

Work Bench

A design for holding the work

by Tage Frid

There are many workbenches available on the market today. Aside from obvious reasons of economics, why make my bench? I can convince my students and myself easily enough, but to convince you I should explain the benefits of this design and how I arrived at these specifics.

When I came to this country in 1948 I was given a tour of the school where I was to teach. I was guided to a large room and introduced to the teacher with whom I was to work. We talked for a while, or rather he did the talking because my vocabulary didn't go much beyond yes and no. By using arms and legs I finally conveyed to him that I wanted to see the woodshop. When I was told I was standing in it I just about passed out. In the room was a huge thickness planer I think Columbus' father must have brought over, and a few small power tools. I was really flabbergasted when I saw the student "workbenches." These were large tables for two persons with a vise in each end. Most of the time the students were holding down their work with one hand and working with the other. Some had taken much time to make special contraptions to hold their work so they could use both hands, which I'm sure was the Lord's intention when he designed us with two. (Of course the Japanese use their feet to secure their work, leaving both hands free.)

After being in school for a few months I realized that the bench I wanted did not, to my knowledge, exist in this country. So I designed my first workbench, which was quite similar to the one I was taught on. Later we made one for each student. Since then we have been making workbenches every two or three years so that the students have their own when they graduate. I find it a good exercise in which they learn

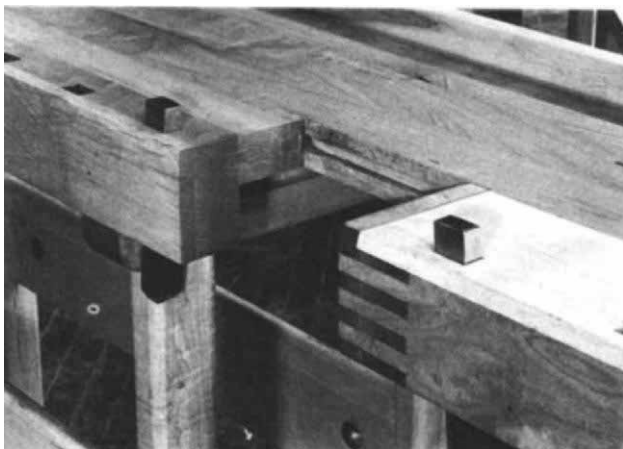


how to set up the machines for mass production and work together as a production team. It takes us three days from rough lumber to have all the parts ready to fit and assemble, and to have the bench top glued up. This year each bench cost us about \$100, half for wood and half for hardware.

Over the years, having made the bench so many times and having had numerous people using and criticizing them, I have arrived at this design and these dimensions as best suited for a cabinetmaker. With its two vises and accessory side clamps there are five possibilities for holding the work—two in the right vise, one in the left vise, one between the bench dogs and one between the side clamps. Both vises are the type with only one screw and no guide pins to interfere with the work. A piece can be clamped all the way to the floor if necessary, and the vise can hold irregularly shaped objects. With only six bolts, the bench is easy to assemble and disassemble, and takes minimum storage space. The only glued parts are the bench top, the right vise and the leg sections. Everything else bolts together so that any damaged pieces are easy to replace.

This bench is almost six feet long, but if you wish to lengthen the bench you can easily do so by extending the bench top at the center and the two leg crosspieces (#18 on the plan) the same amount. You can shorten it in the same way. I would advise keeping all dimensional changes in five-inch increments so that the distance between the bench dogs remains the same. The bench is designed as a right-handed bench but could be converted to a left-handed one by reversing the plans. If additional storage space is needed, I suggest attaching a piece of plywood between the

Vise closeup shows top spline construction. Dowel jig helps support long boards in other vise.



