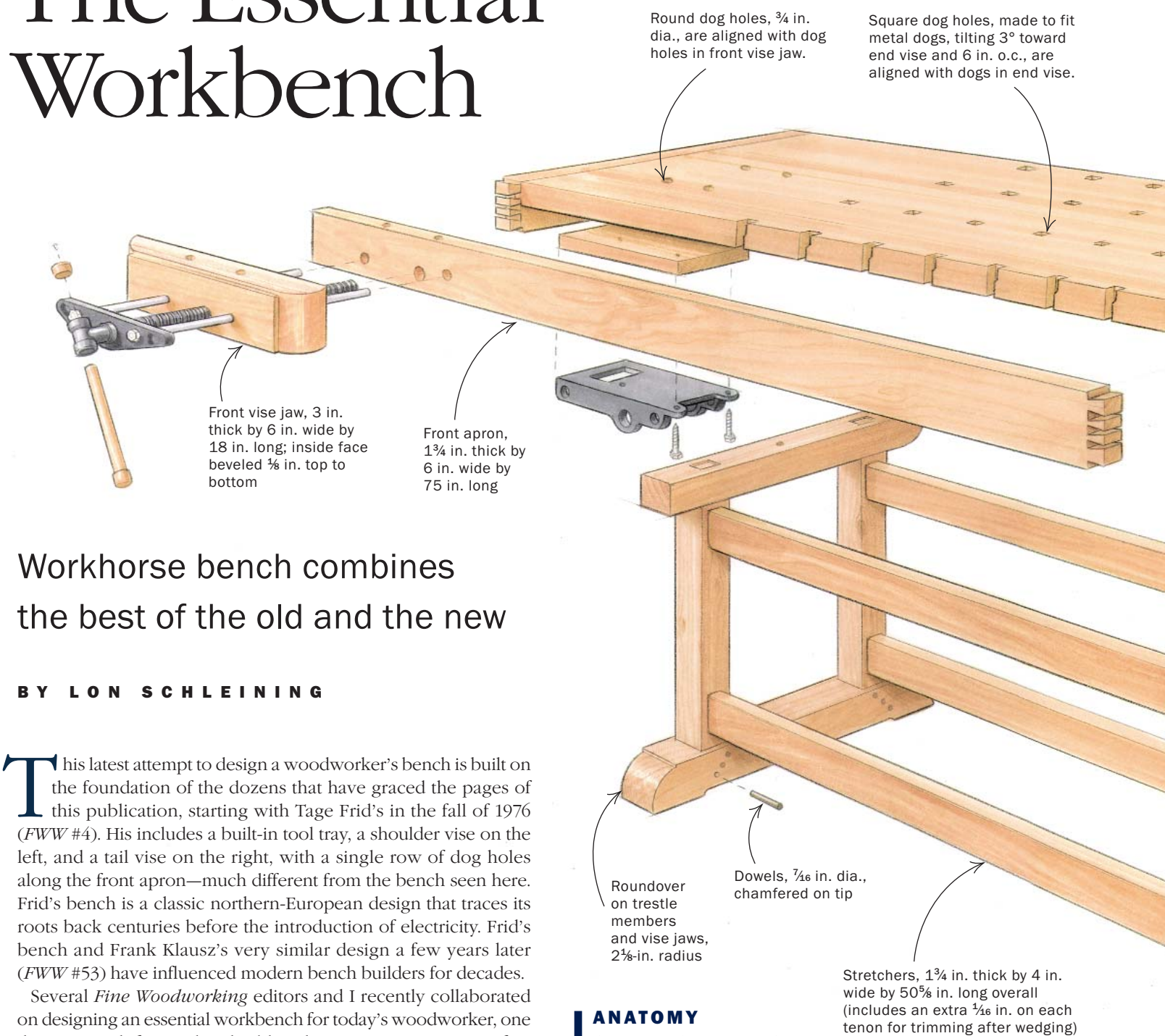


The Essential Workbench



Workhorse bench combines the best of the old and the new

BY LON SCHLEINING

This latest attempt to design a woodworker's bench is built on the foundation of the dozens that have graced the pages of this publication, starting with Tage Frid's in the fall of 1976 (*FWW* #4). His includes a built-in tool tray, a shoulder vise on the left, and a tail vise on the right, with a single row of dog holes along the front apron—much different from the bench seen here. Frid's bench is a classic northern-European design that traces its roots back centuries before the introduction of electricity. Frid's bench and Frank Klausz's very similar design a few years later (*FWW* #53) have influenced modern bench builders for decades.

