



## Try Squares

### THE PROJECT:

While you can certainly use a typical machinist's combination square for layout work, they aren't particularly friendly to the hand, they are heavy and they can easily, if mishandled, ding the wood. In contrast, a wooden square feels soft, light and warm to the touch and is a thing of beauty to look at. The sculpted shape of the blade on these shop-made squares is not just for pretty by the way: The shape reduces weight at the end of blade, focusing the weight at the handle for better balance in hand.

In addition, for our purposes here in this book, the process of making these squares will build your skills truing edges and cutting and paring precisely to layout lines ... and you'll use them for making every other project in the book! Make the small one first, adding the others as the need and inspiration arises. Worried about these shop-made layout tools going out of square due to wood movement? Well don't worry — they will on occasion! As you'll see below, however, a simple test confirms a problem, and a simple fix takes care of it.

### SKILLS INTRODUCED:

Making precision crosscuts and rip cuts; chiseling and paring to a line

### TOOLS INTRODUCED:

Back saw; coping saw; tenon saw; paring chisel



"Der Schreiner" (The Woodworker), by Jost Ammon — 1568



**THE PROCESS:**

**1. Select the Wood**

For the handle, almost any hardwood and grain orientation will do as long as the wood is thoroughly acclimated to your shop environment. For aesthetic reasons, you might want to choose a contrasting color from the blade stock. The latter, however, should be selected from stock of even, vertical grain to ensure stability. Cut out the wood oversized in length by at least  $\frac{1}{2}$ " and by  $\frac{1}{4}$ " in width. Don't worry about getting the end cuts perfectly square at this point.

**2. Size the Tongue Stock to Thickness**

Because you probably won't find  $\frac{1}{4}$ " stock at your lumberyard, you'll need to resaw the wood for the tongue from a thicker piece of wood.

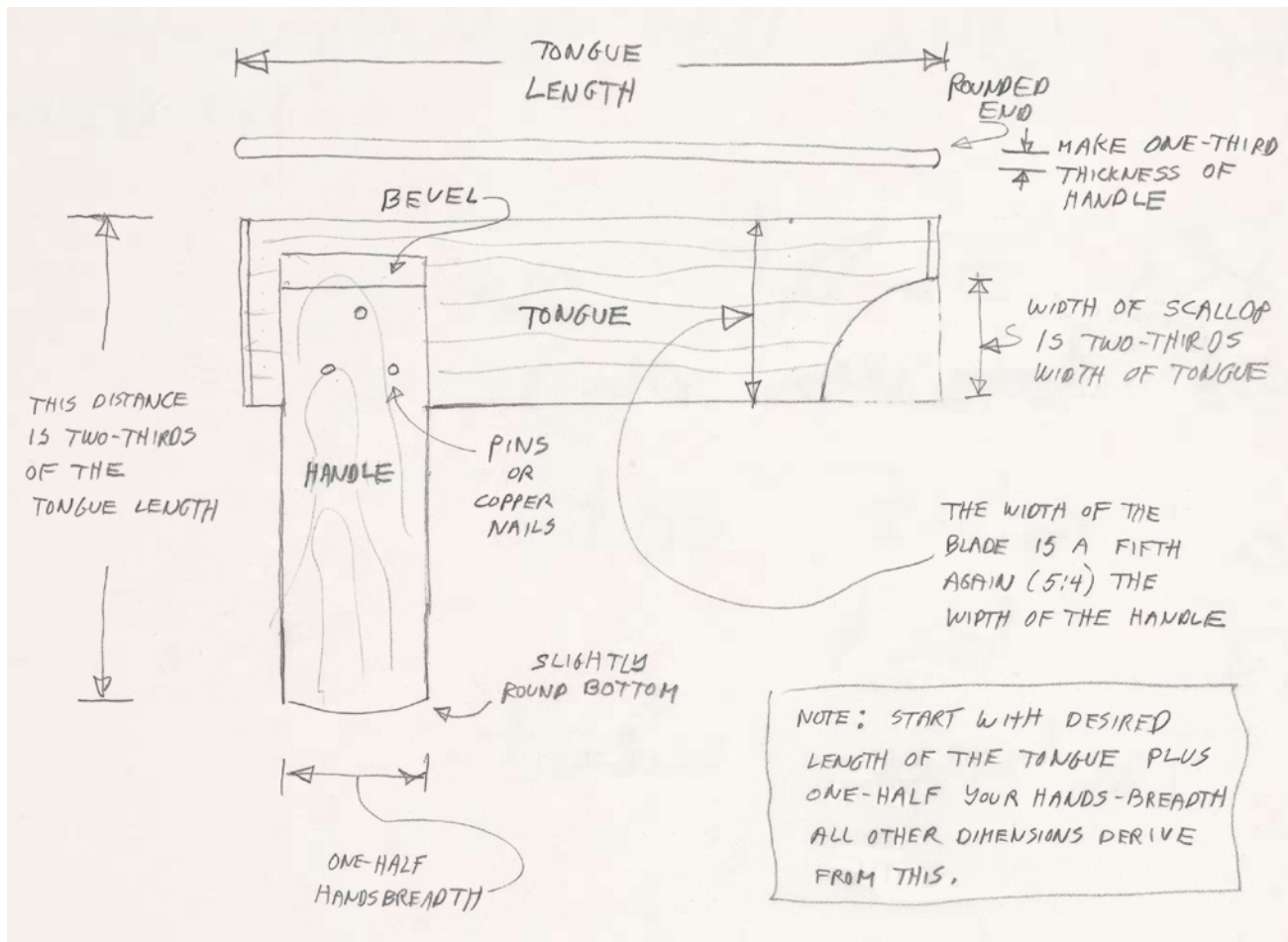
A thin board secured in place with a couple of hold-downs provides an adequate stop for smooth-planing the tongue stock.

