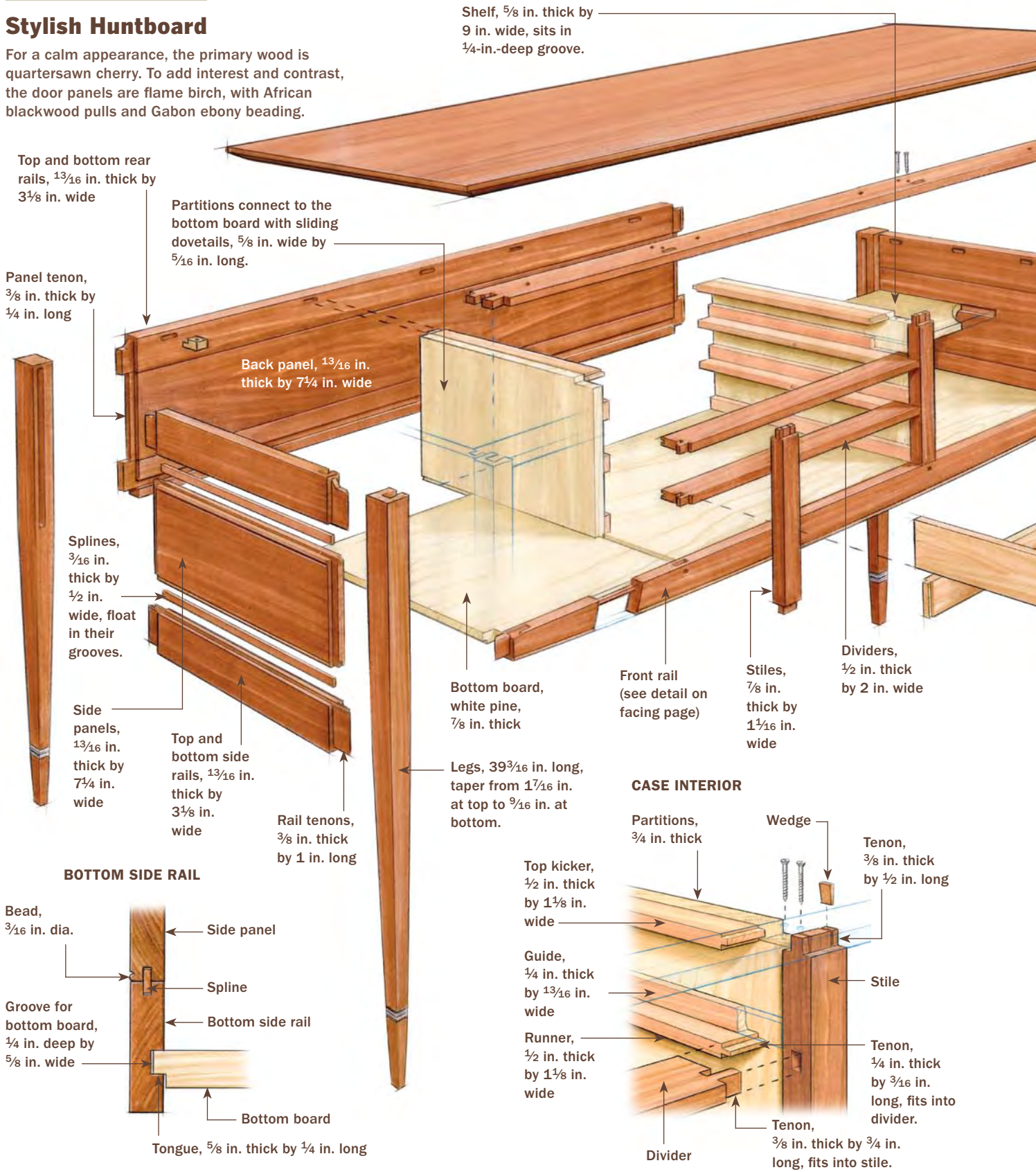


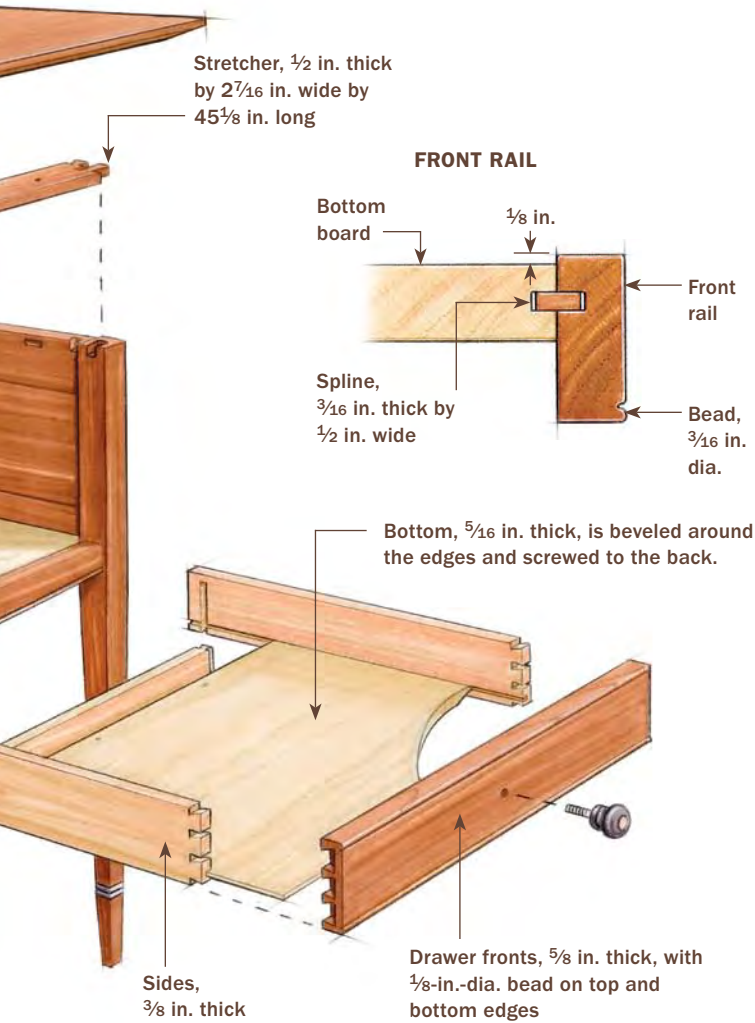
Assembly note.

The huntboard glue-up is complex. It's easiest to start by assembling the side aprons and the legs. But glue only the front legs in place at this stage—you'll need to remove the rear legs for a later step (see p. 95).

Stylish Huntboard

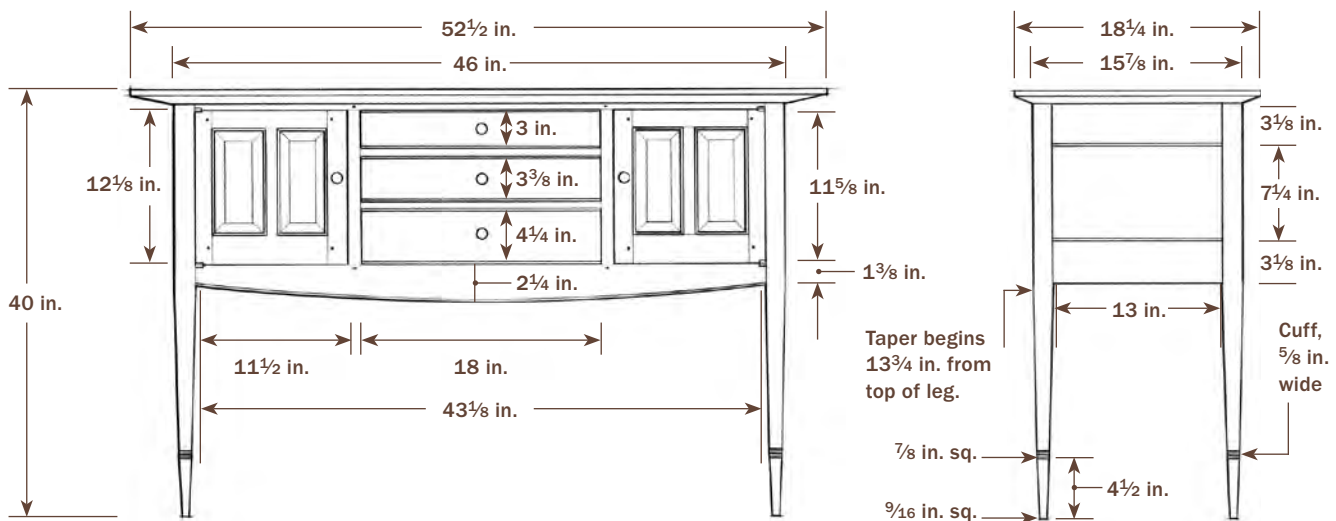
For a calm appearance, the primary wood is quartersawn cherry. To add interest and contrast, the door panels are flame birch, with African blackwood pulls and Gabon ebony beading.





Fitting a critical joint.

The front stretcher is rabbeted and dovetailed to the legs and side aprons to help stabilize the case against racking forces. Begin by marking the shoulders of the rabbet with the case dry-assembled (top). Cut the stepped rabbet using a backsaw and chisels, then saw the dovetails (middle). Set the stretcher in place and scribe for the dovetail housings in the leg and apron (bottom).



Shape the legs and add the banding

In designing the legs of the huntboard, I used a full-size mock-up to help me gauge where they needed refining. After all, visual strength is just as important as actual strength. Once I completed the mock-up, I used it to lay out and cut the real legs as well as to lay out the cuff banding and mortises. Cut the legs on the bandsaw and refine the shape with handplanes.

After cutting all of the mortises and the primary taper in the legs, install the cuff banding. Although you can make your own custom banding, ready-made banding is available (www.vandykes.com, www.woodcraft.com, and www.rockler.com). Cut the dadoes that house the banding using either a router or hand tools. Each section of banding is mitered using a 45° guide block and chisel; the block is also used to miter the door beading. After the banding is glued in place, level the sections with a block plane, then plane a tapered toe from the cuff to the floor.