Several *Fine Woodworking* editors and I recently collaborated on designing an essential workbench for today's woodworker, one that is straightforward to build without compromising performance. This bench was designed to be a tool—more workhorse than showpiece. We did not include traditional components simply for history's sake, and we took advantage of modern innovations. We also wanted this bench to be a project that most woodworkers could build using tools found in an average small shop: tablesaw, portable planer, crosscut saw, router, drill press, and hand tools. The

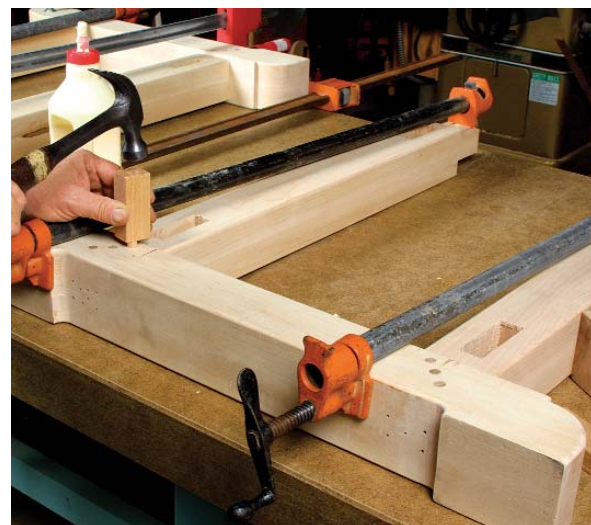
ANATOMY OF A WORKBENCH

This bench consists of (and construction proceeds in this order): a trestle base joined with mortise-and-tenons; a thick top laminated from boards set on edge; and front and end vises, both with wood jaws.

BASE ASSEMBLY

The deep mortise-and-tenon joints are either draw-pinned or wedged to ensure decades of rigidity. First, assemble the trestles, then add the long stretchers to complete the base.

BLIND MORTISE-AND-TENONS ARE PINNED FOR STRENGTH



The feet are pinned to the legs. Start by drilling the dowel holes in the feet, dry-fitting the joints, and transferring (left) the dowel-hole locations to the tenons. Then use a center punch (center) to offset those locations slightly on the tenons, creating the draw effect. Last, apply glue to all surfaces, assemble the joint, and drive home the dowels (right).

only heavy-duty tool I used was a 3-hp tablesaw. Ripping lots of 8/4 maple puts a strain on even a large saw, so use a clean, sharp blade.

A durable workbench requires beefy parts

Avid woodworkers themselves, *FWW* editors regularly visit shops across the country, and they see a wide array of workbench configurations. Like all woodworkers, they know what they like and don't like. In the end we all compromised a bit, but we reached a solid consensus. My own involvement arose from having spent the last year researching and writing a book on workbenches (look for it in the fall of 2004 from The Taunton Press). I was commissioned to finalize this design, write the article, and build the bench.

A thick, solid top—We decided on an overall size of 28 in. wide by 6 ft. long. Add a few inches for vise jaws, and it's a nice, big top.

The editors thought 2 in. in top thickness would be plenty, with extra thickness at the edges, but I made this top 2½ in. thick because it wasn't much more difficult to mill and laminate thicker pieces. However, if you start with a premade bench slab, the standard 1¾-in. thickness offers plenty of mass and solidity for serious hand-tool use, especially after adding the thicker apron and end caps.

Gluing up the slab allowed me to machine the square dog holes before the pieces were assembled. Round dog holes might be a better option for a premade slab because square ones are best cut while the top slab is in pieces.

Heavy, rigid base—I wanted the benchtop and base to be nicely proportioned. Many benches I've seen look like top-heavy slabs on spindly legs. Also, it was important that the bench not rack or skid across the floor under heavy handplaning. A thick trestle base,

A jig makes easy work of mortises

There are 16 mortises (and tenons) in the base but only two different sizes. Make two mortising jigs to speed up layout and guide the chisels. The jig is made from three blocks glued and screwed together, with a fence attached on each side to hug the workpiece.



Locate and lay out the mortises. With the jig, this job should go quickly.



Drill out most of the waste. The layout lines will guide you. For the blind mortises, set the drill press's depth stop.



Chop out the rest with chisels. Remove most of the material with a ½-in. chisel before switching to a wider one. The jig will guide the chisels precisely.