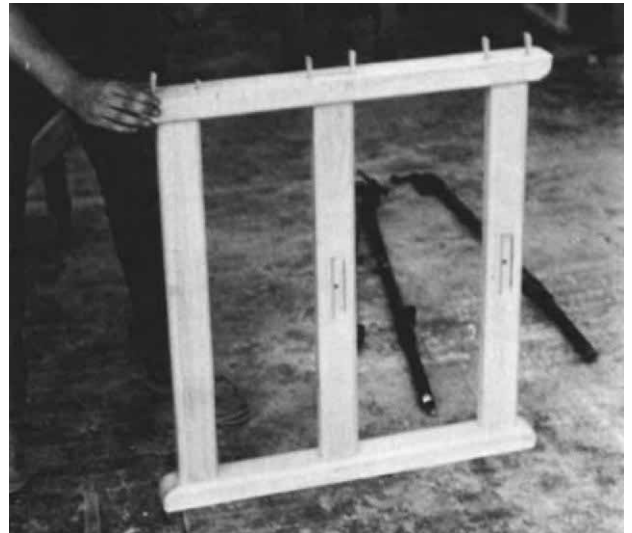
leg crosspieces and inserting two end pieces to form a large storage compartment. If you wish you can add a piece behind the bench to hold gouges, chisels, screwdrivers, etc. But I find it more a bother than a help because if you are working on pieces larger than the bench top surface you have to remove the tools so that they don't interfere.

If you are working on long boards or panels you can make a simple device to support the weight of the board. Take a good heavy piece of wood (a 2x4 or 4x4 will do), and drill holes of at least 1/2-inch diameter in a straight line down the length of the piece about one inch apart. By clamping this into the right vise and moving a dowel to the hole just under the work you can easily add support to a long piece.

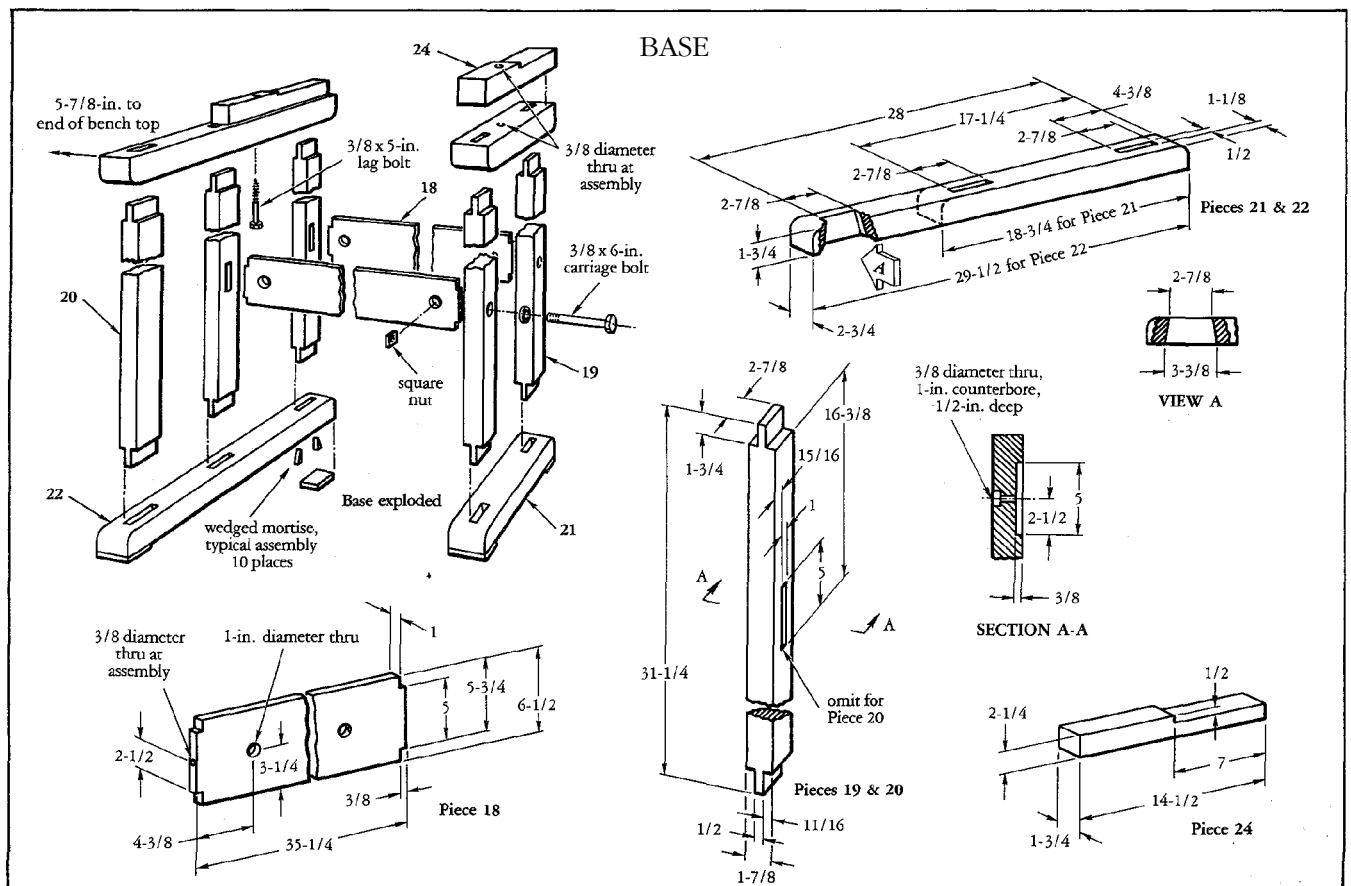
Before beginning, get your hardware. That way, if you wish to make a substitution or if something isn't readily available, you can make all your dimensional changes before any wood is cut. We could not find a 14-inch bolt so we make our own by brazing a nut to the end of some 3/8-inch threaded rod which we have cut to the right length. We got bench screws and dogs at Woodcraft Supply in Woburn, Mass., but I understand Garrett Wade in New York and others also may have them.

