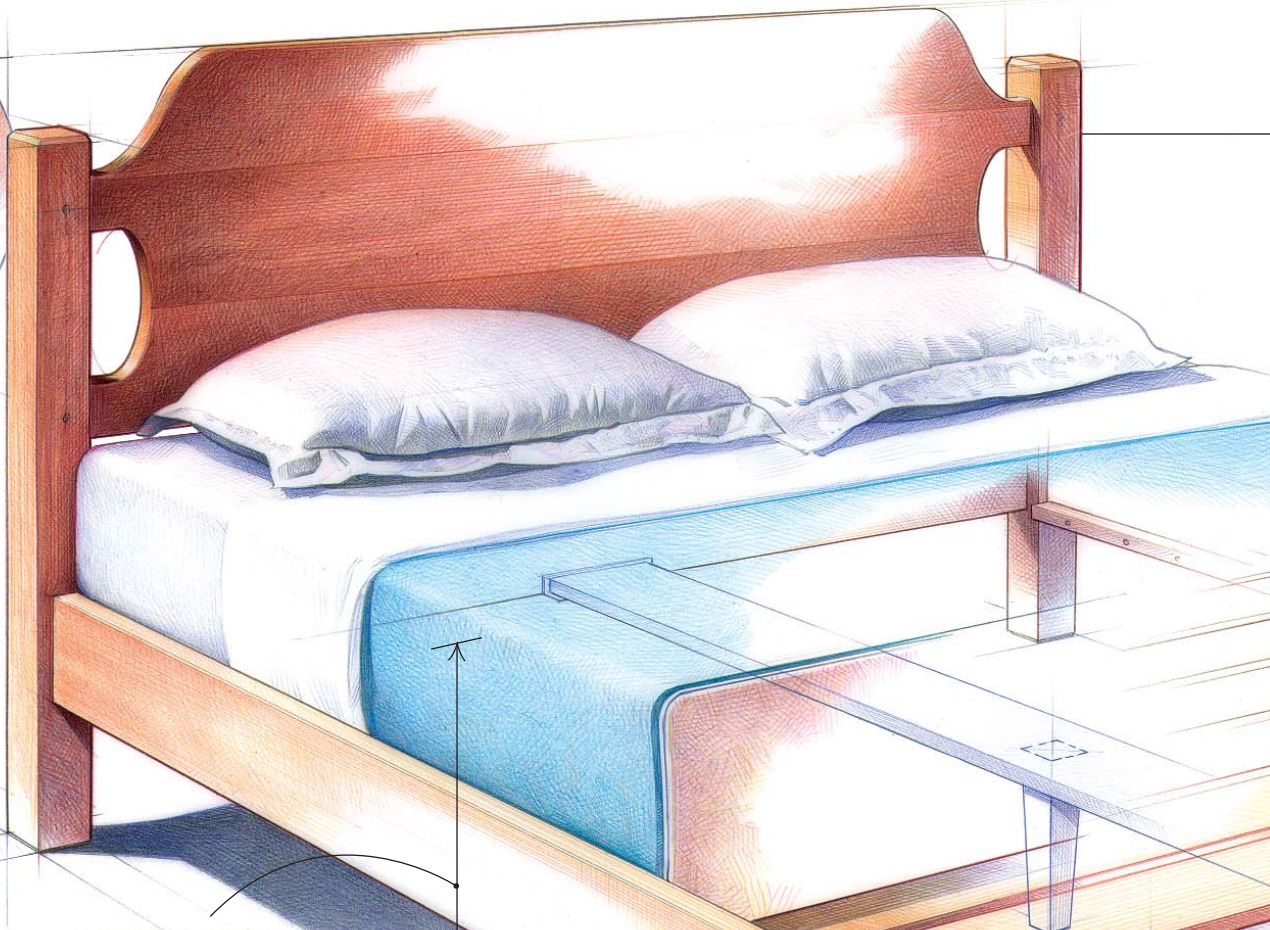


HEADBOARD

Headboards vary in design and can be made from a single, solid board or be of frame-and-panel or post-and-rail construction.