THROUGH-TENONS ARE WEDGED



Wedge the top members and stretchers. The slots in the tenons are angled 5° to match the wedge angle. A hole is drilled at the base of each slot to prevent splitting. Apply glue to all surfaces, including the wedges and slots; assemble the joint; and drive home the wedges (above), using a block of wood to protect them from direct blows. Last, connect the two trestles with the upper and lower stretchers (below), wedging their tenons in place.

joined with pinned or wedged mortise-and-tenons, guarantees stability. I laminated 8/4 lumber to make these thick members (and the top slab) because 8/4 is readily available in most regions.

Splitting the stretchers, two high and two low, leaves a perfect opening for a future cabinet with drawers. The traditional single, wide stretcher would have saved some time, but it also would have blocked this natural storage area.

Innovative vises—Hundreds of woodworkers probably would say they could not get through a day without a conventional tail vise, which is designed primarily for clamping things flat on the benchtop between dogs. Others would say the same for a shoulder vise, which offers the capability of clamping workpieces between its jaws without interference from guide bars or screws. The Veritas Twin-Screw Vise incorporates some of the capabilities of both types, allowing long boards or large panels to be clamped with benchdogs as well as clamping an upright board up to 15 in. wide for operations such as dovetailing. The two screws are connected with a chain, preventing the jaws from racking no matter where a workpiece is located or which row of dog holes is used.

I've always loved the look and performance of thick wooden jaws on a front vise but found it tedious to crank the long screw in and out constantly. I was tempted to install a cast-iron, quick-action Record-style vise, until I found a German-made quick-action vise screw and guide bars at Woodcraft. That allowed me to design a wooden front jaw to match the one I made for the Veritas end vise



BENCHTOP GLUE-UP

The benchtop is made of 8/4 maple, set on edge. Make the top in sections narrow enough to fit through the thickness planer.

MAKE UP THE TOP SLAB IN SECTIONS



Joint and plane the pieces. Run them through the planer on edge to ensure uniformity.



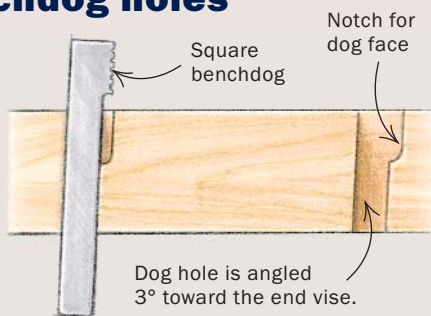
Glue up the top. The base makes a level glue-up platform, but protect it from drips. Use a notched card to spread glue.



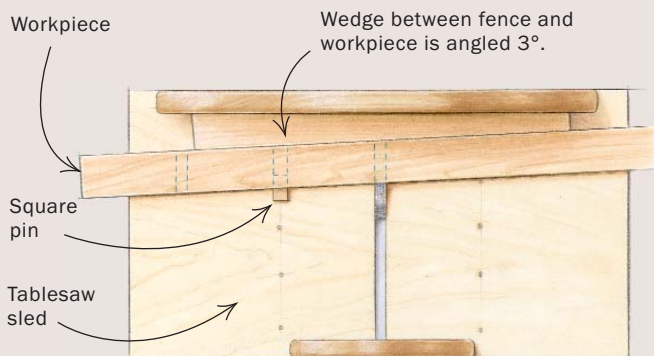
Use cauls to keep the slab flat. Wrap them with clear tape for easy cleanup. Snug them down first, then clamp across the width.

Milling benchdog holes

Cut the holes for the square benchdogs with a dado blade before glue-up. The notches for the dog faces can be routed or chopped out with a chisel.



Dado the dog holes. Use a crosscut sled with a wedge against the fence to cut the slots at a 3° angle. A square pin sets the distance between dog slots.



TOP VIEW OF SLED

and still have quick action. However, a cast-iron vise also would have been fine (see *FWW* #158, pp. 56-59, for proper installation), and a patternmaker's vise is an interesting option.

Both square and round benchdogs—The debates over round vs. square and wood vs. metal will go on as long as folks work wood. All dogs have advantages, but I prefer square, steel ones. However, lots of accessories are designed to fit into 3/4-in. round holes, so I incorporated both types into the bench. For the end vise, I milled square dog holes to fit specific steel dogs. But I can make wood ones if I choose, fitting them to the holes for the metal dogs. I ran two rows of 3/4-in. round dog holes for the front vise. This gives me the option of using round dogs as well as hold-downs and holdfasts, which use 3/4-in. holes. The round dog holes also provide the option of locating and securing jigs with 3/4-in. dowel pins.