Assemble the side and rear aprons

One of the most challenging aspects of this design is planning for the inevitable seasonal movement of the 13½-in.-wide aprons. Cherry boards that wide will move significantly, increasing the potential for cracking the case, opening a gap where they meet the top, and pinching a drawer or a door.

A simple and attractive solution is to make each apron in three parts: a top and bottom rail and a center panel, joined with cherry splines but no glue. The tenons of the rails are glued into the legs, while the stub tenons of the panel float in their mortises. As a decorative element, and to disguise small gaps that

will open during the dry winter months, I cut beads in the center panel where it meets the rails (see “Bottom Side Rail” on p. 92).

The most accurate way to cut the tenons and shoulders on the three parts of each apron is to dry-assemble them with the splines and cut them all at once, holding the pieces together with masking tape. Clean up the shoulders with a shoulder plane, then take apart the assembly and trim the center panel tenons down to ¼ in. long. Now, cut the miters and haunches in the longer tenons of the rails. Finally, cut a groove in the bottom rail to accept the tongue of the bottom board.

Fit the front rail and stretcher

When the aprons have been fitted, it's time to cut, shape, and fit the bottom front rail. Also, cut the slot in the rail for the spline that connects it to the bottom board, and scratch the bead along the bottom edge.

The front stretcher is dovetailed into the top of the front legs and into the top of both side aprons just behind the legs (see the photos on p. 93). For accuracy, dry-assemble the case and place the rail in position. Lay out the location of the shoulders and dovetails and then cut them. Place the rail back in position, mark the dovetail housings, then rout and chop them out. Finally, cut the mortises for the two kickers of the top drawer into the back edge of the stretcher. Also, cut the mortises for the knife hinges in the stretcher and the bottom front rail.



Attach the front rail to the bottom. Glue the spline into the bottom board, then add the front rail. Be sure all of the joinery lines up before clamping.



Glue the drawer stiles and dividers to the front rail. Assemble the stiles and dividers, then fit them into the front rail as a unit.



Slide in the interior partitions from the back. Glue will help the tapered pins slide. Clamp the partitions, then let the glue dry before going any further.



Attach the case to the rear assembly. After gluing the front legs and side aprons to the case, slide the shelf into position and drop the carcass into place.



Add the top stretcher and kickers. With the case upright on the floor, install the stretcher. This is tricky because you have to glue in the kickers for the top drawer at the same time. The stiles of the drawer frame are tenoned into the stretcher. Drive wedges into the tenons, then screw the stretcher to the interior partitions.

Thick stock and solid joinery create a stiff structure

With a huntboard, it's possible that many heavy items will be stored in the drawers and compartments. To make the case quite stiff and sturdy, the bottom board and the top are thick, and strong joinery in the face frame and interior partitions helps tie the top and bottom together.

The face frame and the drawer runners and dividers are joined with mortises and tenons while the interior partitions connect to the bottom board with sliding tapered dovetails (the slots and pins are wider at the back and narrower toward the front). Tapered dovetails ease assembly but still provide a strong mechanical joint.

To cut the dovetail slots in the bottom board, dry-fit the face-frame assembly and the bottom rail. Connect the bottom board with the spline and mark out the dovetail-slot locations. Remove the bottom board and cut the slots. Clamp a fence to the board and remove most of the waste with a straight bit. Then finish with a $\frac{5}{8}$ -in. dovetail bit. Taper the slot by shifting one end of the fence over by about $\frac{1}{16}$ in. and then running the dovetail bit through the cut again.

Use a router table when cutting the dovetail pins in the partitions. Be sure to leave the partitions long for now, as trial and error is the only way to set the pin cut for a perfect sliding fit. I use a side rabbeting plane to taper the pins to fit, though you also could use a paring chisel.



Build doors and drawers after glue-up

When all the partitions have been cut and fitted, dry-assemble the piece, then lay out and cut the slots in the partition and side apron for the shelf that's tucked behind one door. Also, lay out and cut all the mortises



Jig creates perfect bead stock. The jig is a piece of $\frac{1}{2}$ -in.-thick plywood with two fences spaced the width of a block plane. The plane rides on identical shims, ensuring uniform thickness. A brad in front of the beading holds it in place.

for the buttons that secure the top as well as the mortises in the rear apron for the two top-drawer kickers. Once you're sure everything is fitting nicely, get ready for the glue-up.

There are a lot of pieces to put together here, so to make the job easier, assemble the case in steps. After the case is glued up, cut the top to final dimensions, shape the under-beveled edge, and secure it in place with buttons and screws.

Finally, after building the doors, assembling the drawers, and turning and installing the knobs, the piece is ready for finishing.

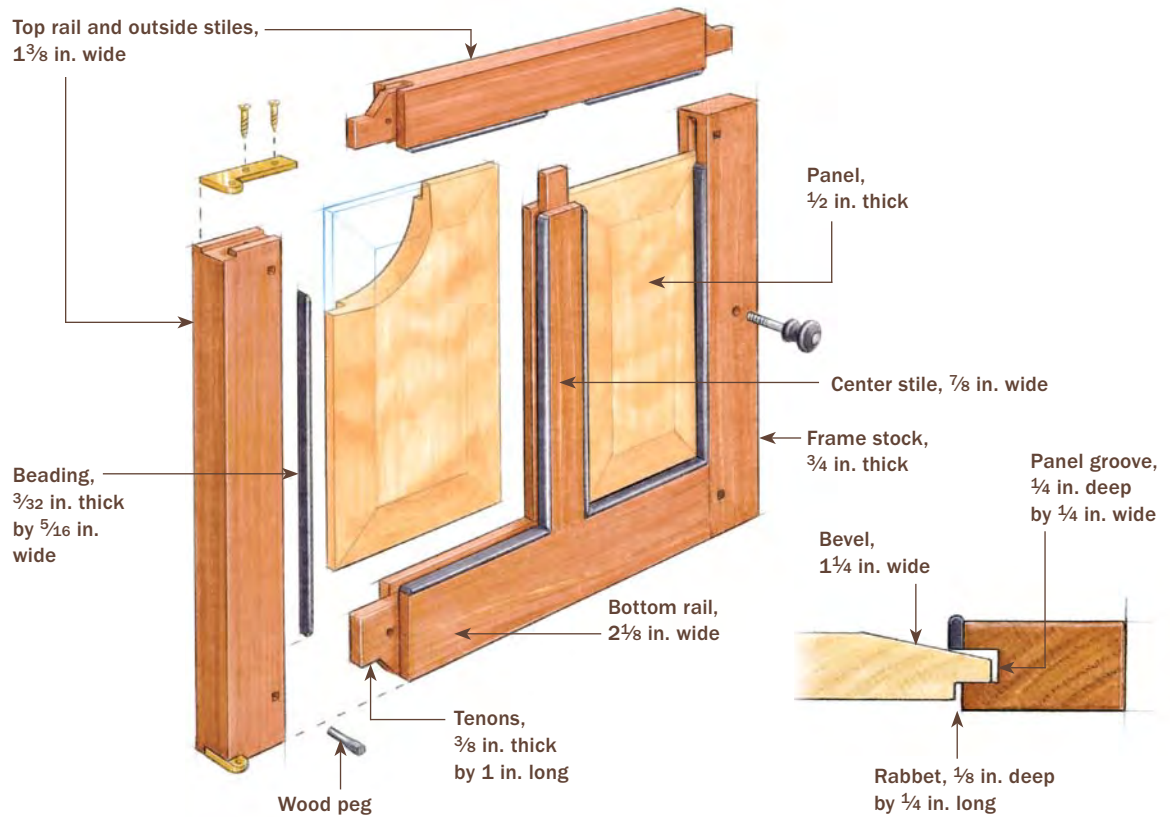


Glue the beading to the frame. The beading should be proud of the outside of the frame. Use plenty of clamps and a caul to ensure a good bond.



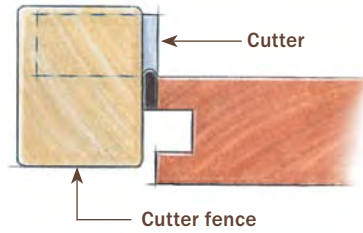
Simple jig for perfect miters. Clamp a 45° guide block to the frame members and chop the beading to length.

Doors Feature Contrasting Beading





Scratch the Bead



Run a simple scratch stock along the beading. You're done when the cutter just starts to bite into the frame.



Cut the panel grooves, then assemble the door.

Cutting the grooves after the beading is applied ensures a flush fit between panel and beading. Trim the horns after the glue dries.

Nothing beats the dazzle of shellac

To bring out the rich color of the cherry, I started with a light coat of oil/varnish. Once dry, I padded on many layers of orange shellac (1-lb. cut) using a clean cotton rubber,

rubbing it out between coats with 0000 steel wool. A final ghosting with a rag with just vapors of alcohol leaves a beautifully smooth finish. A topcoat of wax is the final and renewable protective finish.

Wall Cabinet in Cherry

MATTHEW TEAGUE



Most every home has a narrow wall—usually at the end of a hallway or beside an entry door—where nothing seems to fit. This piece was designed for such a space. I keep tall vases in the cabinet and candles in the lower drawer, but it can be adapted easily to all sorts of needs. Add a few drawers, and you have a good spot for sewing supplies. With more shelves, this piece makes a handsome spice cabinet; the lower drawer is perfect for storing teas or loose spices.

