



Frank Klausz created his ideal work area in a small space by pairing a hefty workbench with a utility table. The bench provides lots of clamping power and the table contains storage bins and drawers.

A Classic Bench

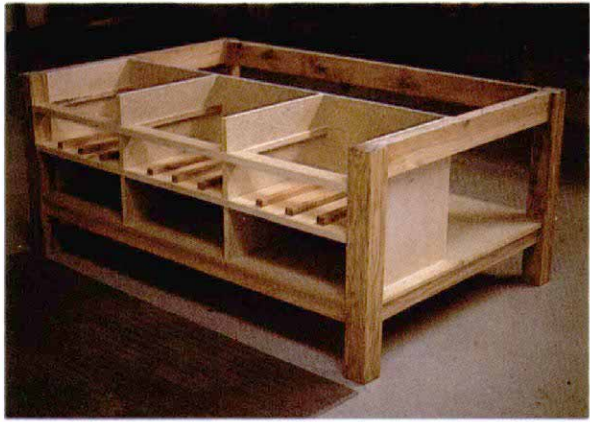
Workstation's center is worth building right

by Frank Klausz

If you are a serious woodworker who prefers handtools, one of your first investments should be a hefty, well-designed workbench. My joiner's workbench, shown in the photo above, is the heart of the ideal workstation. Based on a traditional design, my bench is outfitted with shoulder and tail vises and steel dogs that can clamp a workpiece in a variety of positions. And it's built solidly enough to be stable under any kind of sawing, planing, scraping, or pounding.

Near my workbench is a wooden chest with my chisels and other handtools, all sharpened and ready to use. To make it easier to use the chest I built a small platform that raises the box

10 in. to 15 in. off the floor. If your bench is near a wall, you might prefer a wall-hung cabinet, as workmen in Europe often do. A 27-in.-high utility or helping table with a 40-in. by 60-in. work surface is located about 4 ft. behind the bench. This table, shown in figure 1 on the facing page, houses 12 plastic drawers (available from WW Grainger, Inc., 5959 W. Howard St., Chicago, Ill. 60648): small ones for dowel pins or screws, larger ones for chisels and other tools. Larger planes and portable power tools fit on its bottom shelf. Don't try to save steps by putting the drawers in your main workbench—if you clamp a large piece in the shoulder vise, you can't open the drawers. You could build drawers



Assemble the 27-in. high utility table with mortise-and-tenon joints. Locate shelves to fit standard plastic drawers for small tools and odds and ends. Larger tools go on the bottom shelf. Make the 40-in. by 60-in. top from particleboard and 1/4-in. maple plywood. To plane long boards, right, Klausz uses a bench slave with the shoulder vise.



that open from both sides of the bench, but putting them in the utility table is much handier.

By arranging my workspace like this, I have plenty of room to work comfortably and can easily step over to get a chisel or a handful of screws. Everything is at my fingertips. The workbench and table also work well together. I do all of my planing, sawing and joint cutting on the bench, then assemble the pieces on the table. The table, being several inches lower than the bench, is perfect for holding a chair or a chest of drawers at a comfortable work height. When I'm assembling on the table, I still have a clear workbench for trimming joints and other last minute touches.