No tool tray—I like tool trays, but many woodworkers think they are only good for collecting debris. Although this design lacks one, a tool tray could be attached easily to the back of the benchtop. Keep in mind that the large space between the stretchers will house a small chest of drawers for protected storage close at hand.

Build the base first

It's more glamorous to build the top than the base. But if you build the base first, you can use it for gluing up the top slab. Then, when the top is ready, you can set it on the base to finish installing the vises. Wedged mortise-and-tenons join the legs and stretchers, creating strong resistance to racking; pegged mortise-and-tenons join legs to feet. Laminating two layers of 8/4 material (each 1 3/4 in. thick after surfacing) creates the right thickness for the base members. Mill the legs and top crossmembers down to 3 in. square but leave the feet at 3 1/2 in. square.

Leave the stretchers the full 1 3/4 in. in thickness and rip them 3/8 in. oversize in width to allow them to move. When a wide plank is ripped into narrower pieces, tension in it is released, resulting in boards that bow one way or the other. Let the stretcher stock sit for two days, straighten and rip it to rough width, then run it through a



Flatten the slab. A five-board section of the top slab is narrow enough to fit through a benchtop planer.

portable planer on edge to clean each edge and bring the pieces to final width. If there's any fitting to be done, it's easier to do it on the tenons, so cut the mortises first, using a four-sided guide block to help with the chisel work. Then cut the tenons on the tablesaw, using a dado set.

Cutting the thumbnail profile—For the next task, cutting a large thumbnail profile on the feet, it will be worth your time to install a sharp new blade on the bandsaw. Before cutting the curve, I used a tablesaw and a crosscut sled to cut the small step at the top of the profile. After the bandsaw cut, the smoothing went quickly using a rasp and some files, followed by sandpaper.

Assembling the base—Start with the two trestle assemblies; it's critical that they be flat and square. After the dowels have been driven home and the glue has set, dry-fit and then glue and wedge



Now glue three sections into one big slab. Place a try square across the dog holes and use a long bar clamp diagonally to correct any misalignment. Again, use lots of clamps and cauls to keep the sections level.

the stretchers in place. Put glue in the mortises and on the tenons as well as on the wedges and in the wedge slots. At every step of the way, measure diagonally to make sure everything stays square, and sight across the trestle tops to be sure the assembly doesn't twist as you clamp it. Your eye will pick up minute variations.

Build the top

The boards for the top are plainsawn 8/4 stock set on edge and laminated face to face. The top's finished thickness is 2½ in., but you should expect some bowing when you rip the boards from wider stock, so rip the boards for the slab just under 3 in. wide. Once the strips have stabilized for a day or two, joint them straight on one edge, rip them on the tablesaw to about 2¾ in., and then plane them on edge to about 2⅝ in. This leaves the pieces ⅛ in. oversize to allow for finish planing after each section is glued up. Cut the slots for the square dogs now, while the pieces are separate.

TRIM THE ENDS OF THE TOP IN TWO STEPS



Use the simple two-fence jig shown. Rout deep slots in both sides of the slab, then use a jigsaw to cut off the waste, leaving square shoulders and a tongue that will fit into the end caps.



INSTALL THE VISES, APRON, AND END CAPS

Because of the half-blind dovetails, the end caps and front apron must be fitted and attached to the bench one at a time, from right to left, as are the vises.



Cut the right-hand set of half-blind dovetails. First, cut the tails in the front apron, and then clamp the front apron in place with the right-hand end cap behind it to transfer the layout of the dovetails.



Attach the large vise nuts to the back of the end cap. Also, finish cutting and fitting the dovetails.

Most woodworkers have a portable surface planer capable of planing a 12-in.-wide board. So glue up and mill the 26-in. top slab in three sections of five boards, each able to fit through the planer and easier to handle than the full slab.

Clamping with cauls is a two-step process. First, align the boards by applying clamp pressure to the cauls. After the boards are in line, clamp them together horizontally. Aside from straight cauls, the other key to success is a flat gluing surface. The top crossmembers on the base form the perfect platform to prevent the top from twisting during glue-up.

A damp (not wet) toothbrush makes short work of cleaning the glue out of the dog holes as long as this is done immediately after the slab is clamped up. Once the glue has set for an hour or so, remove the cauls and scrape off the excess glue. Let each slab cure overnight before moving on to the next one.

Plane the sections before gluing up the entire slab—If the cauls have been placed correctly, the glued slab sections should be flat with no twist. Remove any leftover glue from the top surfaces. Then, with the top surface of the slabs down on the planer bed, run them through, taking light cuts until the bottom surface is clean. Turn the slabs top-surface-up and run them through again, taking light cuts until the top surface is clean. Turn them over once more and plane the underside until you reach the 2½-in. thickness.