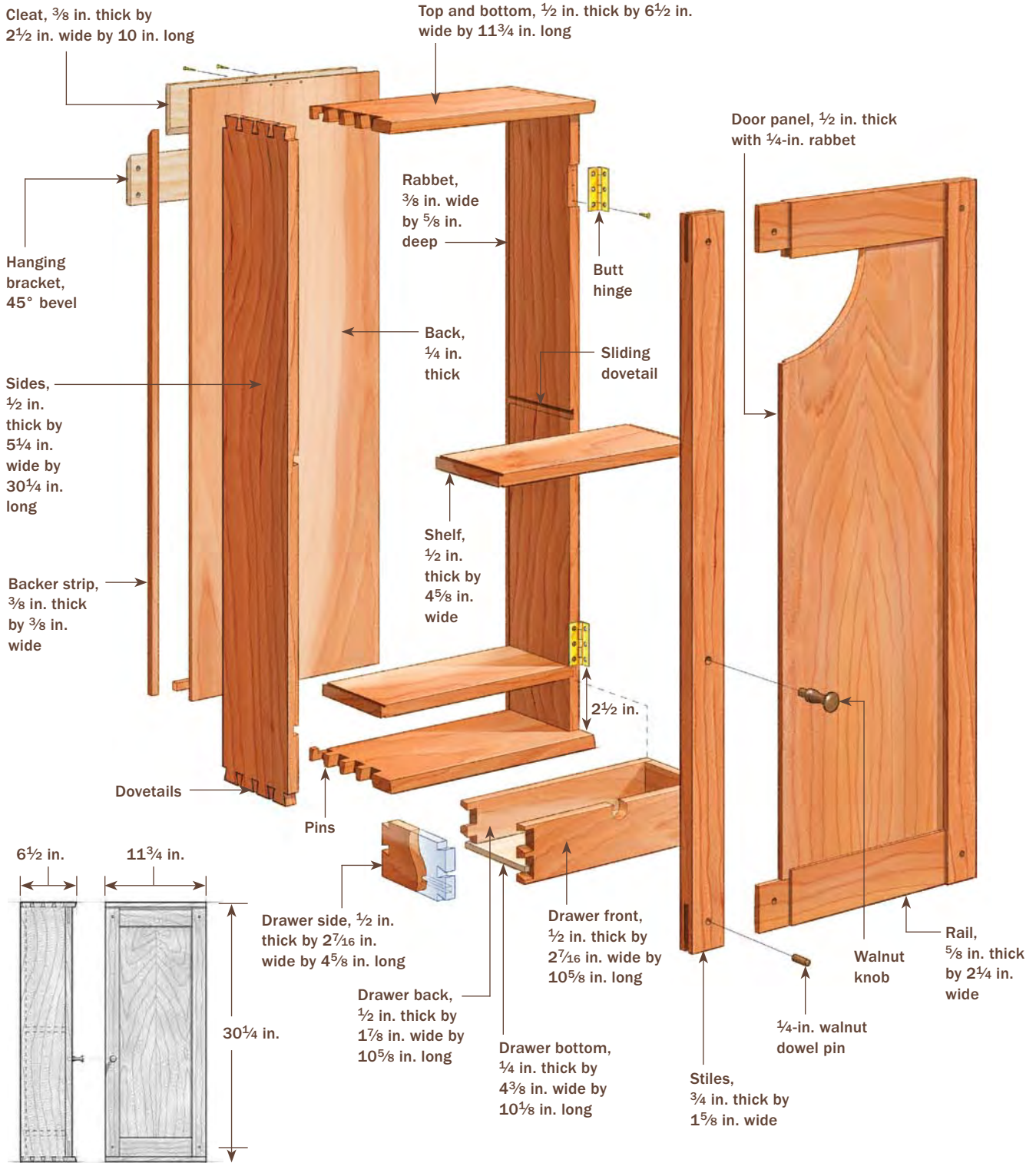
Instead of using elaborate moldings, raised panels, or an arched door, this cabinet design highlights the basic joinery that is the standard in quality woodworking. Traditional dovetail joinery holds the case together, while sliding dovetails lock the shelves into place. The door is a simple frame-and-panel assembly, but I chose bridle joints instead of traditional mortises and tenons because the exposed joinery complements the through-dovetails on the case. Instead of cutting a raised or fielded panel, I opted for the clean look of a flat panel.

An efficient method for dovetailing the carcass

I cut the dovetails with a combination of traditional methods and power tools. The tails are cut first, using a $\frac{1}{2}$ -in. by 14° dovetail bit and a shopmade sled that is run against a fence on the router table. The first and last pins should be inset about $\frac{3}{8}$ in.

Cherry Cabinet

The small size of this project makes it ideal for practicing dovetails and learning a quick and handsome frame-and-panel joint.





Lay out the tail centerlines. A single line is all that's needed to mark the tail centerlines (above). On the tablesaw, use the miter gauge with a tall auxiliary fence to make a sawcut at each centerline (right).



Cut the dovetails on the ends of the case sides. Using the router table equipped with a dovetail bit and a sled to support the stock, the author cuts the dovetails in short order.



Mark the pins with the tails. Use a marking knife to scribe the pin lines on the ends of the top and bottom.



Hand saw the pin lines. With the knife lines as a reference, use a dovetail saw to cut along each pin line.



Rout away the waste. After clamping a backer block flush with the top edge of the top or bottom piece, use the router and a straight bit to cut close to the dovetail-saw cut lines.



Trim the excess. After routing, a thin web of wood sometimes remains in the pin. Use a chisel to remove the web and shave away excess stock as needed.



Test the fit. Good-fitting dovetail joints should go together with only moderate hand pressure or a little persuasion from a mallet.

from the ends, with the other three pins spaced evenly between them.

Using this cutting method, you need only mark the centerline of the cuts and set the router bit to the exact height of the mating stock. This is a lot of material for the router

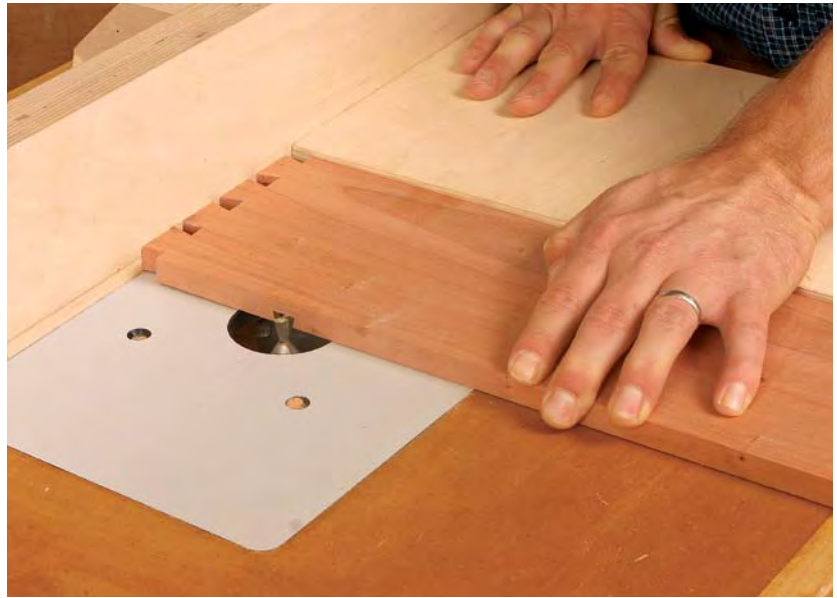
bit to remove in one pass, so I remove a little at the tablesaw first. Holding the stock upright against the miter gauge or crosscut sled, I take a single pass split on each centerline at the tablesaw. The rest of the stock is cut with a single pass through the router bit. Be sure that you clamp the stock to the sled before routing, but don't worry if the tail spacing is slightly irregular; any irregularities in the work will actually do a better job of mimicking traditional hand-cut joinery.

To start cutting pins, use a marking gauge set to the thickness of the sides and mark both ends of the top and bottom to establish the baseline of the dovetails. Clamp the pin stock in the vise, align the ends squarely, and use a marking knife to mark out the pins from the tails. Then trace all the cut lines with a pencil so that they will be easier to see when cutting. Saw the pins by hand, then clean up the excess stock with a router set to cut as deep as the top and bottom are thick.



Sliding dovetails are easy on a router table.

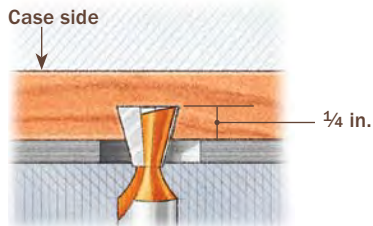
The router table and a single dovetail bit are used to cut the dovetail grooves in the sides and the dovetail on each end of the shelves.



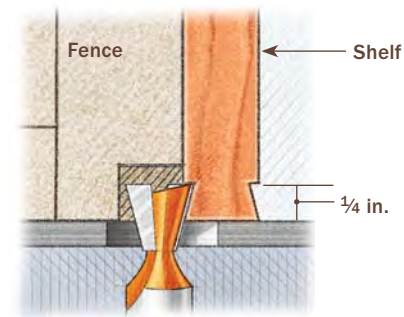
No Need to Change the Bit Height

The router-bit height is the same no matter if you are cutting the dovetail groove in a side or the dovetail on the ends of a shelf.

ROUTING THE CASE



ROUTING THE SHELVES



Create the groove. Cut the dovetail groove with the case side flat on the table. Use a pusher board to feed the workpiece and to keep it square to the fence (above). Position the shelves vertically against the fence to cut the tails (left).

To rout out the bulk of the waste and establish a baseline for the tails, use a simple right-angle jig or large backer block clamped to the end of the stock; the block is used to help register the base of the router as you remove the waste.

Once the pins are cut, you'll probably need to trim a little here and there. It's best to trim the pins instead of the tails, which have a tendency to split as you pare them to size. Once trimming is complete, the pins and tails

should fit together with firm hand pressure or a few light mallet taps.

If you've got the hinges in hand, go ahead and mortise the sides of the case to accept the hinges. You could do this later by hand, but it's easier to do now with a router.

Sliding dovetails secure the shelves

At this point, you're ready to cut the sliding dovetails that hold the shelves. Again, start by marking out the centerlines of the shelf locations on the case sides. It's a good idea to remove a little of the stock at the tablesaw before routing.

Cut the dovetail grooves first, then assemble the case

Because this is such a small cabinet, I cut the dovetail grooves on the router table. Use the same bit you used to dovetail the carcass. Position the bit in the router table so that about ¼ in. is exposed, and use a square backer board. The pusher board not only holds the case sides square to the fence, it prevents tearout as you rout the tails. Once the dovetail grooves are cut on the case sides, you can assemble the case. Be sure to glue it on a flat surface. After the clamps go on, double-check to make sure the assembly is square.

