





The moment I first saw one of these benches in a church in Iowa's Amana colonies, I wanted to build one. After researching the benches' history with Amana historian Peter Hoenle, I discovered that the original benches were made in Ebenezer (now West Seneca), N.Y., in the early 1800s for the churches of the Community of True Inspiration, a communal society that still exists. The benches, with their removable backs, were transported from New York to Iowa in 1846 when the entire community relocated to near Iowa City. The majority of the benches, some upwards of 22 ft. long, are still used each week by members of the church. I scaled down the bench to 5 ft. to better fit in a typical home. I also used hickory for the legs and battens and pine for the rest.

For a seemingly spartan design, the joinery is pretty exciting—and it's all visible. The legs use staked joinery to attach to the seat and battens, which themselves are joined via sliding dovetails. The seat and splat are linked with a knockdown joint, whose angled tenon requires special care. A tapered wedge locks the joint. To top it all off, the back rest connects to the splats with drawbore pegs. It sounds like a lot, but it's worth it; the originals have been going strong for nearly 200 years.

#### **Battens with sliding dovetails**

Done right, the sliding dovetails create a solid mechanical joint that also benefits from glue. Cut the housings first. After clearing most of the waste with a dado stack, I use a router and jig to create the flared side walls. I then use the same dovetail bit in the router table to cut the dovetail on the battens. Only light mallet taps should be needed to assemble the joint. I leave the battens about 1 in. long for fitting.

The seat gets angled notches at its back edge to make room for the angled splats. Trace each