MATTRESS HEIGHT

Consider the thickness of the mattress and the choice of a slatted support or a box spring when determining the height of the side rails.

**STANDARD
MATTRESS SIZES**

TWIN

39 in. by 75 in.

FULL (OR DOUBLE)

54 in. by 75 in.

QUEEN

60 in. by 80 in.

KING

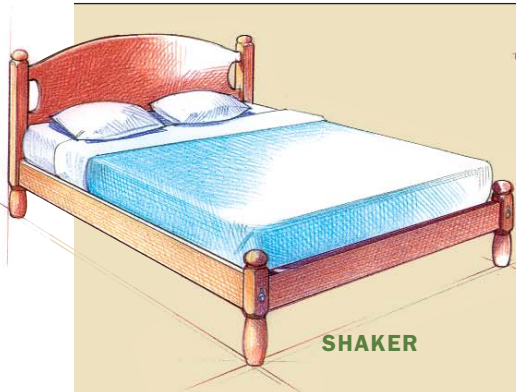
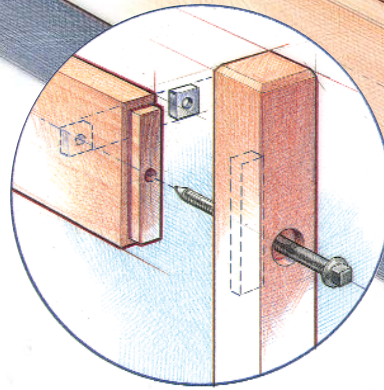
76 in. by 80 in.

CALIFORNIA KING

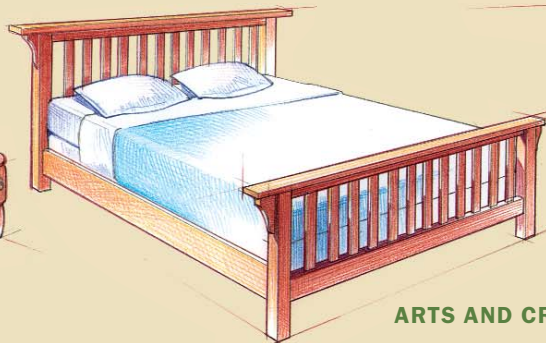
72 in. by 84 in.

POST-AND-RAIL CONNECTION

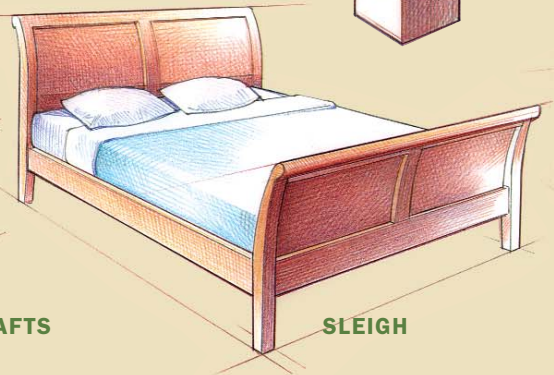
Bed bolts are the traditional method to obtain a rigid, squeak-free connection between posts and rails. The joint also must knock down for disassembly and transport of the bed.



SHAKER



ARTS AND CRAFTS



SLEIGH

Anatomy of a Bed

Different styles share basic construction details

BY JEFF MILLER

MATTRESS SUPPORT

Although conventional wisdom says a box spring prolongs the life of a mattress and adds support, most manufacturers concede that a well-designed slatted support is an acceptable substitute.

Bed designs may vary widely, but sound construction is a critical part of any design's success. Fortunately, there aren't too many structural issues to deal with. First, you have to figure out the best way to support the mattress and box spring. Also, because most beds need to be transportable, they must come apart quickly and easily, and when put back together be rigid and silent. That means you must choose the best systems for joining the rails to the posts, and the posts to the headboard. I've built countless beds during my woodworking career. Using the techniques I've learned, you can make any style of bed.