Cut the shelves to length and rout the dovetails on each end

With the case assembled, mark the shelf length directly from the case. Measure for a snug fit. Use the router table to cut the tail on each end of each shelf. There's no need to change the height setting from the dovetail-groove cut made earlier in the case sides.

Adjust the router fence so that only a small edge of the bit is exposed. Rout the tails on the ends by taking a pass on each face using the same jig you used to rout the dovetails

on the case. Use a piece of test stock and adjust the fence in small increments to sneak up on a good fit.

When you're satisfied with the fit, rout each side of the two shelves and slide the shelves into place. A drop of glue at the front and back of each shelf—applied as the shelf slides into the dovetail grooves—is all you need.

Rabbet the case to accept the back

After the case is glued up, I use a rabbeting bit on the router table to cut a ⅜-in.-wide by ⅝-in.-deep rabbet around the back of the case. To minimize the chance of splintering, stop the cut just short of each corner, then complete the rabbet with a bench chisel. Also, it's best to take about three light passes instead of trying to hog off all the stock in one pass.

The back is nothing more than a ¼-in.-thick panel glued and brad-nailed to the center of the top, bottom, and shelves. The back must be free to expand and contract with changes in humidity, so limit the glue to an area about 2 in. wide. Small strips of ⅜-in.-sq. stock are glued to the sides of the rabbets on the back of the case to secure the panel.

Mount case to wall with cleats

I used a simple two-piece cleat to hang the cabinet (see "Cherry Cabinet," on p. 119). When the cabinet is hung, the pieces interlock for a tight fit against the wall.

Attach one piece to the cabinet so that it butts against the underside of the case top. Use a couple of screws spaced about 2½ in. apart and drive them into the back edge of the cabinet top. Apply a coat of glue between the screws.



Quick door frames on the tablesaw. With each stile and rail connected by a unique version of the mortise-and-tenon called a bridle joint, the door frame enjoys plenty of strength and good looks. To start, cut the tenon shoulders on the rails. After grooving the frame members and mortising the stiles, use the tablesaw to establish the tenon length on each rail.

Add the shelves. After the case is glued and clamped, the shelves are slid into the grooves. For easier assembly, the author applies glue to the back half of the grooves and the front half of the dovetails.

Shadow lines make a simple door interesting

To build the door, the frame is grooved first at the tablesaw and then the joinery is cut on the tablesaw using a tenoning jig. The jig can be either aftermarket or shopmade. I cut the open mortises on the stiles first, then cut the rail tenons to fit.

When the joinery has been cut, plane down the front face of the rails an extra $\frac{1}{8}$ in. so that they will be slightly inset on the stiles.

The simple flat panel for the door is cut from $\frac{1}{2}$ -in.-thick stock, then rabbeted to fit into the frame. Start by gluing the center of

the panel to the center of both rails. Add a few drops of glue to the mortises, then slide the stiles into place on the rails and panel.

Once the door is together, pegging the joints will strengthen the assembly and help frame the cabinet visually. For contrast, I used $\frac{1}{4}$ -in. walnut dowel pins. To add the pegs, simply drill a $\frac{1}{4}$ -in.-dia. hole just shy of the door thickness, then tap a length of dowel into the hole. The excess can be sawn off and then chiseled flush to the front of the door.

After assembling the door, test the fit against the case. If the assembly went to-



Cut the tenon cheeks. With a tenoning jig supporting the rails on end, cut each tenon cheek. The jig also is used to cut mortises on each end of the stiles to accept the tenons.



A dowel pin adds an interesting detail and a little extra strength. Drill a $\frac{1}{4}$ -in.-dia. by $\frac{5}{8}$ -in.-deep hole in the front face of the door, centered on the bridle joint, then glue a dowel pin into the hole.

gether square, you should have a perfect fit. If necessary, trim it for a tight fit on the case using either a plane or the tablesaw. Because you've already mortised the case for the hinges, all that's left is to cut the mating hinge mortises in the door. I use a router to cut mortises, but a chisel works as well.

Adding a drawer

The lower drawer inside is joined using through-dovetails at both the front and back. You can use the same dovetailing method you used for the case.

I drilled an off-center $\frac{7}{8}$ -in.-dia. hole into the drawer face to serve as a finger pull. The hard edges on the finger pull are softened with a knife, and the whittled surfaces are a nice surprise when someone opens the drawer for the first time. Without fail, they pull out the drawer and take a closer look. That closer look is as near to a trophy as a woodworker gets.

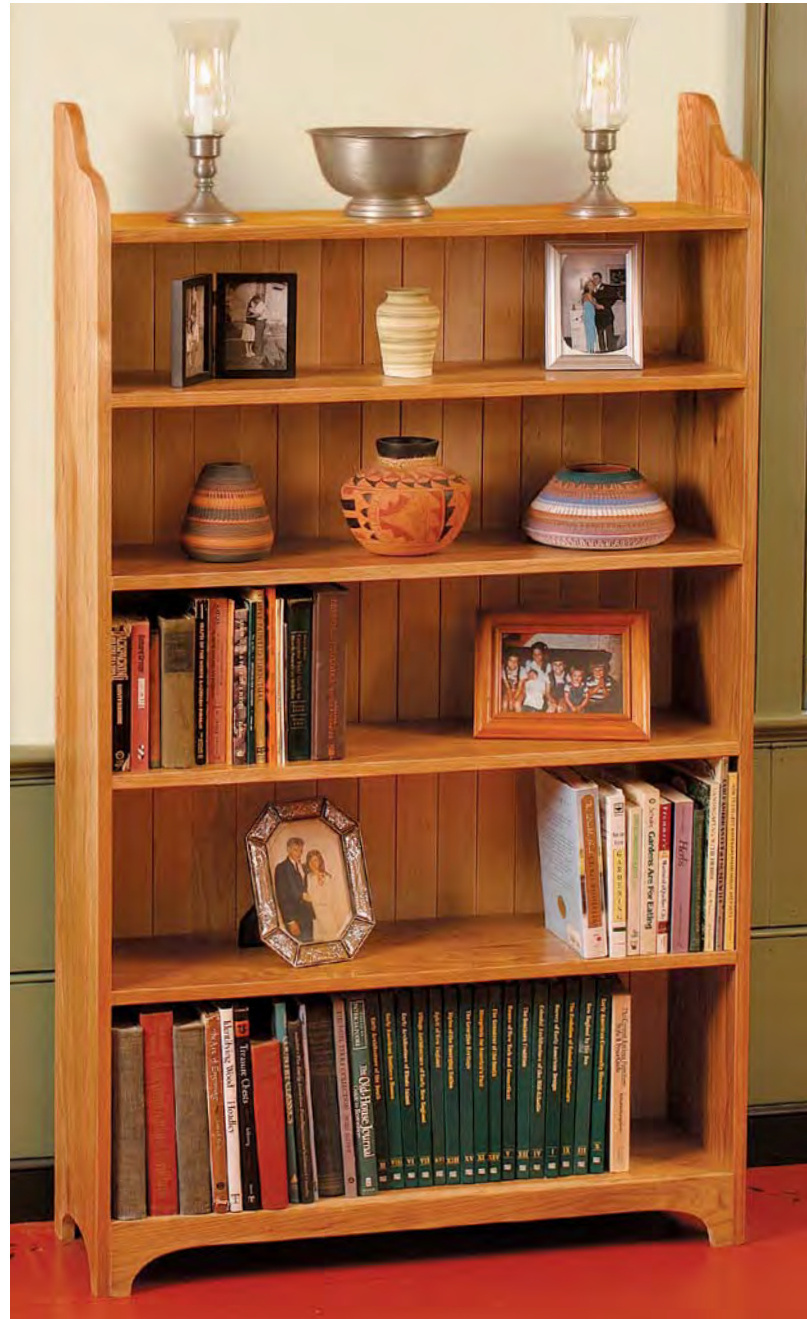
Quick, Sturdy Bookcase

MARTIN MILKOVITS

In my home, bookcases show up in every room, serving not only as places to store our growing collection of books but also as places to display art and other items of interest. This butternut-and-maple bookcase is a versatile piece, big enough to hold a good number of books and/or collectibles while small enough to fit in almost any room.

The design is understated, with bracket feet and gentle curves along the tops of the sides, and maple back boards contrasting softly with butternut sides and shelves.

But you can use this construction method to build a bookcase in any style. The shelves are attached to the sides with sliding dovetails, which provide a mechanical connection that will never pull apart. Sliding dovetails also are used to connect cabinet tops to bottoms, to join vertical partitions to shelves, to attach molding to case sides, to connect breadboard ends to tabletops, and to attach drawer fronts to sides. In this case, I stopped the dovetails for a clean look on the front of the piece. The back boards are shiplapped to allow for wood movement.

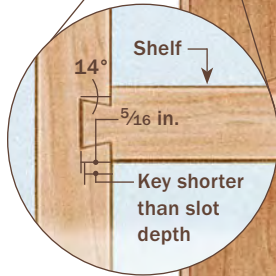


Simple but Strong Anatomy

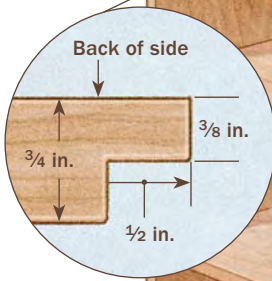
This butternut-and-maple bookcase can hold a heavy load of books. The tapered sliding dovetails that connect the shelves to the sides create a powerful wedged joint and eliminate the need for clamps during assembly. All of the parts are made of $\frac{3}{4}$ -in.-thick stock, except for the back boards (see detail).