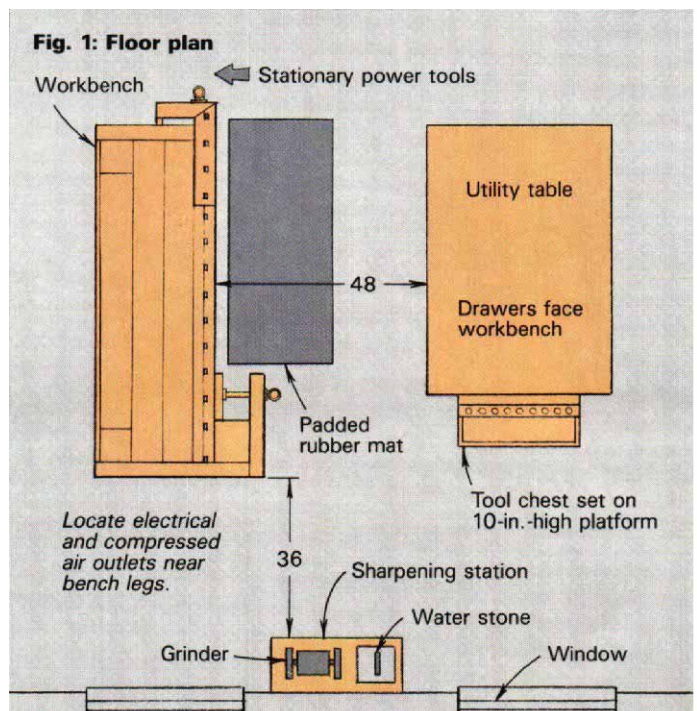
Apart from the knots in the base, my workbench looks pretty much like any other traditional cabinetmaker's bench. Our ancestors invested more than 1,000 years in developing its design and they left very little for us to change. When I worked in Europe, I visited many different shops and the workbenches were always the same design and about the same size—7 ft. by 3 ft.—although the bench height was tailored to the height of the cabinetmaker who used it. Apart from little touches like the stops and oil dish shown in figure 2, the only difference I found was that some craftsmen treat their benches with loving care and some don't.

All the European cabinetmakers I visited used similar shoulder and tail vises to hold their work. The bench screw (available from Garrett Wade Co. in New York City and Woodcraft Supply Inc., Woburn, Mass.) on my shoulder vise gives it about a 7-in. capacity. It can hold a short piece by itself or, working with a bench slave (see figure 2), hold a long piece in an efficient work position. The slave is a notched 1 1/2-in. by 2-in. piece of hardwood tenoned into a cross-lapped base. A wooden block hanging from two wooden ears connected with a dowel supports the work.

The tail vise can hold wood in the same manner as the shoulder vise, but it's most often used with the bench dogs to lock pieces down flat on the benchtop. I use traditional square metal dogs (I ordered mine from Garrett Wade). It's crazy to try to use dowels for bench dogs. They might work if the dogs just kept the wood from sliding on the benchtop, but they must also clamp the work tightly against the top. Square dogs have slightly angled faces so you can pinch the board between the jaws, then drive the dogs down to snug the piece against the top. A workpiece suspended in midair between the dogs will chatter when you work on it.

A good bench should be built of hardwood, heavy enough so that you can't move the bench with a stroke of your handplane. Hardwood is expensive, so I cut costs by buying green wood and drying it myself or scavenging rejects at local sawmills. The bench legs and base are cut from second- or third-class chunks of red oak, white ash and beech—any hardwood will do. It's not scrap, but it's not good enough for furniture.

Though each workbench is a little different, depending on the material you have to work with, don't drastically alter the basic dimensions shown on the drawings. You could go a little wider or longer without creating a monster, but scaling the bench down and using much thinner stock eliminates the weight essential to a good bench. The correct height of the bench is easy to determine. Stand up, put your hands next to your pockets and your palms parallel to the floor. The distance between your