Beds come in a variety of standard sizes, but these standards are not absolutes. If your mattress is larger than standard, you'll have to adjust the frame size; but if it is smaller, you should size the frame for a standard mattress so when the time comes to replace it, a new mattress will fit. In general, plan to leave $\frac{1}{4}$ in. to $\frac{1}{2}$ in. of space on the sides to allow room for the bedding. I sometimes leave a little more room at the end, with a footboard that rises above the mattress, so there is some space to hang your toes off the end of the bed or to accommodate the cord of an electric blanket.

*Jeff Miller is a furniture maker in Chicago and the author of *Beds* (The Taunton Press, 1999).*

FOOTBOARD

A foot rail (shown here) is one option, while a true footboard is a smaller version of the headboard (see the Arts and Crafts and sleigh beds below).

King-size beds require a center rail supported by an angle iron at each end and a leg in the center.

DESIGN DETERMINES JOINERY

Many styles of beds are united by similar post-and-rail construction. By changing a few details, it's possible to change the look of a bed to suit your taste. Shaker beds typically feature slab headboards and foot rails. Arts and Crafts style beds have both a headboard and footboard made of slats or square spindles. Sleigh beds introduce a curve to their frame-and-panel construction. To keep the lines clean, most designs use concealed hardware. Because of their height, four-poster beds must disassemble completely. All four rails are connected by bed bolts, and the headboard floats in mortises in the posts.

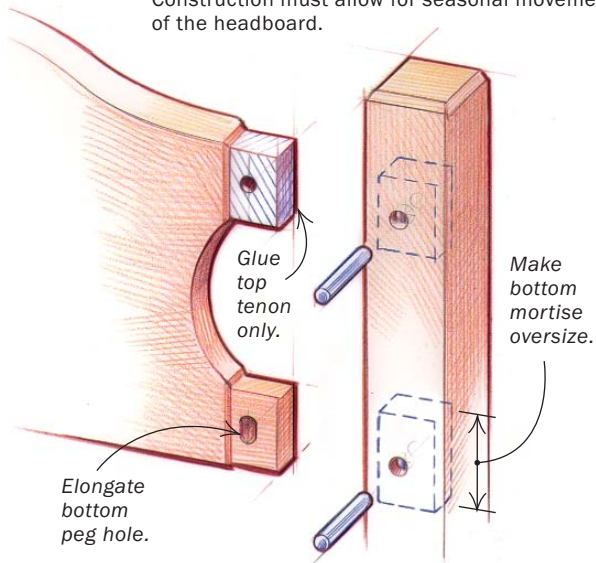
FOUR-POSTER

CONSTRUCT THE HEADBOARD

SOLID HEADBOARDS NEED ROOM TO MOVE

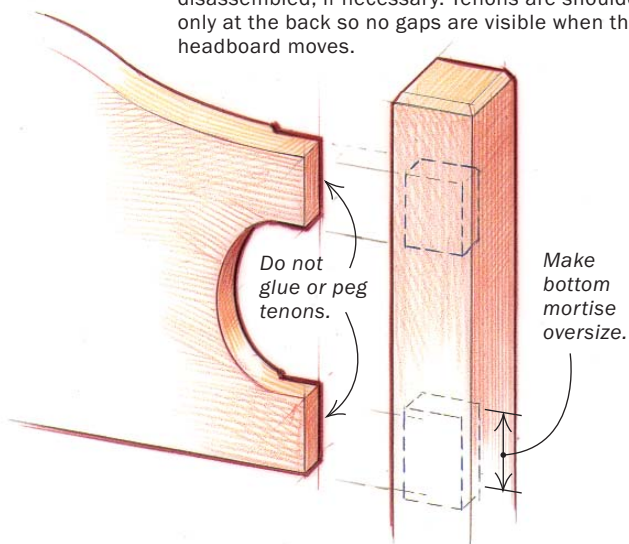
HEADBOARD WITH TWO TENONS

Construction must allow for seasonal movement of the headboard.