While this can be done with a rip handsaw, it's a slow, tedious job. You could do what the 17th century joiners did and split the stock out of a bolt of wood, but that usually leaves a whole lot of planing to do, not to mention a whole lot of waste! In the 18th and 19th centuries, cabinetmaker's would use a two-man-powered frame saw with a thin and narrow blade for this purpose (at least with larger stock), but I don't expect that you'll come up with one — so let's figure on your doing this on a band saw.

You'll need to resaw the tongue stock to just over  $\frac{1}{4}$ " thick. Install the widest blade you can on your band saw (I use a 1"-wide blade on my saw) and set the fence to index a cut of about  $\frac{5}{16}$ ". Now set the trued edge of the board to be resawn on the table and orient the trued face against the fence — then run the board through the blade. Change to a push stick when your hands get to within about a hand's breadth of the blade. Use your jack plane to flatten and smooth the cut face of the board by holding the stock against a thin board clamped to your workbench. Be sure to leave the board at least  $\frac{1}{4}$ " thick. Finally, true the remaining edges and the two ends with a block plane.



Here I'm using my shop-made straightedge to check the edge of the tongue for true.



**3. True the Edges and Faces**

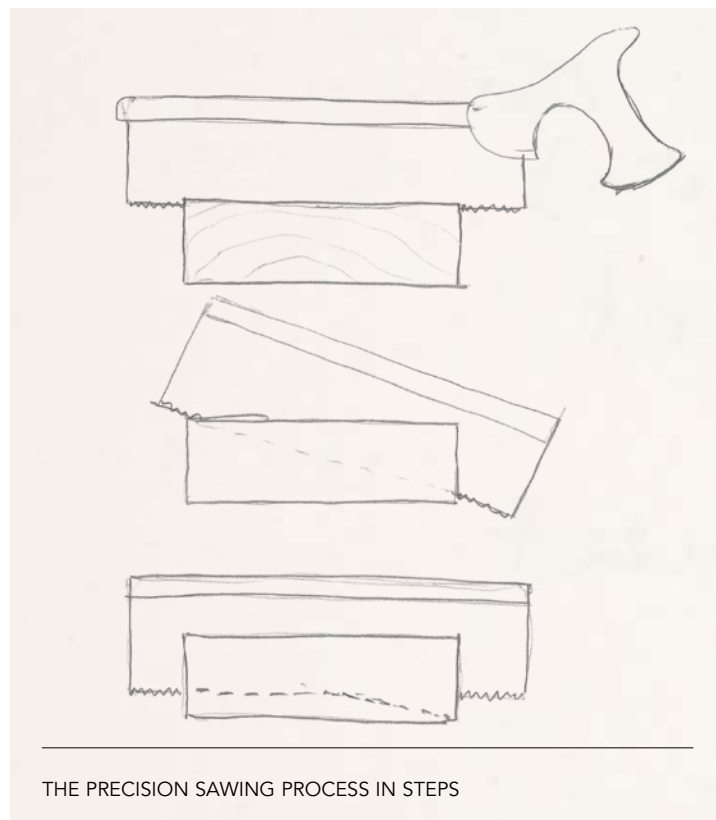
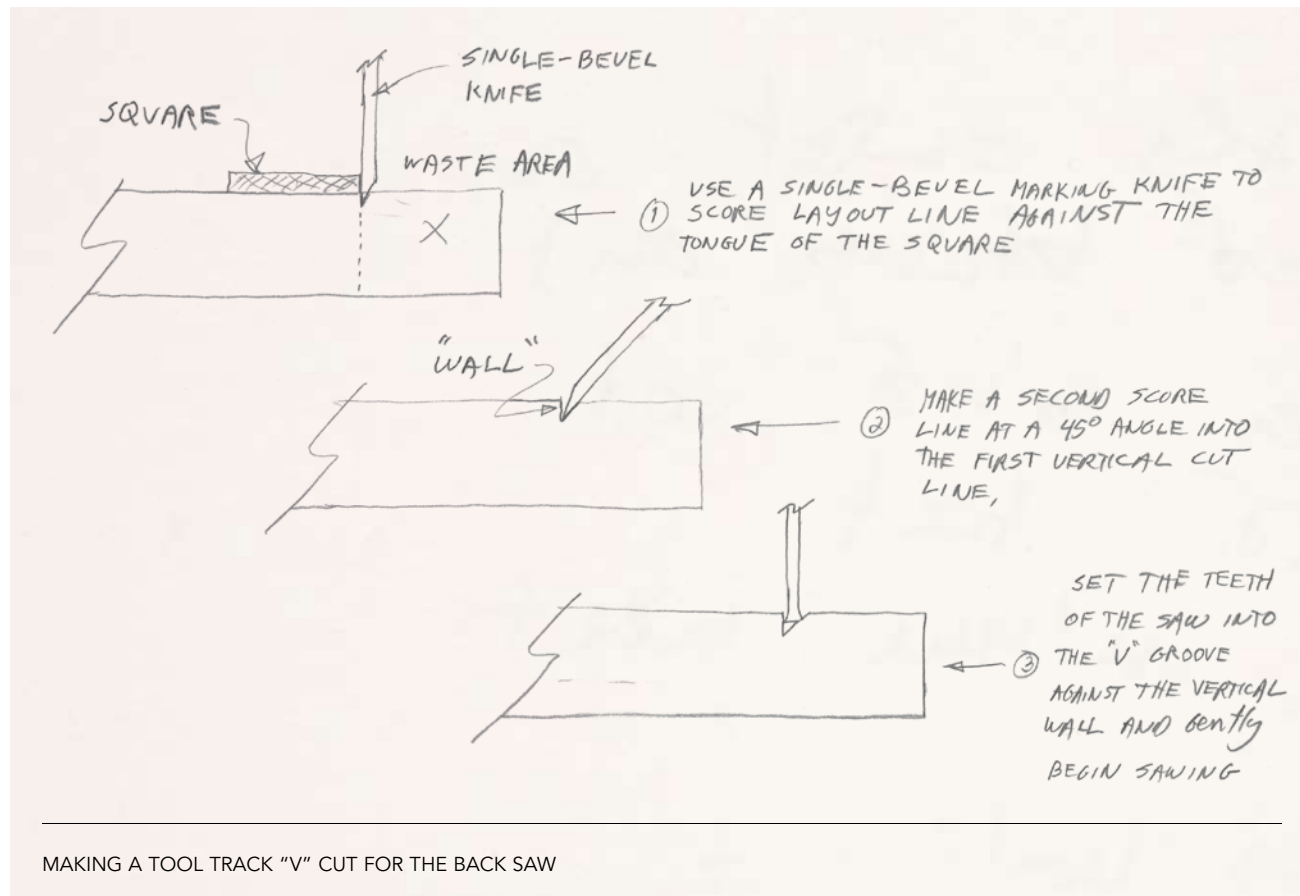
Using a sharp jack or smoothing plane, smooth the faces and then true the edges of the tongue and the handle stock straight and square to the face and parallel to one another. Use calipers to test the parallel-ness of the edges of the tongue — it has to be within a few thousandths of an inch to pass muster here. To make an adjustment to an edge, set your plane to take fine shavings and take a few strokes at the end of the board that needs to be narrowed. Now make a full-length stroke and check with your straightedge for straightness, and with calipers for parallel with the opposite edge.

**4. Lay Out the Components**

Using a tongue length of 8", mark the length of the handle to the proportions specified in the drawing. Leave about  $\frac{1}{4}$ " waste at one end of each component for final trimming.