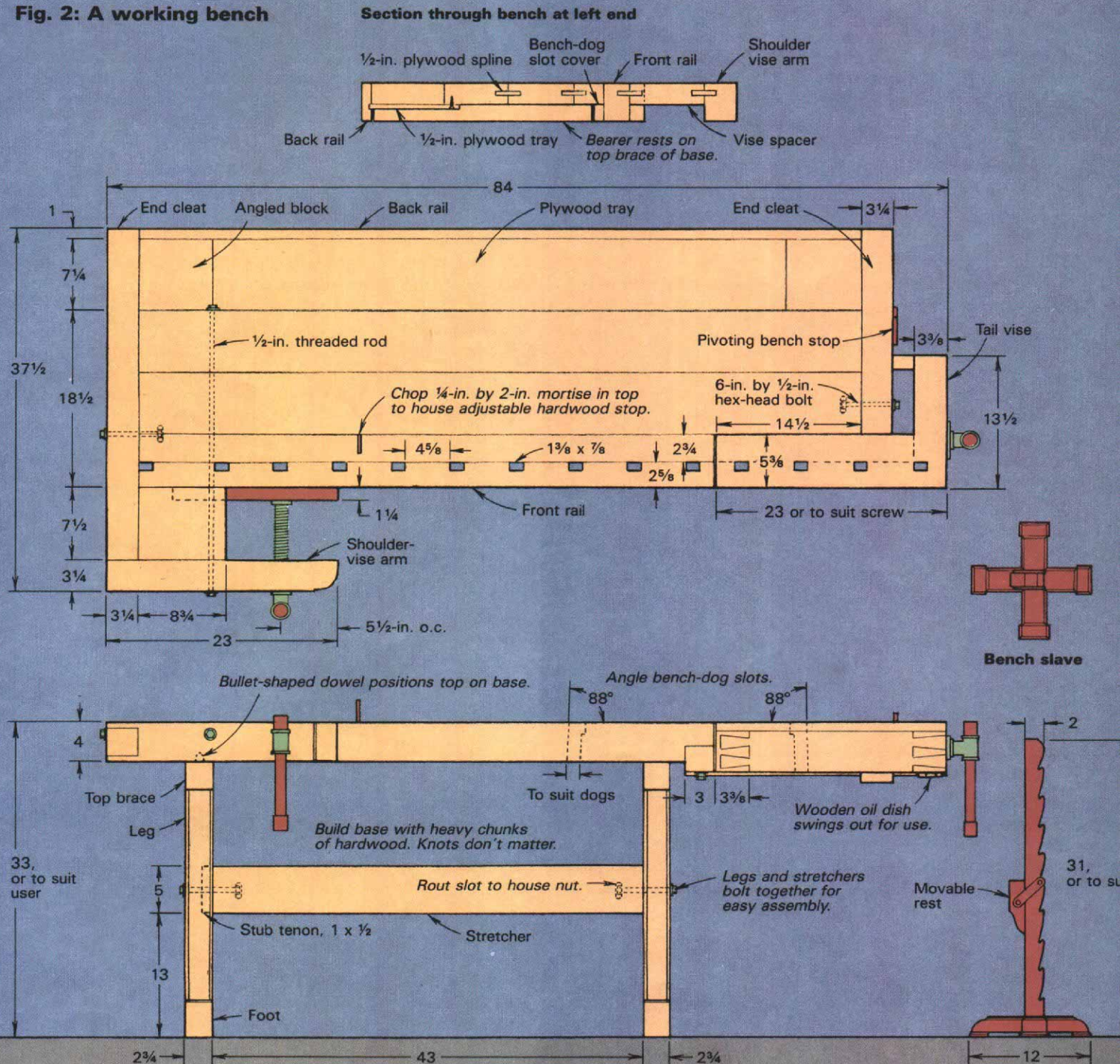
palms and the floor equals the bench's height. If you make the bench higher, you can't take advantage of your body weight when handplaning. Using your body weight, not just your arm muscles, will give you hours of easy planing while the other guy is pushing and shoving.

Construction of the base—My bench is supported by a sturdy base: two heavy uprights joined by a pair of wide stretchers. The pieces for the uprights are mortise and tenoned; the leg-to-top-brace joints are through-wedged; the others blind. So the bench can be broken down to be moved, the stretchers are fastened to the legs with bolts and captured nuts. To position the top, bullet-shaped dowel pins in the top braces of the uprights fit into holes

bored in heavy bearers screwed to the underside of the bench top. The weight of the top holds it on the base.

Begin base construction by determining the height of your bench, as discussed above. I'm 6-ft. tall and my bench is 33-in. high. Adjust the leg length, up or down, in the area between the stretchers and feet, then cut all the parts as shown in the plan. I cut the mortises with a hollow-chisel mortiser, but you could chop them by hand or mill them with a router. Drill a bolt hole through each stretcher mortise from the inside of the mortise. Insert the stretcher tenon and use the hole in the leg as a guide to bore into the end of the stretcher. Remove the stretcher and deepen the hole to accept a 6-in. hex-head bolt. I rout a slot at the end of the bolt hole to house the captured nut.