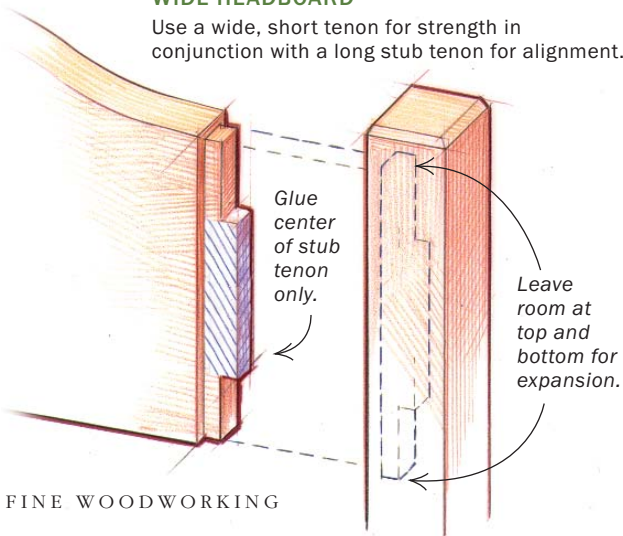
FLOATING HEADBOARD

Use this method to allow for the entire bed to be disassembled, if necessary. Tenons are shouldered only at the back so no gaps are visible when the headboard moves.



WIDE HEADBOARD

Use a wide, short tenon for strength in conjunction with a long stub tenon for alignment.