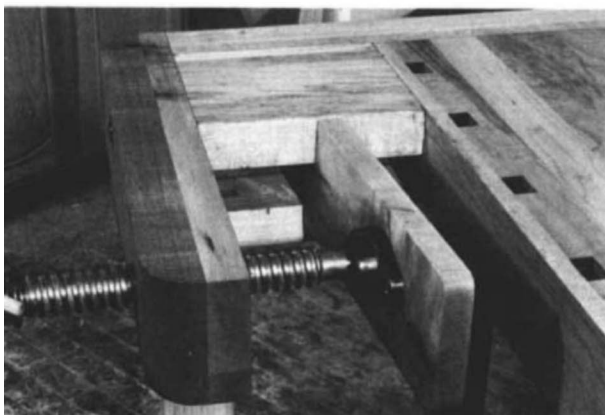
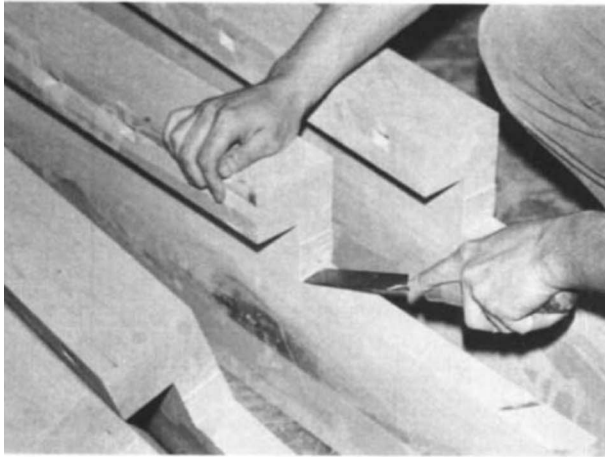
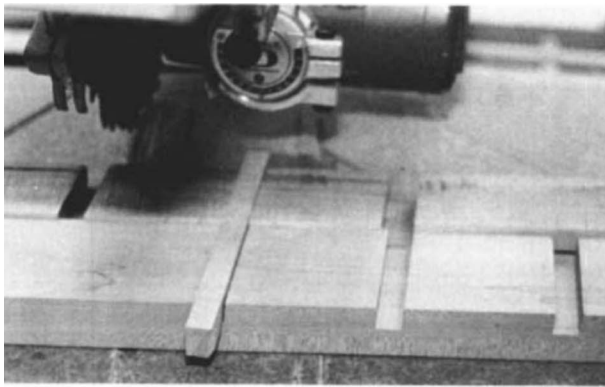
When choosing the wood, make sure you select a dense hardwood and be sure the wood is properly dried. We use maple because it is extremely hard and durable and is the least expensive in this area (it takes about 60 board feet). When cutting up the stock be sure to cut the longest pieces first. Cut them all one inch longer than the final dimension. It is best to purchase rough lumber, joint and thickness-plane