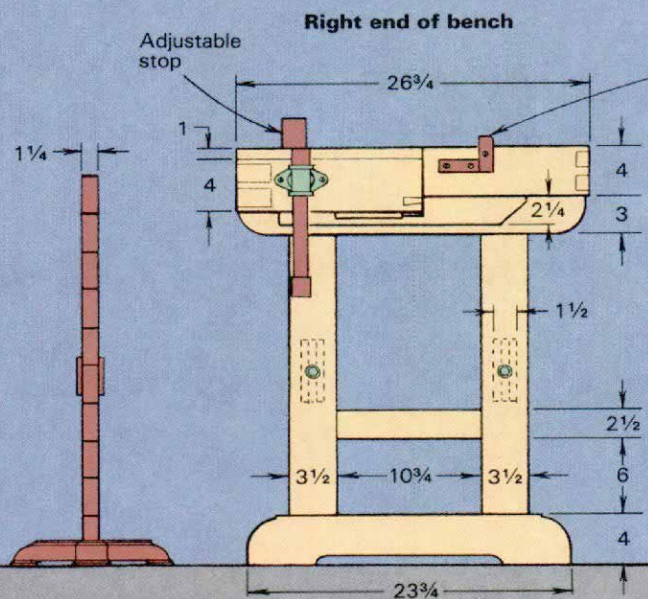
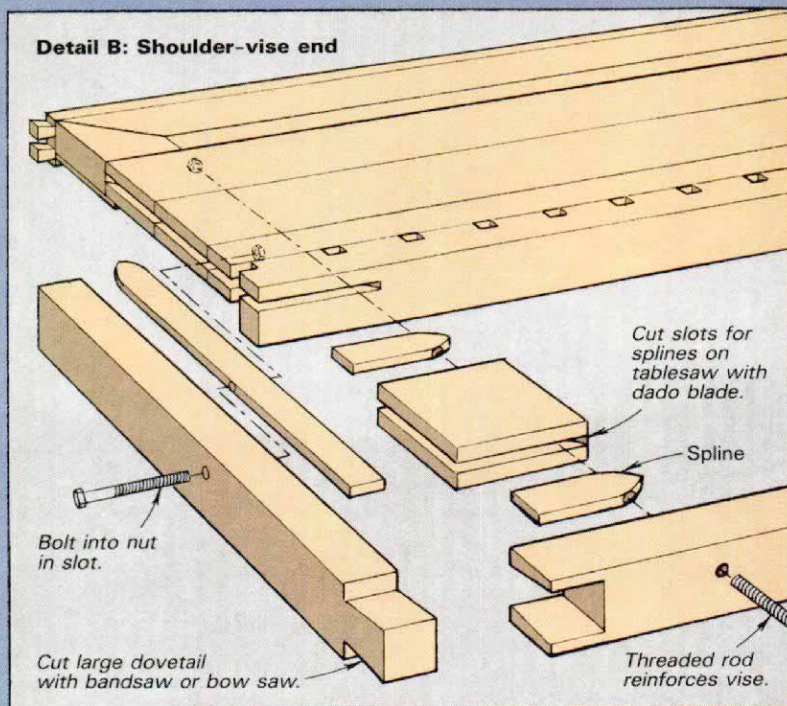
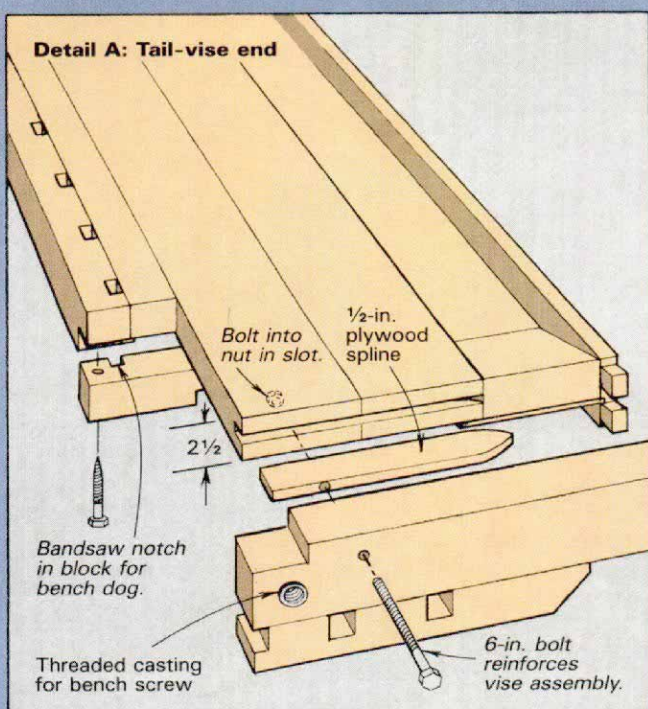
Fig. 2: A working bench