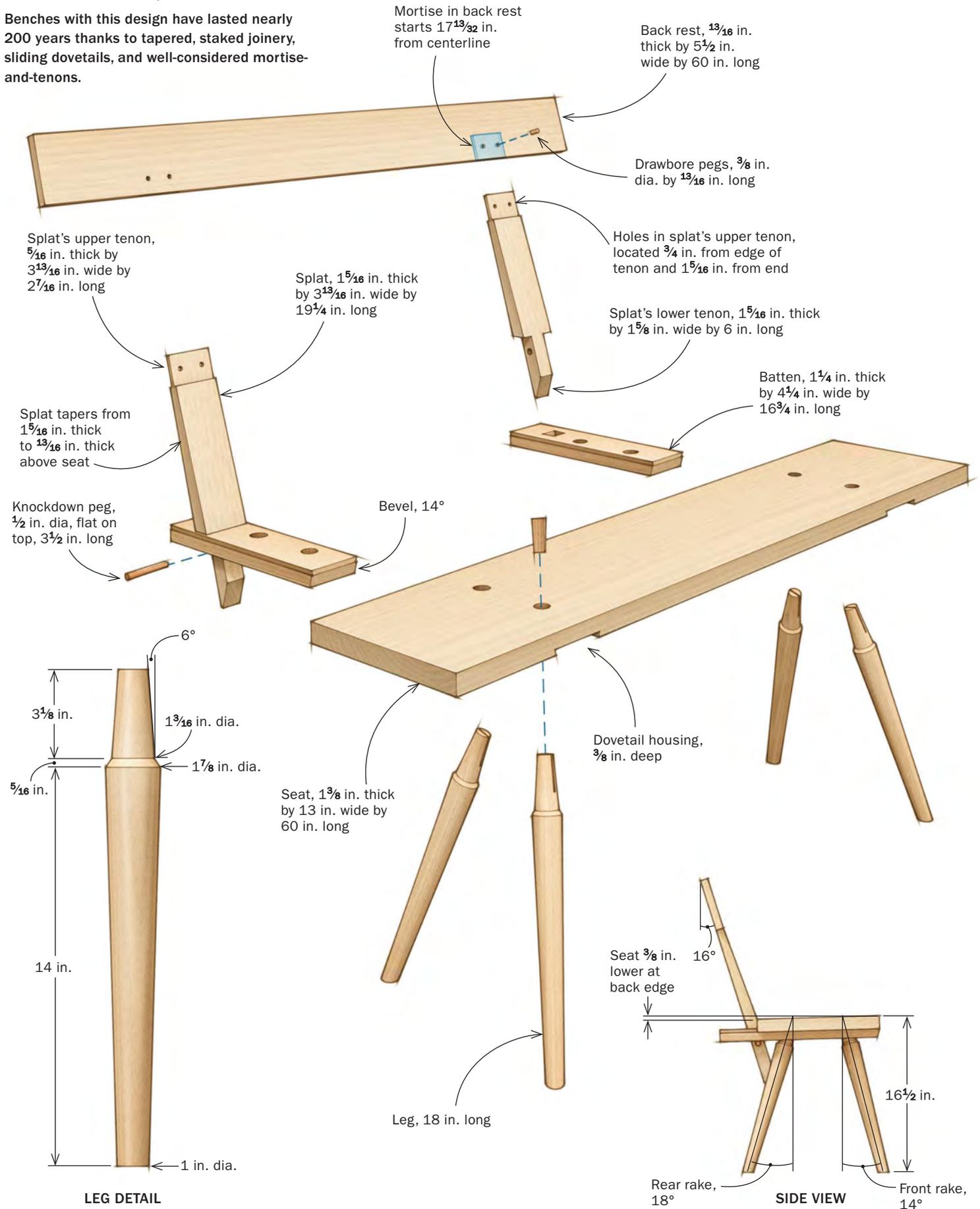
# Amana Church Bench

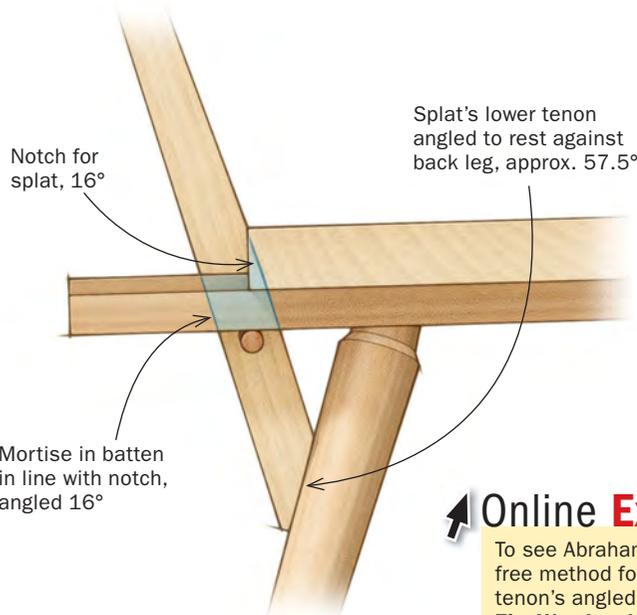
Essential form belies a master class in techniques

BY JAMEEL ABRAHAM

## A FEW PARTS, JOINED WELL

Benches with this design have lasted nearly 200 years thanks to tapered, staked joinery, sliding dovetails, and well-considered mortise-and-tenons.