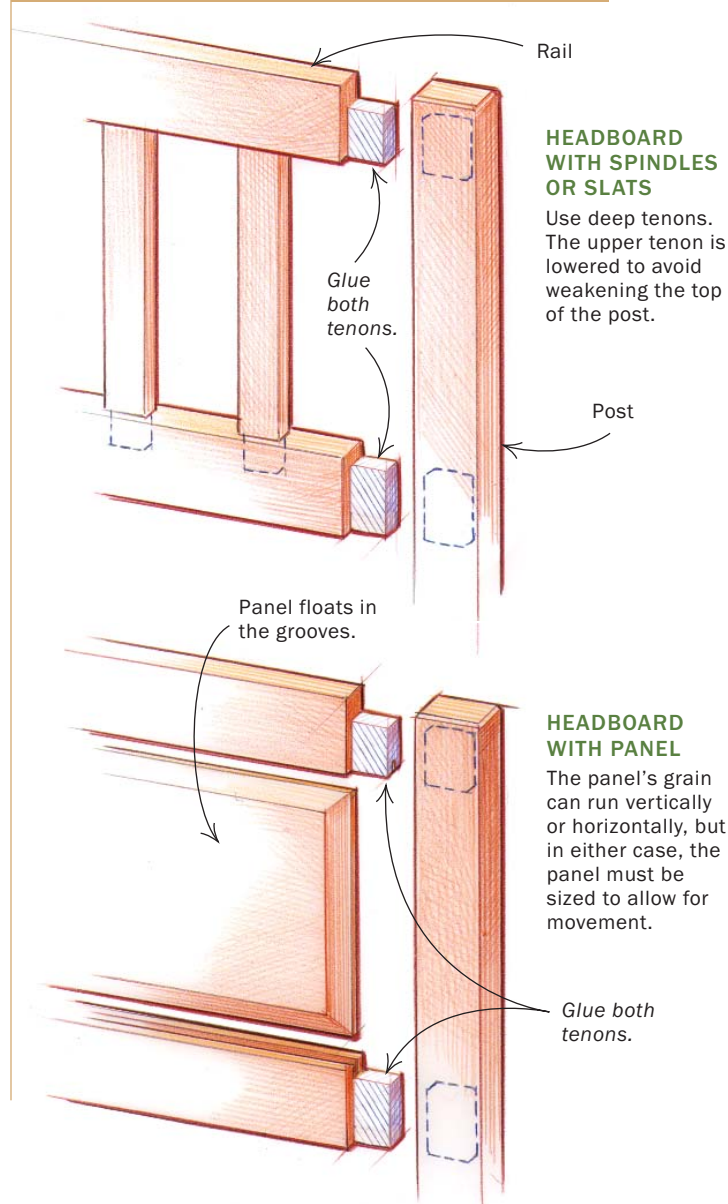


The headboard (and footboard, if there is one) assembly usually is built as a unit, with mortise-and-tenon joints connecting the rail to the two posts. The mortise-and-tenon provides the maximum strength to this connection, but the details of the joint vary based on the bed's design. On a wide plank headboard, some allowance must be made for wood movement. With two separate tenons, glue only the upper one, or use a wide, short tenon floating in a long, shallow mortise, anchored in the center with a full-depth tenon that is glued.

On a four-poster bed, the headboard plank simply floats (without glue) in deep, slightly oversized mortises. The headboard then can be removed when the bed needs to be disassembled.

A headboard that has slats, spindles, or a frame-and-panel design will have a crest rail tenoned into the top of the posts. Be sure to offset the mortise-and-tenon joint toward the bottom of the crest rail so you leave as much wood as possible at the end of the post, above the joint.

SLATS OR PANELS REQUIRE POST-AND-RAIL CONSTRUCTION

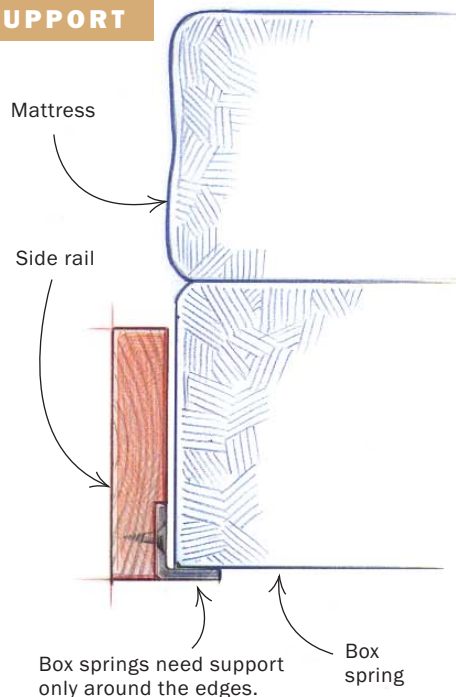


SUPPORT THE MATTRESS

BOX SPRINGS NEED EDGE SUPPORT

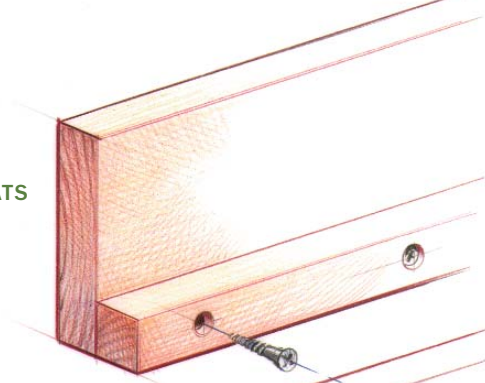
About 80% of the mattresses sold in the United States come with a box spring. Full- and queen-size box springs need support around the edges in the form of wooden cleats, angle iron, cast-iron hangers, or aluminum extrusions. All of these supports are screwed to (and sometimes recessed into) the side rails. King-size box springs come in two halves for portability and need an additional support down the center of the bed that's wide enough to support both halves, with a leg in the middle of this support.

The side rails are typically 5 in. to 8 in. wide and 1 in. to 1½ in. thick. The combined width and thickness should be enough to prevent the rail from sagging under load. I usually use 6-in.- or 7-in.-wide rails with a box spring; but to hide the box spring completely, the rails must be close to 8 in. wide. This choice is strictly a design decision.