With the tongue stock held upright in the vise at my joinery bench, I saw it to width using a 10 tpi (or ppi) crosscut handsaw. (A typical rip hand or panel saw would be overkill here — in this thin stock it would tend to jam and it would leave a very coarse kerf to clean up.)



### 5. Precision Crosscut the Components to Length

Begin by marking a square cut line at the layout marks using a sharp marking knife. Set your knife at the measurement and then slide the blade of a square to the knife. (Yes, you do need a square to make a square!) Scribe a line across the width of the board and then down each edge. Create a tool track for the backsaw by making a second cut in from the waste side of the line on the face as shown in the drawing at top. The shape of the cut will be a "V" with a perpendicular "wall" along the cut line. Now clamp the stock securely on the bench with the marked face upward and set the saw blade into the "V." Begin sawing with short, gentle strokes across the full width of the board to keep it from jumping out of the "V," lifting up on the handle to take the weight of the saw off the wood (to prevent the saw from jamming and jumping out of the kerf). Increase the length of the stroke as the blade creates a kerf, establishing its own tool track. The track should fall between the blade and your eye so you can watch the line without leaning over the saw.

The goal now is to keep your body oriented so that your arm can move smoothly back and forth, piston-like. (Note that your skills and accuracy will quickly grow if you devote some time to making numerous practice cuts to teach your body how to stand in relation to the saw to prevent deflections.) Continue with full strokes, keeping the blade engaged across the full width of the board while tilting the blade so you are cutting both across the top of the board with the blade in its tool track and down the edge facing you.

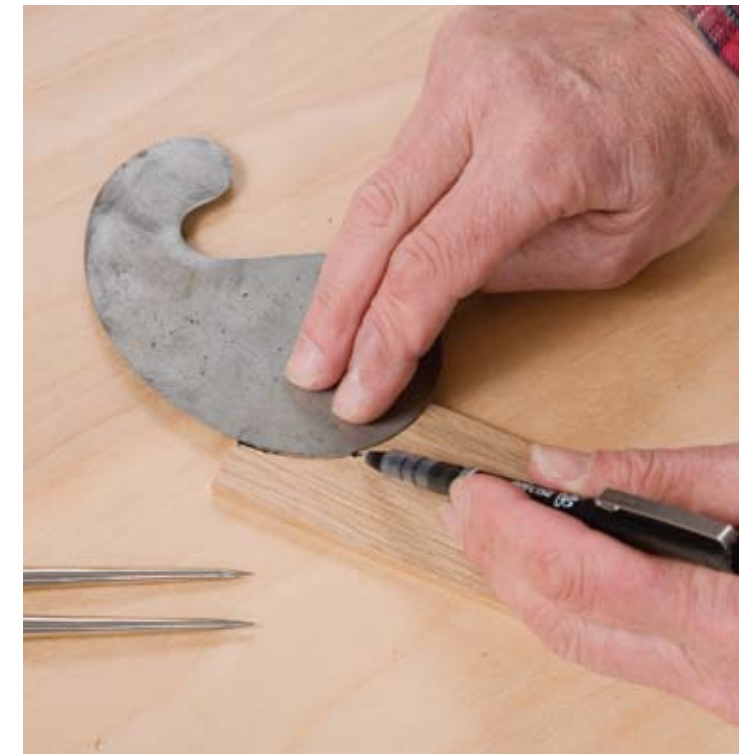
Try not to cut downward on the backside of the stock at first. When you have cut fully down the edge toward you, continue to saw as you tilt the blade back up so that it now cuts down on the far side of the stock. If you keep the blade indexed to both the face and the edge cutlines that you can see, the saw will automatically cut right to the line along the face and edge that you can't see — this is the inherent, benevolent magic of the Western-style back saw working for you!

### 6. Shape the Blade and Handle

With the blade now cut to width and length, lay out a curved cut-out at one corner as shown in the working drawing. The radius isn't critical, other than to leave the upper one-third of the tongue straight as is. I often use the French curves of a "gooseneck" cabinet scraper to trace a pleasing changing radius. You can also use a compass or simply find a jar lid that looks right to your eye to draw the curve. Square across the edges and draw the line on the other side.

