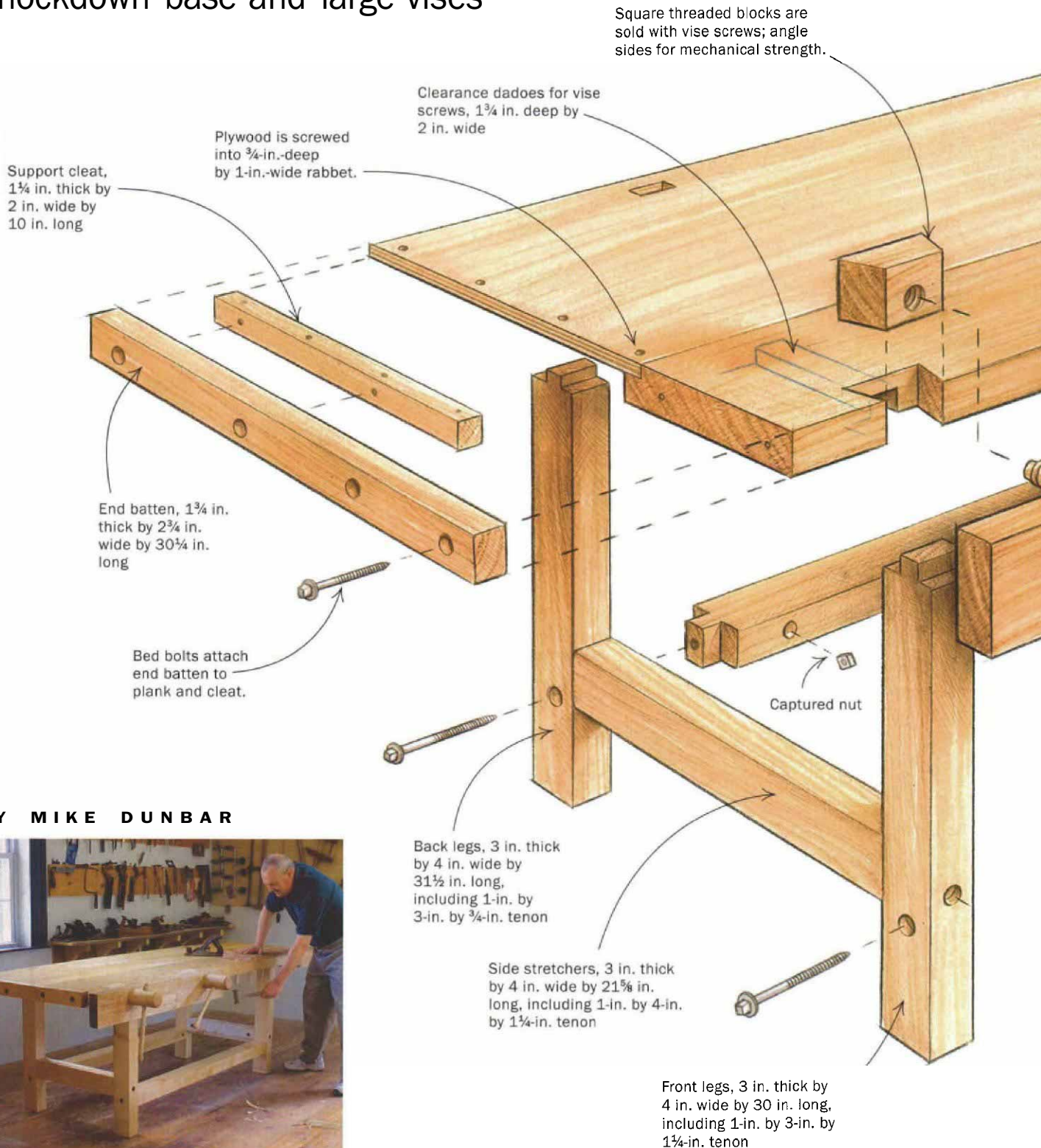


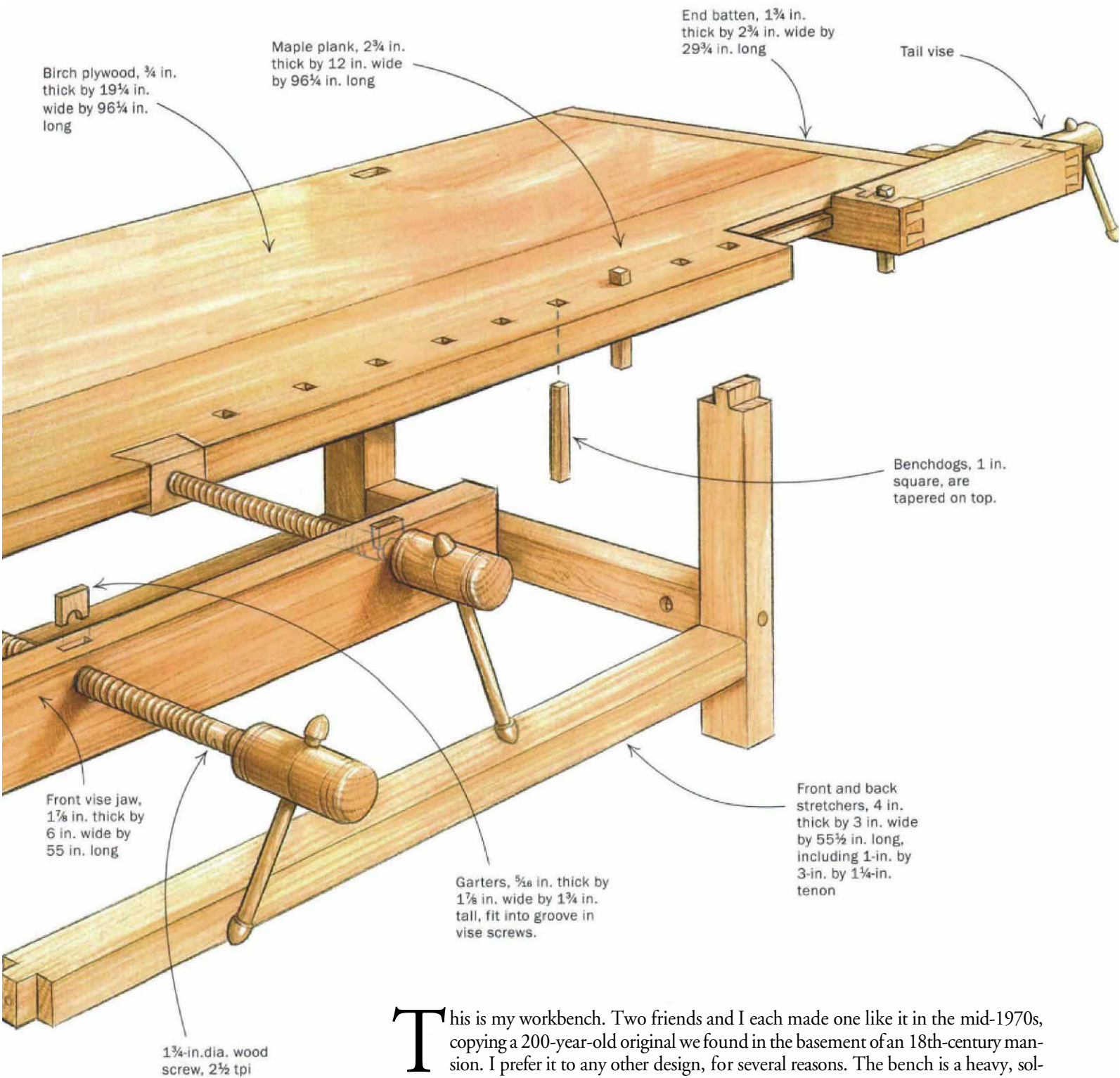
Mike Dunbar's Workbench

Heavy-duty bench has a wide top, knockdown base and large vises



BY MIKE DUNBAR





This is my workbench. Two friends and I each made one like it in the mid-1970s, copying a 200-year-old original we found in the basement of an 18th-century mansion. I prefer it to any other design, for several reasons. The bench is a heavy, solid structure. No matter how hard the work, there is no need to hold down this one with sandbags. And its joints don't wobble when I'm handplaning or sawing. If they do loosen because of seasonal movement, a tweak with a bed-bolt wrench makes them rigid again.

The bench's wood vises are very strong. The twin-screw front vise has ample space between the screws, which means I can drop a long, wide part between them. And the jaws are wide enough to hold a 6-ft-long board for edge-jointing without additional support.