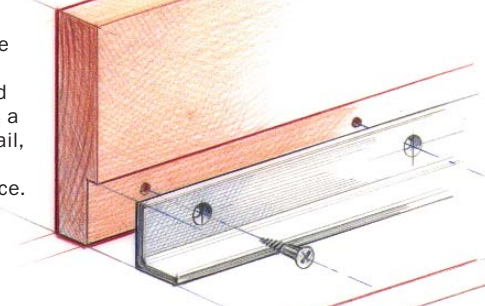
WOODEN CLEATS

An economical choice, wooden cleats are glued and screwed to the rails.



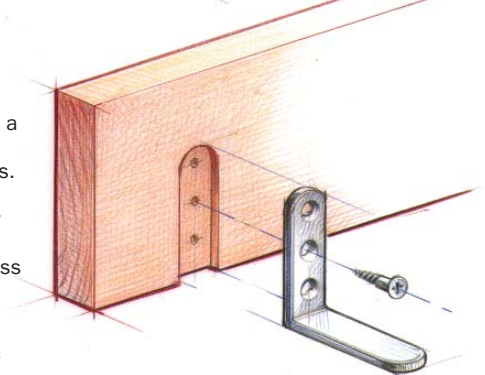
ANGLE IRON

Angle iron can be purchased or recycled from old bed frames. Run a rabbet in each rail, then screw the angle iron in place.



CAST-IRON HANGERS

Because of their length, cast-iron hangers support a greater range of box-spring widths. They can be mounted slightly below the rail to lower the mattress height.

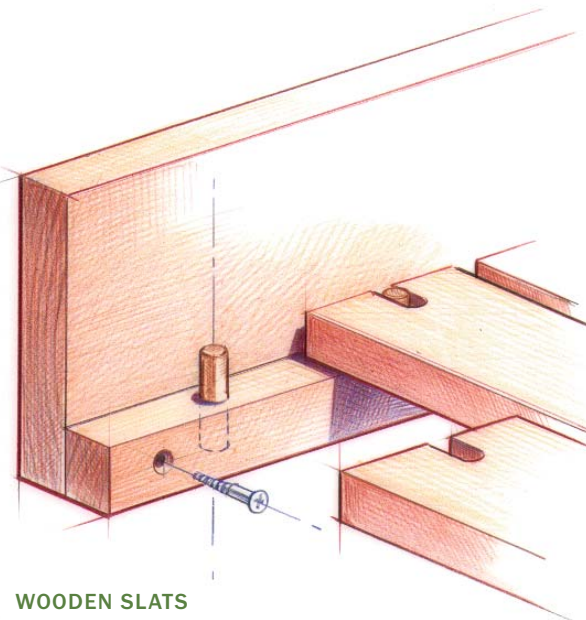
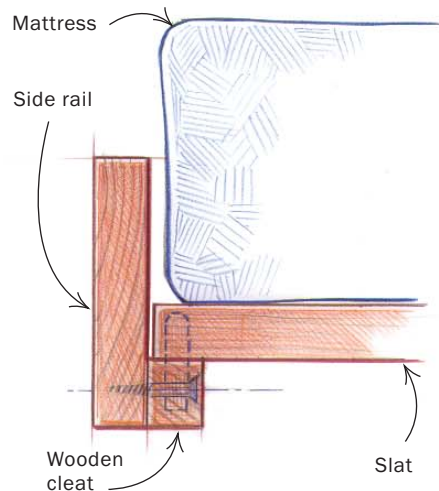


FOR A LOW PROFILE, USE SLATS INSTEAD OF A BOX SPRING

In Europe, 80% of mattresses are designed to be used without a box spring and to be supported by wooden slats. I find the slatted support a little firmer, but the choice is up to you.

I use ¾-in.-thick by 4-in.-wide slats, which are thicker and wider than commercially available ones. Spaced 1 in. apart, the slats provide some flex for comfort and also allow for air circulation around the mattress or futon. Soft maple or poplar makes good slats, but avoid softwoods, which are too flexible. The slats usually rest on wooden cleats. To keep the slats from shifting, I notch the ends, fitting each slat over a dowel that protrudes from the cleat. On a king-size bed, I add a strut down the center from headboard to footboard, with a leg in the middle.