Now secure the tongue flat on the bench with clamps or holdfasts, locating the curved layout line close to edge of the bench (to reduce vibration). Then cut along the line with a coping saw or a bow saw fitted with a narrow blade. Orient the blade so that it cuts on the downward pull stroke. Cut to within  $\frac{1}{16}$ " of the line on both sides and then use your half-round cabinetmaker's rasp and file to shape the curved edge to the line. Just for looks, I apply the same curve to the bottom end of the handle, following the same process — though I wait until after I've cut the bridle joint to do this.

With the stock held securely to my bench, I cut to the curved line with a coping saw. The teeth are oriented to cut on the down stroke.



To lay out the decorative curve at the end of the tongue, I'm using a curved cabinet scraper and choosing a section of changing radius that looks good to my eye.





I smooth up the curve with a cabinetmaker's file.



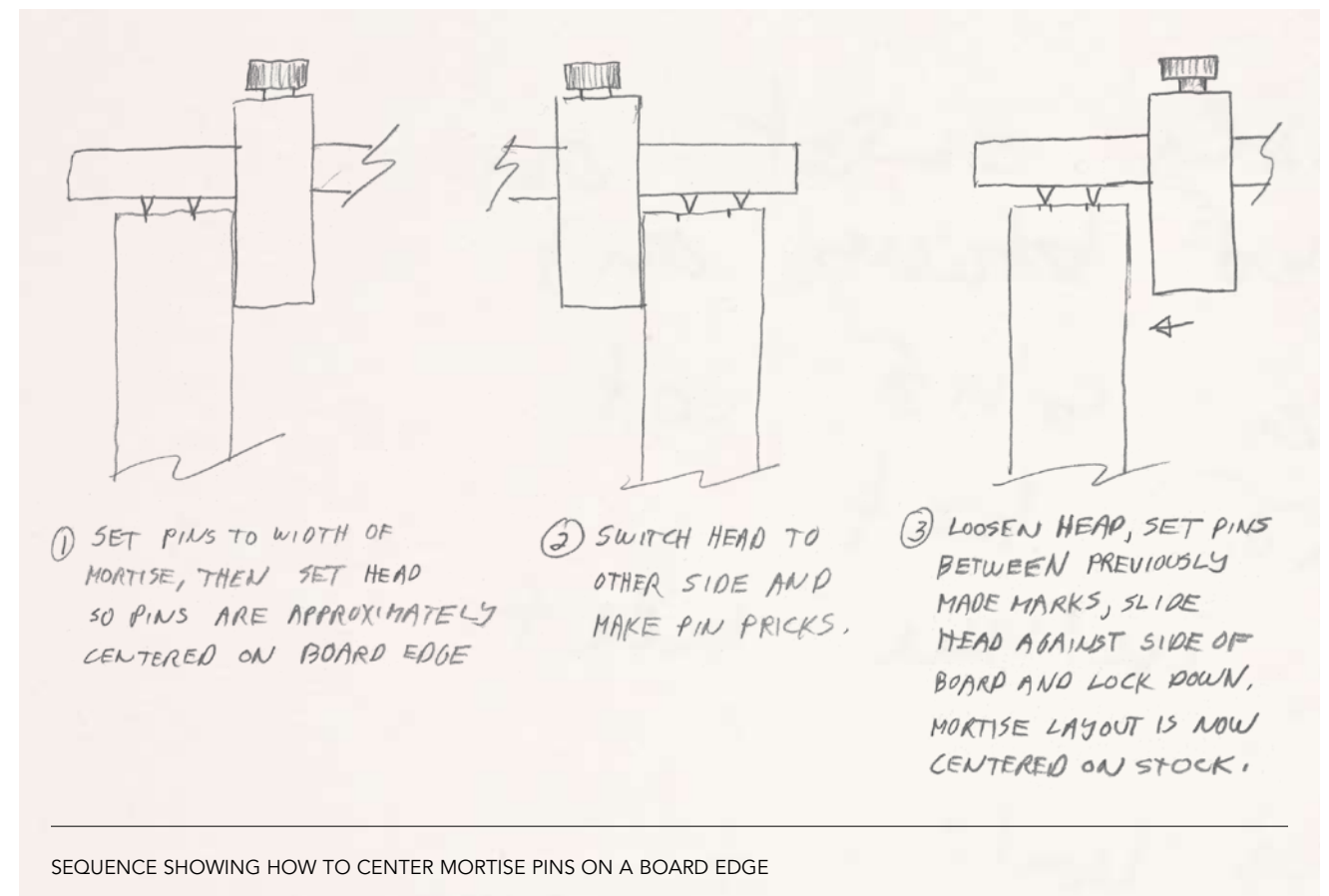
On the straight end grain, I use a flat file to smooth and gently shape it by giving it a slightly elliptical cross-section.