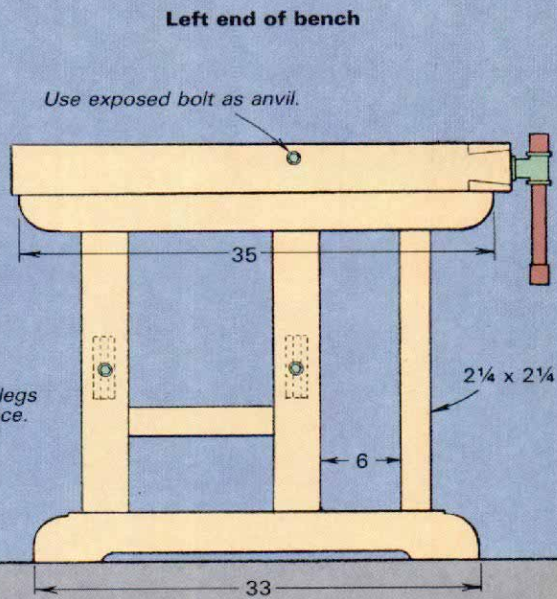
Assembling the top—The benchtop, with its tool tray and two vises, is the most complicated part of the bench so you must measure very carefully when making the parts. It consists of 2½-in. thick boards sandwiched between a thick front rail, which is mortised for the dog slots, and the tray and back rail assembly in back. Both ends are capped by heavy cleats. All pieces are splined and glued. The vises themselves are constructed separately and then fitted to the top.

For the 2½-in. stock, I used quartersawn maple, but you might want to jazz up your top by using several different woods. That's OK if the different species are about the same density and will move with the seasons and wear at similar rates. Lay out the glue joints so that the notch for the tail vise is created in gluing up—

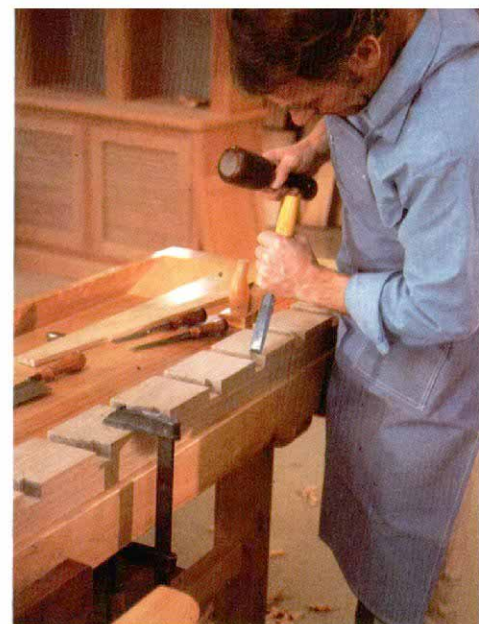
this avoids a lot of sawing and awkward cleaning up later. Since you want to reinforce the shoulder vise with a threaded rod through the top, as shown in the drawing, remember to bore a ½-in. diameter hole through each component before assembly. You can take care of the splines and minor alignment problems when you attach the vise. Glue the 2½ in. pieces together with 1½-in. by ½-in. plywood splines, trim the assembly to size, then cut the grooves for the end cleats, as shown in the drawings. Although the glued-up top is big and heavy, you can cut the grooves by standing the top on end and passing it over your table-saw's dado head. If this sounds too nerve-racking, use a router. Always reference the top surfaces of the benchtop and cleats against the fence or router base so the grooves will line up. Next,



Hold piece against pivoting bench stop for crosscutting. Flip stop down when not needed.