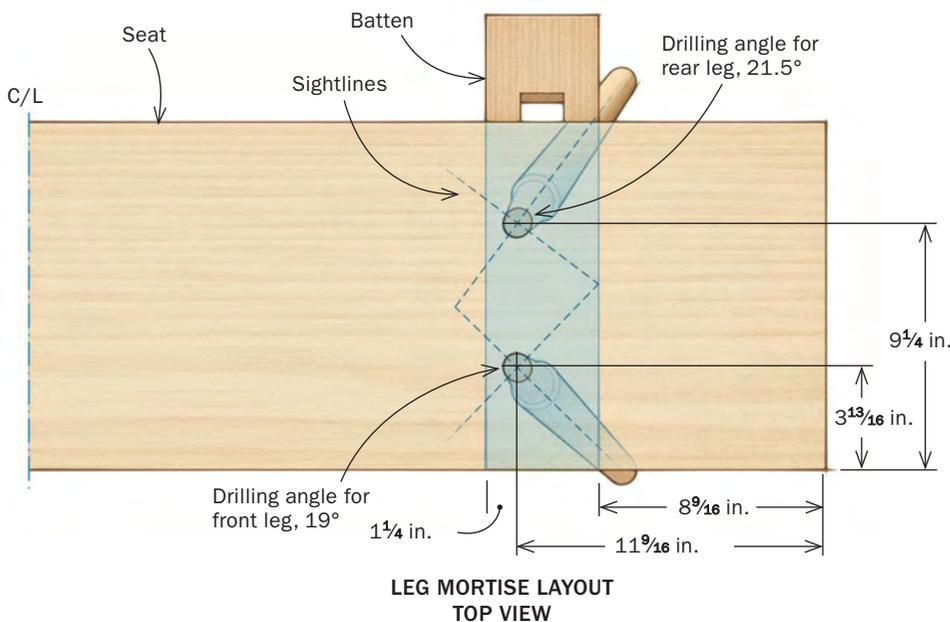




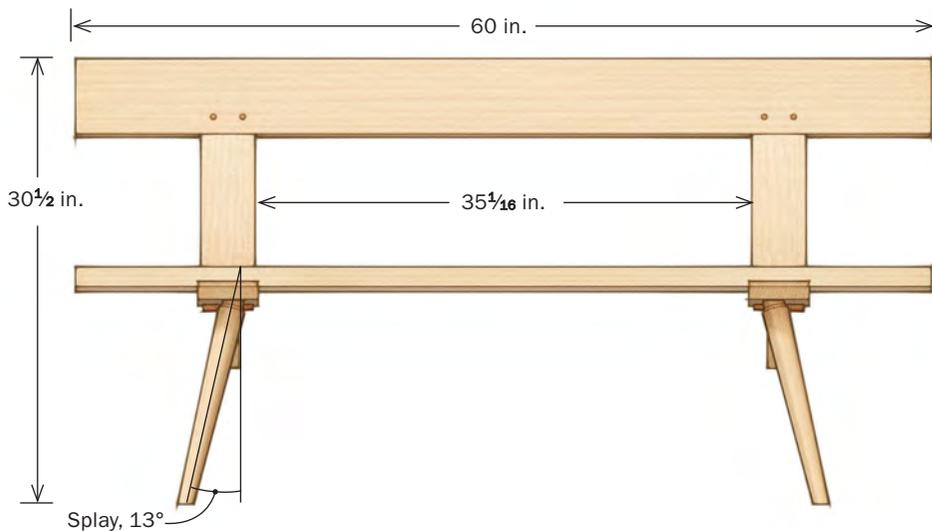
JOINERY DETAIL

**Online Extra**

To see Abraham's math-free method for cutting the tenon's angled end, go to [FineWoodworking.com/298](http://FineWoodworking.com/298).



LEG MORTISE LAYOUT  
TOP VIEW



FRONT VIEW

splat onto the seat to lay out the notch's width. Saw and chop the joint first, then refine it with an angled paring block, deepening it until the notch's top edge meets the top face of the seat at the very corner. Blue tape or a backer strip at the top of the seat can help control blowout. Then chop the ends for nice, crisp shoulders.

**Angled mortise-and-tenons**

Angled through-mortises in the battens accept the long splat tenons. Although this is a knockdown joint, it yields an incredibly rigid structure.

To lay out the mortise for the splat, I drive a batten into its housing until it's 1/8 in. proud at the front edge of the seat. Then I knife a line where the batten meets the notch to mark the front of the mortise. To mark the back, I hold a splat blank in the notch and trace against it with a pencil. A pencil line is fine here since I'll plane the future tenon to fit.

After removing the batten to lay out the rest of the mortise, including transferring it to the batten's bottom face, I drill and chop away most of the waste, then carefully chisel the ends with an angled paring guide block clamped to the batten.

With the mortise done, turn to the accompanying tenon on the splat. To make sure the splat lines up perfectly with the notch at the back of the seat, place the splat right on its batten and use the mortise to mark the tenon's width. I cut the cheeks on the bandsaw, chop the shoulders with a chisel, and shave down the thickness with a handplane. Leave this tenon long for now. You'll cut it to length later when the base is assembled. Do check its fit though. Insert the splat into the batten, then tap the batten until the splat tightens up to the notch. There should be no gap where the splat meets the top of the seat.

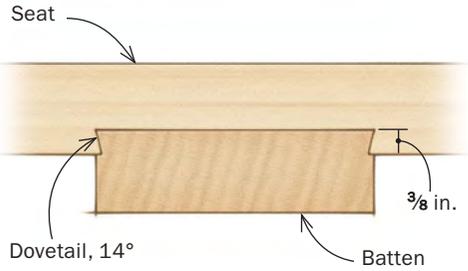
With the splat still tight against the notch, mark the front of the batten to length. After cutting at this mark, I cut the bevel on the batten's front end for a nice shadow line.

Finally, install the batten. When driving it, stop a couple of inches from the front of the seat, apply some glue to the housing, install the splat, then drive the batten until the splat seats against the notch. Clamp the front of the batten to the seat to close any gaps, remove the splat, and let the glue cure.