Sides, $\frac{3}{4}$ in. thick by $10\frac{1}{2}$ in. wide by 64 in. long

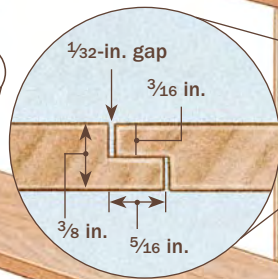
DOVETAIL



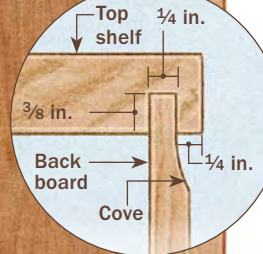
SIDE RABBET



SHIPLAP



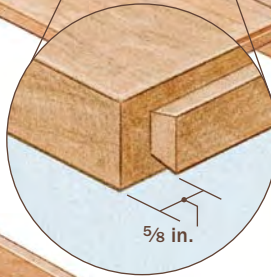
Top shelf, $10\frac{1}{2}$ in. wide



GROOVE FOR BACK BOARD

Shelves, $\frac{3}{4}$ in. thick by 10 in. wide by $34\frac{1}{2}$ in. long, shoulder to shoulder

STOPPED DOVETAIL



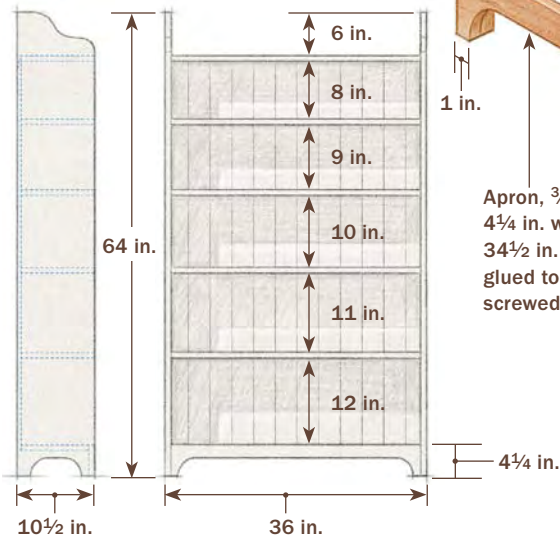
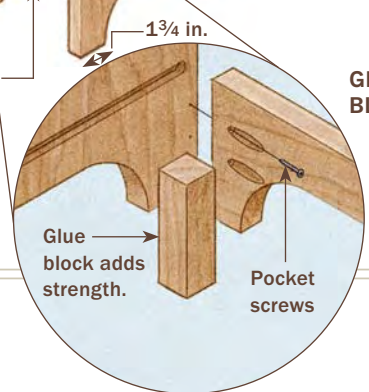
Back boards, $\frac{3}{8}$ in. thick, are attached to shelves with 15-ga. finish nails.

Bottom shelf, $9\frac{1}{4}$ in. wide

Apron, $\frac{3}{4}$ in. thick by $4\frac{1}{4}$ in. wide by $34\frac{1}{2}$ in. long, is glued to shelf and screwed to sides.

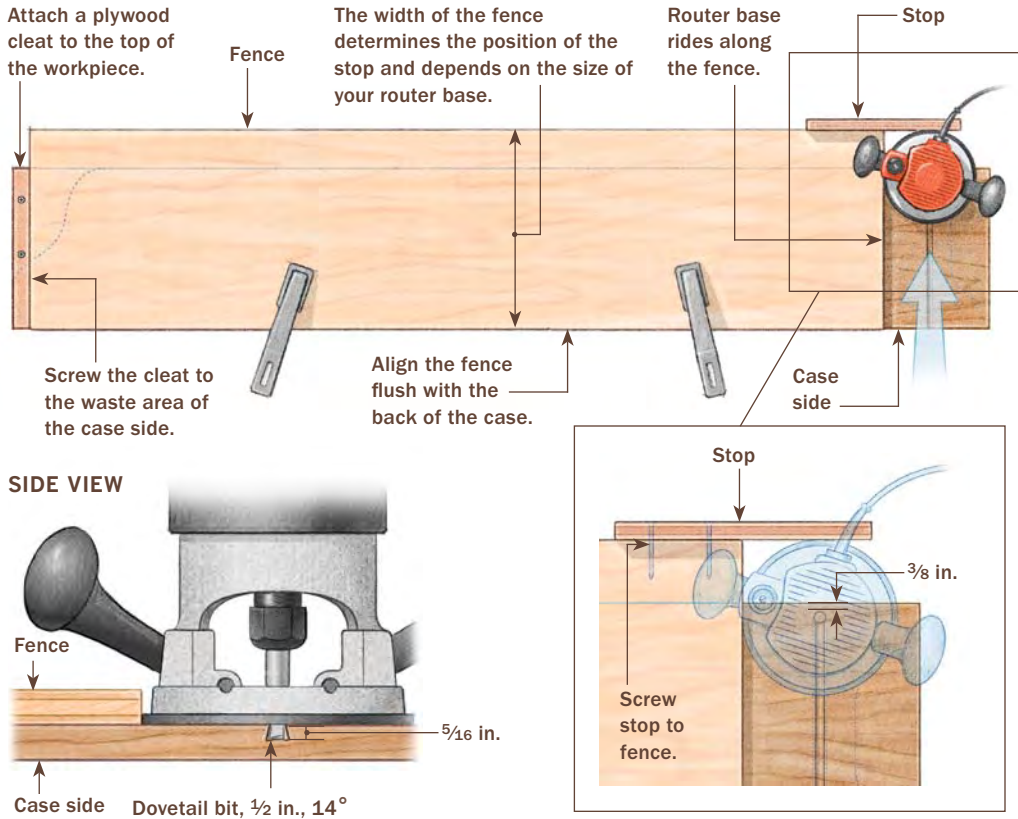
Glue block, 1 in. by 1 in. by $3\frac{1}{2}$ in. long

GLUE BLOCK



Tapered Slots in Two Steps

To ensure consistent results, the slots for each shelf are routed using a long fence and a plywood cleat. After the first pass, add a shim between the fence and cleat, then use the same router setup to taper the slot.



First pass. Attach a cleat to each case side. Screw the plywood cleat to the top of the inside case sides and perfectly square to the edges. Place screws in areas that will be wasted away when you profile the ends.



Clamp the fence to the workpiece. Align the front edge of the fence flush with the back of the case side and tight against the cleat at the top.



Rout the slot. Holding the router tight against the fence for control, cut until you reach the stop. Let the bit stop spinning before backing it out of the slot or you could ruin the cut.



Second pass. Shim out the back side. Place the shim between the fence and the cleat. Veneer tape is the perfect thickness ($\frac{1}{32}$ in.) to create the desired taper.



Reclamp and rerout. With the shim in place and the fence reclamped, run the router through the slot to add the taper.

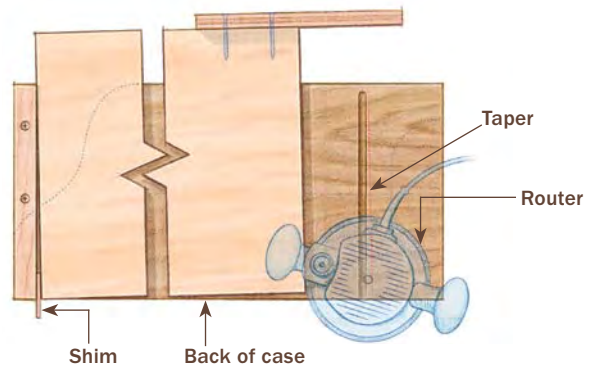


Trim the fence. After routing both slots for the bottom shelf, cut the fence down to repeat the process on the next set of slots.

Why taper the dovetail?

A sliding dovetail has two parts: the slot and the dovetail key. Here the slots are routed into the case sides and the keys are cut on the ends of the shelf. When you use this joint in wide stock, binding is a common headache during glue-up. The joint goes halfway home, then the glue makes the wood swell and the joint seizes. That's why I taper the joint slightly toward the front of the case. The taper—cut on one side of the slot and on the corresponding face of the key—makes it easy

ADD A SHIM TO TAPER THE SLOTS



to slide the shelf in from the back without binding and creates a wedging action in front as the shelf is tapped home.

The amount of taper is not that critical as long as it is consistent. I keep it to about $\frac{1}{32}$ in. (about as thick as three business cards) per 10 in. of board width. With a taper like this, the joint can be almost completely assembled for trial fitting and can be driven home with a few mallet blows.

Router method simplifies complex joint

Tapered sliding dovetails can be cut by hand, using saws and chisels, but this method can be imprecise and time-consuming. I prefer to use a router and a few simple jigs to do the job. The

method is clean and allows you to dial in the fit of each joint. To avoid confusion, be sure to label mating parts as you work.

Cut slots with a handheld router

For strength, the slot should be no deeper than half the thickness of the side. Likewise, the thin part of the key should be at least half the thickness of the shelf, and the length at least one-third the thickness of the shelf.

First, screw a $\frac{3}{4}$ -in.-thick plywood cleat to the top of the case sides. Mark the shelf locations on each side, then make a $\frac{3}{4}$ -in.-thick plywood fence to locate the slots in both sides. Cut the fence to a length that aligns the router bit with the lower shelf location and rip it to a width that will place the router bit $\frac{3}{8}$ in. from the front of the side. Screw

a stop to the business end of the fence and clamp the assembly in place (see “Tapered Slots in Two Steps” on p. 145).

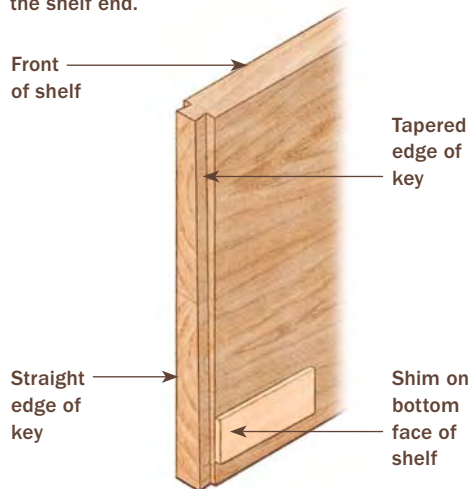
Set the router to make a $\frac{5}{16}$ -in.-deep cut and rout the slot across the side until you reach the stop. Next, remove the fence and place a shim between the rear edge of the cleat and the rear edge of the fence. Re-clamp the fence in place, then pass the router through the slot to create the taper along the bottom edge. Repeat this operation in the opposite side of the case. Once you have both slots for the bottom shelf routed and tapered, trim the fence to cut slots for the next higher shelf and repeat all of the previous steps.

