

Precision

Tips from the die-making trade

by Fred J. Johnson

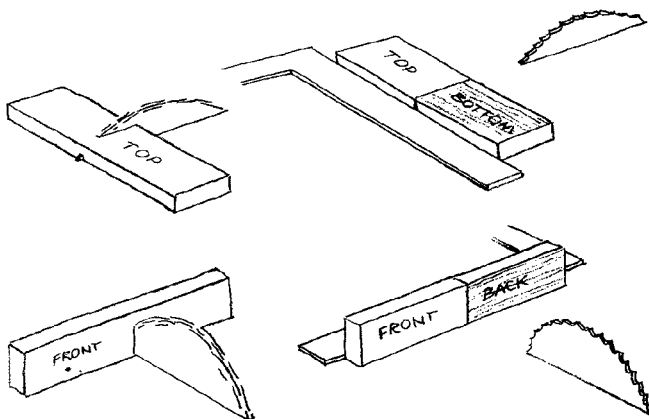
As a package designer, I am fortunate to be associated with some extremely skilled woodworkers—the steel-rule die makers who make the cutting dies used to produce folding cartons out of boxboard. Many of these cartons, beverage carriers for instance, require incredibly complex cutting dies made to tolerances usually associated with metal work. The dies are made from $\frac{3}{4}$ -in. thick hardwood-plywood blocks, which separate the steel cutting and scoring rules. Solid birch is used for the really tiny pieces of wood. I have discovered that it pays to watch others at work. Each craft and each woodworker has distinctive methods of getting the job done. Having learned from die makers a number of ways to be safer and more accurate in my own woodworking, I would like to share some of them here.

Proving a table saw

It is so easy to be a good craftsman when all of your sawn pieces are perfectly rectangular—every edge an exact 90° . Achieving this state sometimes seems difficult, but here is an easy way to check your saw to see if it is cutting squarely.

Take a piece of scrap with parallel edges and crosscut with the board flat on the saw table. Turn one of the pieces over and put the sawn edges back together. Align one side against a straightedge and examine the cut. Any error will be doubled. When you have set the miter gauge or sliding table so that only a line shows, the saw will be cutting truly square.

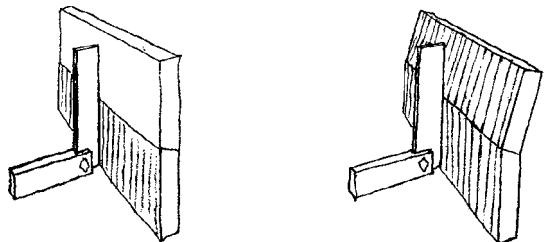
To see whether the blade is set at 90° to the table, crosscut with the scrap on edge. Crank the sawblade to its maximum height and make a cut, then check as before.



Proving a jointer

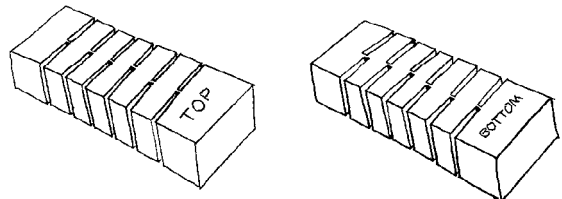
To prove that the jointer fence is set exactly at 90° to the table, joint two pieces of scrap and mark the machined edges. Stack them with jointed edges together and check their faces with a straightedge. Then turn the top piece around, keeping the same edges together, and recheck the faces. If they are not flat, then what you see is twice the error.

When edge-gluing stock, it is not imperative to have the jointer set at 90° . Anything close will do—providing the boards have relatively straight grain. Mark their faces and run alternate faces against the fence. They will edge-join flat; the error cancels.



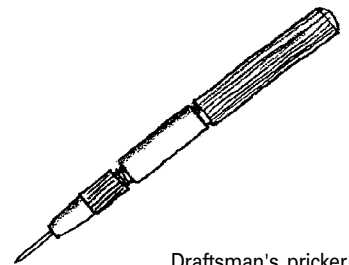
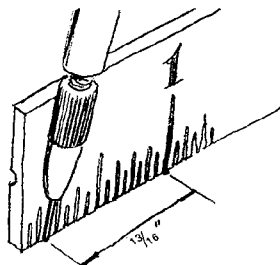
Adjusting band saws and jigsaws

Here is a simple way to ensure that the blades of band saws and jigsaws are cutting at a true 90° to the table. Set the top blade guides at the height that you are going to cut. Then take a scrap of wood an inch or so wide and cut across the width to its center. Turn it around and make another cut up to the first, stopping about $\frac{1}{32}$ in. short of cutting through. Turn the block over and examine the two kerfs. Any offset will be double the error—adjust the table and try again. It pays to recheck after changing the height of the blade guides.



Accurate measurement

To measure really accurately you need a good ruler and a draftsman's pricker, or else one made from a dowel and needle. I use an 18-in. Starrett adjustable square blade in satin chrome. Stand the ruler on edge and slide the pricker down the ruler's engraved grooves at the desired dimension, being careful to hold the pricker perpendicular to the face of the ruler. Using this technique, you can accurately space lines one hundredth of an inch apart, if your ruler is so graduated.