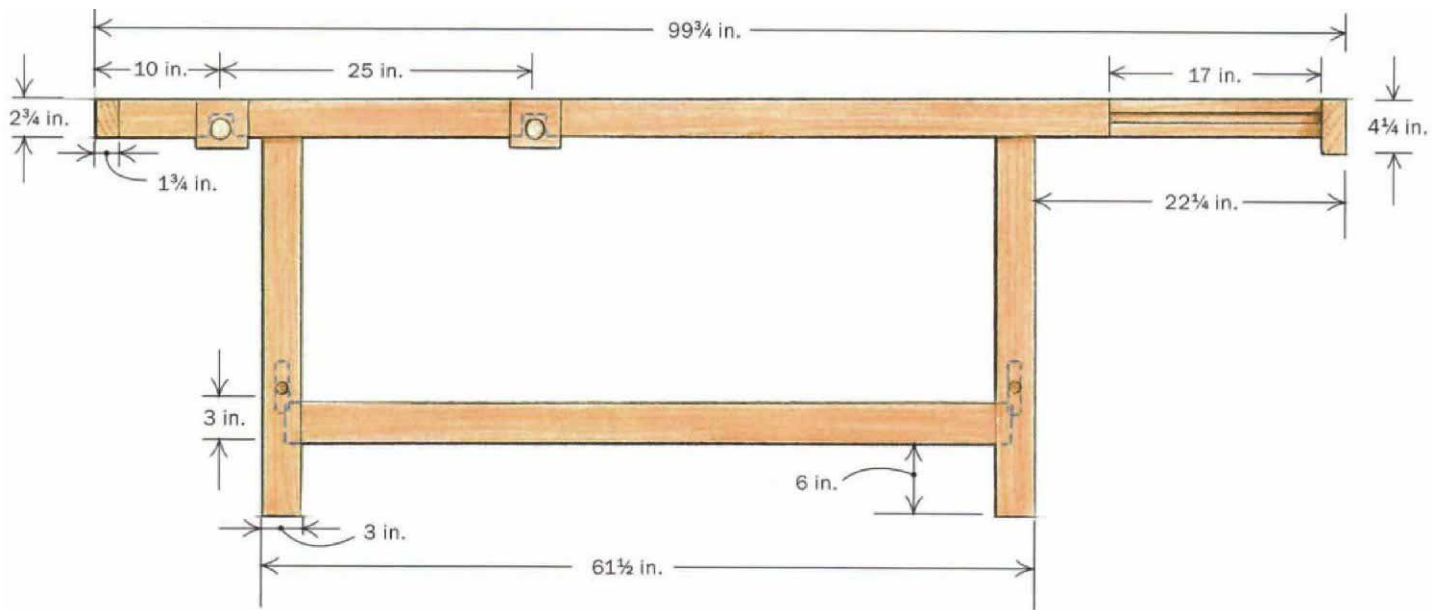
The bench does not have a tool tray, leaving its entire wide top available not just for woodworking but also for assembly. When I worked by myself as a professional furniture maker, this bench was all I needed. Finally, I am a woodworker, and a bench made entirely of wood has a deep appeal for me.

Making this bench is more heavy work than it is hard, although the tail vise is somewhat



Bed bolts, $\frac{3}{8}$ in. dia. by 6 in. long

BASE AND BENCHTOP



complicated. Many of the parts are so large that joining them borders on timber framing. A second pair of hands comes in handy for some stages on the project.

Some heavy lifting will be required

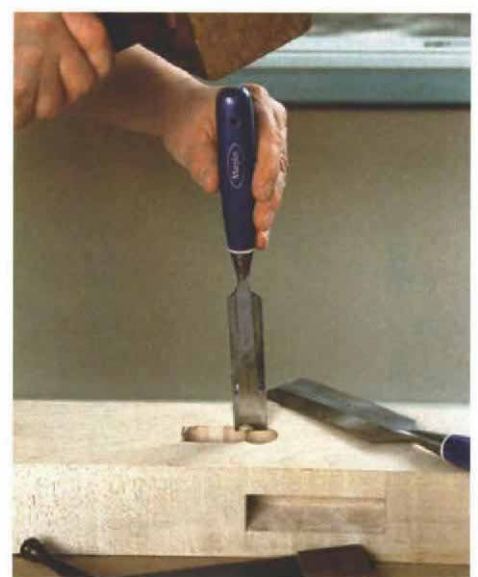
The bench can be made of just about any type of hardwood. Because this is a workbench, practicality governed my choices. In my region, yellow birch is cheaper than maple but isn't available above 10/4. So I used birch for the 2-in.-thick parts and hard maple for the thicker ones. If you cannot find 12/4 hardwood, you can glue up your stock.