Mortise-and-tenon legs to foot and top brace.



Benchtop is positioned on the base by bullet-shaped dowels, left. The base itself is low-grade hardwood. Before assembling the top, above, chisel out dadoed slots so L-shaped dogs fit flush with top.

mill the front rail and the bench-dog slots in it. Note that the front rail and tail-vise face must be the same thickness so the bench-dog slots line up. I cut the slots with a dado head on my radial-arm saw, then chisel the L-shaped notch for the dog's head by hand. After assembly, I glue a backing piece to the front rail to enclose the notches. Test the fit of each dog before you glue up. If they are too tight, it will be hard to trim the slots after the rail is glued to the top. I set the dogs into the bench at an 88° angle, nearly perpendicular to the surface. A greater angle might increase the dog's down-clamping pressure, but you'd lose the ability to reverse the dogs and use them to pull something apart—the dogs would slide out of the angled slots. I use the dog's pulling ability in my restoration work. If I have to disassemble a chair that's too fragile to withstand much hammering, for example, I reverse the dogs, fit the chair parts between the padded dogs, then crank the tail vise out until the joints separate. This technique also works on other kinds of furniture.

The tool tray is a piece of ½-in. plywood screwed to the underside of the 2½-in. top and housed in a groove in the back rail, which is in turn dovetailed to the end cleats. I glued two angled blocks in each end of the tray to make it easier to clean.

The end cleats support the two vises. Six-inch by ½-in. hex-head bolts and captured nuts reinforce the splined glue joints. The holes are not too long to bore with standard hand or power auger bits. Chisel or rout the blind notches for the nuts in the underside of the top. I leave the bolt heads exposed. That good-looking hex head makes a handy little anvil for blunting nails so they won't split wood, or for tapping out hinges or other hardware. Before you glue on the cleats, however, make the vise parts and assemble everything dry to make sure it works okay.

Design of vises—I prefer 2-in. dia. wooden bench screws for vises, but they are so rare that most people use metal screws, even though they don't have as nice an action. Tailor your vise to fit the length of the screws you have. The shoulder-vise screw in

the drawing is 1¼ in. in diameter by 13 in. long. The tail-vise screw is 1¼ in. by 17 in. Be sure to have the screw (and all other hardware) before you build the vise.