Gluing together the slabs is a lot like gluing up the individual sections. Again, use the top crossmembers on the base and lots of cauls to keep the pieces aligned. Then it's simple to close the last of the glue joints. However, check the dog-hole locations with a square to be sure they all will be the same distance from the end vise.

A neat trick for trimming the slab to length—Not many of us own a saw capable of accurately crosscutting a very heavy slab almost 2½ ft. wide and more than 6 ft. long. For this project, a simple

router jig will allow you, in one operation, both to trim each end accurately and to create some necessary joinery (see the bottom photos on p. 43). By cutting deep dados on the top and bottom of the slab, a tongue is formed, which fits into a slot milled into the end cap. Cut the remaining ¾-in. tongue to length with a jigsaw (not an important glue surface so not a critical cut). Cut the mating slots in the end caps using a dado set on the tablesaw.

Install the end caps and front apron—The end caps cover the end grain of the top slab and help keep the slab flat. The right-hand end cap also serves as the rear jaw for the end vise. The front apron beefs up the thickness at this critical work area and serves as the rear jaw for the front vise. I not only needed a strong mechanical joint holding the front apron to the end caps, but I also wanted the areas that act as vise jaws to remain flat, with no end grain protruding as it would if I used through-dovetails or finger joints at the corners. Half-blind dovetails seemed to be the perfect solution, oriented as shown in the drawing on p. 39.

After cutting the joinery but before gluing the end caps and front rail in place, use a drill press to bore the holes for the vise hardware. Mount the end caps with cross-barrel bolts. The Veritas vise includes four of these; use two for each end cap. Apply glue only along the front 3 in. or 4 in. of the tongue and the groove. This limits wood movement of the slab toward the back of the bench.

The front apron is attached to the slab with glue only (and help from the half-blind dovetails).

Mount the vises and attach the top

Both vises come with thorough instructions, making the hardware straightforward to mount. The twin-screw vise attaches to the bench rather simply, with its two large screws passing through large nuts attached to the inner face of the end cap. It's critical that holes in the front and rear jaws align perfectly, so drill them at the



Now for the front vise. Start by attaching the mounting bracket under the benchtop. The blocking under the bracket will increase the clamping capacity.



Locate the clearance holes in the front apron. Clamp the front apron accurately in place and tap a brad-point drill bit through the holes in the hardware to transfer their locations. Drill the holes in the front apron and front vise jaw at the same time.

same time. The length of the chain determines the distance between holes, so careful layout is in order. The vertical location of the holes is determined by adding 1½ in. to the thickness of the top slab to allow the large vise nuts to clear the underside of the benchtop.

Mounting the front-vise hardware and the large wood jaw is even more straightforward. First, the mounting bracket must be bolted to the underside of the benchtop. I used ⅝-in. lag screws. Next, the vise screw and guide bars are run through the bracket to locate their clearance holes in the front rail. Last, make the large wood jaw and bolt it to the vise hardware. Somewhere along the way, the front jaws for both vises must receive their large thumb-nail profile, identical to the one on the trestle feet.

Once you have all of the hardware and vises in place, mill a ¼-in. bevel on each of the outside jaws to accommodate flex in the hardware as the jaws tighten, which helps them maintain good clamping pressure at the top. Now you can attach the top to the base. Two lag bolts along the centerline of the bench are plenty for attaching the benchtop to the trestle base.

Flatten the top and finish the bench

Do the final flattening after the top has been mounted to the base and all of the vises are in place. If your glue-ups went well, all you will have to do is some scraping and sanding.

I didn't want a slick finish, as beautiful as it might be. Clamps, hold-downs, and vises depend on friction to hold parts securely. The traditional finish for a benchtop is linseed oil thinned with turpentine, which seals the wood enough to make glue removal pretty easy but doesn't make the surface more slippery than it is naturally. However, I wiped on a thinned varnish for greater protection. To make sure moisture absorption is even on all sides, it's important to coat the top and underside of the bench equally. □

Lon Schleining is a contributing editor.



Attach the front-vise hardware to the front jaw. Use the vise hardware to clamp the front jaw in its proper position before drilling for the attachment screws. Last, cut the half-blind dovetails on the left-hand end cap and attach it.



Assemble the hardware for the twin-screw end vise. Clips join the chain at the proper length. Again, use the vise hardware to clamp the jaw in position before drilling for the attachment screws.