Before cutting any wood, determine what bench height is comfortable for you. When working with hand tools, it is more efficient and easier if you can bring into play all of the larger muscle groups in your body, above all those in your legs and back. Most benches are too high for me, forcing me to work only with my shoulders

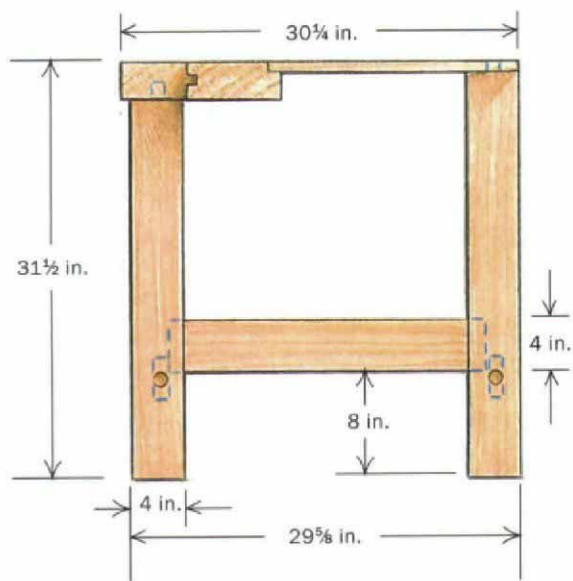
and arms. I am 5 ft. 9 in. and a little short in the leg. My benchtop is 32 in. high.

Besides wood, you will need to order two other items: 1 3/4-in.-dia. wooden bench screws and threaded blocks, which you can get from Crystal Creek Mill (P.O. Box 41, DeWitt, NY 13214; 315-446-1229). Mention this project to get the same components I used. The three screw-and-block sets will run you \$195.

You can cut your own threads if you have a large tap and die suited for this job (one that's at least 1 1/2 in. dia. with 5 tpi or fewer). Antique tap-and-die sets for wood may be found at a flea market or tag sale. The tap would be the most useful of the two, because it would allow you to make the threaded end batten near the tail vise out of one piece of wood. Without it you'll have to join one of the threaded blocks to the end of the batten. The Beall Tool Co. (800-331-4718; bealltool.com) offers wood-threading kits for making 1 1/2-in.-dia., 5-tpi screws and nuts. It includes a router jig



Timber-frame techniques. Use a circular saw to cut the tenon shoulders on these large beams. The cheeks are then cut on the bandsaw. Get an assistant, if you can find one, to help you support the long, heavy timbers. For the mortises in the legs, first drill out the waste, then square with a chisel. Afterward, the tenons are pared to fit the mortises.



and bit and a 1½-in.-dia. tap, which would solve the aforementioned joinery problem.

You'll also need 16 bed bolts and a wrench, which you can get from Ball and Ball Hardware Reproductions (800-257-3711).

A knockdown base is easy to move

The original bench knocks down completely. This leads me to suspect that it belonged to an interior joiner, what we would call today a finish carpenter. These guys were the elite of the building tradesmen and were responsible for raised-panel walls, wainscoting, staircases, mantels, moldings and doors.

Working on a magnificent Portsmouth, N.H., mansion, a joiner could be on the job site for months. He would move his bench and toolbox right into the house. When finished, he'd put them in a wagon and move them onto the next job site. A bench that knocks down is still a good idea today because it is easier to move to a new shop.

The legs and stretchers are joined with mortises and tenons held together with bed bolts. The joints can't be at the same height or the bed bolts would bump each other, so offset their elevations. Notice that there are tenons on the tops of the legs, as well, to secure the top to the base. Cut all of the joints at the same time.

Cut the shoulders of these large tenons with a circular saw and then rip the cheeks on the bandsaw. Bore out the mortises with a drill bit and square the corners with a chisel. I used a shoulder plane to fit the tenons.