it rough, and then final thickness-plane the whole top together after it is glued. If a thickness planer isn't available, buy the lumber planed and align carefully during gluing. I suggest not using pieces wider than four inches in the top because of possible warp problems. We use 8/4 stock for everything except pieces #18 and #8, which are 5/4 stock. For the heavier pieces which finish 2-3/4 by 4 inches, we glue-up two pieces of 8/4 because in this area it is just about impossible to find properly dried lumber of that thickness. If necessary, you can bricklay or stack these pieces if you are short on lumber. We use Titebond yellow glue for all the glued sections.



Base parts are wedged and glued.





Many students have found it best to start assembly with the base, as it goes together very easily. Assembling the base first eliminates many pieces, making things less confusing when the vise is to go together. If you wish, you may round over the edges of the base pieces and radius the ends of the feet. These details, along with your vise corners and handles, will give your bench a personal touch. Sand all pieces before gluing. Be sure to hammer evenly on both wedges and don't over-hammer or the wood will split. After the wedges are in, check the sections for squareness. At this point you can remove the clamps because the wedges will hold everything in place. Clean off all the excess glue while it is still wet and you will have little finishing work. After the glue dries, saw off the excess of the wedges and plane the tops even and flat. Clamp the base together to drill the hardware holes.

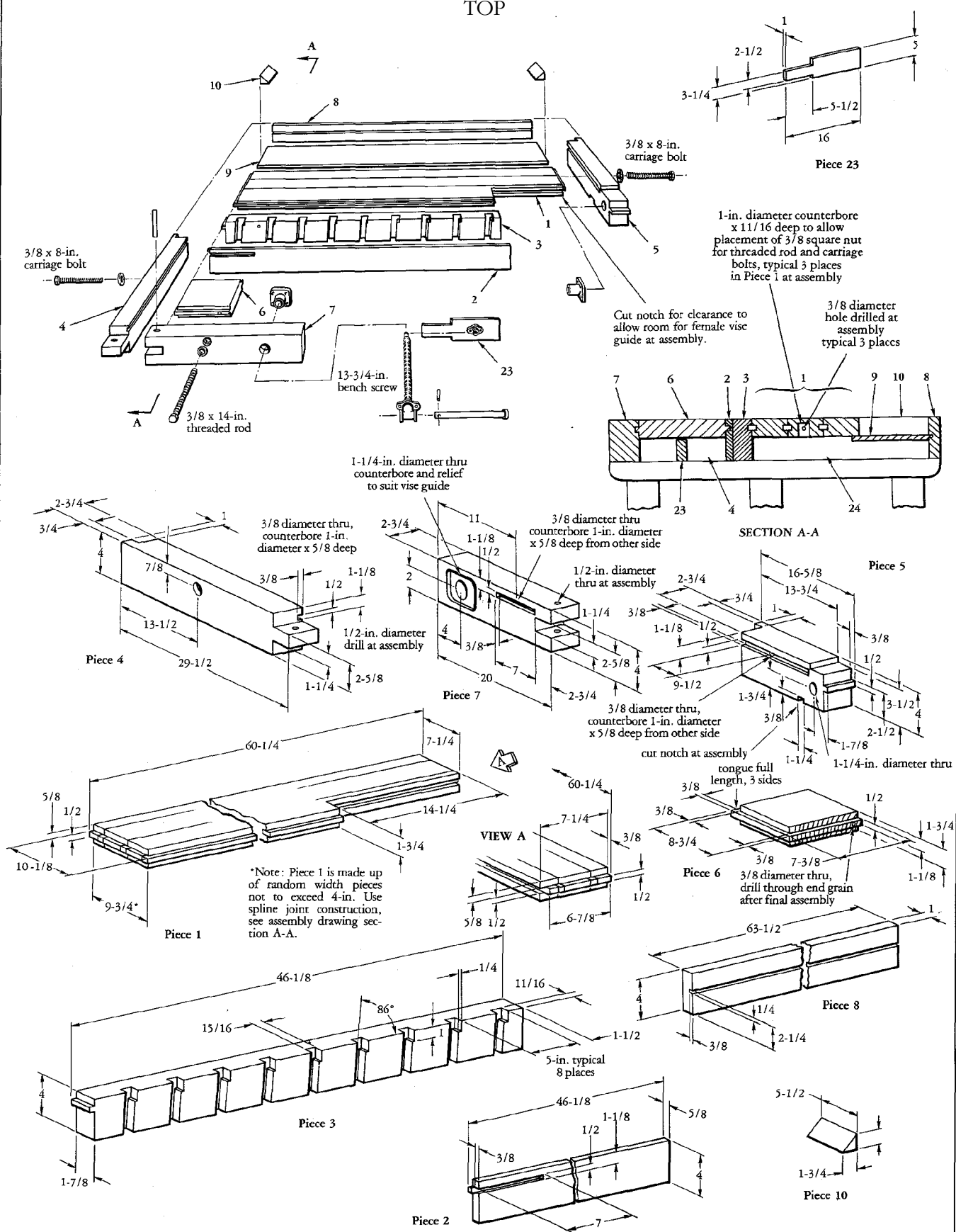
In making the bench top, we use splines between the pieces to make gluing up easier. It isn't a bad idea for strength either, because of all the hammering that will take place on the top surface. A spline should definitely be used between pieces #1 and #3 to help align the front piece flush with the rest of the top. We use a dado head to cut the grooves for the splines but it could be done with a shaper, a hand router or a plough plane. The bench top is glued and planed before piece #3 with the bench dog slots is added. We use the dado head on the radial arm saw to cut the bench dog slots with a stop set to keep the spacing and the angle consistent. It could be done instead with a router, a saw and chisel, or a router plane. The top step of the slot is chiseled out by hand at the very end. Cap piece #2 is added afterwards and a brad is used in each end to prevent the piece from sliding over the length during gluing. Don't use too much glue or it will be necessary to do a tedious clean-up inside each bench dog slot. After the front piece is attached, the top is cut in length and width. The tongues are made at each end with a shaper, circular saw, hand router or rabbet plane.

The lengthwise cut for the right-hand vise must be parallel to the front of the bench top, and the crosswise cut precisely square to it. This can be done on a band saw, or with a circular saw or hand saw. For making the groove for the right-hand vise to ride in, you can use a hand router or chisel it out. The accuracy of this groove is very important because it will determine how smoothly your vise works.