**Back rest is drawbored**

The joinery for the back rest, a straight mortise-and-tenon, is a break from the angled work so far. Its drawbore means it's no less interesting though. Again, lay out the joints using the parts

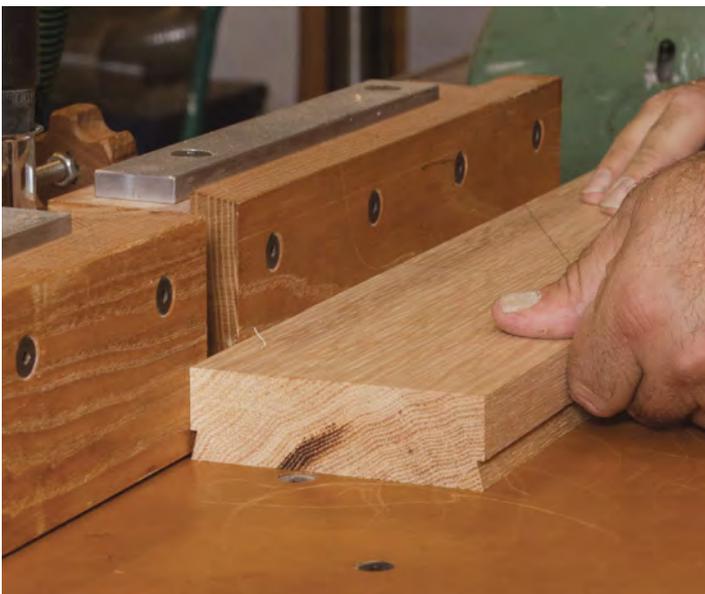
## DOVETAIL BATTENS ARE THE HEART OF THE SEAT



**Use a jig to shape the dovetail housing.** The jig is screwed together, with the narrow front and back pieces secured so they're tight to the seat. They also serve as a backer at the edge to eliminate blowout from routing the dovetails.



**Route the dovetail housing to shape, width, and depth.** After clearing most of the waste with a dado stack, Abraham secures the jig in place and routes. The router's base is trapped by the jig's wider side pieces, which determine the width of the housing. The side pieces are parallel.



**Use the same bit in the router table to shape the battens.** After setting the bit's height with a test piece, Abraham routes his battens. These are 1/4 in. wider than the slot, and he sneaks up on the tail's width; instead of moving the fence, he handplanes an edge between passes.



**Insert batten by hand before lightly tapping with a mallet.** If your fit's any tighter, the glue might swell it so much it won't assemble. Additionally, you could blow out the front edge of the seat while inserting the battens.



**Saw an angled notch at seat's back edge for angled splat.** Saw kerfs every  $\frac{1}{4}$  in. or so before carefully knocking out most of the waste with a chisel. This notch makes room for the splat, which runs through the batten and rests against the rear legs.



**Angled paring block perfects the slope.** The block's angled end is cut to match the notch. By clamping the block to the seat, Abraham can take light paring cuts that start high and, by gently tapping the block down, go deeper until he ends up with a crisp corner at the top of the seat.



**Dry-fit the batten to lay out its mortise for the back splat.** Use a knife tight to the seat's notch to scribe the front of the mortise (far left) and the splat blank to lay out the back of the mortise (left). Abraham uses a pencil here, which is accurate enough, since he'll plane the splat's future tenon to fit. Transfer the marks to the batten's bottom face, remembering that they angle across the batten's edges.

themselves. Insert the splats into the battens and clamp the back rest to them, using spacers to set the correct height. Even though I haven't cut the splats' upper tenons yet, this setup allows me to use a knife to mark the length of the mortise on the back rest and the shoulder on the splats.

The back rest's mortises are centered in the stock, but the splat's corresponding tenons are offset toward the back so the taper can be cut into the splat's front face.

After the joints have been fitted, dry-assemble the back rest and splats to lay out the splat's taper, which runs from the top of the seat to the back rest. The taper gives the sitter a little ergonomic comfort—a welcome consideration from an austere piece of furniture.