Bed-bolt basics—Bed bolts are very effective fasteners and, when tightened, will not allow the slightest wiggle. The bolt has a square head with a large flange and requires a two-step hole. Drill the counterbore for the flange first. The long hole for the bolt goes into the bottom of the mortise, through the length of the tenon and past the location of the nut.

The nut sits in a hole drilled into the back of the rail. Assembling the joint is easy: Tap the mortise and tenon together, hold the nut in place and slide a bed bolt into the hole. A couple of quick turns



Locate the leg mortises on the plank. First turn everything upside down and level the back legs.



End battens support the plywood portion of the benchtop. Each batten is bolted to the thick plank and also to a cleat that supports the plywood and keeps it level with the plank. The plywood is screwed onto the cleat and into a rabbet at the back edge of the plank.

FRONT VISE



Size and strength. The thick wooden screws are far enough apart to accommodate a wide workpiece, and the jaw is long enough to support a 6-ft. board for edge-jointing.

catches the nut. When all of the fasteners are hand-tight, grab the bed-bolt wrench and finish the job.

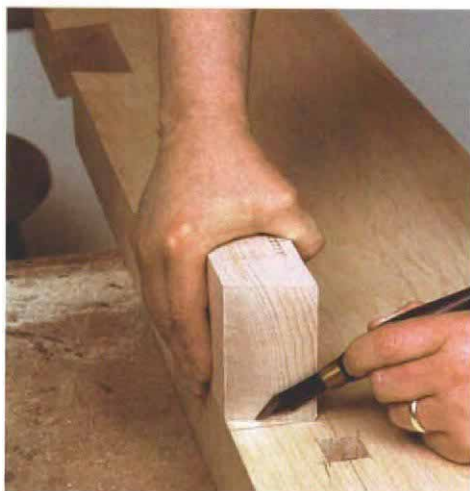
The plank is the key to the top

The top of the bench is made of two pieces: a 3-in.-thick plank at the front and a thinner plywood panel behind. The front and back legs are different heights as a result. The thick front plank anchors the vises and provides a durable surface for your heaviest and most forceful work. The rear panel will not take the same punishment as the front and does not have to be as thick. Its role is to provide a wide, level surface. On the original bench this was a wide pine board, but I used birch plywood for its stability.

The width of the front plank is a variable and can depend on whatever you can find or glue up. A piece of wood this thick is seldom flat as it comes from the lumber dealer and will need to be planed. If your machines are not up to a job this heavy, you may have to find someone who can do the work for you. I surfaced my 12-in.-wide plank in my planer, because it wouldn't fit on my jointer. Luckily it was straight but just cupped a bit. I took a couple of passes off the domed (heart) side, just to get a flat to work on. Then, I took light passes off the concave side. Because this surface is not seen, there is no need to flatten it completely. Finally, I flipped the plank again and finished dressing the upper surface. Set the plank aside for several days and let it equalize before flattening it again with a light pass. While you are at it, joint the front edge so that it is straight and square to the upper surface.

This plank requires a few operations before it's ready to drop into place on the substructure. First, lay out the leg mortises in the underside and cut and fit them to the tenons on the top of the front legs. Next, rout the rabbet in the back edge to create a lip that will support the plywood portion of the top, which will be secured with wood screws.

Make room for the vises—The front vise is secured to the bench with wood screws threaded through two dovetail-shaped nuts,



After angling the sides of the threaded blocks, lay out their recesses. The trapezoidal shape gives mechanical strength to this joint, which is also glued.



Circular saw comes in handy again. Cut the shoulders first, then cut some kerfs through the waste section.



After chopping out the waste, pare the sides. Use one of the threaded blocks to guide your chisel.

which are set into the plank. Bevel the sides of two of the three threaded blocks (the other one is for the tail-vice assembly). Then use the blocks to lay out their recesses. Lay out these notches so that the blocks project slightly from the front edge of the bench-top; plane them flush later. Cut the deep notches with a handsaw or circular saw, and clean up the walls with a wide chisel.

The top is far too thick for the wood screws to clear it on the bottom side, so you have to cut channels for clearance. Tap the nuts into place temporarily to see where the threaded holes line up with the bench. Cut the channel edges first, with a straightedge clamped on the plank to guide your circular saw. Then make a lot of kerf cuts through the center and chop out the waste.