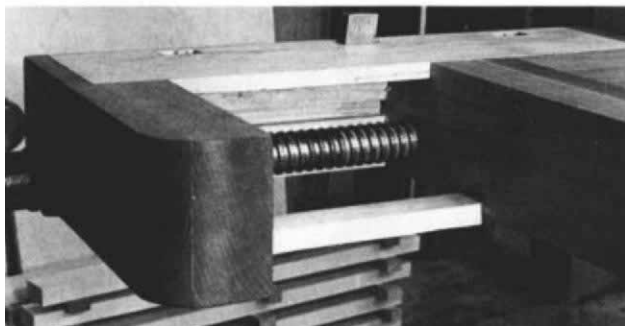
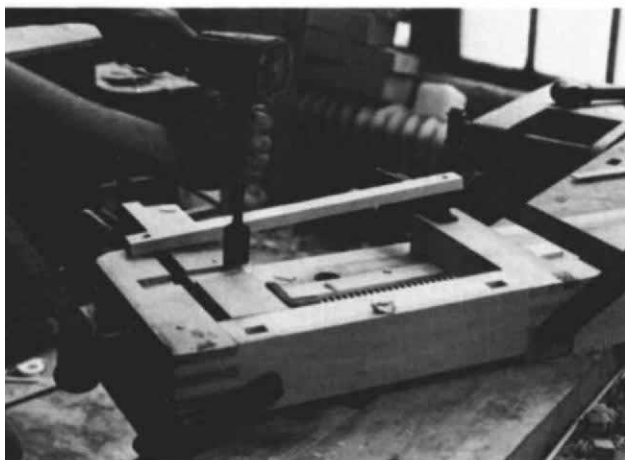
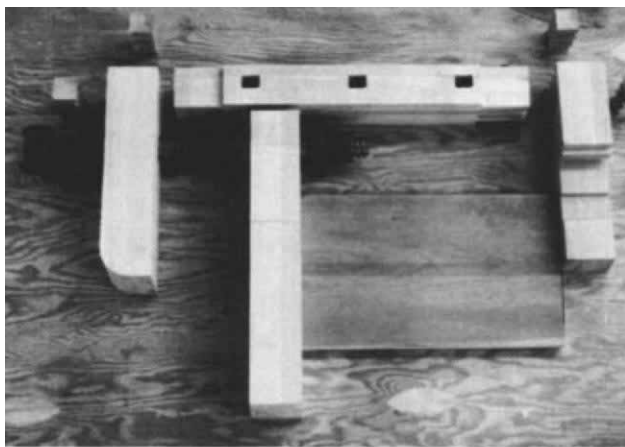
As mentioned previously, none of the end cap pieces is glued. For this reason it is essential that the holes for the bolts are drilled very accurately or the bolts will not go in square. Therefore I suggest drilling the holes in pieces #4, 5, and 7 on a drill press or with a doweling jig. At the same time, drill the hole for the vise in piece #7. After the holes are drilled, the end cap pieces are clamped in place with filler #6 inserted. The holes are then continued into the bench top. The best way to do this is to use an extra-long drill bit, or a bit on an extension. If you don't wish to invest in the bit, you can cut a dado and let the bolt ride in that. The same procedure should be followed on piece #18. If you do use a dado and wish to close up the groove, you can add a piece to conceal the bolt. However, this isn't necessary because the nut will nestle in the

At top, radial arm-saw jig helps cut out bench-dog slots of consistent spacing using dado blades. Student uses chisel to clean saw cuts made to shape bench-top corner for vise. Below, Piece 3 is planed to align with Piece 1. Bottom photo shows vise.

TOP



SEE ERRATA AT END OF ARTICLE



At top, plywood board is used to square three vise parts when gluing them together. Middle vertical board is bench-top end (Piece 5). After gluing, other parts of vise are fitted together with the vise in place on the top. Other photos show bottom and rear views of vise.

shoulder of the right-angled hole, pulling the bolt in tight. In our benches we insert the vise hardware brackets flush, but this certainly isn't crucial.

Now comes the most difficult part of assembly—the right-hand vise. It is advisable to make the tongues on the pieces all slightly oversized and carefully fit them with their grooves. It is essential that every part of the vise be completely square. We use finger joints in the corners but dovetails would probably be faster if you are only making one bench. In gluing the vise pieces together it is helpful to cut a piece of plywood to the exact dimension of the inside rectangle of the vise. If you clamp the vise pieces around this piece, the vise will have to end up square. The plywood also provides an edge to clamp against on the open side.