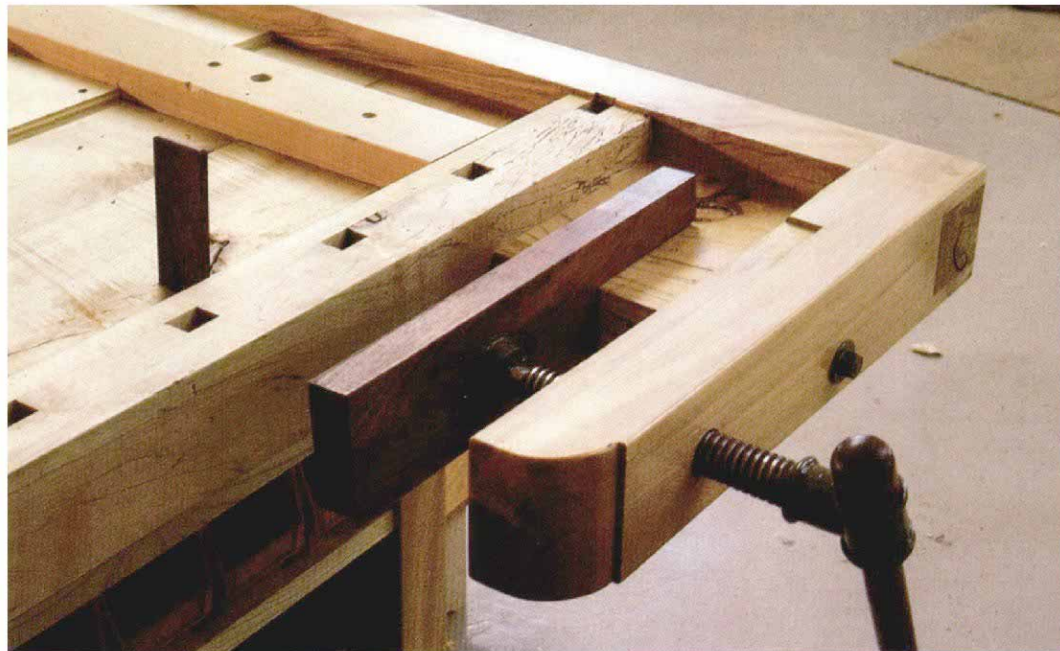
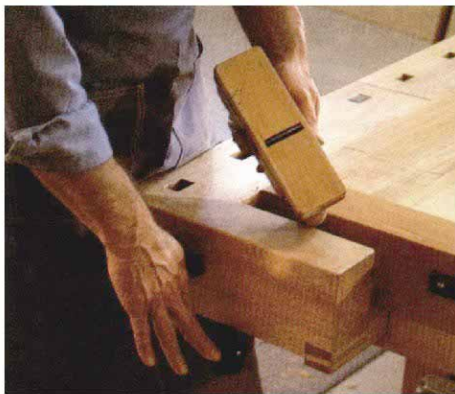
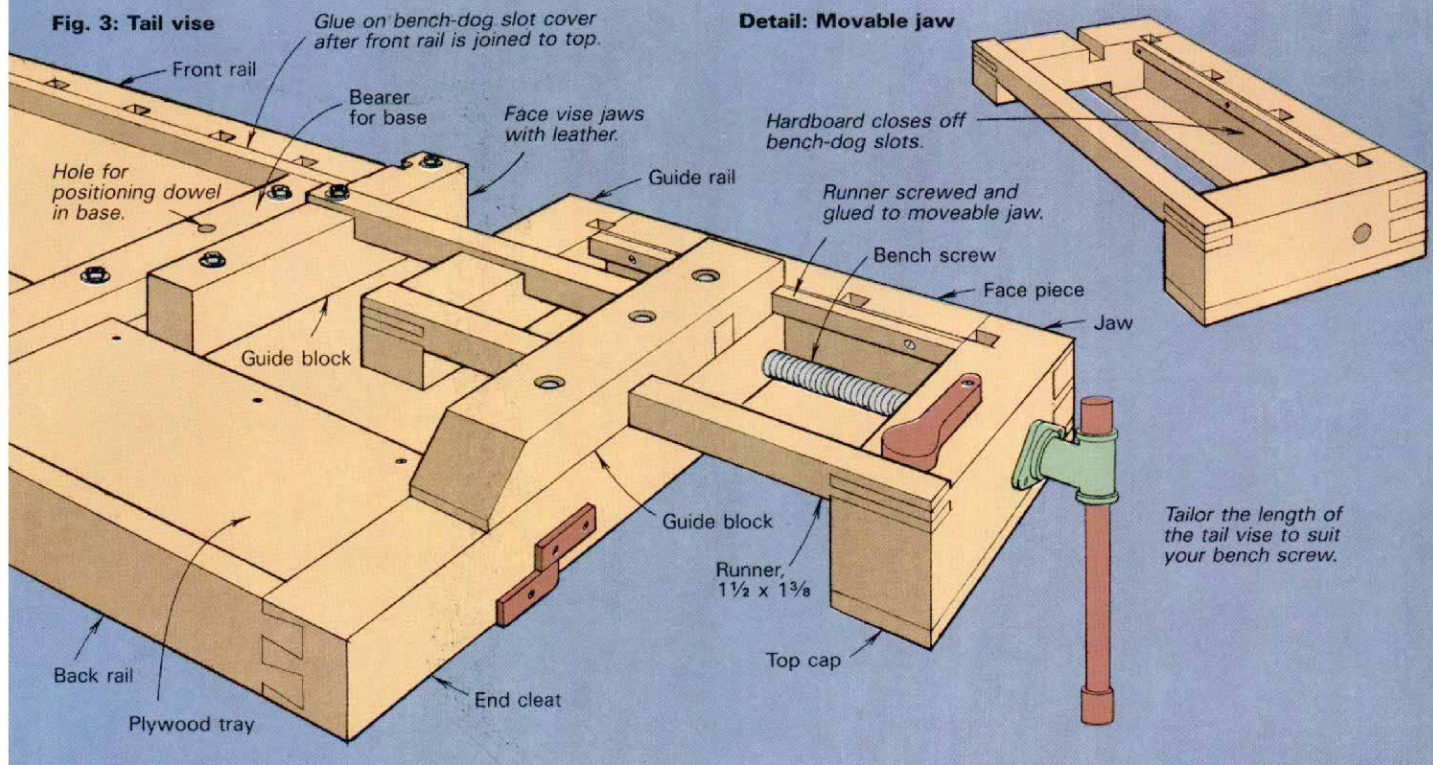
The tail vise has two parts—a jaw assembly and guides fixed to the benchtop. The jaw assembly consists of a heavy jaw and face piece dovetailed together. The jaw houses the screw, the face piece is the same thickness as the front benchtop rail and is likewise slotted for bench dogs. A guide rail, parallel to the jaw, is dovetailed to the face piece and a runner connects it and the jaw. This assembly is further held together by two top caps, whose top surfaces will be flush with the benchtop. Two guide blocks bolted under the bench are notched for the runners that guide the jaw assembly. The vise-screw nut is housed in the end cleat.