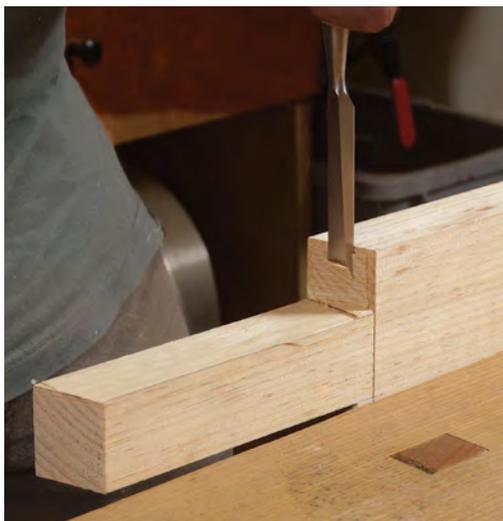
Finally, lay out and drill for the drawbore pegs. I don't glue this joint; the pegs are sufficient. But don't assemble it yet. There's still more to do: the knockdown joint. Here, tapered pegs run



**Same angled paring guide adjusts the mortise's angled ends.** Remove most of the waste at the drill press and then with rough chops. Finish with light paring cuts while holding a chisel tight to the angled block. Pare from both faces to avoid blowout. Install the battens after this step.

## SPLATS ARE KNOCKDOWN AND DRAWBORED

**Chisel perfects the splat's lower tenon shoulders.** Rather than saw right on the angled shoulders, Abraham cuts close and finishes with a chisel. The cheeks are simply ripped at the bandsaw. Leave this tenon long for now.



**Trace the bottom of the batten onto the splat tenon.** This line lets you accurately locate the angled hole for the dowel that will lock the knockdown joint.



**Drill at an angle above the line from the batten.** About a quarter of the hole's diameter should fall within the batten's mortise. To create the angle, prop up the splat with a shim under its tenon shoulder.



**Plane a tapered flat along an oak dowel while testing it frequently.** This dowel wedges the splat against the batten. When testing it, check that the flat seats firmly and evenly. Trim it to length after achieving a good fit, leaving the narrow end long for easy removal.

through angled holes in the splats' lower tenons. The wedging action keeps the splats tight to the battens—and lets you take the bench apart for cross-country moves.

### Staked undercarriage supports back

Even with its little tweaks and added interest, the joinery until now is typical of flat work. The legs, though, are firmly in chair territory, with turned, tapered tenons and matching tapered mortises.

I turn the tapered legs and their tenons. The tenons need to be smaller than the largest diameter your reamer can cut. While you can use the measured drawing as a guideline when sizing the tenon, your individual reamer will determine the actual dimensions.

The rake, splay, and position of the legs were designed so the beveled ends of the splats' beveled tenons rest firmly on the backs of the rear legs. This triangulation is what makes the bench so strong.

I use a pair of inexpensive laser levels, one plumb and one in a shopmade adjustable mount, to cast sightlines onto my drill and



reamer. I usually turn the lights off in the shop so the laser beams are more visible.

Start by drilling through the seat and batten from the top. This will isolate blowout to the bottom, where it will be removed when you flip the seat to ream from below. Hold the drill and your elbows close to your body for the best control.

When reaming, center the lasers on the hole by eye. The lasers should walk up the reamer and meet at the middle of the top of the tool. Ream slowly and carefully, taking frequent breaks to clear out the waste and checking that you're still aligned with your lasers. You could skip the reaming and use straight tenons, like many of the original benches do, but the joint would not be as strong.

Before gluing the legs into the seat, I drive them into the mortises dry and mark the tenon at the underside of the batten.



**Clamp the back rest to the splats to lay out their mortise-and-tenons. Dry-fit the splats and then clamp them to the back rest with risers for even spacing. Next, remove the risers to knife the bottom edge of the back rest onto the splats. Then, since the splats' upper tenons are full-width, knife the width of the splat onto the back rest to mark the mortise's width.**



**After mortising the back rest, drill for the drawbore pegs. Two pegs in each mortise guarantee a strong connection.**

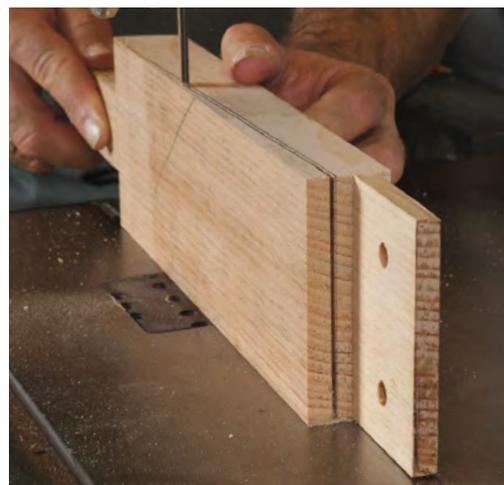


**Mark the drawbore's offset. Use a center punch  $\frac{1}{16}$  in. smaller than the hole. Register the punch against the hole's edge toward the shoulder. Drilling at this mark will create a hole offset  $\frac{1}{32}$  in. toward the tenon.**