The vise should be glued and fitted and all the holes drilled for the hardware before cover piece #14 is added. The hole for the vise is drilled in piece #11, and from there guided into piece #5, with #5 bolted in place. It might be necessary to chisel a little notch into the bench top to make room for the vise bracket, but such a notch is invisible. The bench is flipped upside down for the fitting of the guides. The notches should be scribed off the runner pieces and carefully routed or chiseled out by hand. Countersink all the screws so that they don't interfere with the vise travel. Piece #17 should be screwed down first and then the other guides set in place. Take the time to make all of these fit right. Fitting the vise will drive you crazy at times, but be patient and worry about one section at a time and eventually it will all fit just right. When the vise is working properly, piece #14 is added. It is set into pieces #11 and 12 so these pieces must be chiseled out. If you want to get a little fancy you can undercut the edges so that the effect is almost like one large dovetail. A complimentary angle is cut on the edges of #14 and the piece is glued. You must glue only to the moving pans of the vise and not to any of the stationary parts of the bench top. Drill up from the bottom through the bench dog slots to locate the tops of the slots and finish chiseling them out.

Piece #8 is screwed onto the back of the bench after it receives a groove to support the plywood for the tool trough. The plywood is screwed directly to the underside of the bench top and is further supported by the filler pieces which secure the top to the legs. The filler pieces #24 stabilize the top and connect it to the base. The two corner blocks are screwed in from the bottom. Their only function is to make the trough easy to sweep out. Piece #23 is used to prevent direct clamping onto the work you are holding. A piece of plywood would function equally well here.

After the bench is completed, the top should be hand planed and belt sanded level. All the edges should be eased off slightly, or "broken," to minimize chipping out when something hits against an edge.

All of the places on the underside of the right-hand vise where wood is running against wood should be coated with melted paraffin thinned slightly with turpentine—say a tablespoon or two to a block of paraffin. The paraffin is first melted in a can or pot, and the turpentine is added with the container removed from the heat source. The mixture is liberally painted on in its liquid state to protect the pieces and help them to function smoothly. No oil is used on any of these pieces.

At completion, the rest of the bench and especially the work surface should be completely penetrated with raw

[*Author's note:* Material for this bench includes 50 board feet

[*Editor's note:* Blueprints of this bench are available for \$6. The prints do not give any additional information, but some readers may find the orthographic projections drawn to a scale of 1-1/2 and 3 inches to the foot convenient to work with. Send check to The Taunton Press, Box 355, Newtown, CT 06470. Connecticut residents add 7% sales tax.]



ADDENDA, ERRATA, ETC.

On the workbench drawings in the fall issue, in Piece 11 (p. 45) the hole for the bench screw should be 1-3/4 inches up from the bottom, not the 2 inches indicated. And the missing type on Piece 10 (p. 43) should read 1-3/4 inches.... The reversing third drum for the stroke Sander in the summer issue is no longer available as a stock item. George Mooradian says he'll make some up if he gets enough orders. Otherwise, he recommends his off-the-shelf Model 1000 special extended shaft mandrel as a substitute. . . .

More bench business: In Fall '76, page 43: piece 3 should total 46 in. long, not 46-1/8 in.; the top of the bench-dog slot in piece 3 is 1-3/16 in. wide, not 15/16 in., (the bottom of the slot is 15/16 in.); on piece 7 the dado is 7-3/8 in. long, not 7 in.; piece 5 is 16-3/8 in. long, not 16-5/8 in.; the protruding tongue of piece 23 is 2-1/4 in., not 2-1/2 in.; bolts are shown as hex-head but mislabeled as carriage bolts. On page 45, piece 12, the dado slot is 1-1/4 in. wide, not 3/8 in. wide...