Now is a good time to cut the bracket feet on the bottom of the sides as well as the profile on top. Clean up those edges before proceeding.

Taper the Dovetail Keys

The keys are cut and tapered at the router table using the same bit that cut the slots, adjusted so that its height is a hair under the slot depth. Use a tall auxiliary fence to keep the long workpieces stable.

Shim the rear edge of the shelf bottom and rout both sides of the shelf end.



Test piece gets you started. Take light passes along both edges of a test piece (made from a shelf offcut) until it slides halfway or more into a slot with hand pressure.



Shim out the bottom rear of the shelves. Use a shim of the same thickness used to taper the slots. Veneer tape is great because you can iron it on and take it off easily.



Fine-tune the fit. Keep making hairline passes on the router table to get the key to slide closer to home (top left). To micro-adjust the fit, use a sanding block cut to the same angle as the dovetail bit and attach adhesive-backed P120-grit sandpaper to it (below). The goal is to get the shelf to slide with just hand pressure until it is about 1½ in. from being fully home (below left).



Cut keys on the router table

Place the same bit you used to cut the slots into the router table and set the depth so that it's a hair less (0.005 in. or so) than the depth of the slots. This will create a tiny gap to make the sliding action easier. Using a test piece the same thickness as the shelves, adjust the fence and take light cuts on both sides until the test piece fits about halfway or more into a slot with hand pressure. Once you've reached that point, you are ready to rout the actual shelves.

First, add a shim to the bottom rear of each shelf. The shim should be the same thickness as the shim used to taper the slots. Rout the top side of the key on each end of each shelf. Then flip each shelf to cut the bottom of the keys. At this point, each shelf should slide freely about halfway home but tight after that. To fit the shelves individually, make hairline passes across the top, straight side of each key until the shelf slides to within 1½ in. of being fully home with





Trim $\frac{5}{8}$ in. from the front of the key. Use a handsaw to remove most of the waste, and clean up the cut with a sharp chisel.



Push and pound. Stand the sides rear-edge up on an assembly bench. To install each shelf, place a spot of glue inside the corresponding slots near the front edge. Push in the shelf as far as you can by hand and fist, then rap the shelf home with a mallet. When installing the bottom shelf, put the apron in place to serve as a stop. Later you can screw the apron into place.

Nail in the back boards in order. Slide the top edges of the boards into the groove under the top shelf. To avoid misses, mark the shelf locations across the back, then nail each board to each shelf with 15-ga. finish nails.



only hand pressure. Use a small, angled sanding block to dial in the fit.

Next, use a handsaw and a chisel to trim $\frac{5}{8}$ in. from the front of the keys. Refine the fit with the sanding block if needed. Now rout a groove under the top shelf, $\frac{1}{4}$ in. from the back edge, for the back boards. Next, rip the lower shelves to size along their back edges and trim an additional $\frac{3}{4}$ in. off the front of the bottom shelf to accommodate the apron. Finally, cut the rabbets that hold the back boards.

Glue in shelves, then add back boards

Once you have all the shelves fitted to the sides, the hardest work is done. Now's the time to glue up the case and cut and fit the back boards and apron.

The maple back boards are ripped to random widths no wider than $3\frac{1}{2}$ in. Once the

boards are cut to final size, use a raised-panel cove cutter to rout a $\frac{1}{4}$ -in. tongue along their tops. Then rout the rabbets along their sides to create the shiplap.

To glue in the shelves, stand the sides rear-edge up on an assembly bench. Place a spot of glue inside the corresponding slots near the front edge, slide in the shelf as far as you can with hand pressure, then tap the shelf home with a mallet.

After installing the apron and glue blocks, the piece is ready for finishing (the back boards are finished before final installation). For this bookcase, I sprayed on Deft® clear lacquer.

After you have the back boards in place, the bookcase is ready for your collection of Russian nesting dolls.

Cherry and Fir Bookcase

PETER ZUERNER

Several years ago, my sister Cicely was looking for a bookcase that would be attractive, functional, and reasonably easy to move. The piece I designed and built for her is now one of the stock pieces in my furniture shop. I call it, appropriately, Cicely's Bookshelf.

I wanted the bookcase to have a spare and elegant look, so I kept the frame parts to a minimum and elevated the piece off the floor by extending the corner posts to create four short legs. All four edges of the top, along with the front edge of each shelf, were given a generously sized cove to create the illusion of thinner stock. As a result, even when the piece is filled with books, it appears light and graceful.

Choose the wood with care

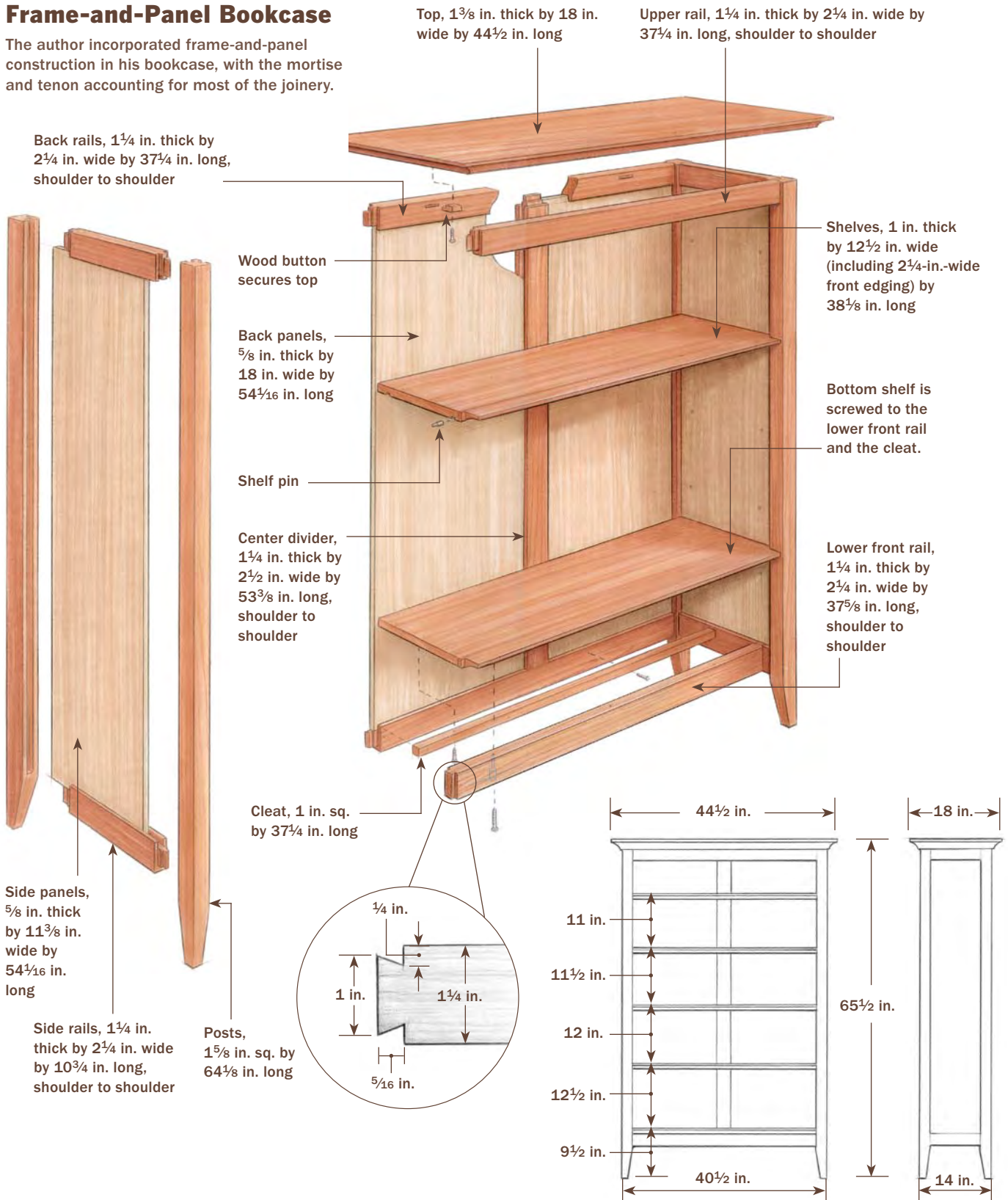
For me, the first and most important step in any furniture project is the process of selecting the wood. Consistent color and grain are important, and I'm always on the lookout for something interesting. I especially like to incorporate special grain or a natural defect. Not only does an odd grain or a small defect make each piece a bit more unique, it also provides a strong visual connection to the tree from which it evolved. For instance, the piece shown here has a small, sound knot near the front of the lower shelf, about midway across the span.

In this piece, I liked the idea of blending darker cherry with the strong grain of quarter-



Frame-and-Panel Bookcase

The author incorporated frame-and-panel construction in his bookcase, with the mortise and tenon accounting for most of the joinery.





Cut grooves to accept the fir panels.

To cut stopped grooves in the posts, first clamp an extra-long auxiliary fence to the rip fence of the tablesaw, then clamp a stop block to the auxiliary fence. Use a dado head to cut the grooves.