Now you can glue in the threaded nuts. Leave the tops slightly proud and plane them flush after the glue is dry. Plane the front edges flush, too. Next, cut out the large notch for the tail vise. A circular saw will cut through most of the stock, but you will need a handsaw to complete the corner. Clean up the sawcuts with a handplane, keeping everything square (not the easiest task but very important). Rout the long groove along the notch, and finish it with a sharp chisel.

The last task in preparing the front plank is to cut the dog holes. Although you can use any type of dog you prefer, I chose the clever, low-tech type I found on the original. The dog holes are $\frac{7}{8}$ in. square, and each square dog has a slight taper planed onto one face. There is a dog for each hole in the bench. Each is tapped into place from below, narrow-side up, and sits flush with the top until it is needed. Tap it with a mallet until it projects slightly above the surface and tightens in place. The dog holes are roughly $6\frac{1}{2}$ in. apart, but some are offset to avoid the screws for the front vise.

The plywood section—The bench's end battens are bed-bolted to the thick plank and have support cleats along their inside edges for securing the plywood. The plywood is also screwed into the rabbet on the back edge of the thick plank. With the thick plank in place on the front legs, place the plywood in its rabbet to locate the mortises for the rear legs. Cut these mortises, then attach the plywood to the plank and the end battens.

A trick for vise handles

Each wood screw has a thick hub with lines scribed into it. These are both for decoration and for laying out the holes for the handles. Drill a 1-in.-dia. hole. You can make the handles out of a piece of dowel with pins in the ends or end caps to keep them from falling out. However, I prefer the old technology used by the original maker. Turn your handles using wood that is still slightly green. You can split some from a firewood pile. Leave the ends $\frac{1}{8}$ in. bigger than the hole in the vise-screw hub.

Boil one of the bullet-shaped ends to soften it, and drive it through the hub with a mallet. The wood will compress as it passes through the hole (some may be sheared away by the hole's edges), then it will spring back on the other side.

Front vise jaw wears a garter

The jaw is a piece of $\frac{3}{4}$ hardwood. Its width is not critical and can depend on the wood you have on hand. Unlike most period



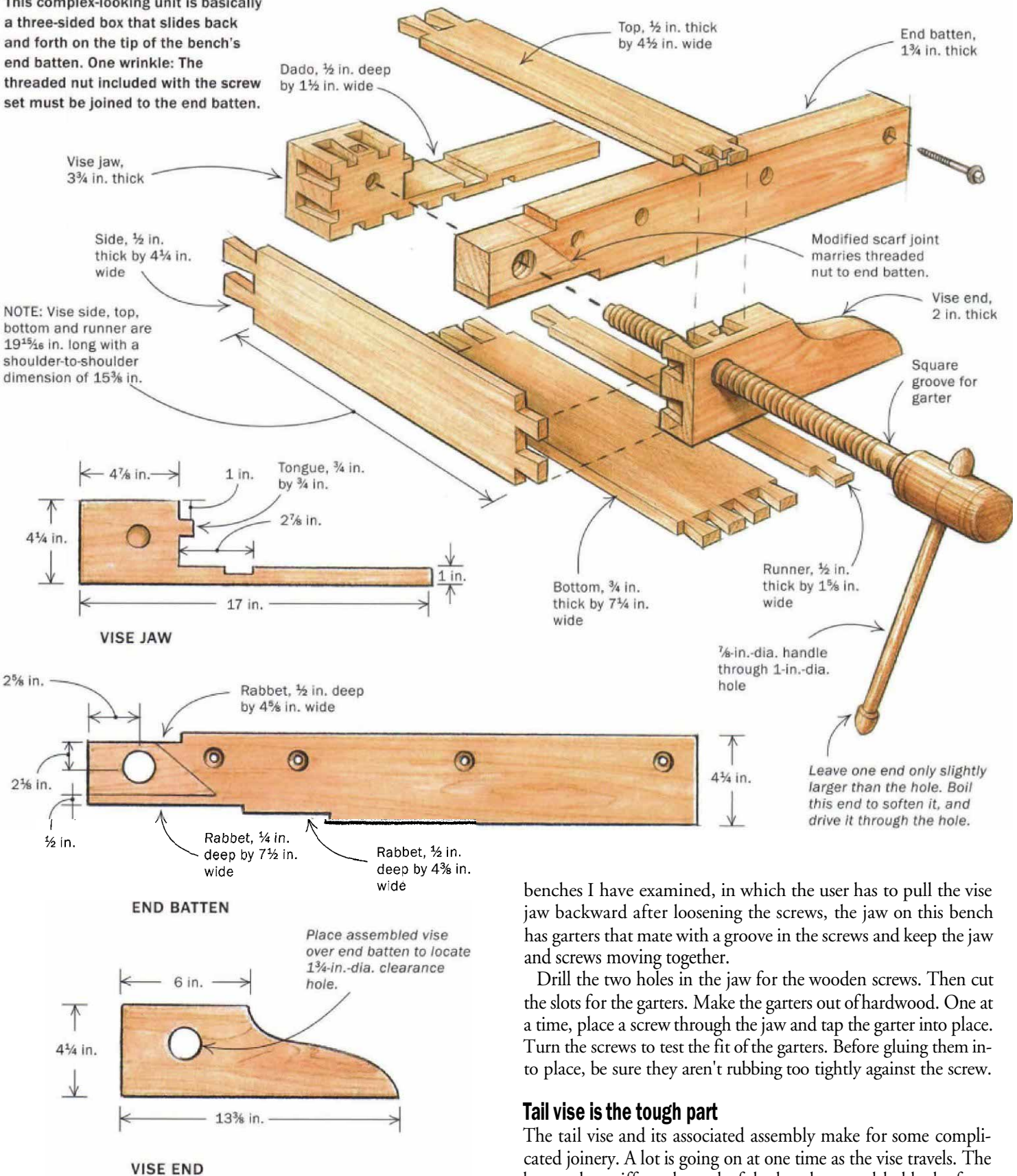
Cut clearance channels for the vise screws. Tap the threaded blocks into place temporarily to determine the location of these channels. Remove the blocks before cutting. Define the edges with a circular saw, kerf out the middle, then chop out the waste.