Some mattresses are designed to be used with solid platforms, which are made of plywood with support underneath to prevent the plywood from sagging. However, because these platforms do not have built-in flexibility or give, they should not be used with regular mattresses.



WOODEN SLATS

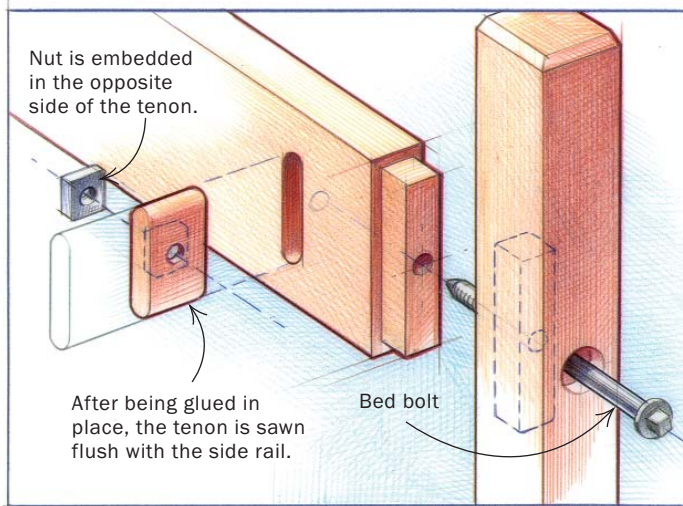
Slats combine the right amount of support and give for a mattress. Notching them to fit around dowels fixed to the cleats prevents the slats from shifting.

THREE SOLID POST-AND-RAIL JOINTS

Because the side rails support the mattress, the joints between the side rails and the bedposts are important to the overall solidity of the bed. Yet they need to be disassembled easily. This is an interesting challenge, considering that wood expands and contracts

with seasonal humidity changes. Wood also can compress, either as a result of seasonal changes operating against a metal fastener, or due to the stresses placed on the bed in use. There are a wide variety of fasteners available that attempt to meet this challenge.

BED BOLTS ARE TRADITIONAL



Traditional bed bolts are forged to have a square-drive head that flares out, creating a broad bearing surface on the wood. Regular bolts employ a washer for the same effect. To install both types of bolt, a counterbored hole is drilled through the bedpost and into the rail, where it meets either a nut embedded in the rail (for the traditional bed bolt) or a nut and washer in a recess. The bolt alone is not enough to hold the rail securely and to prevent rotation, so either a shallow mortise-and-tenon or a pair of dowels is needed to complete the glueless joint.

Another modern approach is to use bolts and washers with barrel nuts. This approach does not require a special wrench. Alignment of the drilled holes, however, is critical, and barrel nuts that are large enough to use with $\frac{5}{16}$ -in. or $\frac{3}{8}$ -in. bolts often require $1\frac{1}{2}$ -in.-thick rails. There are many approaches to dealing with the bolt hole in the post: The simplest is to treat it as part of a quality joint and to leave it exposed. More

likely, you'll want to conceal the hole, either with a brass cover screwed to the bedpost above the bolt hole or with a simple mushroom-shaped wooden plug, although the latter tends to work its way loose.



A new bed bolt. Traditional bed bolts (rear) have stood the test of time, but newer bolts with barrel nuts (front) are easier to install. Simply drill a hole on the inside face of the rail and drop in the barrel nut.

INSTALLING BED BOLTS



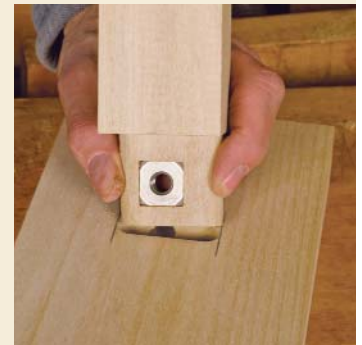
Drill the bolt hole. After drilling through the post into the tenon, remove the post and complete the hole to its full depth.



A recess for the nut. Use a plunge router and a straight bit to cut a mortise on the inside of the rail.