To ensure that the two edges of the tongue are precisely parallel, I measure their width with a caliper at each end of the board. I'll trim one edge as necessary until I get them parallel within a couple thousandths of an inch.



With the tongue held in a bench hook set on my joinery bench, I cut the tongue to precise length with a crosscut backsaw.



### 7. Lay Out the Bridle Joint

Laying out a bridle joint offers an excellent excuse for learning to use a mortise gauge with tool slaving! Begin by marking the extent of the slot to receive the tongue along the handle as indicated in the working drawing. Note that the top edge of the tongue extends past the end of the handle, allowing you to trim the top as necessary to maintain a perfect 90° angle. Now set the pins of the mortise gauge to the width of your 1/4" chisel (remember that you made the tongue stock a bit thicker than 1/4" — you'll later plane it thinner to fit the completed slot of the bridle). To center the slot along the edge of the handle, eyeball the centerline and index the mortise gauge head first to one face of the handle, then the other, making a mark each time with both pins. The exact centerline falls between these marks — so back off the head, set the points between the marks, move the head back up against the stock and lock it down. Now run the points up one edge from the cross-edge mark, across the end and down the other side to the other cross mark. Use your marking knife to deepen the lines and to make a V-cut across the



To layout the bridle joint that will accept the tongue, I set the dual pins of a mortise gauge to the width of my 1/4" chisel — which is slightly narrower than the thickness of the tongue stock.



After centering the dual marks on the edge of the handle stock I scribe the cutline for the bridle, starting and stopping at a layout line indicating the depth of the bridle joint.



I make the cut using a tenon saw, beginning by gently cutting all the way across the end of the board with the blade inserted into the V cut I made earlier with a marking knife.



Tilting the blade upward as I go, I cut along the facing edge of the board, trying to split the cutline until I reach the bottom layout line.



To finish the cut, I simply tilt the blade back up as I continue to cut, being careful to keep the blade registered against its previously cut kerf. With practice, you'll find that the blade will automatically transfer the cutline on the front edge to the back, making a joint line that will need little if any paring to fit.

end grain. (Don't try to make a V along the grain on the sides of the stock — its difficult to do with accuracy. Instead, darken these lines with a pencil or fine-point pen.

### 8. Saw Out the Cheeks

To saw down the bridle's cheek layout lines, set the handle upright in your vise (but angled a little away from you) and place a light to shine across the layout lines at a low angle so you can clearly see them. Using your rip-filed tenon saw, follow essentially the same process for precision crosscutting presented above in Step 5. Begin the

cut by placing the blade in the V across the end of the board; make a few gentle strokes to start the kerf going across and then continue cutting along the front edge down to the cross mark while keeping the blade engaged across the full width of the board; then tilt the blade up as you continue stroking the saw, using the just-cut kerf as a tool track to guide the saw as you cut the far edge of the joint. Be sure to look behind the board as you are in the final stages of the cut so you won't cut past the far cross mark. Then turn the stock around in the vise and cut along the other cheek line.

### 9. Remove the Waste

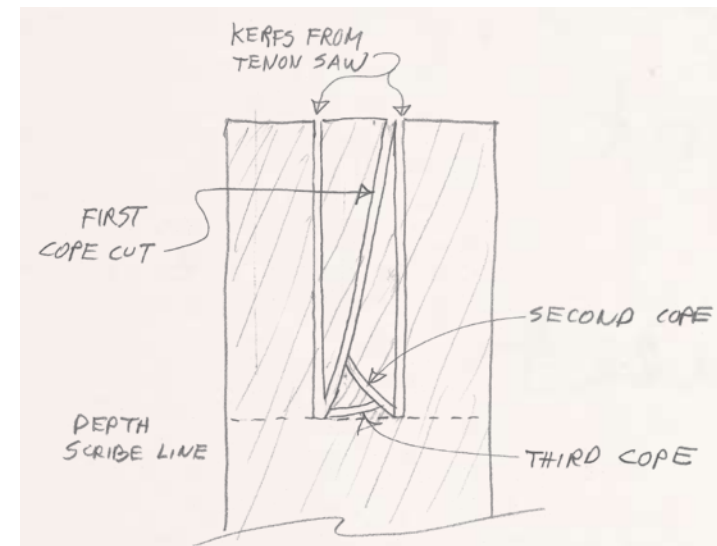
You can remove most of the material between the cheek cuts by cutting it out with your coping saw. Slide the blade down one of the kerfs to the bottom; lift it back up about 1/4" and start to stroke back and forth, turning the blade into the waste. The trick is to keep the blade moving as you rotate it, otherwise it will tend to jam. In just a few strokes you will have cut to the other cheek line and released the bulk of the waste.