A garter keeps the vise jaw moving with the screw. This thin strip is mortised into the jaw and fits into a groove near the screw hub.

TAIL VISE

This complex-looking unit is basically a three-sided box that slides back and forth on the tip of the bench's end batten. One wrinkle: The threaded nut included with the screw set must be joined to the end batten.



benches I have examined, in which the user has to pull the vise jaw backward after loosening the screws, the jaw on this bench has garters that mate with a groove in the screws and keep the jaw and screws moving together.

Drill the two holes in the jaw for the wooden screws. Then cut the slots for the garters. Make the garters out of hardwood. One at a time, place a screw through the jaw and tap the garter into place. Turn the screws to test the fit of the garters. Before gluing them into place, be sure they aren't rubbing too tightly against the screw.

Tail vise is the tough part

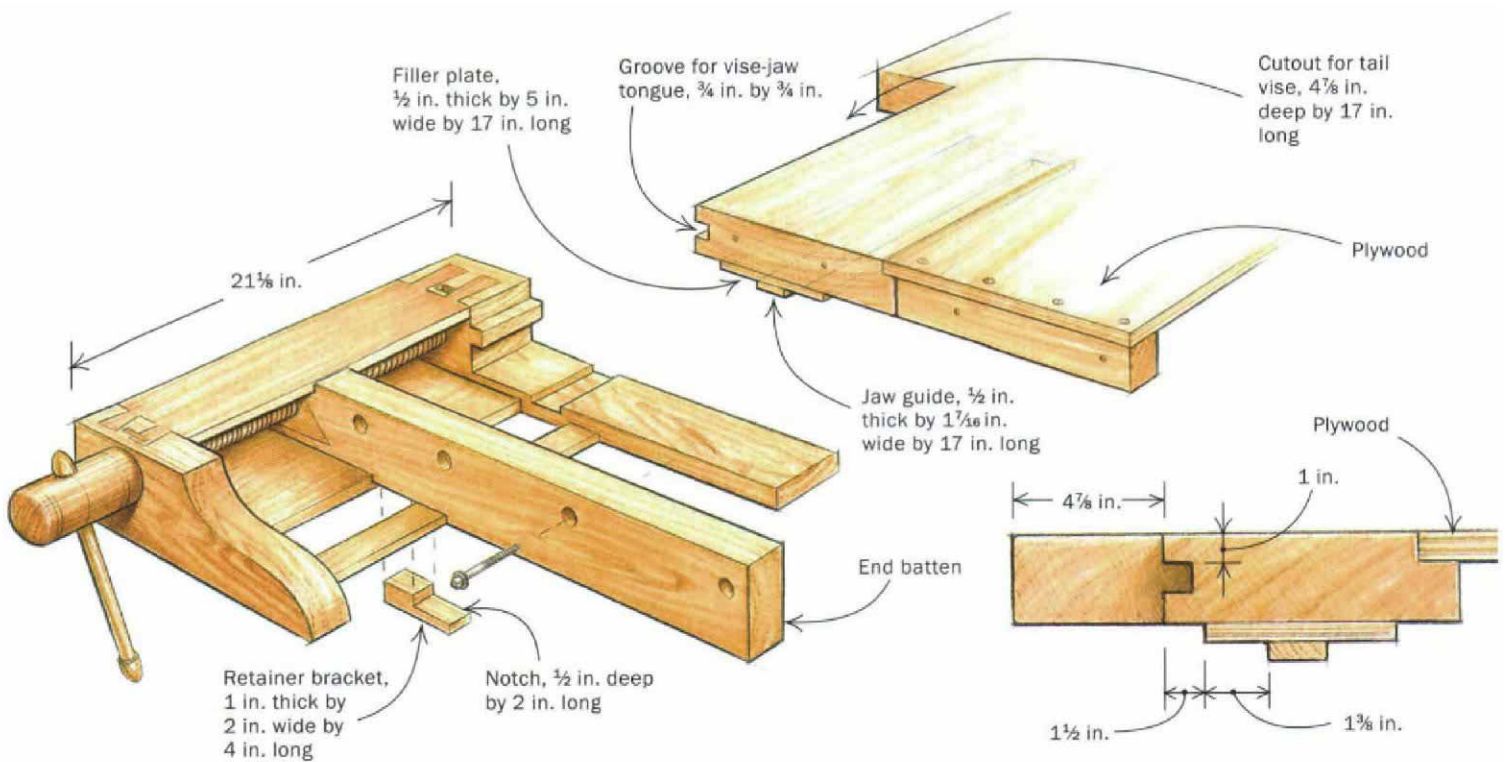
The tail vise and its associated assembly make for some complicated joinery. A lot is going on at one time as the vise travels. The batten that stiffens the end of the benchtop and holds the front plank and plywood level is threaded for the tail-vise screw. It also acts as one of the guides for the vise. Without a large tap to cut the



Think of the vise as a three-sided box with closed ends. Build up the jaw end (foreground) from thinner stock. An ogee contour decorates the opposite end piece. The top, side and bottom are joined to the ends with large dovetails.



Slide the assembled tail vise into place to locate the holes for the vise screw. This measurement determines where the vise screw will pass through the end of the tail vise and where it will enter the jaw end (at right).