I cut the large dovetails on the bandsaw or with a bowsaw. The dovetails are very strong, beautiful and show craftsmanship. Finger joints would work, too. You can cut these on the tablesaw. The dog slots are cut using the same method as on the front rails. Close off the open side of the slots by gluing on a piece of ¼-in. plywood after the jaw assembly is glued up.

To ensure proper alignment, bore the holes for both vise screws on a drill press before assembly. I first bored a 1¼-in. dia. hole for the depth of the embedded nut, then, using the same center point, bored a 1¼-in. dia. hole through the piece for the screw. After boring the end cleat, I clamp the tail vise to the bench and use the drill bit to mark the center of the screw hole. Unclamp, transfer the center point to the outside of the piece and bore a 1¼-in. dia. hole. Make fine adjustments with a rasp.

After assembling the tail vise on the bench, I close it and, to make sure its faces are parallel, saw through where the end of the vise meets the bench with a sharp, fine-point backsaw, being careful to keep the saw between the two pieces. Then I glue top-grain cowhide to each face.

The shoulder vise is much more straightforward, but you may have a little trouble with the threaded rod running through the top to reinforce the dovetail joining the end cleat and vise arm.



Flip-up bench stop is handy for crosscutting near tail vise, top left. Carved oil cup under vise swings out when you need to lubricate plane sole or saw, left. Underside of bench near shoulder vise, above, shows hardwood bench stop and the track that guides vise jaw.

Since you drilled the top pieces before assembly, you should be able to clear the splines and any misalignments by running a bit on a 12-in. extension in from the front and back. Then bore the vise block and arm separately before attaching the unit to the top.

To finish the bench, level the top with a sharp jointer plane, checking by eye, straightedge or winding sticks, then sand with a large vibrator-type finish sander. I put two coats of Waterlox (available at large building supply houses) on every wood surface, then add several more coats to the top. Next rub on paste wax for a beautiful shine that will protect the top from glue or

stain. Wax your bench regularly and resurface it every year. I believe lots of people, including customers, look at your bench as an indication of your craftsmanship. Besides, I am spending about 10 hours a day looking at and working at the thing, and it should be beautiful. □

Frank Klausz makes furniture and restores antiques in Pluckemin, N.J. Klausz's two videotape workshops, Dovetail a Drawer and Wood Finishing, are available from The Taunton Press. For more on building workbenches, see FWW #4.