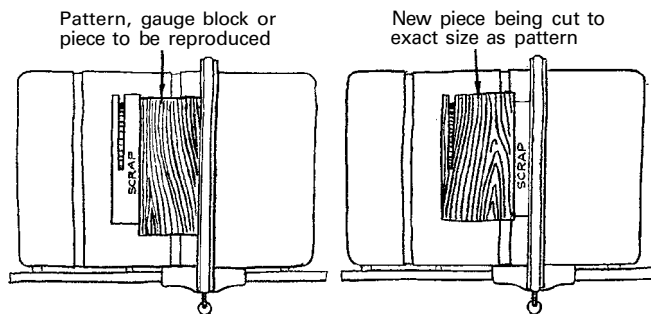


Draftsman's pricker

Cutting to precise dimensions

Here is a technique for sawing wood to precise dimensions, invaluable when reproducing a previously sawn piece. Place the piece to be reproduced against the rip fence of the table saw. Leave enough space between it and the blade for a safe cut. Hold some scrap wood against the piece and run the scrap through the saw. Then replace the piece with the scrap. Now the distance between the blade and the scrap is the same as the piece to be reproduced.

Steel-rule die makers use this technique to saw blocks of plywood to precise dimensions. They keep precut and marked blocks and strips, usually made of Micarta, aluminum or precision-ground steel. If they want to cut a block to $3\frac{1}{16}$ in. wide, they will stack pieces measuring 3 in. and $\frac{1}{16}$ in. and also a $\frac{1}{16}$ -in. steel strip against the rip fence and then cut the scrap block. This technique also saves setup time.



Precision crosscutting

The mark of precision crosscutting on a table saw is perfect edges that are smooth and straight all the way around. Some blades (carbide and dado blades are the worst offenders) chip splinters off the trailing edge of the cut. To prevent this, always place a solid backup behind and under the workpiece. Stand a piece of straight scrap on edge and screw it to the miter gauge so that it extends beyond the sawblade, for good support. The saw kerf in the scrap is also a precise way to align your cutoff mark because it represents exactly where the saw is cutting, even if there is a slight wobble to the blade.

The same principle holds true for the saw slot in the table. For super-precise cutting where you cannot tolerate any splintering, the sawblade should fit the slot exactly. Make a wooden table insert and hold it firmly in place with a stick. Then crank the blade through the insert to the depth of your cut. Now the edges of the work will be supported right at the tabletop—especially important in dado work.

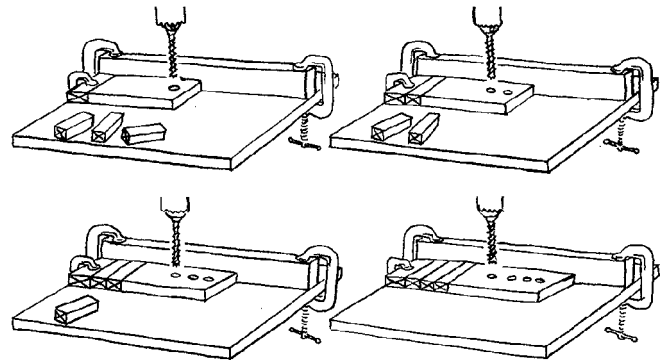
The same techniques apply to other tools. Shaper cutters, even if sharp, often tear giant splinters off the end grain. If you can't leave enough scrap on the work to trim later, glue a piece of scrap to the edge and trim it off afterwards.

Step-and-repeat

Step-and-repeat is what die makers call the process of accurately spacing holes or cuts. It is ideal for doweling. The basic setup consists of spacing blocks cut equal to the desired spacing, and stop blocks that define the end spaces. The work is held against a stop block and is then drilled or cut. The work is moved away from the stop block, and spacers are put between stop block and work, one at a time.

Fred Johnson, 50, of Long Beach, Calif., is filling his house with his reproductions of 18th-century antiques.

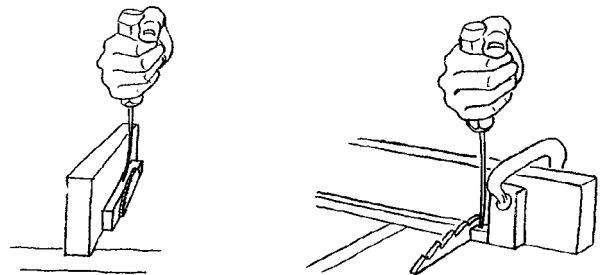
This technique has three advantages: It will space as accurately as you make your spacing blocks, you can make any number of pieces exactly the same, and you can make mating parts with exactly the same spacing. Be careful not to get sawdust between the blocks or inaccurate spacing will result.



Ice-pick technology

One of the more difficult things to do on a table saw is to cut small pieces of wood precisely and safely, especially when using the rip fence. The die makers solve this problem with ice picks. They hold the workpiece securely in the jig or fixture, or firmly against the rip fence, with the point of an ice pick. They use the pick to guide it carefully past the blade.

On rare occasions an accident chews the end off an ice pick and sends a blade or cutterhead to the sharpening shop. But consider the alternatives. Ice picks are made of excellent steel that can withstand the pressure needed to control the workpiece. Square-handled picks are best because they don't roll.



Miter gauges

The play of the miter-gauge bar in its slot can be annoying as well as contribute to inaccuracy by causing wide, long planks to jerk through the blade. To cure this, remove the bar from the protractor pan. Put it on an anvil or stout piece of steel, and peen the top edges slightly with a hammer. Go lightly over both top edges, being careful not to hit it at much of an angle. Check the fit and peen until it fits the way you want it to. If you overshoot, file the fat parts. To set a miter gauge, mark the required angle on the underside of the board to be cut. This can often be scribed directly from the work. Set the miter gauge against the same edge that will be used when cutting. Now swing the bar to align exactly with the scribed line and lock it. It is now set perfectly. □