threads in the batten, I had to find a way to join one of the threaded blocks to it. I settled on a version of a scarf joint that provides some mechanical support and plenty of glue surface.

The vise itself is a three-sided box with closed ends. The jaw end is a 4-in.-square piece of hardwood. I glued up mine in a sandwich from thinner stock, which made it easier to create the tongue that protrudes from this block. A hole in the inside surface of the jaw receives the end of the vise screw. The other end piece is 8/4 and has a clearance hole drilled through it for the screw. The ogee contour on this piece is more decorative than functional.

The top and side pieces of this box are 1/2 in. thick and joined to the jaw with large half-blind dovetails. The bottom is 3/4 in. thick and joined the same way. There also is a guide strip on the bottom, which is 1/2 in. thick and also dovetailed to the jaw and end pieces. Make all of the parts for the tail vise, then test their fit and action before glue-up.

Cut the mortise for the garter and tap it into place. You cannot avoid cutting into the dovetails when you make this mortise. Drill and square the dog hole in the jaw the same way as those in the benchtop. This hole should fit between the dovetails.

Use bed bolts to secure the end batten to the thick part of the benchtop. Make the small retainer bracket through which the narrow guide strip passes and screw it into place on the end batten.

The vise may work somewhat stiffly at first but will eventually wear in so that it moves smoothly and without effort. Waxing the moving surfaces will help the action.

I completed my bench by finishing it with several coats of boiled linseed oil thinned with a little turpentine. Let the wood absorb as much oil as possible before wiping off the excess. □

Mike Dunbar is a contributing editor. He and his wife, Sue, run a Windsor chair-making school in Hampton, N.H.