If your tenon saw makes a kerf thinner than your coping saw blade, the coping blade will mar the sidewall of the kerf and will be difficult to turn at the bottom of the cut. In this case, instead of fretting about your coping saw, you will find it easier to cope with a fret saw. (Puns intended). If you don't have a fret saw, you can make a series of cope cuts as shown in the drawing at right.

To remove the remainder of the waste, get out your 1/4" paring chisel and mallet. Set the stock down on your bench (it's a good idea to protect the bench with a scrap of wood) and secure it in place with a hold-down. Position the tip of the chisel to remove about half the remaining waste and tap it down about halfway through the stock. Reset the tip to remove half again and



I chop and then pare right to the line with a chisel sized to the width of the cut (or slightly under). To prevent the chisel from "blowing out" the far edge, I come in halfway from one side, then turn the stock over and finish up the cut.



CUTTING OUT WASTE WITH A COPING SAW — THREE STEP PROCESS



After cutting both vertical lines, I remove nearly all the waste between with a fret saw.



I use a square to test the bottom of the cut for square — I'll pare the bottom as necessary until the protruding tongue of the square touches the layout on each edge without forming a gap.



To pare the sides of the bridle joint to fit the tongue stock, I use a float or a cabinetmaker's rasp, testing the fit after every few strokes.



For a decorative touch, I often curve the bottom of the handle, laying it out to a radius similar to the radius at the end of the tongue. Here a jar lid is close enough!



repeat. Continue until you are within  $\frac{1}{16}$ " or less of the scribed cross mark, then set the chisel in the mark. Position yourself so you can see that the chisel is vertical (you can set a square in the background for reference) and then tap down halfway through the stock. In most cases, the chisel — being wedge-shaped — will automatically slightly undercut the base of the joint. This is a good thing as you don't want a high spot under the tongue. Now turn the handle over and repeat the process. Check the bottom of the bridle with a square — the tongue should touch the bottom of the cut on each side of the handle. If it doesn't pare away the high spots until it does.

#### 10. Fit the Blade to the Handle

If you have deviated a bit from the layout lines, adjust the inside cheeks of the joint with your flat cabinetmaker's rasp or a float and then smooth with a cabinetmaker's file. (You can substitute a thin, flat hardwood stick faced with 120-grit sandpaper for these tools.) Test fit the tongue stock blade and, as will likely be necessary, plane it thinner with your smooth plane until it slides in.

I remove the bulk of the waste with a backsaw.

#### 11. Shape the Edges

Using your trim plane, shape and soften all the edges of the handle with a slight bevel, working a stronger bevel at the top of the handle where it meets the blade (for hand comfort and appearance). If you want, you can shape a deeper chamfer to fit the palm of your hand. Also saw, rasp and then file a radius similar to the one at the end of the tongue on the bottom end of the handle for both comfort and for the sake of appearance. Finally, work a slight bevel along all the edges of the tongue.

#### 12. Install the Tongue to the Handle

Apply thin glue to the inside of the cheeks and slide in the tongue. (Hide glue is perfect here because it doesn't swell the wood, which can interfere with assembly.) Clamp a machinist's combination square to the assembly to hold it true until the glue dries overnight. To permanently ensure against movement (and to add a decorative element), I install three rose-headed copper nails with roves (dish-shaped washers) as shown in the series of photos on page 106. The source for these nails and roves is listed in the Resources. You could alternatively choose to install three  $\frac{3}{16}$ " dowels and, if you want to get fancy, make the dowels shorter so they come below the surface of the handle on both sides allowing you to easily set a decorative inlay of contrasting wood or other material over them.

#### 13. Test for Square

A try square isn't of much use, however, unless it is dead square. To check yours for that admirable condition, set the handle against a trued edge of a board and draw out a line indexed along the tongue and onto the face of the board. Now flip the square over and draw over the line. If the square is true, the lines should be absolutely parallel. If not, you can carefully plane the edge of the tongue until they are. Repeat the process to check the underside of the tongue — you'll want this edge square for checking the edge of a board for true.