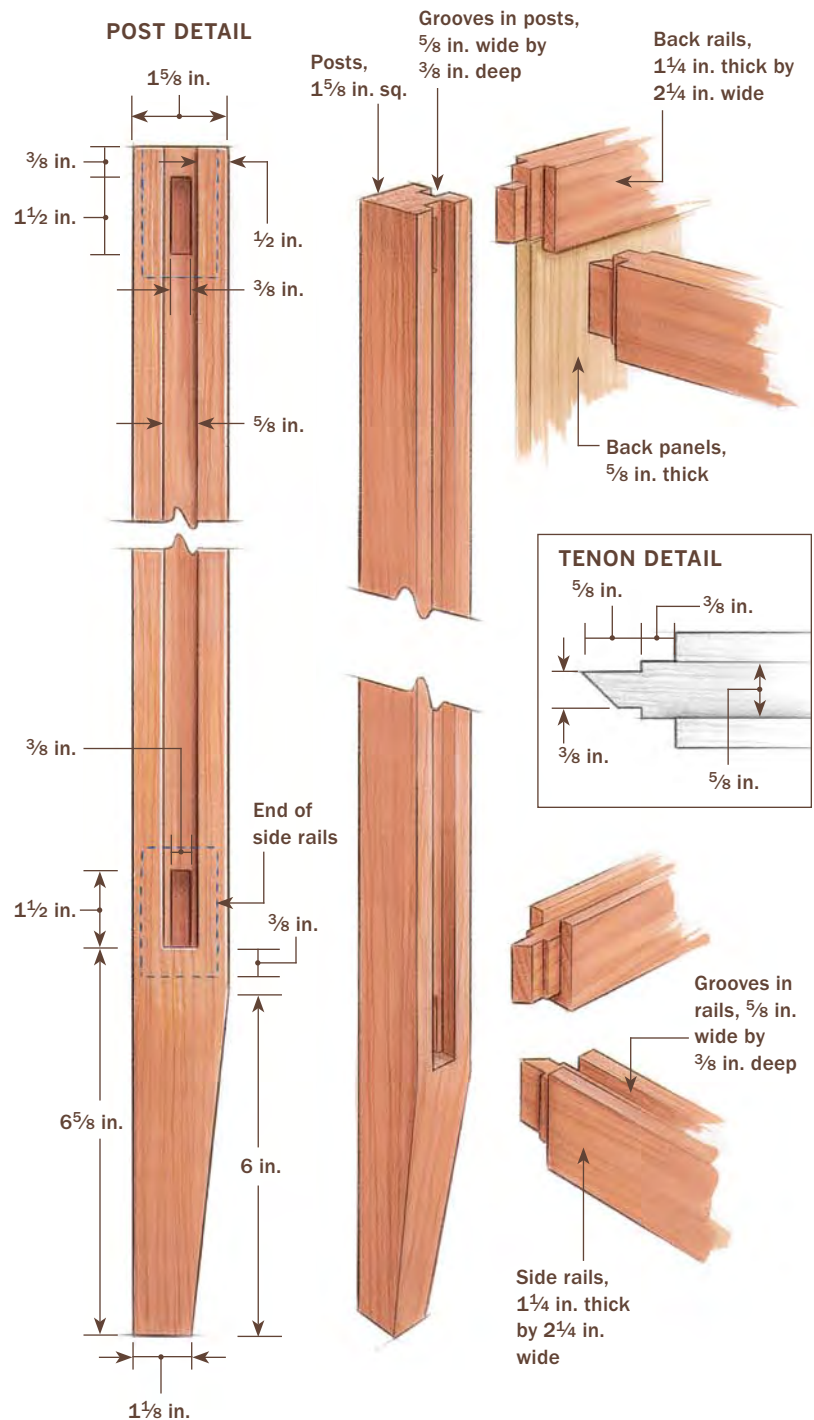
Square the corners. The dado head leaves a rounded portion at the stopped end of the grooves. A chisel makes them square in short order.



Two-step tenon. Use a dado head to cut the tenons. First clamp a stop block to the fence to establish the tenon length. Then cut the portion of the tenon that fits into the groove. To create the step, reset the blade height and reposition the stop block, as shown.

Cut the Joinery for the Posts and Rails

The rails have stepped tenons that fit snugly in both the panel groove and the mortise, adding strength to the joints.



sawn Douglas fir. So I used cherry for the frame parts, the top, and the front edging on the shelves. The quartersawn fir is incorporated into the panels.

Sometimes, when wood is moved from one location to another, the new conditions of temperature and humidity can cause it to warp a bit, often within a few hours of the relocation. So once I have all of the oversize stock together in my shop, I like to give it a few weeks to acclimate to its new temporary home. Then, after rough-milling the stock, I allow it to sit for another day before cutting it to final size. Any last-minute twisting or cupping gets removed at this stage.

Construction is straightforward

I began by gluing up blanks for the $\frac{5}{8}$ -in.-thick side and back panels. To do that, I resawed $\frac{8}{4}$ fir, book-matching the panels to add a balanced look.

All of the shelves were made from commercially available $\frac{5}{4}$ by 12-in.-wide stair stock. However, the front of each shelf received an edging of $2\frac{1}{4}$ -in.-wide cherry, so the bookcase ends up with an all-cherry look when viewed from the front. The cherry edging has another plus. Because fir sometimes can be splintery, the cherry almost eliminated any splitting out when the coves were cut.

Most of the frame was put together with mortise-and-tenon joints. The one exception is a sliding dovetail joint that I used to connect each end of the lower front rail to the lower side rail.

To accept the panels, I cut $\frac{5}{8}$ -in.-wide grooves into the posts, the center divider, the side rails, and the upper and lower back rails. The grooves in the posts were stopped about 7 in. short of the bottom. Then, at each stopped end, I used a bench chisel to square up the rounded portion.

After all of the joints had been cut and fitted, I cut the panels to final length and width. All of the panel surfaces were sanded through 220 grit. After that, I applied four coats of tung oil to each panel.

Oil finishes sometimes bleed from the wood pores while drying. When that happens, the finish often ends up with tiny beads of hardened oil, and that can give the finish a slight roughness. So once a coat had dried, I sanded it lightly with 1,000-grit sandpaper wetted with mineral oil. The wet-sanding removed any beads that formed. Then, I wiped the sanded surfaces with a clean, soft cloth and allowed the mineral oil to dry. Once it was dry, I added the next coat of tung oil.



Assembly begins at the back. With all of the parts cut and fitted to his satisfaction, the author is ready to begin assembly. First, though, he applies four coats of tung oil finish to all of the panels.



Assemble the back. The two back panels are slipped into the grooves in the frame parts and then clamped.



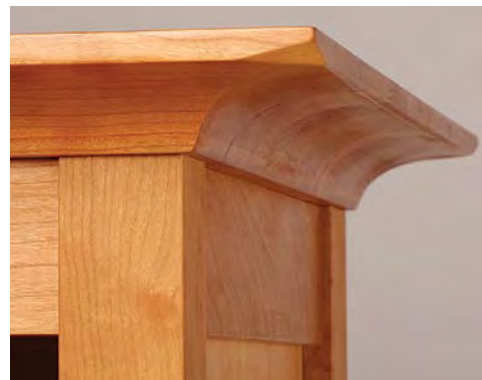
Add the remaining frame-and-panel parts. Once the back glue-up has dried, the remaining frame-and-panel parts are added in one big glue-up. First, the lower front rail is assembled to the two lower side rails and then all four of the side rails are added to the back posts. Following in quick succession are the side panels, front posts, and the upper rail (left). An assortment of clamps keeps the joints tight until the glue sets up (above).

Assembly starts with the back section

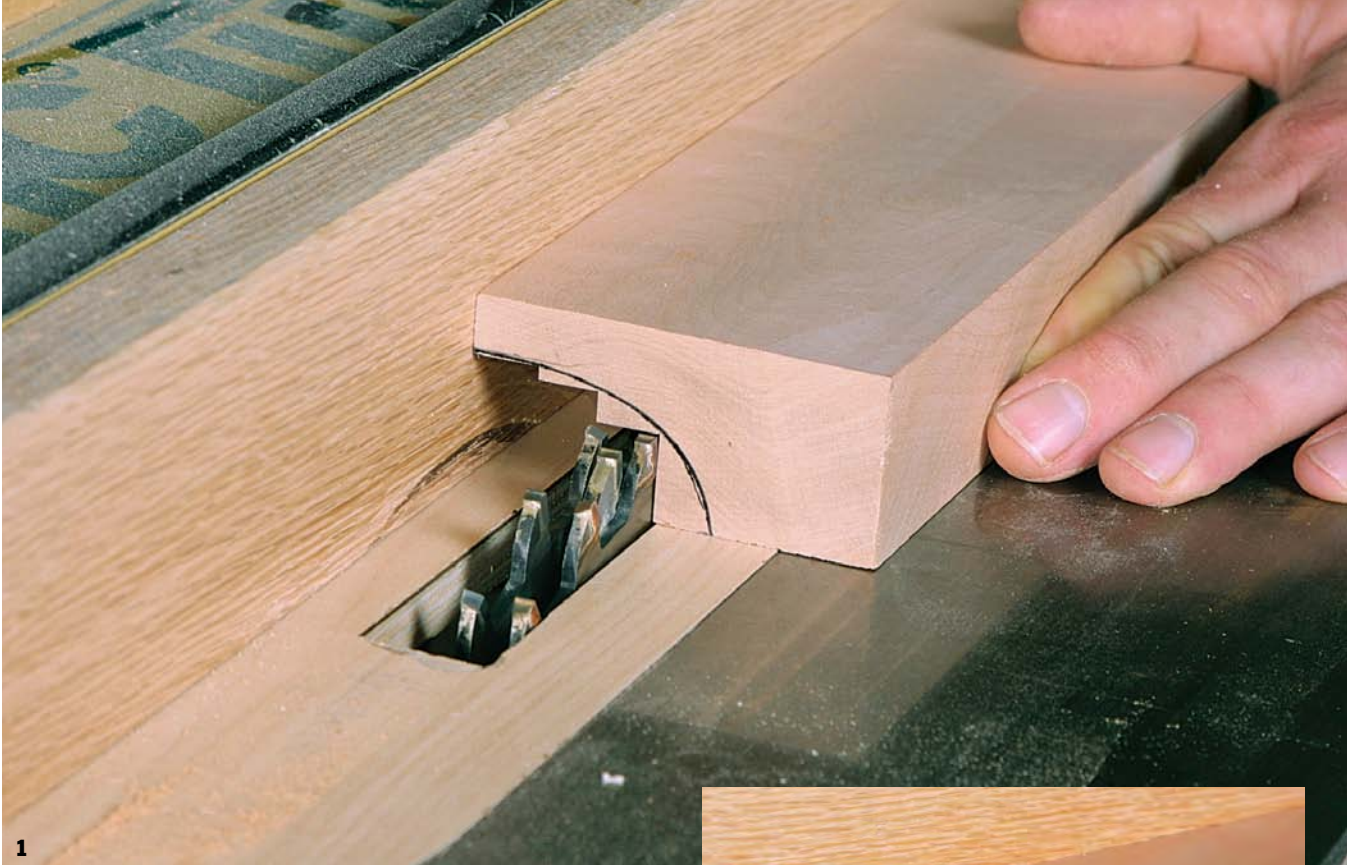
I started the assembly process by putting together all of the parts that compose the back section—the two back posts, the upper and lower back rails, the center divider, and the two back panels. Except for the panels, all of the mating surfaces were glued together. That way, the panels are free to expand and contract in width as their moisture content changes.