Only after that do I cut the kerf for the wedge. This allows me to seat the tenon without the tapered mortise closing the kerf. I apply glue to the tenon and the mortise. I then drive the tenons into the seat, stopping at the marks. I use liquid hide glue for its extended open time. Then I glue and drive the wedges, which should be about  $\frac{1}{16}$  in. wider than the tenon so its edges bite into the seat. I apply glue to only one side of the wedge so if the tenon shrinks, it moves away from the wedge on the unglued side instead of pulling away from the mortise. Once the glue cures, saw the tenons flush and smooth the top of the seat.

The bottoms of the legs need to be cut to length. Place the bench on a flat surface (I use my workbench top) and shim it so the seat is level left to right and angled down front to back. Now measure  $16\frac{1}{2}$  in. down from the front edge of the seat and set a pair of dividers to the distance between the  $16\frac{1}{2}$  in. mark and



**Bandsaw the splat's taper. At the top of the taper the splat should be flush with the back rest. Bandsaw close to your line before refining with a plane. Don't assemble the splats and back rest yet.**

## LEGS ARE TURNED AND STAKED

**Turn the tapered tenons while checking them in a reamed test hole.** After roughing away most of the tenon with a gouge, Abraham adjusts the fit using a scraping tool. A reamed test hole in a partially resawn block lets you monitor the fit.



**Laser level in a tilting carriage lines up angled mortises for legs.** Abraham adjusts the carriage to the appropriate drilling angle, then positions it so the laser falls on his sight line. The laser left plumb is set perpendicular to the sight line.



**Ream from the underside after drilling through from above.** Ream slowly and check your progress frequently. Small changes affect the rake and splay more than you'd expect. Abraham blocks up the plumb laser to allow it to clear the batten.



the top of the workbench. Use the dividers (I use the Accuscribe made by Fastcap) to mark a line around the bottom of each leg. Saw to the line with a backsaw and chamfer the cut.

The back assembly has two final steps, trimming and angling the splats' lower tenons to length and angling the back rest.

Each splat's lower tenon needs to be cut to precise length and beveled at the end so it rests evenly on the back of the leg. Get this information, both the length of the tenon and the angle of the bevel, from the bench itself. I tend to saw the tenon long, then sneak up on the exact fit with a plane until the bevel rests at the back of the leg just as the splat bottoms out in the batten. Treat each tenon's length and angle independently. With the splats fitted to the legs, drawbore the back rest to the splats.

I gave my bench a soap finish, which is what the original benches have. They're still maintained with soap, and in fact, inside the church in Amana where I first saw them there is a sill cock and central drain for washing the wood floor and benches. □

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## ASSEMBLE AROUND THE SEAT



**Glue the legs in place.** Orient the legs so the growth rings are perpendicular to the long grain of the seat. This places the tenon in the most favorable position for seasonal shrinkage, helping the joint to stay tight over time.



**Wedges are extra insurance.** The kerfs should also run perpendicular to the seat, causing the white oak wedges to push against the seat's end grain. Trim the tenons and wedges flush after the glue dries.



**Mark the legs' lengths.** On a flat surface, use coins to shim the bench so the seat is level left to right and drops  $\frac{3}{8}$  in. front to back. Set the caliper to draw a line  $16\frac{1}{2}$  in. below the top front of the seat.



**Splat's lower tenon trimmed and angled to rest against legs.** It's crucial to get each tenon's length and angle correct, since their contact with the legs strengthens the back structure. Determine these measurements from the bench itself, and plane them to fit. Attach the splats to the back rest afterward.



**Back assembly is knockdown thanks to tapered wedge.** The original Amana benches were disassembled and traveled halfway across the U.S. in 1846 thanks to this design, and many are still used weekly. Your version should hold up just as well.