To attach the handle to the tongue, I apply a thin film of glue to the inside of the bridle joint and then slip in the tongue. I clamp a machinist's steel square to the assembly to ensure that the two pieces are aligned perpendicular to one another.

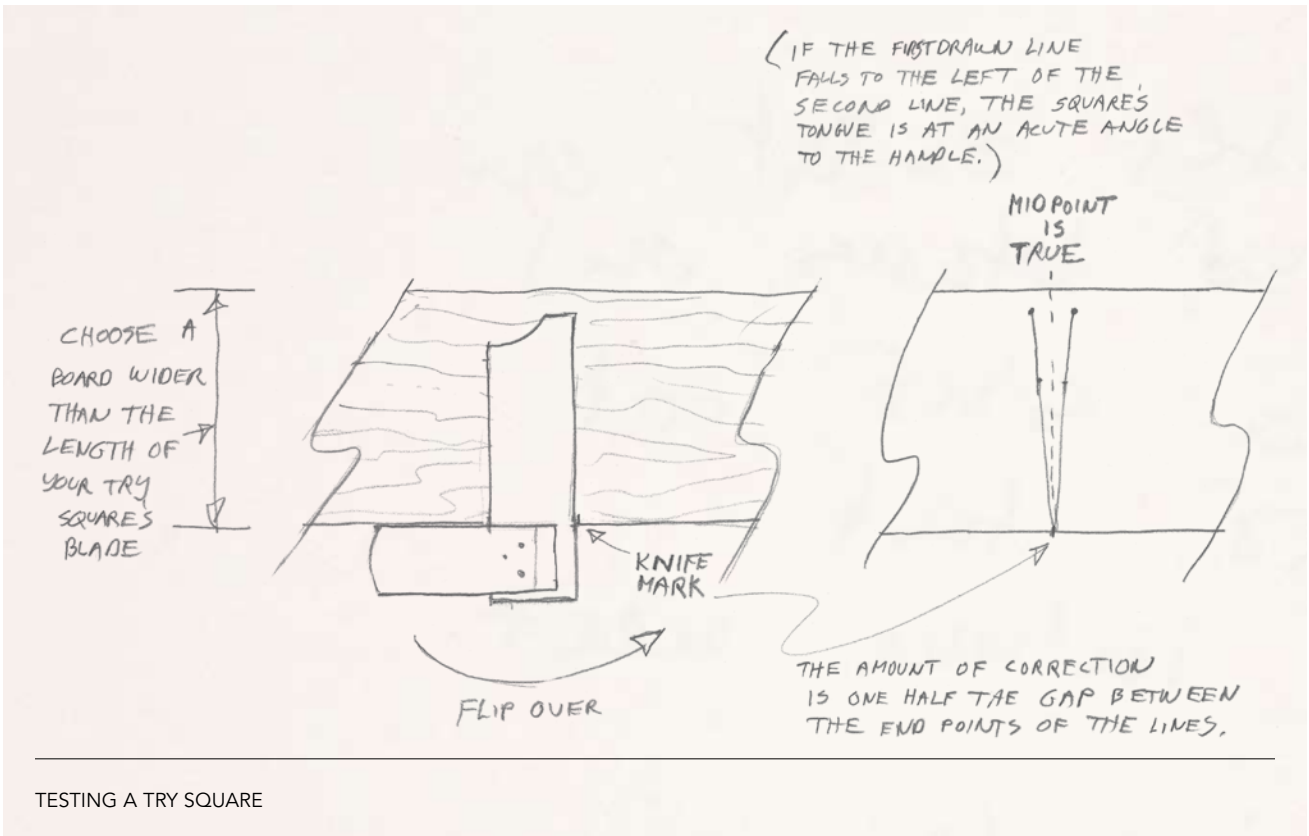


I smooth the radius with a series of rasps and files.



I bevel the top of the handle where it meets the tongue by planing across the board with a block plane to layout lines.





#### 14. Apply an Oil Finish

Because you want your square to be as stable as possible over time, apply at least six coats of penetrating oil or shellac, following the process outlined earlier for the straightedge.

After the glue dries, I fix the two parts permanently together with either wooden pegs or copper rose-headed nails and roves. Here, I'm setting the roves on the nails with a punch that has had a hole drilled in its end to slip over the nail.

I clip off the excess nail shank within about  $\frac{1}{16}$ " of the rove and then peen the copper shank over the rove with a brass hammer with a rounded head. This action spreads the shank slightly and then rounds it over the rove, which compresses the nail head and rove together and locks the rove in place permanently.