Once the back section was dry, I joined most of the remaining parts in one big glue-up. I began by adding the lower front rail to the two lower side rails. After that, the four side rails were assembled to the mortises in the two back posts. Then I simply slid the side panels into the grooves in the side rails. Once the upper front rail was mounted, I added the clamps and checked the frame for square.

While the clamped parts dried, I cut the top and the shelves to final width and length. Then I cut the coved profile. Although you can use a special shaper cutter, I cut the coves in two steps using a tablesaw and a router table. For this technique, I used a dado head



The lamb's tongue. A small bevel at each corner of the top is cut with a chisel to help soften the hard right angle of the edges.



1

Remove most of the waste. Make a series of increasingly deeper cuts with the dado head. A test block, with the cove profile marked on the end, helps establish the location of the cuts.

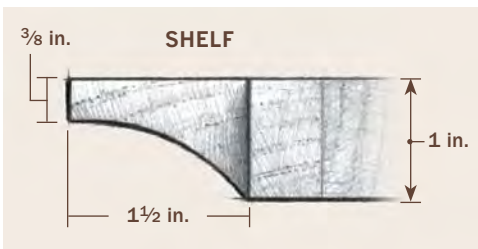
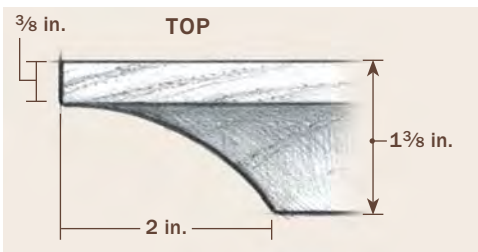


2

Make a series of cuts using the router table and a large cove bit. Use a curved scraper to smooth out any wavy edges left by the cove bit.

Cut the Covs in Two Steps

Applying a generous cove to the exposed edges of the top and the shelves makes the parts look thinner, giving this large bookcase a lighter feel.



in the tablesaw and made several passes to remove most of the waste stock. Then, using a $\frac{3}{4}$ -in.-radius cove bit mounted in a router table, I made a series of additional passes. The cove bit easily conforms to the profile, so it's more efficient at removing waste stock than a straight-sided dado head is.

After the work with the cove bit had been completed, I was left with a wavy profile that needed to be smoothed out. A curved scraper came in handy here.

Once all of the covs had been cut and smoothed, I used a chisel to cut a small bevel,



Attach the bottom shelf.

The bottom shelf is secured by driving screws up through the cleat and the lower front rail. To allow the shelf to expand and contract with changes in humidity, the author uses a rat-tail file to slot the portion of the hole that accepts the shank of the screw.



Add the top. After cutting several shallow slots in the upper rails, the author slips a notched wood button in each slot. Then the buttons are screwed to the underside of the top.

sometimes called a lamb's tongue, where the coves meet at the corners. Granted, it's a small detail, but it brings the corners to a crisp point. Also, to anyone looking at the bookcase, the bevel sends a subtle message that this isn't a production piece but was made by a craftsman.

At this point in the construction, all five of the shelves were just about complete. I simply had to notch the front and back corners to fit around the inside corners of the four posts.

I used a simple jig to drill the holes for the pins that support the shelf. And here I had two options. I could have drilled a series of holes, spaced evenly apart, to provide adjustability. Or, if the client didn't want to see all of those holes, I could have simply drilled them where the shelves were going to go.

To add strength to the bookcase, the bottom shelf was fixed in place. It rests on two parts: the lower front rail and a cleat that's screwed to the inside face of the lower back



Straightforward construction. You won't need much more than a weekend or two to build this elegant bookcase.

rail. Six screws hold the shelf in place. The screws were driven up through counterbored holes in the lower front rail and the cleat.

Next, I sanded all exposed surfaces until smooth, except for the panels, with 220-grit paper. Then, again excepting the panels, I added four coats of tung oil, sanding between

each coat with 1,000-grit paper while the oil was still wet.

To allow the top to expand and contract in width as the humidity changes, I attached it to the frame using eight small wood buttons. A final rubdown with a soft, dust-free cloth completed the project.

Metric Equivalents

INCHES	CENTIMETERS	MILLIMETERS	INCHES	CENTIMETERS	MILLIMETERS
1/8	0.3	3	13	33.0	330
1/4	0.6	6	14	35.6	356
3/8	1.0	10	15	38.1	381
1/2	1.3	13	16	40.6	406
5/8	1.6	16	17	43.2	432
3/4	1.9	19	18	45.7	457
7/8	2.2	22	19	48.3	483
1	2.5	25	20	50.8	508
1 1/4	3.2	32	21	53.3	533
1 1/2	3.8	38	22	55.9	559
1 3/4	4.4	44	23	58.4	584
2	5.1	51	24	61	610
2 1/2	6.4	64	25	63.5	635
3	7.6	76	26	66.0	660
3 1/2	8.9	89	27	68.6	686
4	10.2	102	28	71.7	717
4 1/2	11.4	114	29	73.7	737
5	12.7	127	30	76.2	762
6	15.2	152	31	78.7	787
7	17.8	178	32	81.3	813
8	20.3	203	33	83.8	838
9	22.9	229	34	86.4	864
10	25.4	254	35	88.9	889
11	27.9	279	36	91.4	914
12	30.5	305			

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Credits

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Front cover: Main photo by Thomas McKenna. Top to bottom: Anissa Kapsales and Ken St. Onge

Back cover from top to bottom: Steve Scott, Thomas McKenna, and Steve Scott

The articles in this book appeared in the following issues of *Fine Woodworking*:

pp. 4–13: Shaker Blanket Chest by Charles Durfee, issue 172. Photos by Mark Schofield except for photo p. 5 by Michael Pekovich. Drawings by Fred Carlson.

pp. 14–23: Hickory and Ash Blanket Chest by Peter Turner, issue 203. Photos by Anissa Kapsales. Drawings by Bob La Pointe.

pp. 24–33: Shaker Chest of Drawers by Christian Becksvoort, issue 206. Photos by Anissa Kapsales except for photo p. 24 by Michael Pekovich. Drawings by Bob La Pointe.

pp. 34–41: Classic Shaker Cupboard by Christian Becksvoort, issue 218. Photos by Anissa Kapsales except for photo p. 35 by Dennis Griggs. Drawings by John Hartman.

pp. 42–47: Frame-and-Panel Doors Made Easier by Christian Becksvoort, issue 218. Photos by Anissa Kapsales. Drawings by John Hartman.

pp. 48–57: Shaker Chimney Cupboard by Michael Pekovich, issue 232. Photos by Ken St. Onge except for photo p. 48 by Michael Pekovich and photos pp. 51, 53, 56, and 57 by Rachel Barclay. Drawings by John Hartman.

pp. 58–69: Pennsylvania Spicebox by Steve Latta, issue 196. Photos by Steve Scott. Drawings by Bob La Pointe.

pp. 70–79: The High Art of the Lowboy by Philip C. Lowe, issue 201. Photos by Steve Scott. Drawings by Bob La Pointe.

pp. 80–89: Arts and Crafts on Display by Michael Pekovich, issue 211. Photos by Thomas McKenna. Drawings by Bob La Pointe except for drawings pp. 81 (left), 82, and 83 (except detail drawings) by Dave Richards.

pp. 90–99: The Versatile Huntboard by Garrett Hack, issue 187. Photos by Thomas McKenna. Drawings by Bob La Pointe.

pp. 100–109: Sleek Console Built for Today's TVs by Anatole Burkin, issue 214. Photos by Thomas McKenna except for photo pp. 101 (top left) and 108 (bottom) by Michael Pekovich. Drawings by Bob La Pointe.

pp. 110–124: A Low Console for Home Theater by Steve Casey, issue 200. Photos by Steve Scott except for photos p. 110 and 111 (top right and bottom left) by Dean Della Ventura. Drawings by John Hartman.

pp. 118–125: Wall Cabinet in Cherry by Matthew Teague, issue 180. Photos by Tom Begnal except for photo p. 118 by Kelly J. Dunton. Drawings by John Hartman.

pp. 126–133: A Better Way to Build Wall Cabinets by Garrett Hack, issue 210. Photos by Michael Pekovich. Drawings by Bob La Pointe.

pp. 134–142: Build a Vanity Cabinet by Mario Rodriguez, issue 235. Photos by Thomas McKenna. Drawings by Bob La Pointe.

pp. 143–150: Quick, Sturdy Bookcase by Martin Milkovits, issue 194. Photos by Thomas McKenna. Drawings by John Hartman.

pp. 151–158: Cherry and Fir Bookcase by Peter Zuerner, issue 161. Photos by Tom Begnal except for photo p. 151 by Michael Pekovich, photo p. 155 (bottom) by Kelly J. Dunton, and photo p. 158 by Scott Phillips. Drawings by Bob La Pointe.

pp. 159–166: A Classic Case by Gregory Paolini, issue 179. Photos by Andy Engel except for photos p. 162 by Rodney Diaz. Drawings by Bob La Pointe.

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