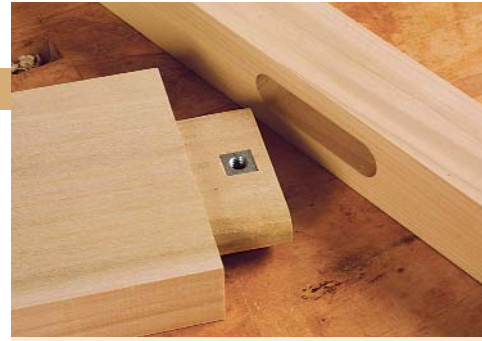
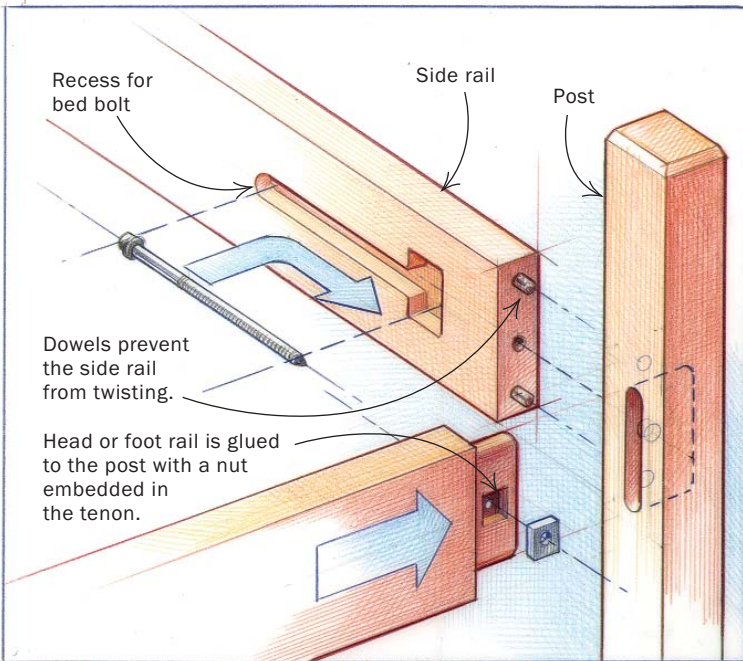
Locate the nut. Fit a tenon into the mortise, insert the bolt, and give it a sharp tap to leave an indentation (left). Drill a hole at the mark and inset the nut into the tenon. Glue the tenon into the rail with the nut facing away from the post (right), and trim it flush.



One tight joint. After cutting the tenon flush with the rail, insert the bolt through the post and crank it tight with the bed-bolt wrench.

HIDE BED BOLTS FOR A CLEAN LOOK

You also can bolt a bed together from the inside of the rail, leaving no holes or hardware visible on the outside. This involves embedding the nut in the tenon of the headboard or footboard rail, then routing a specially shaped recess on the inside of the side rail. It helps to make a jig for routing the recess in the rail.



INSTALLING HIDDEN BED BOLTS

Hidden nut. The nut is inset into the tenons on the head or foot rail and faces away from the side rails.



Hidden bolt. Use a jig to rout a T-shaped slot inside the side rails (above). Then insert the bolt and tighten it into the nut embedded in the head or foot rail (right).



BRACKETS ARE FAST AND INVISIBLE

There are many types of two-part fasteners for attaching the side rails to the posts. Look for the most solidly made hardware. Because screws driven into end grain don't have a lot of holding power, you should glue dowels into the rails to provide some long grain for the screws to pass through. Use the largest screws possible when attaching all parts of the hardware. If the fasteners loosen up, it is hard to fix the problem. For all of these reasons, my preference is to use fasteners only on occasionally used beds.

INSTALLING BED-RAIL BRACKETS



Install the clip plate. Glue hardwood dowels into the inside of the side rail to give the screws something to bite into besides end grain.



Make room for the clips. The strike plate is recessed into the post. In addition, deeper mortises are required to accommodate the two clips.

